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US Army Corps
of Engineers®
New Orleans District

Mississippi River - Gulf Outlet

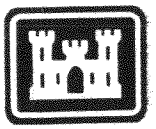
New Lock and Connecting Channels



Evaluation Report

Engineering Investigations

Volume 3 of 9
Appendix B
March 1997



U.S. Army Corps
of Engineers
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Mississippi River - Gulf Outlet
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EXECUTIVE ADDENDUM

to the

EVALUATION REPORT

ENGINEERING INVESTIGATIONS

Volume 3 of 9
Appendix B
March 1997

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

EXECUTIVE ADDENDUM

INTRODUCTION

EA.1. This executive addendum to the Engineering Appendix has been added to present the engineering alternatives developed to address issues raised during the public comment period on the Draft Evaluation Report. These issues related to the need for (1) a section of floodwall proposed on the east bank of the IHNC canal where there is currently an all earthen section, and (2) the interruption of vehicular access across the canal at St. Claude and Claiborne Ave. Bridges during construction of a new bridge at St. Claude and the replacement of the main span and towers of the Claiborne Ave. Bridge.

EA.2. References. For the bridge design one additional reference is needed under the Technical Publications heading. Add:

Louisiana Department of Transportation and Development (LADOTD), Bridge Design Manual, Third Edition, 1987.

FLOODWALL

General

EA.3. The Mississippi River flood protection levees and floodwalls must be extended from the existing lock northward approximately 2500 feet on the east and west banks to tie into the new lock.

EA.4. The recommended flood protection plan for a portion of the east bank, as presented in the main body of this appendix (plates B42 & B43), calls for the construction of 2186 feet of a combined earth/concrete capped I-wall section (MRL B/L Sta. 624+35.17 to 615+53.8 = 0+00 Lock B/L to 13+05.5). The existing Mississippi River flood protection in this reach is an all earthen levee section. The requirements to provide a navigation by-pass channel during demolition of the existing lock along with the design deep draft channel cross-section necessitated some levee degrading and use of a concrete caped I-wall for stability reasons.

EA.5. The replacement of an all earthen levee section with a floodwall is very objectionable to the local residents. To address this issue several alternatives were investigated. Based on these investigations, it is recommended that an earthen section with a concrete fold down wall (see plate EA-6), replace the combined earth/concrete capped I-wall shown on plates B-42. The concrete fold down wall will consist of panels 4 feet high by 10 feet long.

Recommended Operation

EA.6. The proposed fold down floodwall adds a maintenance and operability burden on the Orleans Levee District (OLD). To date this fold down floodwall has not been reviewed by the OLD.

EA.7. The fold down floodwall is 4 feet high and will be raised when the Carrollton gage reading rises to 15' and further rise is predicted. The 15' gage reading translates to a 13.8' stage at the IHNC canal. As shown on plate EA-6, the earthen embankment portion of the fold down wall cross-section is at elevation 18.8. The fold down wall portion of the flood protection provides the freeboard requirements for the MR&T project.

EA.8. Stage duration data indicate that a stage of 15 feet at the Carrollton gage occurs annually for a duration of 23 days, on the average; however, the stage does not reach 15 feet at all during many years. During high water years, stages exceed 15 feet for periods of one to three months. The need to raise the wall, based on occurrences of a stage of 15 feet at Carrollton with a predicted rise, would occur about once every 2 years on the average.

Alternatives

EA.9. Criterion set for the project requires that residential relocations be avoided. This eliminated the possibility of a levee setback. Therefore, several alternative wall designs were evaluated. All, except for the recommended fold down wall concept, were pile supported T-walls of various configurations that included an earthen embankment to within two feet of the top of the walls. All of these options proved prohibitive because of costs. The recommended earthen section with a fold down concrete wall proved to be the best cost alternative that addresses the local residents' concerns. The level of a design effort for these alternatives was sufficient to prove that the concrete capped I-wall could be replaced at an increased cost of $600,000. Refinements to these designs could be realized in the next level of design.

REPLACEMENT OF ST. CLAUDE AND CLAIBORNE AVENUE BRIDGE CROSSINGS

General

EA.10. The recommended plan, as presented in the main body of the appendix, required a two-year interruption of vehicular traffic across the IHNC canal at St. Claude Ave. while the St. Claude Bridge was being replaced. The interruption of traffic at the Claiborne Ave. Bridge was estimated to be seven months. These outages proved to be one of the more significant impacts surfaced through the public review process. We revisited the bridge plans in an effort to reduce delays without greatly increasing the project costs. A/E firms were contracted to provide bridge design expertise. Several alternatives were investigated at both St. Claude and Claiborne Avenues. The solutions significantly reduced delays/outages to a negligible amount.

EA.11. The revised bridge plans increased the project cost by approximately $13,000,000. These bridge revisions eliminate the need for the extensive detour routes previously proposed. The cost of the detours is $8,400,000, leaving a net increase to the project cost of $4,600,000 for the bridge revisions. However, the detour routes were added back into the project mitigation plan for other reasons described in Volume 2, Community Impact Mitigation Plan. The revisions leave the main arteries virtually unaffected, and may in fact actually be an improvement in comparison to the existing substandard lane widths at the St. Claude Bridge.

ST. CLAUDE BRIDGE REPLACEMENT AND DETOUR

General

EA.12. The A/E firm of URS-Greiner was contracted to provide consultation and bridge expertise. The recommended plan is based on information provided by URS-Greiner and the work previously done by N.Y. Assoc., INC. The recommended replacement bridge at St. Claude will be a 200 foot horizontal clearance double leaf bascule bridge in the existing bridge footprint as originally proposed. However, a four lane detour located 100 feet north of the existing bridge will be provided during construction of the replacement bridge. See plates EA-1, EA-2 and EA-3. The detour will include two single leaf temporary bascule bridges that will span both the existing lock and the demolition bypass channel. The operating time for the new double leaf bascule bridge is 90 seconds. The operating time for the detour bridge is 120 seconds.

EA.13. The construction of the new bridge is complicated by the project criterion requiring avoidance of residential relocations, concurrent demolition of the existing lock, and community opposition to anything but a low level bridge. Under the initial plan, St. Claude Ave. would be closed for 24 months, the channel would be closed to ship traffic for 24 months and barge traffic would be obstructed for 30 continuous days plus intermittent closures to accommodate demolition blasting. In order to reduce vehicular outage, the detour must provide passage over the lock and the bypass channels.

St. Claude Bridge Replacement

EA.14. The initial proposal is described in paras. B.2.138 to B.2.151 of the engineering appendix. The plans for the permanent bridge will not change except that para. B.2.142 is no longer applicable. The construction sequence is described in paras. EA.21 and 22. At the recommendation of the A/E, in the next level of design, a through truss design will replace the submitted girder design. The through truss construction will significantly reduce the elevation of the bridge final grade. This change will reduce the length and height of the approaches.

EA.15. The permanent bridge replacement cost, including the approaches, is estimated to be $28,067,700. This cost has a 25% contingency factor.

St. Claude Detour

EA.16. There is sufficient area north of the existing bridge to construct a 4 lane detour. The western half of the detour is severely constrained by a house that is located at approximate Station 24+10, between Japonica Street and the railroad tracks (see Plate EA-1). On the Eastern side of the canal, the constraints are a pump station located at approximate Station 34+30 between Sister Street and Jordan Avenue and a house on the northeast corner of Jordan Avenue, approximate Station 37+60. The pump station is offset from the existing bridge approach by approximately 160 feet and does not appear to pose any clearance problems for the detour bridge approach structure. In evaluating the location of the detour bridge, it was determined that an offset of 100 feet would provide adequate clearance from the existing structure for demolition. This offset provides approximately 13 feet of clearance from the existing control house to the edge of the detour road. On the east side, a standard LADOTD Type C detour can be utilized within the space available. This configuration has a design speed of 40 mph. On the west side, due to the severe constraints imposed by the buildings between Japonica Street and the railroad, a Type B detour is recommended with 12 foot lanes instead of 11. This configuration has a design speed of 30 mph, which dictates the posted speed limit of 25 mph.

EA.17. Adequate space has been provided to accommodate a 4-lane roadway with 12 foot travel lanes and a 5 foot sidewalk on the northern side (See Plate EA-1). Access to the walkway will be provided by a staircase located east of the houses between Japonica Street and the railroad tracks on the west side and at Sister Street on the east side. By locating the western stairway east of the existing buildings, the roadway section prior to that point will not require a walkway, thus reducing the roadway section and improving the clearance to those buildings. Also note that with more accurate surveys and minor refinements to the detour geometry, the conflict between the east side detour and the pedestrian tunnel might be able to be avoided, thus eliminating the need for the extension of this structure.

EA.18. In order to accommodate both lock demolition and bypass channel two single leaf bascule bridges are required. Only one span will be movable at a time. Both leaf free ends are supported by a common pier. By using a through girder single leaf bascule bridge, the profile for the detour bridge can be set lower than for a similar conventional bridge. This will significantly reduce the amount of fill required for the recommended sheet-pile retained embankment. The profile also maintains existing clearances for all tunnel crossings.

EA.19. The single-leaf bascule with an overhead counterweight is recommended for the temporary movable spans. This bridge type will span the existing navigation lock structure and demolition channel, provide at least 156' of vertical clearance with the span raised, and carry four (4) lanes of vehicular traffic and a 5' pedestrian sidewalk. The single-leaf bascule with an overhead counterweight can be achieved with conventional bascule span types such as a Dutch-style trunnion bascule with an overhead balance frame or Scherzer rolling bascule with a fixed counterweight. The

overhead counterweight eliminates the need for a large bascule pier, and corresponding mass excavation to provide for rotation of the counterweight. In general, bascule piers required for overhead counterweight schemes are of a simplified configuration. The simplified configuration translates to significant reductions in material and formwork required for bascule pier construction. Also, these simplified piers are generally much lighter than conventional bascule piers resulting in reduced loads on the foundations. Thus, the bascule piers will be less expensive than piers for bascule spans with underdeck counterweights. A single-leaf bascule will require a span length of 125' from center of heel trunnion to center of bearing at the toe of the leaf. The piers are pile founded. Excavation and demolition of a portion of the emergency crane support on the west wall may be required to install the piles. The detour alignment over the emergency dam does not present a problem since the new lock will be in operation and the river flood protection completed.

EA.20. In evaluating the detour approach structure, two alternatives were investigated: a sheet pile retained embankment to support the approaches and a steel H-pile frame to support a concrete deck system. The steel H-pile frame option was eliminated due to the complexity of this type of structure with the detour geometry proposed. This type of structure would be particularly complex around the railroad and vehicular tunnel extensions required for this project. At these points, the detour roadway is skewed significantly from the direction of the tunnel; therefore orientation of the steel H-pile frame would be difficult to achieve without interfering with the tunnel geometry. The retaining wall approach is more economical and simpler to construct. The railroad, vehicular and pedestrian tunnels will be accommodated by extending the tunnel structure and abutting the sheet pile retaining wall into that structure. A headwall will be constructed at the end of the tunnel section to match the height and geometry of the retaining wall.

EA.21. The detour route including the two single leaf bascule bridges, approaches, traffic control, and detour removal is estimated to be $17,122,100. This cost has a 20% contingency factor. The salvage value of the bascule bridges and sheet piling has not been considered.

ST. CLAUDE BRIDGE REPLACEMENT CONSTRUCTION SEQUENCE

EA.22. The construction sequence proposed in the engineering appendix must be revised slightly to accommodate the St. Claude detour plan. The new sequence will <u>not</u> lengthen the overall project duration. The construction duration of critical path items is as follows:

EVENT	DURATION
-Claiborne Ave Bridge Complete	N/A
-Detour Construction	9 months
-Bypass Excavation w/ minimal Lock Demolition	4 months
-Lock Demolition	18 months
-New Bridge Construction Except East Pier & Superstructure	16 months
-New Bridge East Pier & Superstructure	3 months
-Remove Detour	3 months

EA.23. The Claiborne Avenue Bridge Replacement will be completed at any time prior to the commencement of the St. Claude Bridge Replacement and lock demolition. The St. Claude bridge replacement is built in the same alignment as the existing bridge. The new bridge cannot be built in its entirety until the existing lock is demolished and the marine traffic moved from the demolition bypass back to the existing navigation channel centerline. The new east pier is located in the center of the bypass. Without the bypass, barge traffic would experience an outage the entire 18 month lock demolition period. This would impose a serious burden to the barge industry and has been eliminated from consideration. Once demolition is complete and marine traffic is returned to the existing navigation channel centerline, the new bridge will be completed. The St. Claude Ave. Bridge and detour construction sequence is further described in paras. EA.35 and 36.

CLAIBORNE BRIDGE REPLACEMENT

General

EA.24. The A/E firm of Modjeski and Masters was contracted to provide consultation and bridge expertise. The recommended plan is based on information provided by Modjeski and Masters and the work previously done by Parsons, Brinckerhoff, Quade and Douglas, INC. Several alternatives were pursued. The recommendation is to replace the main span as submitted in the engineering appendix, but without the pier retro fit. The superstructure will be fabricated and installed in such a manner that vehicular outage will be two to four weeks. Since the work is on the existing alignment, it is not prudent to erect or dismantle steelwork over or adjacent to vehicular traffic. Therefore, the work would be accomplished over weekends thus minimizing impacts during peak demand. The canal would be closed to marine traffic during float-out and float-in periods, each of 12-24 hour duration. The marine outage would be

approximately 21 days. The continuous outage only applies to marine traffic requiring over a 40' height. Scheduled intermittent marine traffic will be allowed throughout the marine closure period for all traffic that can clear the 40' clearance restriction.

EA.25. The replacement of the main span is described in paras B.2.152 to B.2.159. Paragraphs addressing the pier retrofit are no longer applicable. Note that the replacement roadway will match the existing span in-kind; however, the roadway width is substandard for a LADOTD UA-1 classification. The main span replacement is shown on plates EA-4 and EA-5.

EA.26. Opening Times. The estimated time for opening the bridge will be:

Full opening, about 185 seconds.

Half opening, about 90 seconds.

Replacement Span Future Improvements

EA.27. Modjeski and Masters recommended improving the present design. The improvements include replacing the parallel chord Warren Truss with a variable depth Warren Truss and replace the deck with an orthotropic deck. The orthotropic design would reduce the depth of the bottom chord and floor system, thus providing additional vertical clearance for marine traffic. The issue of available vertical clearance is further discussed in para. EA.31 below. Also, the A/E recommends using a span drive system rather than the tower-drive. The advantage of the span drive is that it is installed and tested on the main span prior to installation. The lift mechanism would be brought to the site in a ready to use condition. The tower drive would have to be installed after the piers are completed and adjusted. The tower drive added two days to the vehicular outage time.

Existing Piers

EA.28. The plan proposed in the engineering appendix includes an encapsulation of the existing tower piers based on a theory that the timber piles may be deteriorated, and that the actual load capacity of the piles may be inadequate. Modjeski and Masters has inspected this bridge for the state for several years. They do not accept or endorse this conclusion on the basis that there is no evidence to support it. Rather, they believe that the existing piers, which have served satisfactorily for the last 40 years, will continue to serve satisfactorily for another 50 years. They strongly recommend not modifying the pier. Representatives from the LADOTD agreed with this recommendation. The pier retrofit work has been deleted.

Construction Procedures

EA.29. Both the new lift span and the two new towers will be fabricated and erected off-site for float-in erection. The new towers will be designed to be erected complete in the horizontal position, then floated-in, lifted and pinned to the front tower base shoes, then rotated into a

vertical position using heavy lifting equipment. Rear tower leg adjustments will allow for field plumbing of the towers. The new lift span will be floated into position between erected towers, and while flooding the barges to set the span onto the pier tops, the counterweight ropes will be attached. The counterweights will be precast concrete sections lifted and joined to a frame positioned above the tower roadway on temporary support beams, then raised into position and connected to the ropes. Balancing and operational start-up will follow.

EA.30. The overall cost of the main span replacement, including new mechanical and electrical components is $14,060,700. This cost has a 25% contingency factor.

Vertical Clearance Comparison

EA.31. By locating the new lock north of the Claiborne Ave. Bridge, the Claiborne Ave. Bridge (in the closed position) will be influenced by Mississippi River stages as compared to Lake Pontchartrain stages with the existing lock. The proposed Claiborne Ave. Bridge replacement will not change the low steel elevation when the bridge is closed. River design stages are rarely encountered. With design refinements, an additional 4 feet of clearance could be provided. The net effect is that a negligible loss of vertical clearance (2.5' or less) will occur over 70% of the year.

Bypass Channel for Old Lock Demolition

EA.32. The bypass channel is described in the engineering appendix paras. B.2.98 to B.2.102. The bypass does not change, however, the construction sequence for bridges, detour, bypass and lock demolition is altered. The revised sequence is detailed in paras. EA.34 thru 37.

EA.33. Demolition of the Existing Lock is described in the engineering appendix paras. B.2.120 to B.2.123. The demolition procedures do not change, however, the sequence is revised to accommodate the St. Claude Avenue Bridge Replacement and detour. The construction sequence is described in paras. EA.35 thru 37. The sequence is shown on Plates EA-7, EA-8, and EA-9.

CONSTRUCTION SEQUENCE FOR BRIDGES, DETOUR, AND LOCK DEMOLITION

EA.34. The construction of the Claiborne Bridge Main Span Replacement is not on the critical path; it may be completed anytime within the initial seven years of lock construction. However, it must be complete prior to working on the St. Claude Avenue Bridge replacement.

EA.35. The St. Claude Avenue detour will take nine months to construct. The two single bascule bridges will be fabricated off-site. The bridges shall be installed after the new lock is in operation so that the emergency dam and crane can be removed from the existing lock. Concurrent with the detour construction, the east lock wall backfill will be excavated (after the new lock is in place and the river flood protection established). After the backfill is removed, the old lock northeast

retaining wall shall be demolished and removed. Dredging of the demolition bypass will then commence starting at the northern end. Navigation traffic will continue to pass through the existing lock as it will be used as a "pass-through" lock only (no lockages or head differential).

EA.36. When the detour is completed and opened to traffic, the St. Claude bridge demolition will commence. The east side bridge pier and retaining walls will also be demolished. Demolition of the steel superstructure will be limited to the minimum time required by the contractor to take down the bridge. Bridge demolition equipment shall work without occupying the lock chamber. The canal will be closed only when safety hazards exist to navigation. This is expected to be only a few hours per day, during actual debris removal operations, within a 30-day time frame for the steel superstructure. Concrete masonry removal will require an estimated 30 additional days during which navigation will be impeded only minutes per day (work is underwater) for potential safety hazards during debris removal operations. Dredging of the bypass will be timed so that the dredge will reach the south end after the pier and retaining wall are removed. The bypass will then be opened to barge traffic. Ship traffic will be excluded throughout the 18 month lock demolition.

EA.37. Lock demolition commences, starting at the south end and proceeding north (see plate EA-7). Concurrent with lock demolition will be the construction of the new St. Claude Bridge. The approaches and west pier are constructed and the bascule superstructure is fabricated off-site. Once lock demolition is complete the existing navigation channel is reopened to <u>all</u> navigation. The bridge east pier is constructed within a braced excavation. The superstructure is brought to the site on barge and installed within a 5 day navigation closure. The new St. Claude Bridge is opened and the detour removed.

COST ESTIMATES

EA.38. The code of account cost tables for the NED and Recommended Plans have been revised to reflect these changes to the plans presented in the main body of this appendix. They are attached at the end of this addendum.

RIGHTS OF WAY

EA.39. The rights of way for the lock North of Claiborne Avenue site as shown on plates B-57 thru B-59 are changed only to include acreage for the temporary detour at St. Claude Ave.

COST ESTIMATE
1200 X 110 X 36
RECOMMENDED PLAN

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
1200 X 110 X 36 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	PROJECT PLANNING						
01A10	Real Estate Supplement/Plan	LUMPSUM	LS	$3,000	$3,000	$750	$3,750
01A50	All Other RE Analysis/Docs	LUMPSUM	LS	$22,680	$22,680	$5,670	$28,350
01B--	ACQUISITIONS						
01B10	By Government	LUMPSUM	LS	$116,630	$116,630	$29,158	$145,788
01C--	CONDEMNATIONS						
01C10	By Government	LUMPSUM	LS	$45,080	$45,080	$11,270	$56,350
01D--	INLEASING	LUMPSUM	LS	$0	$0	$0	$0
01E--	APPRAISAL						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$46,000	$46,000	$11,500	$57,500
01F--	PL 91-646 ASSISTANCE						
01F10	By Government	LUMPSUM	LS	$43,680	$43,680	$10,920	$54,600
01G--	TEMPORARY PERMITS						
01G10	By Government	LUMPSUM	LS	$18,050	$18,050	$4,513	$22,563
01G60	Damage Claims	LUMPSUM	LS	$3,000	$3,000	$750	$3,750
01H--	AUDITS	LUMPSUM	LS	$0	$0	$0	$0
01J--	ENCROCHMENTS & TRESPASS	LUMPSUM	LS	$0	$0	$0	$0
01K--	DISPOSALS	LUMPSUM	LS	$0	$0	$0	$0
01L--	REAL PROPERTY ACCOUNTABILITY	LUMPSUM	LS	$0	$0	$0	$0
01R--	REAL ESTATE PAYMENTS						
01R1-	LAND PAYMENTS						
01R1A	By Government	LUMPSUM	LS	$34,510,000	$34,510,000	$8,627,500	$43,137,500
01R2-	PL 91-646 ASSIST. PAYMTS.						
01R2A	Personal Property Moving	LUMPSUM	LS	$1,314,850	$1,314,850	$328,713	$1,643,563
01R2B	Re-establishment Cost	LUMPSUM	LS	$60,000	$60,000	$0	$60,000
01R9-	OTHER PAYMENTS	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD CREDITING						
01T20	ADMINISTRATIVE COSTS	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$36,188,790		
01------	Contingencies					$9,032,198	
01------	Contingency - round off						($20,988)
01------	TOTAL REAL ESTATE						$45,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02---	RELOCATIONS						
021---	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	St. Claude Detour						
	Mob and Demob	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
	Two Single Bascule Bridges						
	Bascule Superstructure	LUMPSUM	LS	$9,162,500	$9,162,500	$1,832,500	$10,995,000
	Substructure and Foundation	LUMPSUM	LS	$1,522,000	$1,522,000	$304,400	$1,826,400
	Approach Ramps	LUMPSUM	LS	$2,244,700	$2,244,700	$448,940	$2,693,640
	Misc. Traffic Control	LUMPSUM	LS	$236,700	$236,700	$47,340	$284,040
	Detour Removal	LUMPSUM	LS	$902,500	$902,500	$180,500	$1,083,000
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$127,500	$637,500
	Replace Superstructure	LUMPSUM	LS	$6,743,000	$6,743,000	$1,685,750	$8,428,750
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$594,201	$2,971,005
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$353,685	$1,768,425
022---	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023---	Cemeteries, Utilities, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$423,340	$423,340	$105,835	$529,175
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$888,160	$888,160	$222,040	$1,110,200
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$854,000	$854,000	$213,500	$1,067,500

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$367,220	$367,220	$91,805	$459,025
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC						
	GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$827,160	$827,160	$206,790	$1,033,950
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$713,700	$713,700	$178,425	$892,125
	NEW ORLEANS PUBLIC SERVICE, INC						
	ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$538,020	$538,020	$134,505	$672,525
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$577,060	$577,060	$144,265	$721,325
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	NEW ORLEANS PUBLIC SERVICE, INC						
	COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD						
	SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,577,460	$1,577,460	$394,365	$1,971,825
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,515,240	$1,515,240	$378,810	$1,894,050
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD						
	WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,257,820	$1,257,820	$314,455	$1,572,275
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$46,360	$46,360	$11,590	$57,950
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,469,280	$2,469,280	$617,320	$3,086,600
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,431,060	$1,431,060	$357,765	$1,788,825
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02--	Subtotal: Relocations				$68,959,506		
02--	Contingencies					$16,526,457	
02--	Contingency - round off						$14,037
02--	TOTAL: RELOCATIONS						$85,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05——	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	270,500	CY	$3.00	$811,500	$162,300	$973,800
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee / I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
0500030	Sitework						
	Protection Cells PS 27.5 Piling	205,800	SF	$14.40	$2,963,520	$592,704	$3,556,224
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,860	LF	$3,315.00	$6,165,900	$1,233,180	$7,399,080
	Lakeside Protective End Cell						
	PS 27.5 Piling	32,200	SF	$11.00	$354,200	$70,840	$425,040
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Dolphins 4X	LUMPSUM	LS	$350,000	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
0500040	Site Work						
	Roadway and Parking, Asphaltic	5,000	SY	$18.00	$90,000	$18,000	$108,000
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,200	CY	$16.00	$99,200	$19,840	$119,040
	Landscaping - 29 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
0500090	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
0500090	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000	$400,000	$80,000	$480,000
0500090	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
0500091	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010--	Earthwork for Structures						
0500100	Site Work						
	Excavation (To El. -61)		Cost Included in Account 09				
	Dressing Exacavated Slopes	60,000	CY	$1.40	$84,000	$16,800	$100,800
	Landscaping of Backfill	LUMPSUM	LS	$805,800	$805,800	$161,160	$966,960
0500100	Lock Site-Backfill						
	Granular Backfill	730,000	CY	$13.75	$10,037,500	$2,007,500	$12,045,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	104,500	CY	$20.85	$2,178,825	$435,765	$2,614,590
0500100	Foundation Protection						
	36" Riprap	60,000	TN	$23.50	$1,410,000	$282,000	$1,692,000
	12" Gravel Bedding	12,000	CY	$18.00	$216,000	$43,200	$259,200
	Filter Fabric	36,000	SY	$3.00	$108,000	$21,600	$129,600
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	26,100	SF	$14.00	$365,400	$73,080	$438,480
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	19,200	LF	$190.00	$3,648,000	$729,600	$4,377,600
	Precast Pad & Flat Jacks	LUMPSUM	LS	$800,000	$800,000	$160,000	$960,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	60,480	LF	$180.00	$10,886,400	$2,177,280	$13,063,680
	Tension Anchors	LUMPSUM	LS	$558,000	$558,000	$111,600	$669,600
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	182,400	LF	$170.00	$31,008,000	$6,201,600	$37,209,600
	3' Crushed Stone Base	34,500	CY	$30.00	$1,035,000	$207,000	$1,242,000
	Furnishing/Handling of Underwater Screeding Frame	LUMPSUM	LS	$500,000	$500,000	$100,000	$600,000
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	46,000	CY	$70.00	$3,220,000	$644,000	$3,864,000
	Piping for Grout	LUMPSUM	LS	$1,100,000	$1,100,000	$220,000	$1,320,000
	Containment Sheet Piling PZ-22	84,000	SF	$15.00	$1,260,000	$252,000	$1,512,000
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mech.:						
0500570	Metals						
	Miter Gates (4 sets)	2,964,800	LBS	$2.00	$5,929,600	$1,185,920	$7,115,520
	Emer. Bulkheads	1,600,000	LBS	$1.80	$2,880,000	$576,000	$3,456,000
0500570	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
0500571	Gate Machinery	LUMPSUM	LS	$1,800,000	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
0500610	Conc. Floating Guidewalls						
	Cofferdam (Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	30,800	SF	$13.80	$425,040	$85,008	$510,048
	Wale System (5 Tiers)	430,000	LB	$1.15	$494,500	$98,900	$593,400
	Guidewall						
	Piling, HP 14X73	10,200	LF	$28.25	$288,150	$57,630	$345,780
	Precast Concrete Pontoons	2,500	CY	$370.00	$925,000	$185,000	$1,110,000
	Concrete, In-Place	2,000	CY	$200.00	$400,000	$80,000	$480,000
	Sand Fill	800	CY	$11.50	$9,200	$1,840	$11,040
	Pontoon Timbers(12X12)	7,800	LF	$35.00	$273,000	$54,600	$327,600
	Miscellaneous Metals	135,000	LB	$1.90	$256,500	$51,300	$307,800

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	44,500	LF	$36.00	$1,602,000	$320,400	$1,922,400
	12"X12"Treated Timber Fenders	6,920	LF	$30.50	$211,060	$42,212	$253,272
	3"X12" Treated Timber Planks	16,680	LF	$16.50	$275,220	$55,044	$330,264
	End Cells						
	Piling, Steel Sheet PS-27.5	73,000	SF	$13.75	$1,003,750	$200,750	$1,204,500
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	26,000	CY	$11.50	$299,000	$59,800	$358,800
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	53,100	CY	$270.00	$14,337,000	$2,867,400	$17,204,400
	Reinf. Conc. Slab (Fc = 6000 psi)	54,500	CY	$160.00	$8,720,000	$1,744,000	$10,464,000
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	855,100	LF	$6.00	$5,130,600	$1,026,120	$6,156,720
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	19,900	CY	$260.00	$5,174,000	$1,034,800	$6,208,800
	Rein. Conc. Slab (Fc = 4000 psi)	42,000	CY	$150.00	$6,300,000	$1,260,000	$7,560,000
	Ballast Concrete	125,600	CY	$70.00	$8,792,000	$1,758,400	$10,550,400
	Piping for Ballast Concrete	LUMPSUM	LS	$1,100,000	$1,100,000	$220,000	$1,320,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000	$3,000,000	$600,000	$3,600,000
0500630	Metals						
	Wall Armor	624,000	LBS	$3.00	$1,872,000	$374,400	$2,246,400
	Floating Mooring Bits	175,000	LBS	$2.50	$437,500	$87,500	$525,000
	Miscellaneous Metals	1,090,000	LBS	$1.90	$2,071,000	$414,200	$2,485,200
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,688,000	LBS	$1.80	$4,838,400	$967,680	$5,806,080
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
0500631	Construction Guides & Instrumentation	LUMPSUM	LS	$223,500	$223,500	$44,700	$268,200
050064--	Culvert Valves & Oper. Mach.:						
0500640	Metals						
	Tainter Valves	195,900	LBS	$1.90	$372,210	$74,442	$446,652
	Culvert Bulkhead	213,500	LBS	$2.00	$427,000	$85,400	$512,400
0500641	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$860,000	$860,000	$172,000	$1,032,000
050065--	Piping Systems:						
0500651	Mechanical						
	Hydraulic System	LUMPSUM	LS	$959,000	$959,000	$191,800	$1,150,800
	Compressed Air System	LUMPSUM	LS	$210,000.00	$210,000	$42,000	$252,000
	Washdown System	LUMPSUM	LS	$240,000	$240,000	$48,000	$288,000
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

MRGO LOCK AND CONNECTING CHANNELS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
File: 12LBRI97.WB1 1200 X 110 X 36 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
0500661	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$322,000	$322,000	$64,400	$386,400
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$526,000	$526,000	$105,200	$631,200
	Raceway System	LUMPSUM	LS	$724,000	$724,000	$144,800	$868,800
	Wire and Cable	LUMPSUM	LS	$744,500	$744,500	$148,900	$893,400
	Lighting Systems	LUMPSUM	LS	$361,500.00	$361,500	$72,300	$433,800
	Signal & Comm. Systems	LUMPSUM	LS	$115,500.00	$115,500	$23,100	$138,600
	Lighting Protection and Ground System	LUMPSUM	LS	$135,000.00	$135,000	$27,000	$162,000
	Elec. Testing	LUMPSUM	LS	$179,000.00	$179,000	$35,800	$214,800
	Generator	LUMPSUM	LS	$143,000.00	$143,000	$28,600	$171,600
	Other Electrical Work	LUMPSUM	LS	$182,000.00	$182,000	$36,400	$218,400
050099--	Associated General Items:						
0500991	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000	$2,453,000	$490,600	$2,943,600
	Lock Slab Demolition	LUMPSUM	LS	$3,679,000	$3,679,000	$735,800	$4,414,800
	Debris Removal	LUMPSUM	LS	$2,836,000	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000	$690,000	$138,000	$828,000
	Guidewall & Dolphin Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000	$1,031,000	$206,200	$1,237,200
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
0500993	Site Work						
	Permanent Mooring Facil.						
	Cells						
	PSA 23 Sheet Piling	144,600	SF	$13.80	$1,995,480	$399,096	$2,394,576
	PS 27.5	26,000	SF	$13.75	$357,500	$71,500	$429,000
	Sand Fill	27,000	CY	$11.75	$317,250	$63,450	$380,700
	Concrete Cap	1,850	CY	$121.50	$224,775	$44,955	$269,730
	Timber Fenders						
	18" Dia. Treated Piles	48,000	LF	$36.00	$1,728,000	$345,600	$2,073,600
	12"X12"Treated Tim. Fenders	22,000	LF	$72.50	$1,595,000	$319,000	$1,914,000
	3"X12" Treated Tim. Bracing	28,000	LF	$63.00	$1,764,000	$352,800	$2,116,800
0500994	Temporary Offsite Parking	LUMPSUM	LS	$983,300	$983,300	$196,660	$1,179,960
05——	Subtotal: Locks				$214,760,305		
05——	Contingencies					$43,047,061	
05——	Contingency - round off						($7,366)
05——	TOTAL: LOCKS						$257,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09——	CHANNELS AND CANALS						
0901——	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
090113--	Traffic Control:						
0901130	Site Work						
	Dredge North Bypass Channel	873,000	CY	$1.85	$1,615,050	$323,010	$1,938,060
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	60	MO	$120,000.00	$7,200,000	$1,440,000	$8,640,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	1,100,000	CY	$1.75	$1,925,000	$385,000	$2,310,000
	Dredge, Main Chann. North of New Lock	58,000	CY	$3.00	$174,000	$34,800	$208,800
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	440,000	CY	$2.65	$1,166,000	$233,200	$1,399,200
	Dredge, River to St. Claude (Use Material as Random Fill)	55,000	CY	$3.05	$167,750	$33,550	$201,300
	Dredge, River to St. Claude	172,000	CY	$1.85	$318,200	$63,640	$381,840
	Dredge, 3 Utility Crossings	200,000	CY	$2.50	$500,000	$100,000	$600,000
090130--	Bank Stabilization:						
0901300	Site Work-North Bypass						
	36" Riprap	36,000	TN	$23.50	$846,000	$169,200	$1,015,200
	12" Gravel Bedding	7,500	CY	$18.00	$135,000	$27,000	$162,000
	Filter Fabric	22,000	SY	$3.00	$66,000	$13,200	$79,200
09——	Subtotal: Channels and Canals				$18,354,250		
09——	Contingencies:					$3,670,850	
09——	Contingency-round off						($25,100)
09——	TOTAL: CHANNELS AND CANALS						$22,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101—	LEVEES						
110101—	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199—	Associated General Items:						
1101991	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992	Tie-In Levee/I-Wall						
	I-Wall/Fold Down	2,200	LF	$415.00	$913,000	$136,950	$1,049,950
	Piling, Steel Sheet PZ-22	85,230	SF	$10.95	$933,268	$139,990	$1,073,259
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994	Utility Crossings & Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,915,894		
11——	Contingencies:					$1,487,384	
11——	Contingency - round off						($3,278)
11——	TOTAL: LEVEES AND FLOODWALLS						$11,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
18——	CULTURAL RESOURCE PRESERVATION						
180086--	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
18——	Subtotal: Cultural Resource Preservation				$480,000		
18——	Contingencies:					$120,000	
18——	Contingency - round off						($0)
18——	TOTAL: CULTURAL RESOURCE PRESERVATION						$600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25——	MITIGATION						
2591——	DIRECT IMPACT MINIMIZATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,068,800	$1,068,800	$267,200	$1,336,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$2,800,000	$2,800,000	$700,000	$3,500,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000
	Cultural Display (Old Lock)	LUMPSUM	LS	$160,000	$160,000	$40,000	$200,000
	Temp Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Training Assistance	LUMPSUM	LS	$1,200,000	$1,200,000	$300,000	$1,500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	New Roadway in St. Bernard Parish			$6,838,400	$6,838,400	$1,709,600	$8,548,000
	Subtotal: Direct Impact Minimization				$14,000,000	$3,500,000	$17,500,000
2592——	INDIRECT COMPENSATION FOR IMPACTS						
	Lighting Improvements	LUMPSUM		$80,000	$80,000	$20,000	$100,000
	Community Improvements	LUMPSUM		$1,400,000	$1,400,000	$350,000	$1,750,000
	Street Resurfacing, Drainage Improvements, and Landscaping	LUMPSUM		$4,000,000	$4,000,000	$1,000,000	$5,000,000
	Business Assistance Program	LUMPSUM		$600,000	$600,000	$150,000	$750,000
	Neighborhood Revitalization Program	LUMPSUM		$4,720,000	$4,720,000	$1,180,000	$5,900,000
	Additional Police/Emergency Medical Services	LUMPSUM		$1,600,000	$1,600,000	$400,000	$2,000,000
	Subtotal: Indirect Compensation For Impacts				$12,400,000	$3,100,000	$15,500,000
25——	Subtotal: Mitigation				$26,400,000		
25——	Contingencies					$6,600,000	
25——	Contingency - round off						$0
25——	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30——	ENGINEERING AND DESIGN						
3001——	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002——	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$3,240,486	$3,240,486	$648,097	$3,888,583
	Cost Estimates	LUMPSUM	LS	$45,268	$45,268	$9,054	$54,322
	Report Preparation	LUMPSUM	LS	$18,348	$18,348	$3,670	$22,018
	VE Investigations	LUMPSUM	LS	$26,325	$26,325	$5,265	$31,590
	AE Contracts	LUMPSUM	LS	$1,270,600	$1,270,600	$254,120	$1,524,720
	Programs & Project Management	LUMPSUM	LS	$123,000	$123,000	$24,600	$147,600
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$176,860	$176,860	$35,372	$212,232
	Cost Estimates	LUMPSUM	LS	$3,140	$3,140	$628	$3,768
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$33,200	$33,200	$6,640	$39,840
300205-	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$785,703	$785,703	$157,141	$942,844
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$13,761	$13,761	$2,752	$16,513
	VE Investigations	LUMPSUM	LS	$25,730	$25,730	$5,146	$30,876
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$61,086	$61,086	$12,217	$73,303
300206-	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$200,481	$200,481	$40,096	$240,577
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	Report Preparation	LUMPSUM	LS	$15,000	$15,000	$3,000	$18,000
	AE Contracts	LUMPSUM	LS	$60,000	$60,000	$12,000	$72,000
	Programs & Project Management	LUMPSUM	LS	$155,728	$155,728	$31,146	$186,874
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003—	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004—	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,345	$70,345	$14,069	$84,414
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005---	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$358,060	$358,060	$71,612	$429,672
	Cost Estimates	LUMPSUM	LS	$32,198	$32,198	$6,440	$38,638
	Engineering During Construct.	LUMPSUM	LS	$151,771	$151,771	$30,354	$182,125
	Construction Project Mgmt	LUMPSUM	LS	$160,250	$160,250	$32,050	$192,300
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$171,141	$171,141	$34,228	$205,369
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$160,097	$160,097	$32,019	$192,116
	Construction Project Mgmt	LUMPSUM	LS	$138,759	$138,759	$27,752	$166,511
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$141,225	$141,225	$28,245	$169,470
	Cost Estimates	LUMPSUM	LS	$12,019	$12,019	$2,404	$14,423
	Engineering During Construct.	LUMPSUM	LS	$45,344	$45,344	$9,069	$54,413
	Construction Project Mgmt	LUMPSUM	LS	$14,477	$14,477	$2,895	$17,372
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$173,994	$173,994	$34,799	$208,793
	Cost Estimates	LUMPSUM	LS	$7,915	$7,915	$1,583	$9,498
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$14,186	$14,186	$2,837	$17,023
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$7,222,740	$7,222,740	$1,444,548	$8,667,288
	Cost Estimates	LUMPSUM	LS	$88,436	$88,436	$17,687	$106,123
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,628,903	$1,628,903	$325,781	$1,954,684
	Construction Project Mgmt	LUMPSUM	LS	$463,354	$463,354	$92,671	$556,025

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$181,122	$181,122	$36,224	$217,346
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$5,662	$5,662	$1,132	$6,794
	Construction Project Mgmt	LUMPSUM	LS	$23,955	$23,955	$4,791	$28,746
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$316,644	$316,644	$63,329	$379,973
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Engineering During Construct.	LUMPSUM	LS	$197,408	$197,408	$39,482	$236,890
	Construction Project Mgmt	LUMPSUM	LS	$545,251	$545,251	$109,050	$654,301
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$197,465	$197,465	$39,493	$236,958
	Cost Estimates	LUMPSUM	LS	$12,019	$12,019	$2,404	$14,423
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$56,714	$56,714	$11,343	$68,057
	Construction Project Mgmt	LUMPSUM	LS	$68,659	$68,659	$13,732	$82,391

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
							$17,000,000
301----	Prior E & D (FY87 - FY95)						
30----	Subtotal: Engineering & Design				$49,545,579		
30----	Contingencies					$6,509,116	
30----	Contingency - round off						9,803
30----	TOTAL: ENGINEERING & DESIGN						$56,100,000

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
1200 X 110 X 36 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$526,913	$526,913	$105,383	$632,296
	Contract Modifications	LUMPSUM	LS	$2,371,906	$2,371,906	$474,381	$2,846,287
	Progress & Completion Reports	LUMPSUM	LS	$424,679	$424,679	$84,936	$509,615
	All Other	LUMPSUM	LS	$3,646,163	$3,646,163	$729,233	$4,375,396
3102——	Review of Shop Drawings	LUMPSUM	LS	$590,415	$590,415	$118,083	$708,498
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$428,468	$428,468	$85,694	$514,162
	Compliance Sampling and Testing	LUMPSUM	LS	$705,749	$705,749	$141,150	$846,899
	Quality Surveys	LUMPSUM	LS	$999,736	$999,736	$199,947	$1,199,683
	Title II Servicse	LUMPSUM	LS	$543,197	$543,197	$108,639	$651,836
	All Other	LUMPSUM	LS	$6,253,462	$6,253,462	$1,250,692	$7,504,154
31——	Subtotal: Construction Management				$16,490,688		
31——	Contingencies					$3,298,138	
31——	Contingency - round off						11,174
31——	TOTAL: CONSTRUCTION MANAGEMENT						$19,800,000

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
1200 X 110 X 36 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$36,188,790	$9,011,210	$45,200,000
02——	RELOCATIONS	LUMPSUM	LS		$68,959,506	$16,540,494	$85,500,000
05——	LOCKS	LUMPSUM	LS		$214,760,305	$43,039,695	$257,800,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$18,354,250	$3,645,750	$22,000,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,915,894	$1,484,107	$11,400,000
18——	CULTURAL RESOURCE	LUMPSUM	LS		$480,000	$120,000	$600,000
25——	MITIGATION	LUMPSUM	LS		$26,400,000	$6,600,000	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$49,545,579	$6,518,918	$56,100,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$16,490,688	$3,309,312	$19,800,000
	TOTAL						$531,400,000

COST ESTIMATE
900 X 110 X 22
NED

13 Mar 97
MRGO LOCK AND CONNECTING CHANNELS
File: 9LBRI97.WB1

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
900 X 110 X 22 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	PROJECT PLANNING	LUMPSUM	LS	$3,000	$3,000	$750	$3,750
01A10	Real Estate Supplement/Plan	LUMPSUM	LS	$22,680	$22,680	$5,670	$28,350
01A50	All Other RE Analysis/Docs						
01B--	ACQUISITIONS	LUMPSUM	LS	$116,630	$116,630	$29,158	$145,788
01B10	By Government						
01C--	CONDEMNATIONS	LUMPSUM	LS	$45,080	$45,080	$11,270	$56,350
01C10	By Government						
01D--	INLEASING	LUMPSUM	LS	$0	$0	$0	$0
01E--	APPRAISAL	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E1-	In-House	LUMPSUM	LS	$46,000	$46,000	$11,500	$57,500
01E2-	C/E Contracted						
01F--	PL 91-646 ASSISTANCE	LUMPSUM	LS	$43,680	$43,680	$10,920	$54,600
01F10	By Government						
01G--	TEMPORARY PERMITS	LUMPSUM	LS	$18,050	$18,050	$4,513	$22,563
01G10	By Government	LUMPSUM	LS	$3,000	$3,000	$750	$3,750
01G60	Damage Claims						
01H--	AUDITS	LUMPSUM	LS	$0	$0	$0	$0
01J--	ENCROACHMENTS & TRESPASS	LUMPSUM	LS	$0	$0	$0	$0
01K--	DISPOSALS	LUMPSUM	LS	$0	$0	$0	$0
01L--	REAL PROPERTY ACCOUNTABILITY	LUMPSUM	LS	$0	$0	$0	$0
01R--	REAL ESTATE PAYMENTS						
01R1-	LAND PAYMENTS	LUMPSUM	LS	$34,510,000	$34,510,000	$8,627,500	$43,137,500
01R1A	By Government						
01R2-	PL 91-646 ASSIST. PAYMTS.	LUMPSUM	LS	$1,314,850	$1,314,850	$328,713	$1,643,563
01R2A	Personal Property Moving	LUMPSUM	LS	$60,000	$60,000	$0	$60,000
01R2B	Re-establishment Cost						
01R9-	OTHER PAYMENTS	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD CREDITING	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01T20	ADMINISTRATIVE COSTS						
01------	Subtotal: Lands and Damages				$36,188,790		
01------	Contingencies					$9,032,198	
01------	Contingency - round off						($20,988)
01------	TOTAL REAL ESTATE						$45,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02--	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	St. Claude Detour						
	Mob and Demob	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
	Two Single Bascule Bridges						
	Bascule Superstructure	LUMPSUM	LS	$9,162,500	$9,162,500	$1,832,500	$10,995,000
	Substructure and Foundation	LUMPSUM	LS	$1,522,000	$1,522,000	$304,400	$1,826,400
	Approach Ramps	LUMPSUM	LS	$2,244,700	$2,244,700	$448,940	$2,693,640
	Misc. Traffic Control	LUMPSUM	LS	$236,700	$236,700	$47,340	$284,040
	Detour Removal	LUMPSUM	LS	$902,500	$902,500	$180,500	$1,083,000
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$127,500	$637,500
	Replace Superstructure	LUMPSUM	LS	$6,743,000	$6,743,000	$1,685,750	$8,428,750
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$594,201	$2,971,005
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$353,685	$1,768,425
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilities, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC						
	GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC						
	ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	NEW ORLEANS PUBLIC SERVICE, INC						
	COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD						
	SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD						
	WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$68,846,046		
02---	Contingencies					$16,498,092	
02---	Contingency - round off						($44,138)
02---	TOTAL: RELOCATIONS						$85,300,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05——	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee / I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
0500030	Sitework						
	Protection Cells PS 27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Dolphins 4X	LUMPSUM	LS	$350,000	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
0500040	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 29 Acres	LUMPSUM	LS	$391,500	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
0500090	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
0500090	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000	$400,000	$80,000	$480,000
0500090	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
0500091	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010--	Earthwork for Structures						
0500100	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	38,000	CY	$1.40	$53,200	$10,640	$63,840
	Landscaping of Backfill	LUMPSUM	LS	$805,800	$805,800	$161,160	$966,960
0500100	Lock Site-Backfill						
	Granular Backfill	460,000	CY	$13.75	$6,325,000	$1,265,000	$7,590,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
0500100	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	38,400	SF	$14.00	$537,600	$107,520	$645,120
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	44,600	LF	$180.00	$8,028,000	$1,605,600	$9,633,600
	Tension Anchors	LUMPSUM	LS	$470,000	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles	133,900	LF	$170.00	$22,763,000	$4,552,600	$27,315,600
	(Compression Only)						
	3' Crushed Stone Base	28,700	CY	$30.00	$861,000	$172,200	$1,033,200
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	50,600	SF	$15.00	$759,000	$151,800	$910,800
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
0500570	Metals						
	Miter Gates (4 sets)	2,142,000	LBS	$2.00	$4,284,000	$856,800	$5,140,800
	Emer. Bulkheads	1,040,000	LBS	$1.80	$1,872,000	$374,400	$2,246,400
0500570	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
0500571	Gate Machinery	LUMPSUM	LS	$1,800,000	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
0500610	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells						
	shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	37,800	CY	$270.00	$10,206,000	$2,041,200	$12,247,200
	Reinf. Conc. Slab (Fc = 6000 psi)	45,200	CY	$160.00	$7,232,000	$1,446,400	$8,678,400
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	727,500	LF	$6.00	$4,365,000	$873,000	$5,238,000
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	8,400	CY	$260.00	$2,184,000	$436,800	$2,620,800
	Rein. Conc. Slab (Fc = 4000 psi)	31,400	CY	$150.00	$4,710,000	$942,000	$5,652,000
	Ballast Concrete	72,000	CY	$70.00	$5,040,000	$1,008,000	$6,048,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
0500630	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000	$100,000	$20,000	$120,000
0500631	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
0500640	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
0500641	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000	$645,000	$129,000	$774,000
050065--	Piping Systems:						
0500651	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
0500661	Electrical	LUMPSUM	LS	$201,500	$201,500	$40,300	$241,800
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$329,000	$329,000	$65,800	$394,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$603,500	$603,500	$120,700	$724,200
	Raceway System	LUMPSUM	LS	$620,500	$620,500	$124,100	$744,600
	Wire and Cable	LUMPSUM	LS	$278,000	$278,000	$55,600	$333,600
	Lighting Systems	LUMPSUM	LS	$89,000	$89,000	$17,800	$106,800
	Signal & Comm. Systems	LUMPSUM	LS	$104,000	$104,000	$20,800	$124,800
	Lighting Protection and Ground System	LUMPSUM	LS	$137,750	$137,750	$27,550	$165,300
	Elec. Testing	LUMPSUM	LS	$84,000	$84,000	$16,800	$100,800
	Generator	LUMPSUM	LS	$140,000	$140,000	$28,000	$168,000
	Other Electrical Work						
050099--	Associated General Items:						
0500991	Demolition of Existing Lock (In-The-Wet Plan)	LUMPSUM	LS	$2,453,000	$2,453,000	$490,600	$2,943,600
	Lock Wall Demolition	LUMPSUM	LS	$2,836,000	$2,836,000	$567,200	$3,403,200
	Debris Removal	LUMPSUM	LS	$690,000	$690,000	$138,000	$828,000
	Bridge Demo. & Removal	LUMPSUM	LS	$481,100	$481,100	$96,220	$577,320
	Guidewall & Dolphin Removal						
0500992	Demolition of Existing Facilities	LUMPSUM	LS	$3,469,000	$3,469,000	$693,800	$4,162,800
	Galvez St. Wharf	LUMPSUM	LS	$696,000	$696,000	$139,200	$835,200
	Coast Guard Facility	LUMPSUM	LS	$3,470,000	$3,470,000	$694,000	$4,164,000
	Private Facilities	LUMPSUM	LS	$132,000	$132,000	$26,400	$158,400
	Tree Removal	LUMPSUM	LS	$1,031,000	$1,031,000	$206,200	$1,237,200
	HTRW Treatment for Abandoned Above Ground Facilities						
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
0500993	Site Work						
	Permanent Mooring Facil. Cells						
	PSA 23 Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
0500994	Temporary Offsite Parking	LUMPSUM	LS	$983,300	$983,300	$196,660	$1,179,960
05——	Subtotal: Locks				$170,335,600		
05——	Contingencies					$34,162,120	
05——	Contingency - round off						$2,280
05——	TOTAL: LOCKS						$204,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09——	CHANNELS AND CANALS						
0901——	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000	$200,000	$40,000	$240,000
090113--	Traffic Control:						
0901130	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	48	MO	$120,000	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	210,000	CY	$1.75	$367,500	$73,500	$441,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
0901300	Site Work-North Bypass						
	36" Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09——	Subtotal: Channels and Canals				$13,827,800		
09——	Contingencies:					$2,765,560	
09——	Contingency-round off						$6,640
09——	TOTAL: CHANNELS AND CANALS						$16,600,000

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
900 X 110 X 22 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101—	LEVEES						
110101—	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000	$100,000	$15,000	$115,000
110199—	Associated General Items:						
1101991	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992	Tie-In Levee/I-Wall						
	I-Wall/Fold Down	2,200	LF	$415.00	$913,000	$136,950	$1,049,950
	Piling, Steel Sheet PZ-22	68,000	SF	$10.95	$744,600	$111,690	$856,290
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994	Utility Crossings & Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,727,225		
11——	Contingencies:					$1,459,084	
11——	Contingency - round off						$13,691
11——	TOTAL: LEVEES AND FLOODWALLS						$11,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
18——	CULTURAL RESOURCE PRESERVATION						
180086—	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
18——	Subtotal: Cultural Resource Preservation				$480,000		
18——	Contingencies:					$120,000	
18——	Contingency - round off						($0)
18——	TOTAL: CULTURAL RESOURCE PRESERVATION						$600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25——	MITIGATION						
2591—	DIRECT IMPACT MINIMIZATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,068,800	$1,068,800	$267,200	$1,336,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$2,800,000	$2,800,000	$700,000	$3,500,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000
	Cultural Display (Old Lock)	LUMPSUM	LS	$160,000	$160,000	$40,000	$200,000
	Temp Relocation of Residents	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	(St. Claude Ave. Bridge) Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Training Assistance	LUMPSUM	LS	$1,200,000	$1,200,000	$300,000	$1,500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	New Roadway in St. Bernard Parish			$6,838,400	$6,838,400	$1,709,600	$8,548,000
	Subtotal: Direct Impact Minimization				$14,000,000	$3,500,000	$17,500,000
2592—	INDIRECT COMPENSATION FOR IMPACTS						
	Lighting Improvements			$80,000	$80,000	$20,000	$100,000
	Community Improvements			$1,400,000	$1,400,000	$350,000	$1,750,000
	Street Resurfacing, Drainage Improvements, and Landscaping			$4,000,000	$4,000,000	$1,000,000	$5,000,000
	Business Assistance Program			$600,000	$600,000	$150,000	$750,000
	Neighborhood Revitalization Program			$4,720,000	$4,720,000	$1,180,000	$5,900,000
	Additional Police/Emergency Medical Services			$1,600,000	$1,600,000	$400,000	$2,000,000
	Subtotal: Indirect Compensation For Impacts				$12,400,000	$3,100,000	$15,500,000
25——	Subtotal: Mitigation				$26,400,000		
25——	Contingencies					$6,600,000	
25——	Contingency - round off						$0
25——	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30——	ENGINEERING AND DESIGN						
3001——	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002——	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,439,755	$2,439,755	$487,951	$2,927,706
	Cost Estimates	LUMPSUM	LS	$34,087	$34,087	$6,817	$40,904
	Report Preparation	LUMPSUM	LS	$15,564	$15,564	$3,113	$18,677
	VE Investigations	LUMPSUM	LS	$22,326	$22,326	$4,465	$26,791
	AE Contracts	LUMPSUM	LS	$956,623	$956,623	$191,325	$1,147,948
	Programs & Project Management	LUMPSUM	LS	$104,267	$104,267	$20,853	$125,120
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$133,163	$133,163	$26,633	$159,796
	Cost Estimates	LUMPSUM	LS	$2,365	$2,365	$473	$2,838
	Report Preparation	LUMPSUM	LS	$6,904	$6,904	$1,381	$8,285
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$24,993	$24,993	$4,999	$29,992
300205-	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$591,556	$591,556	$118,311	$709,867
	Cost Estimates	LUMPSUM	LS	$9,419	$9,419	$1,884	$11,303
	Report Preparation	LUMPSUM	LS	$10,365	$10,365	$2,073	$12,438
	VE Investigations	LUMPSUM	LS	$19,373	$19,373	$3,875	$23,248
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$45,987	$45,987	$9,197	$55,184
300206-	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manual						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005---	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$269,479	$269,479	$53,896	$323,375
	Cost Estimates	LUMPSUM	LS	$24,233	$24,233	$4,847	$29,080
	Engineering During Construct.	LUMPSUM	LS	$114,219	$114,219	$22,844	$137,063
	Construction Project Mgmt	LUMPSUM	LS	$120,613	$120,613	$24,123	$144,736
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,435,885	$5,435,885	$1,087,177	$6,523,062
	Cost Estimates	LUMPSUM	LS	$66,559	$66,559	$13,312	$79,871
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,225,921	$1,225,921	$245,184	$1,471,105
	Construction Project Mgmt	LUMPSUM	LS	$348,722	$348,722	$69,744	$418,466

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

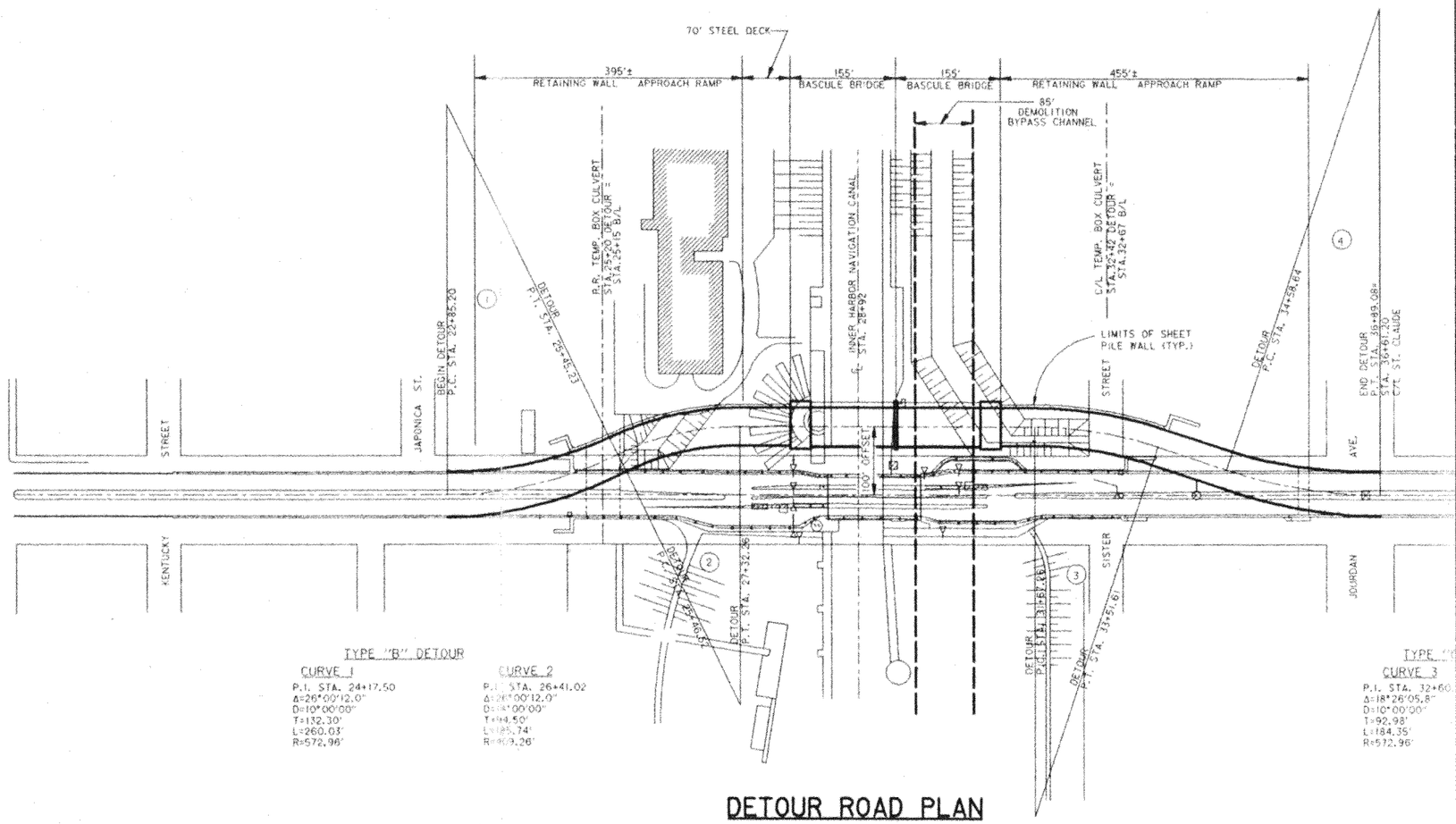
Account Number	Account Number Description	Quantity	Unit	Unit Cost	Acount No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY95)						$17,000,000
30----	Subtotal: Engineering & Design				$44,782,972		
30----	Contingencies					$5,556,594	
30----	Contingency - round off						($39,566)
30----	TOTAL: ENGINEERING & DESIGN						$50,300,000

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
900 X 110 X 22 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$435,994	$435,994	$87,199	$523,193
	Contract Modifications	LUMPSUM	LS	$1,962,651	$1,962,651	$392,530	$2,355,181
	Progress & Completion Reports	LUMPSUM	LS	$351,406	$351,406	$70,281	$421,687
	All Other	LUMPSUM	LS	$3,017,034	$3,017,034	$603,407	$3,620,441
3102——	Review of Shop Drawings	LUMPSUM	LS	$488,544	$488,544	$97,709	$586,253
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$354,541	$354,541	$70,908	$425,449
	Compliance Sampling and Testing	LUMPSUM	LS	$583,981	$583,981	$116,796	$700,777
	Quality Surveys	LUMPSUM	LS	$827,236	$827,236	$165,447	$992,683
	Title II Servicse	LUMPSUM	LS	$449,470	$449,470	$89,894	$539,364
	All Other	LUMPSUM	LS	$5,174,459	$5,174,459	$1,034,892	$6,209,351
31——	Subtotal: Construction Management				$13,645,316		
31——	Contingencies					$2,729,063	
31——	Contingency - round off						$25,621
31——	TOTAL: CONSTRUCTION MANAGEMENT						$16,400,000

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN SHIP LOCK
900 X 110 X 22 PILE FOUNDED LOCK W/ BRIDGE DETOURS

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$36,188,790	$9,011,210	$45,200,000
02——	RELOCATIONS	LUMPSUM	LS		$68,846,046	$16,453,954	$85,300,000
05——	LOCKS	LUMPSUM	LS		$170,335,600	$34,164,400	$204,500,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$13,827,800	$2,772,200	$16,600,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,727,225	$1,472,775	$11,200,000
18——	CULTURAL RESOURCE	LUMPSUM	LS		$480,000	$120,000	$600,000
25——	MITIGATION	LUMPSUM	LS		$26,400,000	$6,600,000	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$44,782,972	$5,517,028	$50,300,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$13,645,316	$2,754,684	$16,400,000
	TOTAL						$463,100,000



TYPE "B" DETOUR

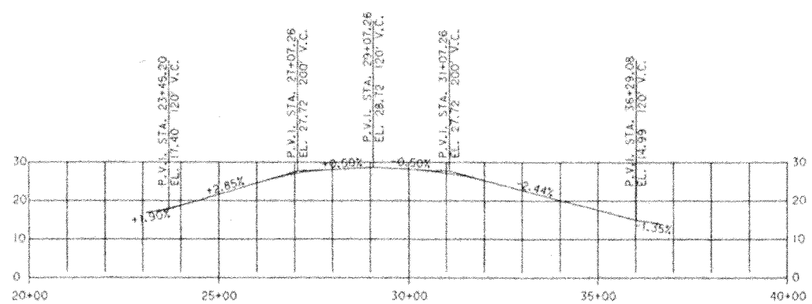
CURVE 1
P.I. STA. 24+17.50
Δ=26°00'12.0"
D=10°00'00"
T=132.30'
L=260.03'
R=572.96'

CURVE 2
P.I. STA. 26+41.02
Δ=26°00'12.0"
D=10°00'00"
T=94.50'
L=185.74'
R=572.96'

TYPE "
CURVE 3
P.I. STA. 32+60
Δ=18°26'05.8"
D=10°00'00"
T=92.98'
L=184.35'
R=572.96'

DETOUR ROAD PLAN

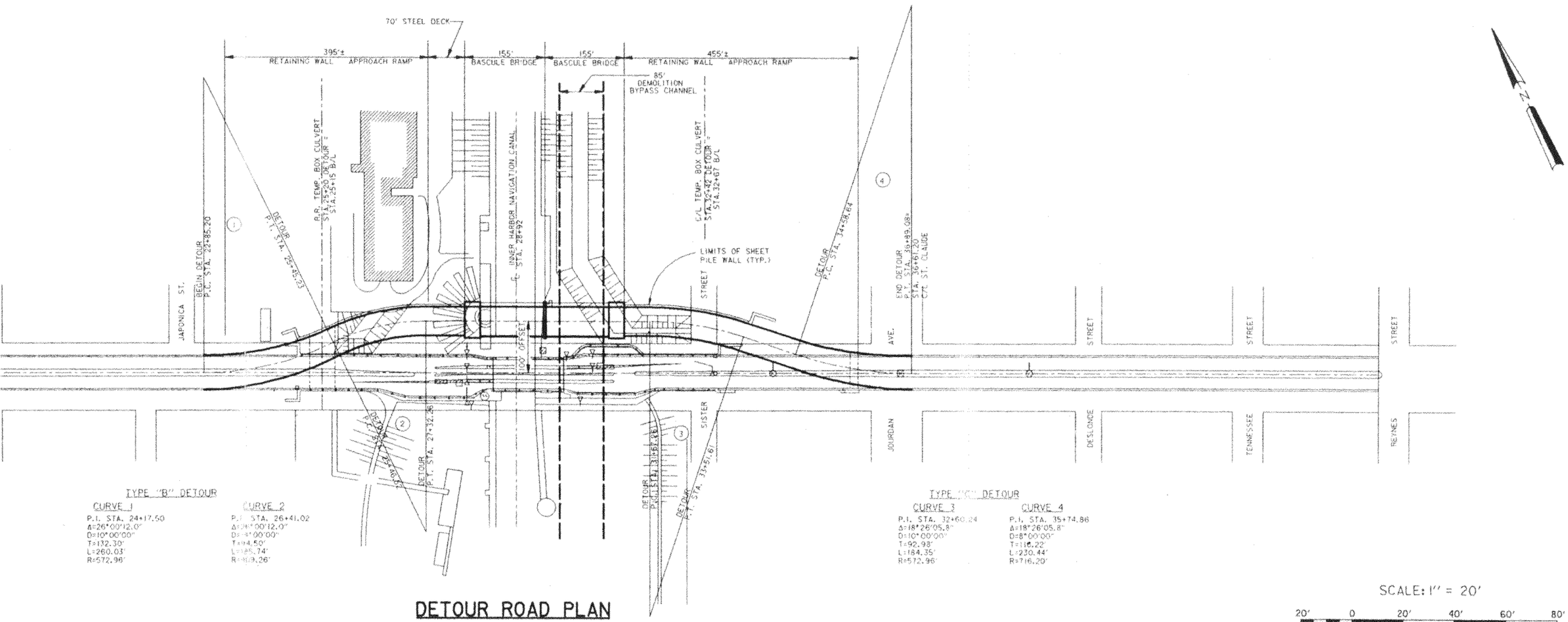
30 MPH GOVERNING DESIGN SPEED
25 MPH POSTED SPEED



DETOUR ROAD PROFILE

SCALE: HOR. 1"=200'
VER. 1"=20'

H-2-40392



TYPE "B" DETOUR

CURVE 1
P.I. STA. 24+17.50
Δ=26°00'12.0"
D=10°00'00"
T=132.30'
L=260.03'
R=572.96'

CURVE 2
P.I. STA. 26+41.02
Δ=26°00'12.0"
D=8°00'00"
T=94.50'
L=185.74'
R=716.26'

TYPE "C" DETOUR

CURVE 3
P.I. STA. 32+60.24
Δ=18°26'05.8"
D=10°00'00"
T=92.98'
L=184.35'
R=572.96'

CURVE 4
P.I. STA. 35+74.86
Δ=18°26'05.8"
D=8°00'00"
T=116.22'
L=230.44'
R=716.20'

DETOUR ROAD PLAN

30 MPH GOVERNING DESIGN SPEED
25 MPH POSTED SPEED

SCALE: 1" = 20'

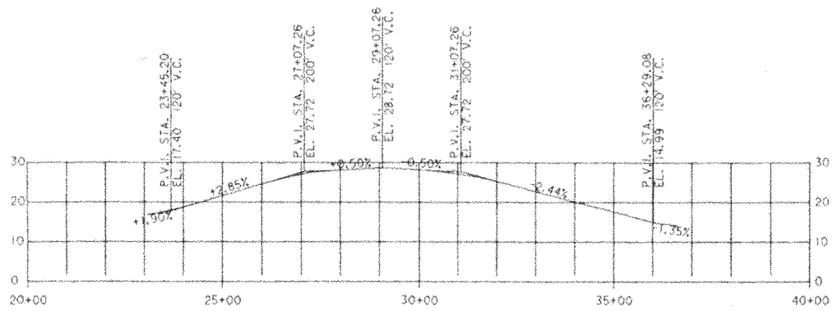
20' 0 20' 40' 60' 80'

SCALE: 1" = 200'

200' 0 200' 400' 600' 800'

SCALE: 1" = 100'

100' 0 100' 200' 300' 400'



DETOUR ROAD PROFILE

SCALE: HOR. 1"=200'
VER. 1"=20'

C·A·D

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
INDUSTRIAL CANAL LOCK REPLACEMENT
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE.

DETOUR ROADWAY GEOMETRY
ST. CLAUDE AVE. BR. REPLACEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: x	PLOT SCALE: 1200	PLOT DATE: 3/6/97	CADD FILE: FILDGN
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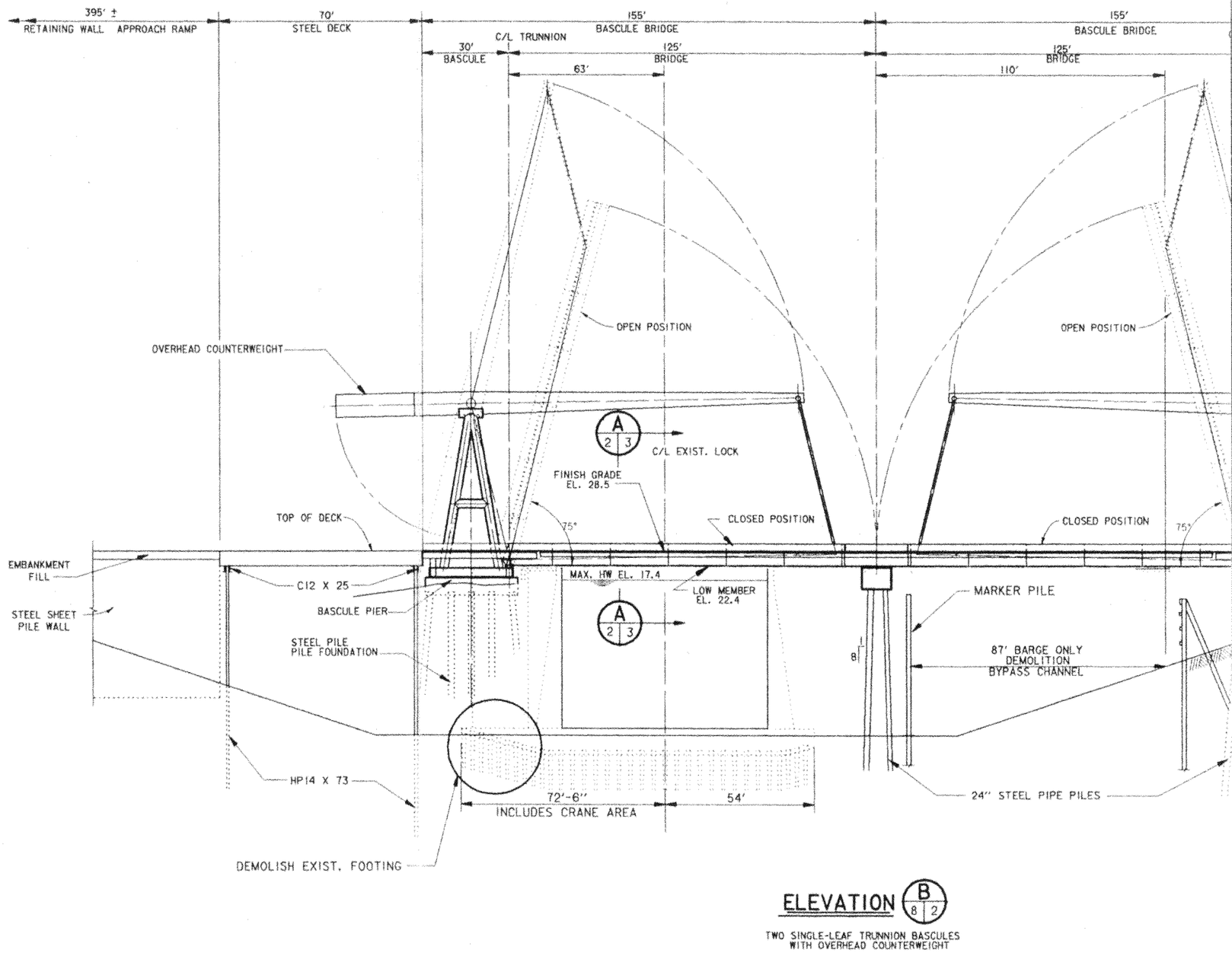
CHECKED BY: x	DATE: MARCH, 1997		

PLATE EA-1

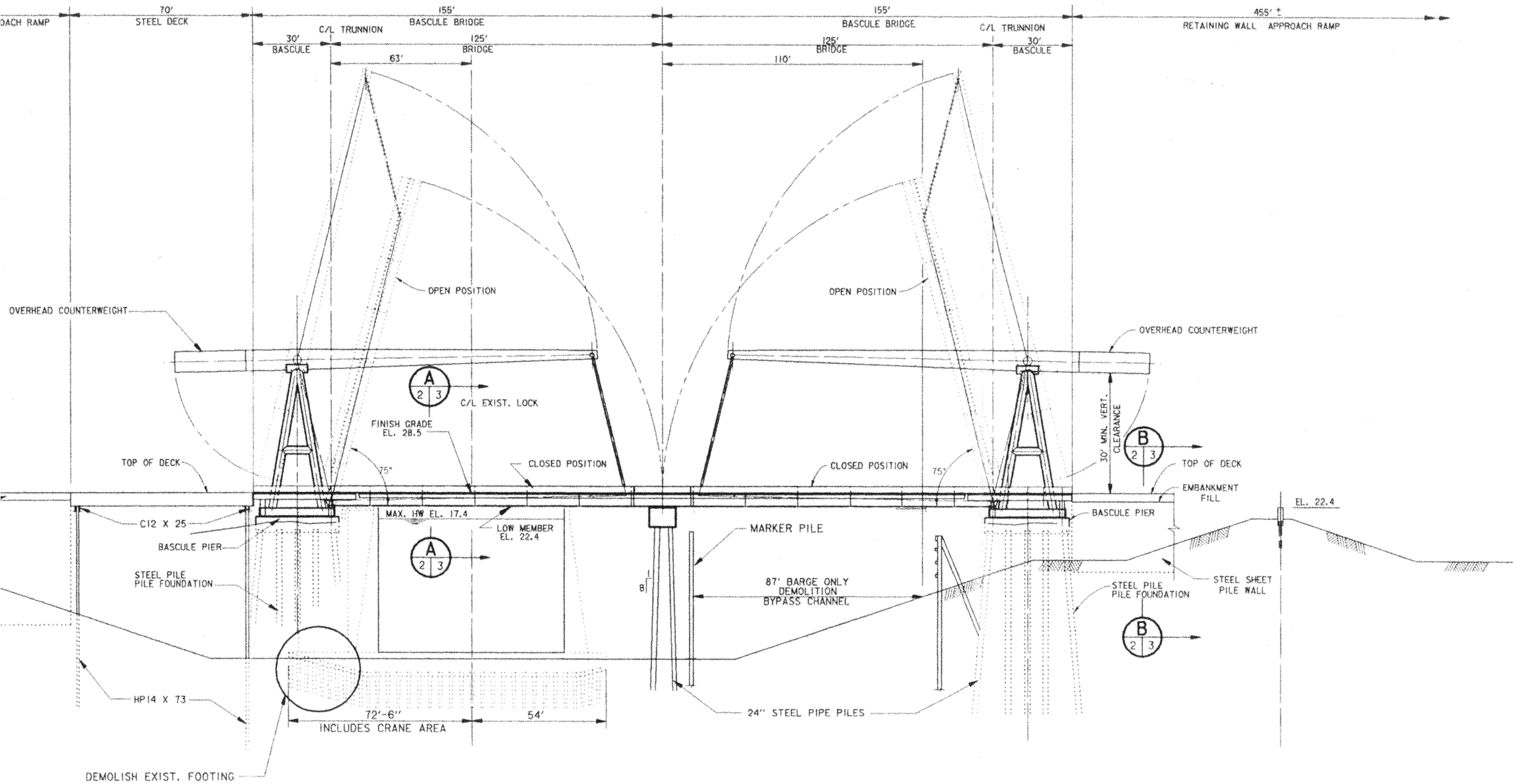


ELEVATION (B 8|2)

TWO SINGLE-LEAF TRUNNION BASCULES
WITH OVERHEAD COUNTERWEIGHT

SCALE:
20' 0 20'

H-4-40392



ELEVATION B 8 2

TWO SINGLE-LEAF TRUNNION BASCULES
WITH OVERHEAD COUNTERWEIGHT

SCALE: 1" = 20'

20' 0 20' 40' 60' 80'

C·A·D

MISSISSIPPIU RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

DETOUR BRIDGE ELEVATION
ST. CLAUDE AVE BRIDGE REPLACEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: X	PLOT SCALE: 240	PLOT DATE: 3/6/97	CADD FILE: P3.DGN
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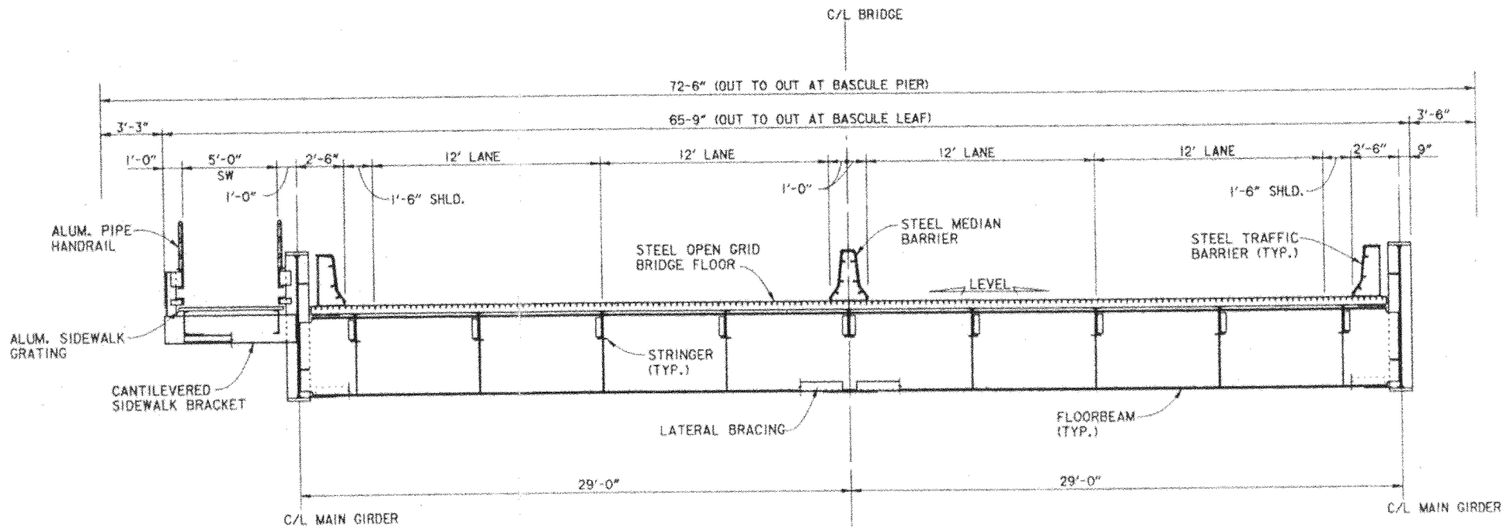
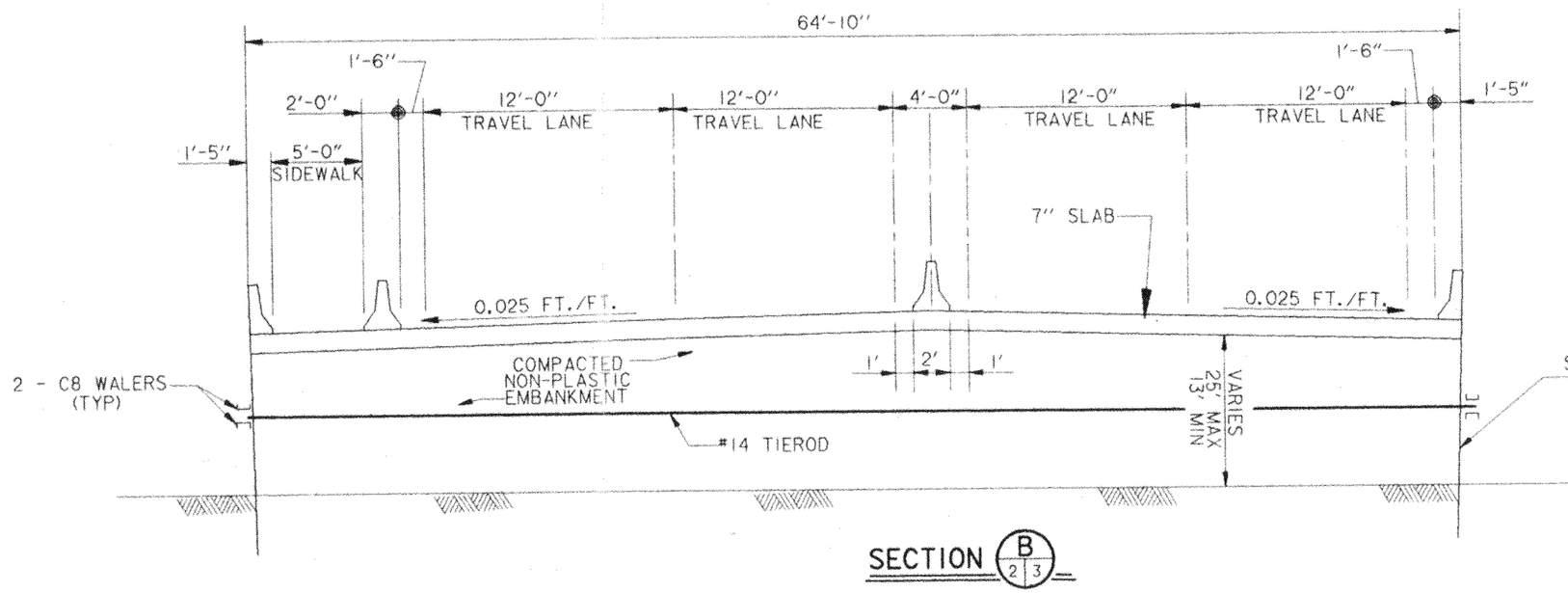


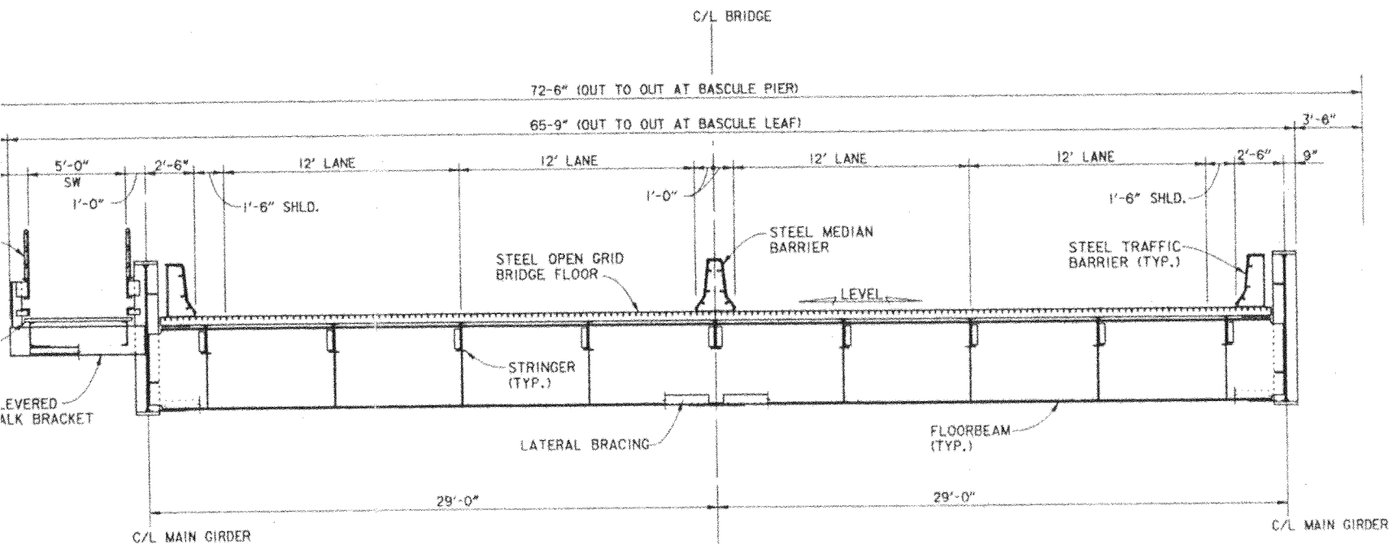
TYPICAL SECTION THRU BASCULE LEAF

SECTION A 2|3



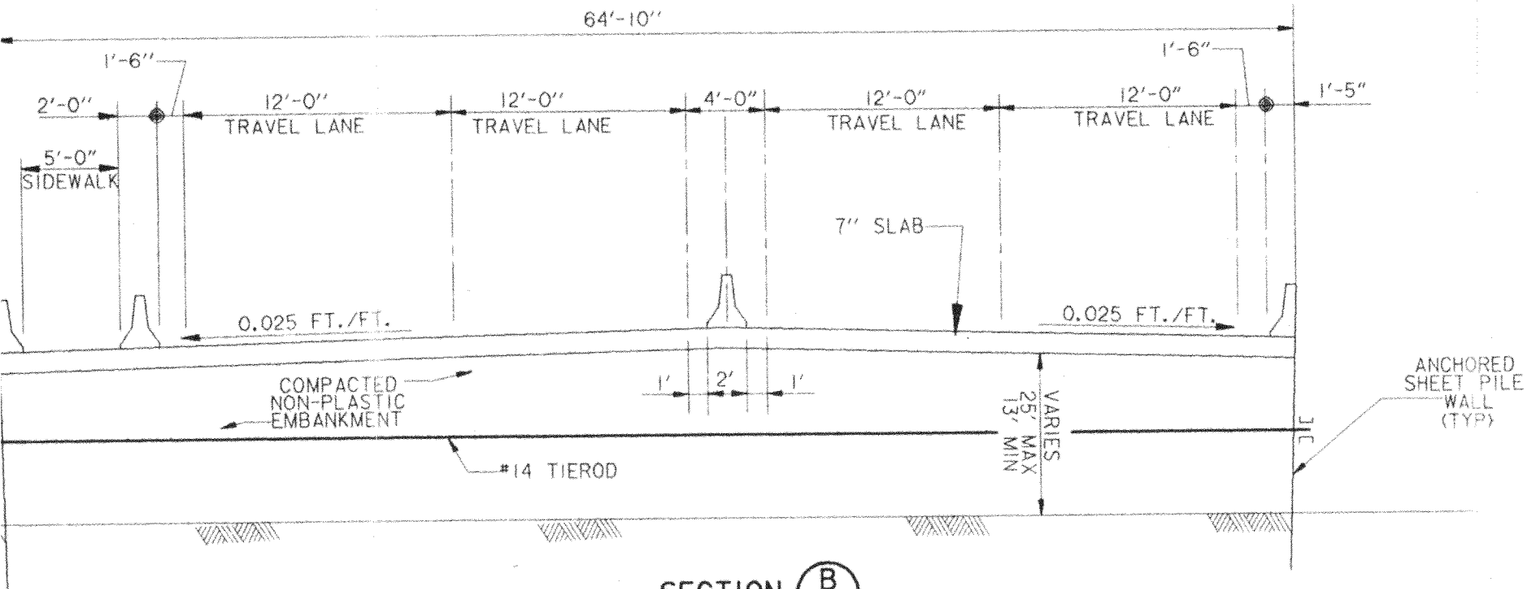
SECTION B 2|3

H-2-40392



TYPICAL SECTION THRU BASCULE LEAF

SECTION A 2|3



SECTION B 2|3

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
INDUSTRIAL CANAL LOCK REPLACEMENT
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE.

DETOUR BRIDGE SECTIONS
ST. CLAUDE AVE. BR. REPLACEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

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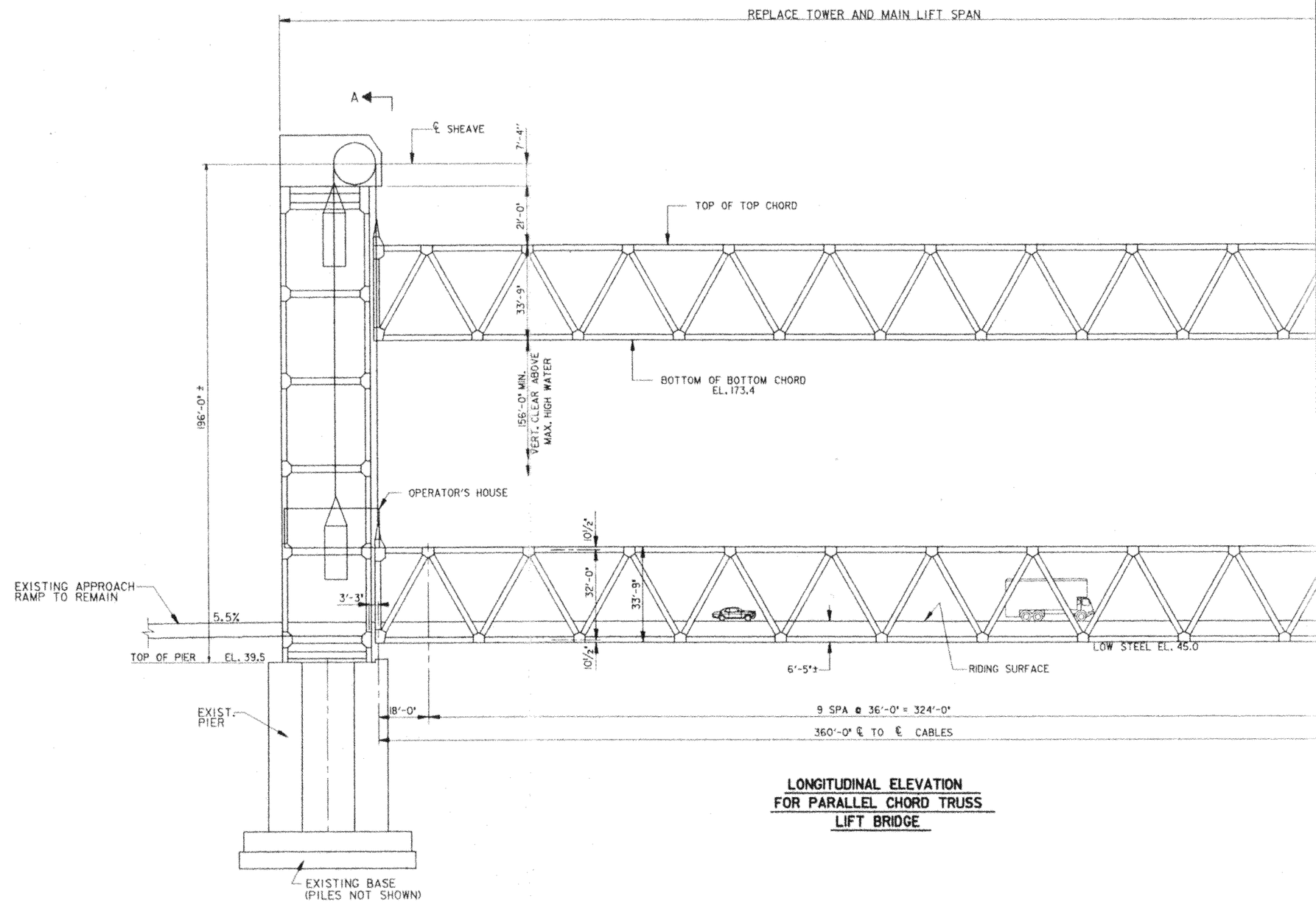
PLATE EA-3

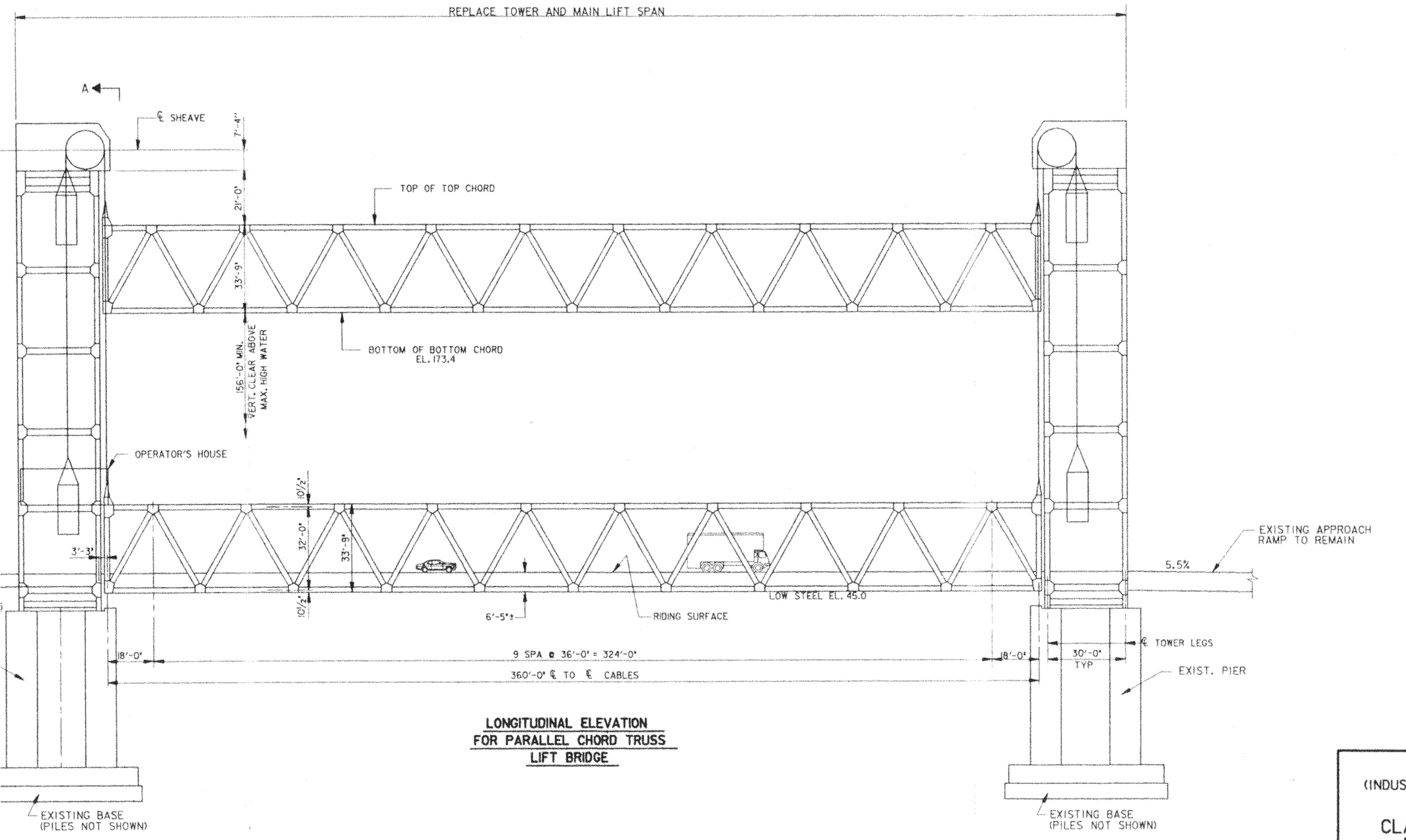


LONGITUDINAL ELEVATION FOR PARALLEL CHORD TRUSS LIFT BRIDGE

SCALE: 1" = 20'

20' 0 20' 40' 60' 80'

File No.
H-4-30883



LONGITUDINAL ELEVATION FOR PARALLEL CHORD TRUSS LIFT BRIDGE

SCALE: 1" = 20'

20' 0 20' 40' 60' 80'

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

CLAIBORNE AVE BRIDGE MAIN SPAN REPLACEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

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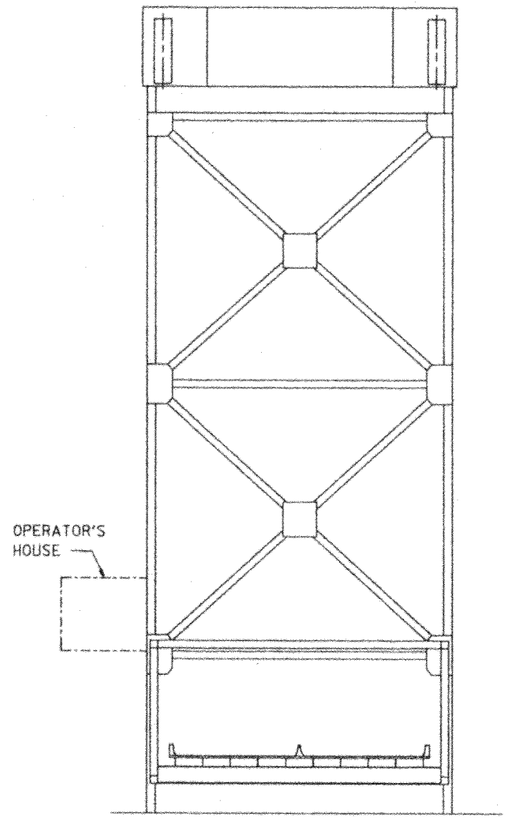
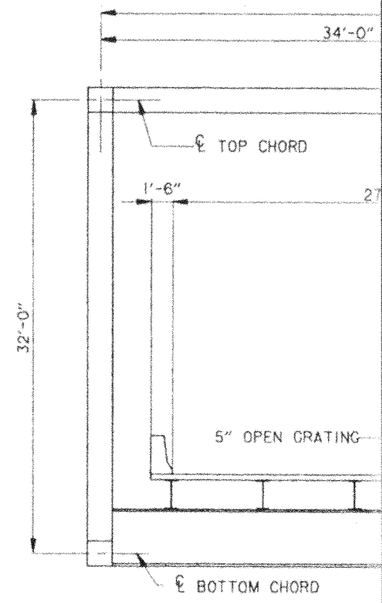
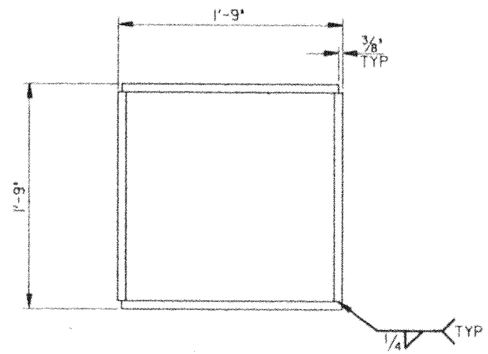


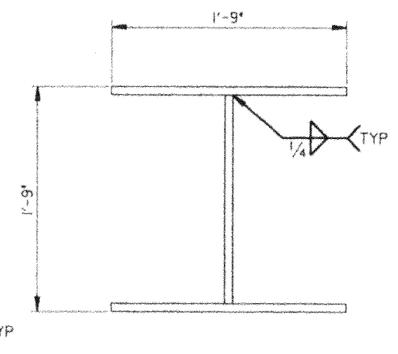
SECTION A-A
SCALE: 3/16" = 1'-0"





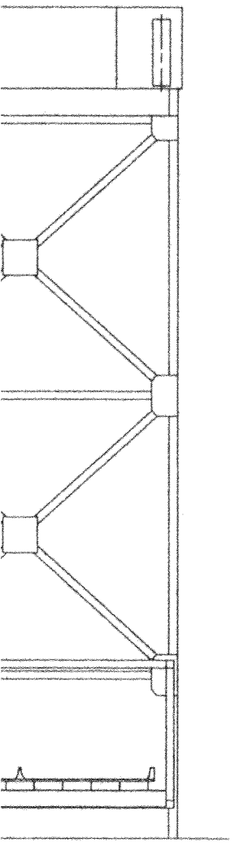
ALL MATERIAL 3/4" PLATE

SECTION THRU TOP
AND BOTTOM CHORDS
SCALE: 3/16" = 1'-0"

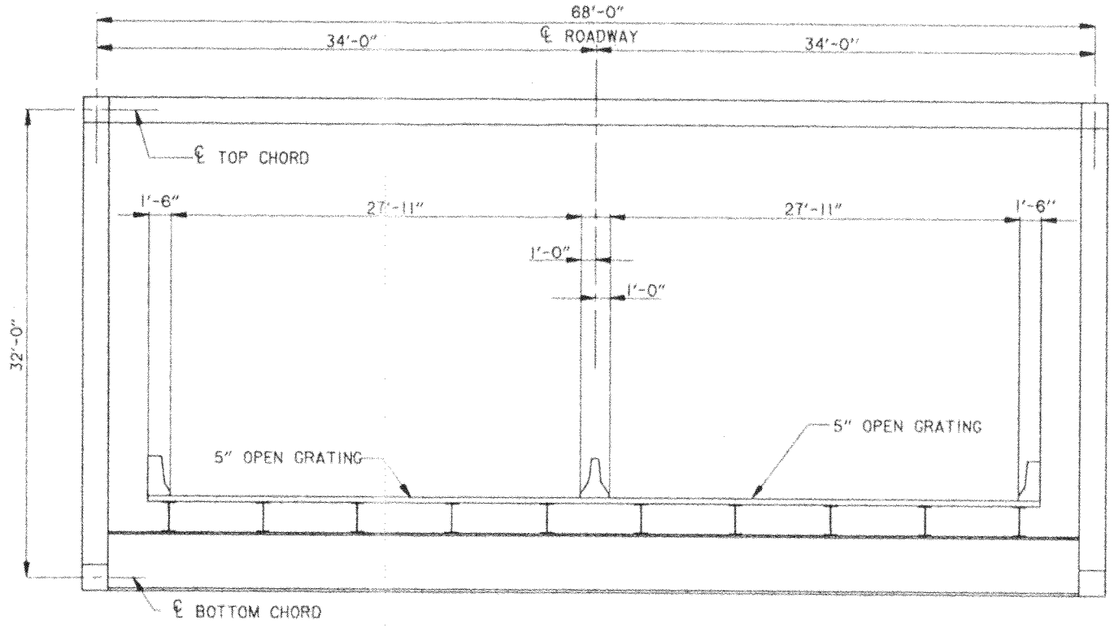


SECTION THRU
DIAGONAL BRACING
SCALE: 3/16" = 1'-0"

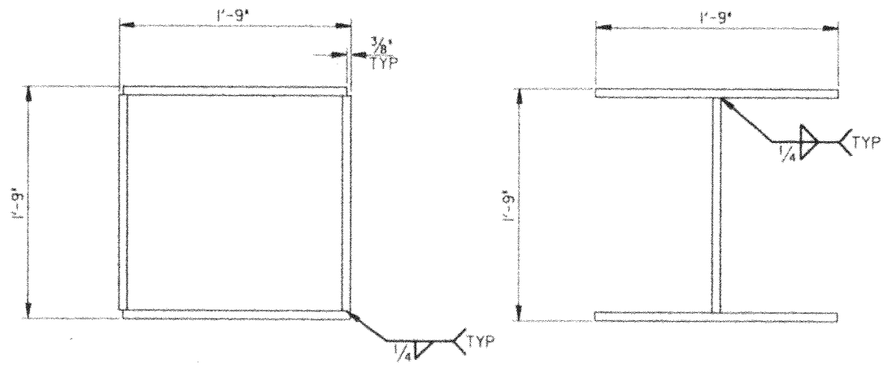
File No.
H-2-40392



ION A-A
:3/16"=1'-0"



MOVABLE MAIN SPAN
SCALE: 3/16" = 1'-0"



ALL MATERIAL 3/4" PLATE

SECTION THRU TOP AND BOTTOM CHORDS
SCALE: 3/16"=1'-0"

SECTION THRU DIAGONAL BRACING
SCALE: 3/16"=1'-0"

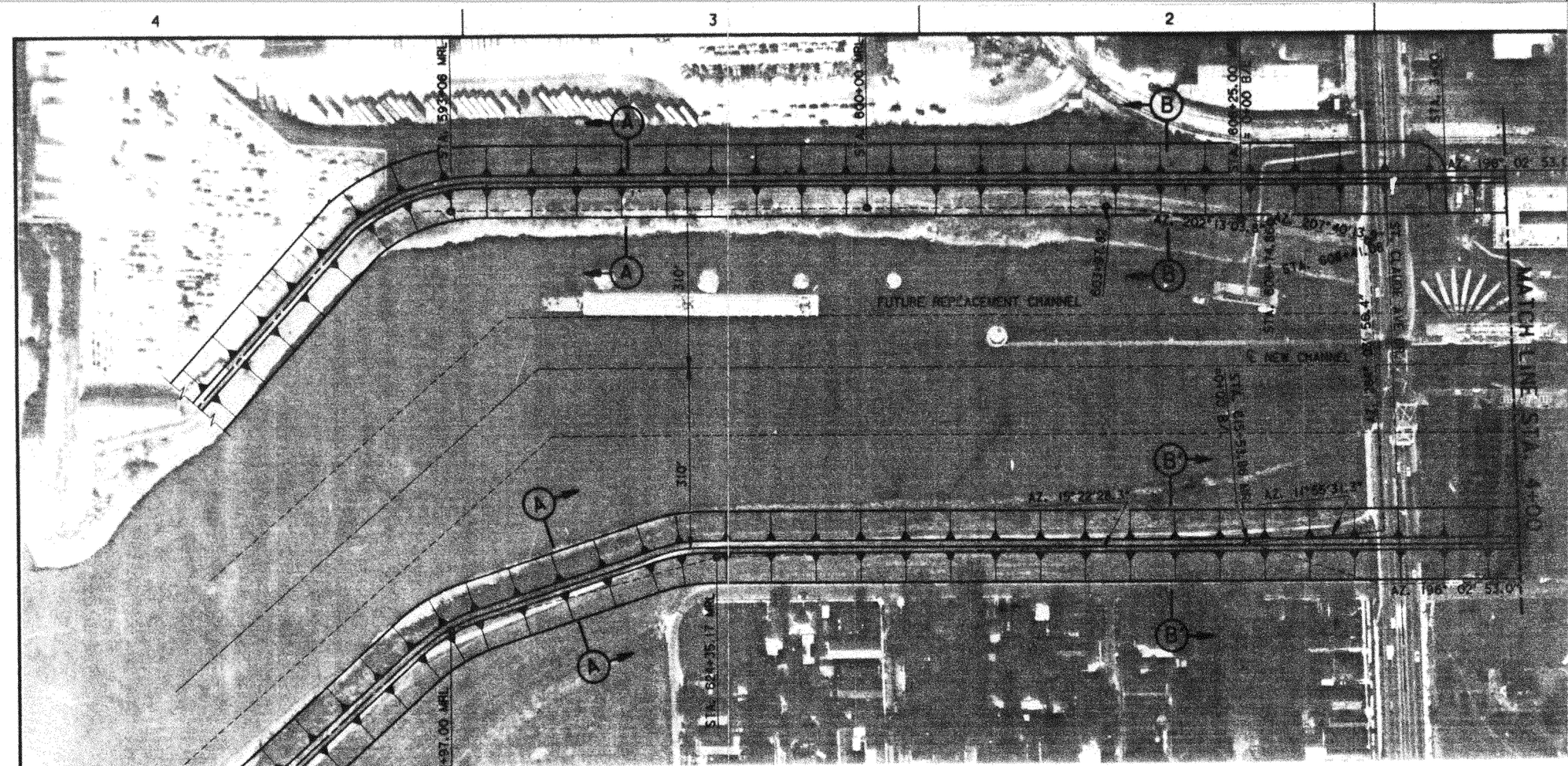
SCALE: 3/16" = 1'- 0"
12" 0 5' 10' 15' 20'

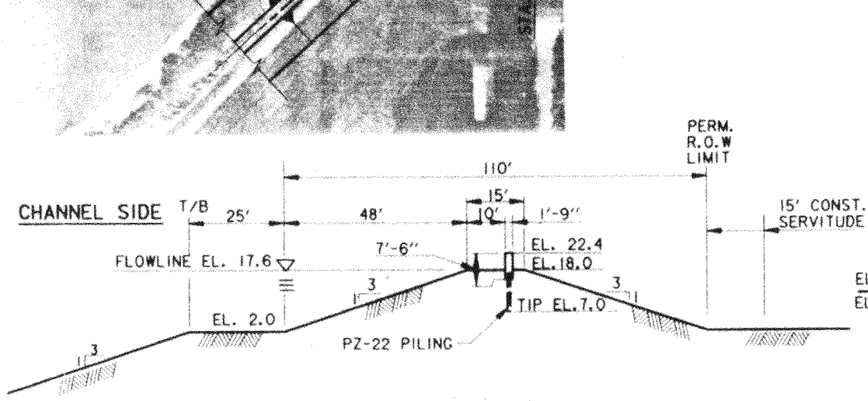
MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

MAIN SPAN - CROSS SECTION CLAIBORNE AVE. BRIDGE REPLACEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: X	PLOT SCALE: 64	PLOT DATE: 3/11/97	CADD FILE: CNCPCA02.DGN
DRAWN BY: X			FILE NO. H-2-40392
CHECKED BY: X	DATE: NOVEMBER 1994		

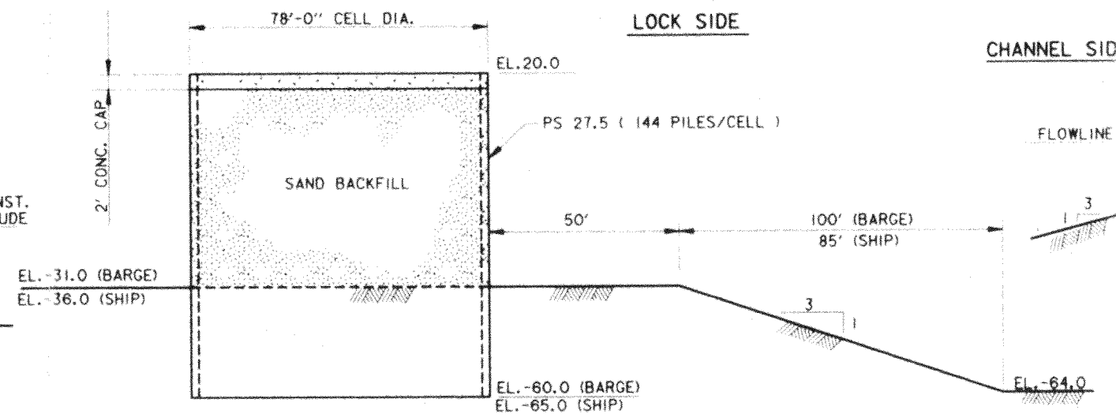




LEVEE/I-WALL SECTION (B) 43|42 (B)

FLOOD PROTECTION

SCALE: 1"=20'



TEMPORARY PROTECTION CELLS

SECTION (A) 26|42 (A) 16|42

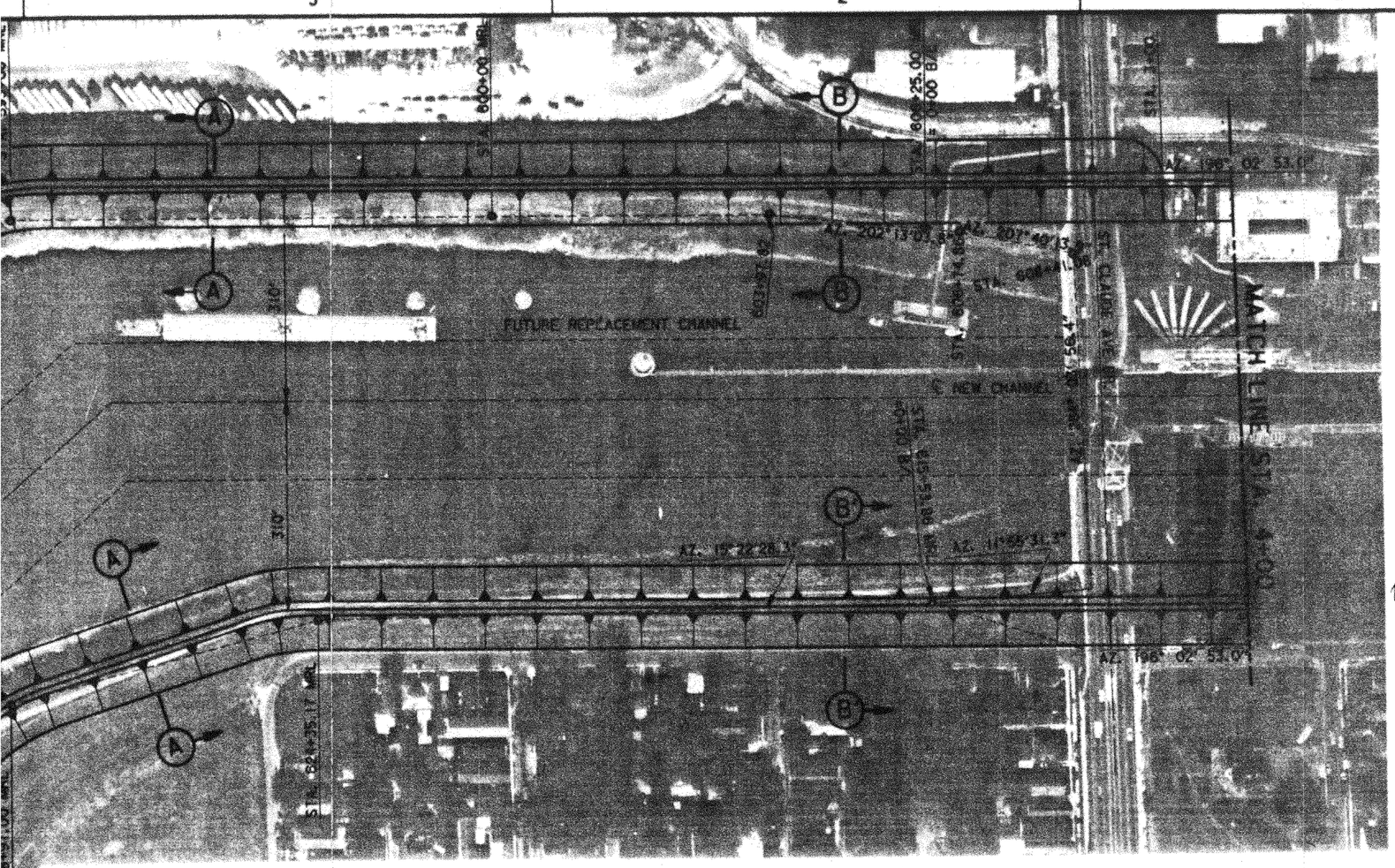
SCALE: 1"=20'

SCALE: 1" = 100'

100' 0 100' 200' 300' 400'

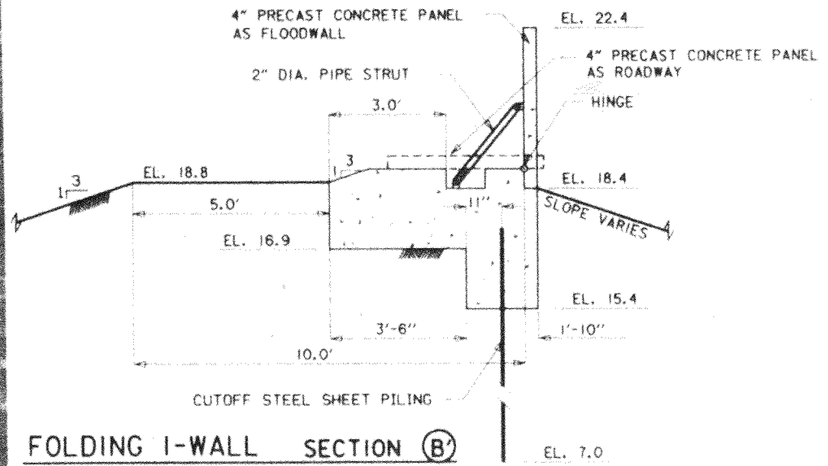
NOTE:
SECTIONS SHOWN ON THIS DRAWING REFER TO DRAWINGS IN THE ENGINEERING APPENDIX.

FILE NO.
H-4-30883



FLOOD PROTECTION

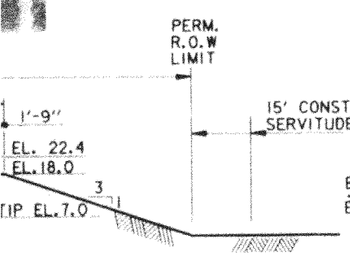
EAST BANK REACH	SECTION LENGTH	WEST BANK REACH	SECTION LENGTH
628+97 MRL B/L To 624+35.17 MRL	(A) 461.8'	593+06 MRL B/L To 600+00 MRL B/L	(A) 694'
624+35.17 MRL B/L To 615+53.8 =0+00 LOCK B/L	(B') 882'	600+00 MRL B/L To To 606+25 MRL B/L= 0+00 LOCK B/L=	(B) 625'
0+00 TO 13+05.5	(B') 1305.5'	0+00 LOCK B/L To 3+00 LOCK B/L	(B) 300'
13+05.5 TO 24+00	(C) 1094.5'	3+00 LOCK B/L To 23+00	(D) 2000'
24+00 TO 39+50 (LOCK TIE-IN LEVEE)	(B) 1550'	23+00 LOCK B/L TO 39+50 (LOCK TIE-IN LEVEE)	(B) 1300'



FOLDING I-WALL SECTION (B')

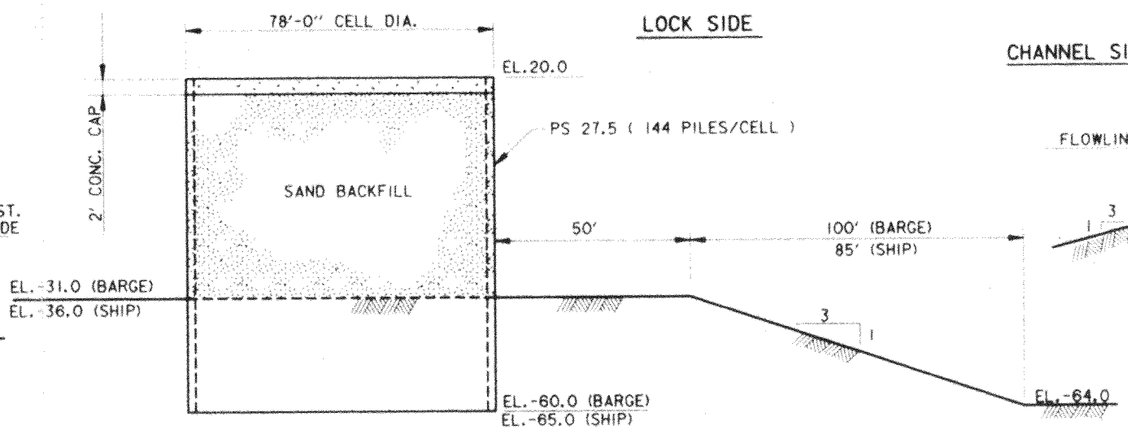
FLOOD PROTECTION

SCALE: 1"=2'



SECTION (B) 43 42 (B)

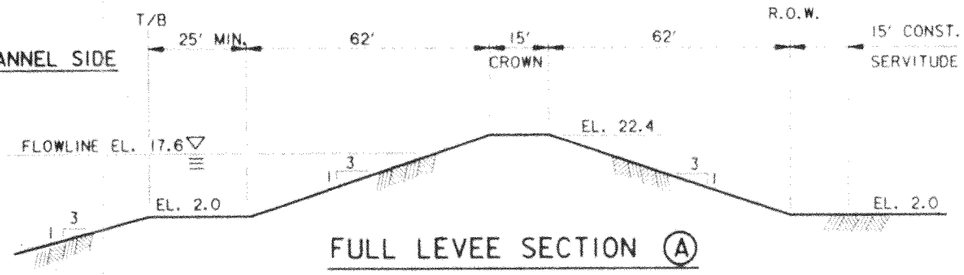
TION



TEMPORARY PROTECTION CELLS

SECTION (A) 26 42 (A) 16 42

SCALE: 1"=20'



FULL LEVEE SECTION (A)

FLOOD PROTECTION

SCALE: 1"=20'

NOTE:
SECTIONS SHOWN ON THIS DRAWING REFER TO DRAWINGS IN THE ENGINEERING APPENDIX.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

RIVERSIDE FLOOD PROTECTION
SHIP AND BARGE LOCK

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

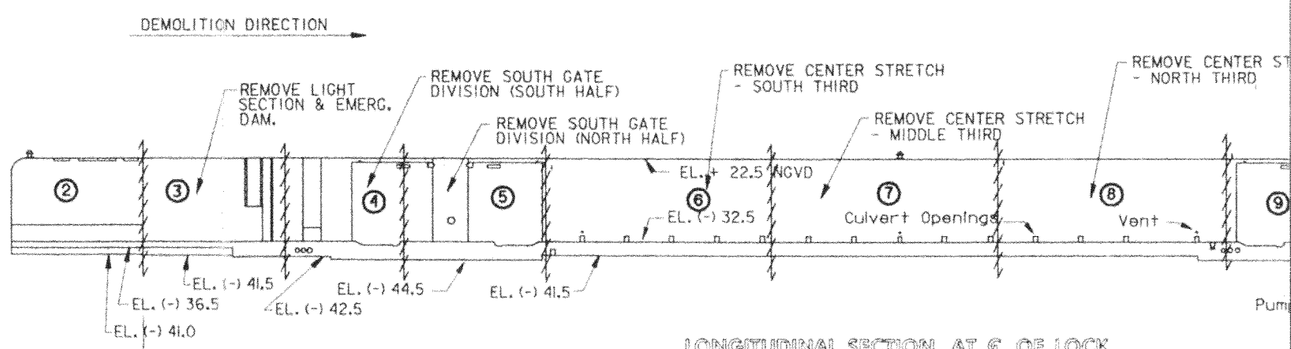
DESIGNED BY: x	PLOT SCALE: 1200	PLOT DATE: 3/11/97	CADD FILE: rmfwfwi.dgn
DRAWN BY: x			FILE NO. H-4-30883
CHECKED BY: x	DATE: NOVEMBER 1994		

NOTES

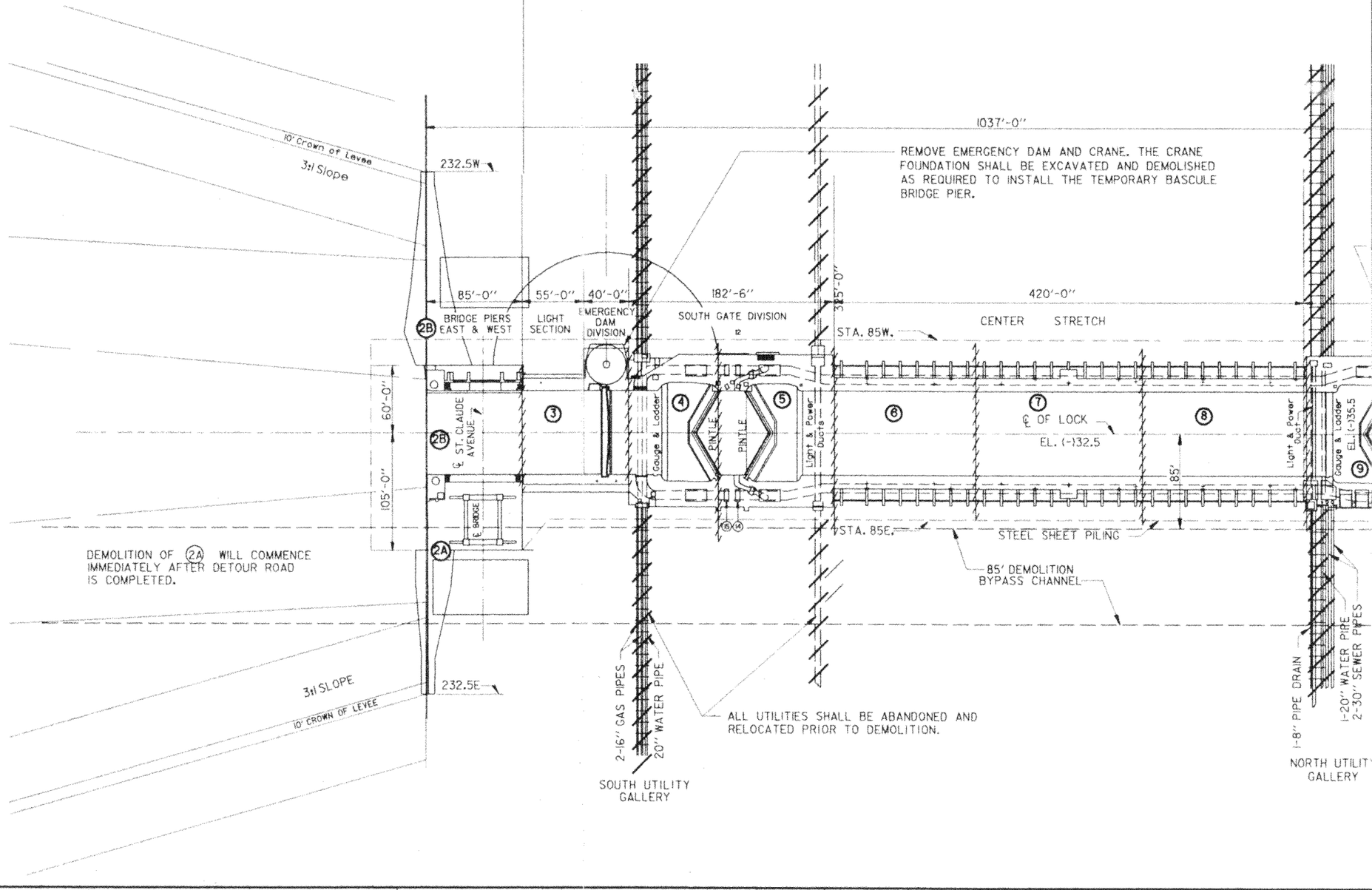
1) ALL DEMOLITION SHALL BE DONE IN THE WET. MARINE TRAFFIC SHALL BE DETOURED THROUGH AN 85' WIDE CHANNEL LOCATED ON THE EAST BANK (SEE PLATE EA-8).

2) SHIP LOCK: THE EXISTING LOCK SHALL BE DEMOLIOSHED IN IT'S ENTIRETY.

3) BARGE LOCK: DEMOLITION OF THE EXISTING LOCK SLAB IS NOT REQUIRED. LOCK WALLS SHALL BE REMOVED TO EL. -30.0.



LONGITUDINAL SECTION AT ℄ OF LOCK



FILE NO.
H-4-30883

HE WET.
THROUGH
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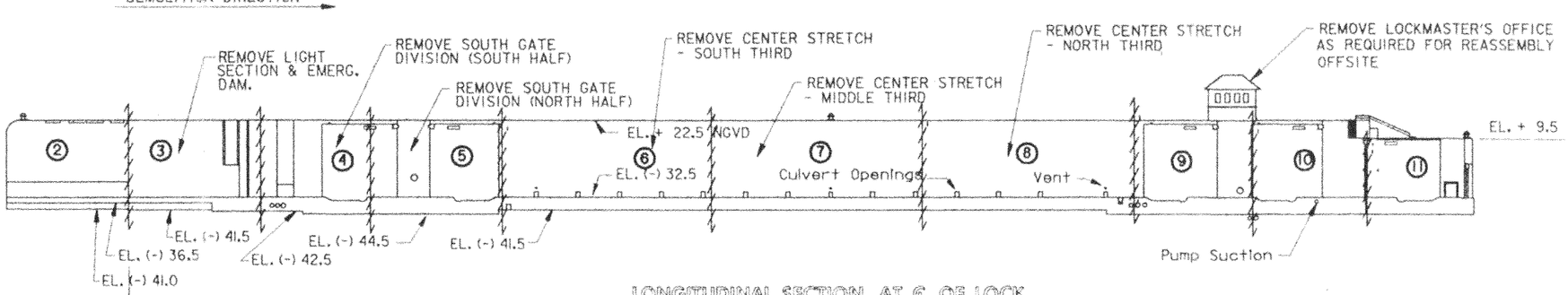
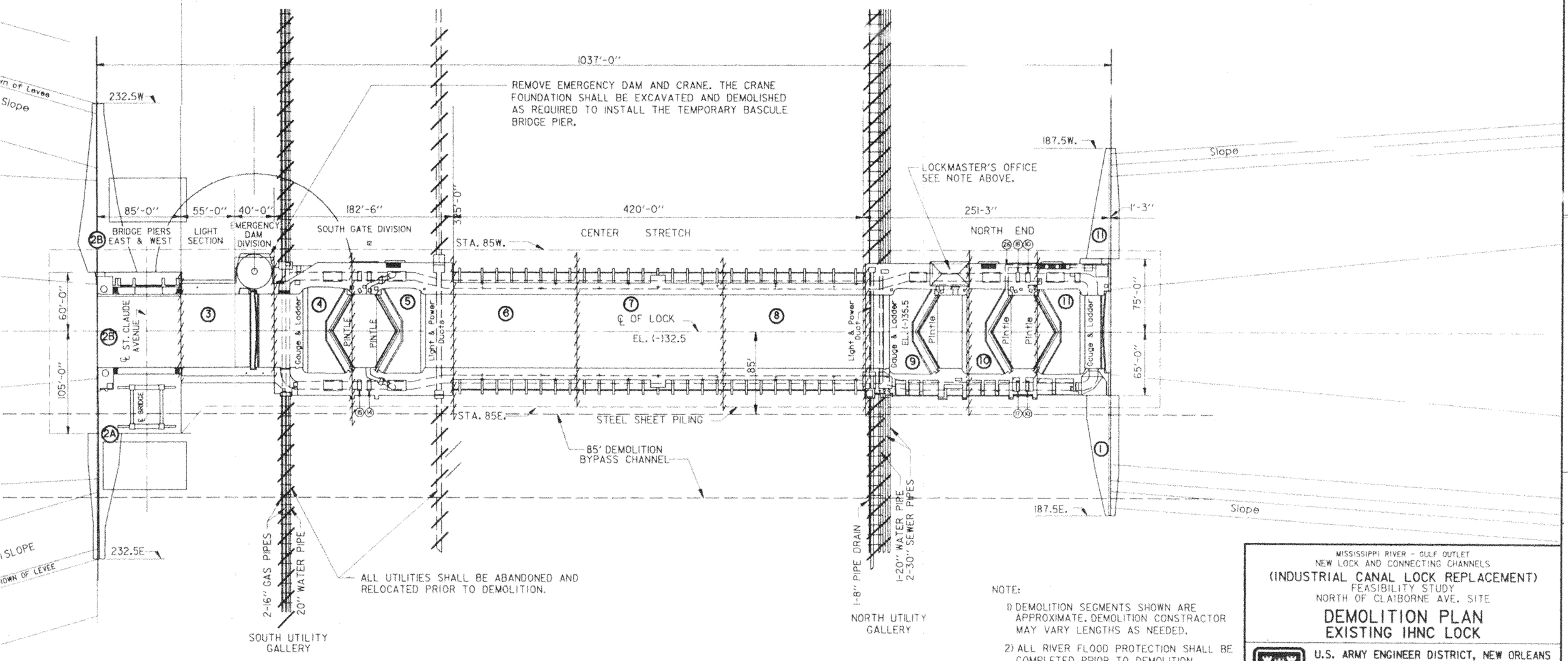
L BE

ISTING
WALLS

DEMOLITION DIRECTION



LONGITUDINAL SECTION AT ℄ OF LOCK



NOTE:

1) DEMOLITION SEGMENTS SHOWN ARE APPROXIMATE. DEMOLITION CONSTRACTOR MAY VARY LENGTHS AS NEEDED.

2) ALL RIVER FLOOD PROTECTION SHALL BE COMPLETED PRIOR TO DEMOLITION.

3) LOCKAGE OCCURS AT THE NEW LOCK.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

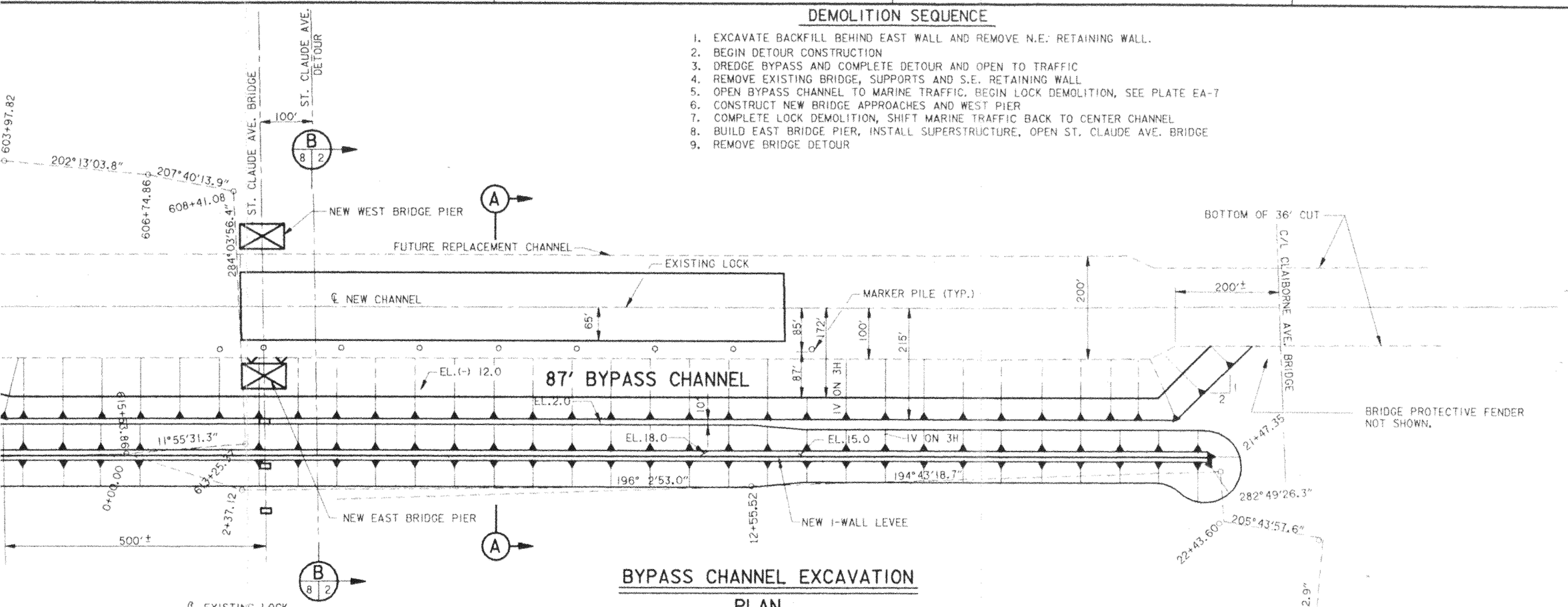
DEMOLITION PLAN EXISTING IHNC LOCK

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: X	PLOT SCALE: 600	PLOT DATE: 3/11/97	CADD FILE: SFSDEMOL.DGN	
DRAWN BY: X			FILE NO.	H-4-30883
CHECKED BY: X	DATE: NOVEMBER 1994			

DEMOLITION SEQUENCE

1. EXCAVATE BACKFILL BEHIND EAST WALL AND REMOVE N.E. RETAINING WALL.
2. BEGIN DETOUR CONSTRUCTION
3. DREDGE BYPASS AND COMPLETE DETOUR AND OPEN TO TRAFFIC
4. REMOVE EXISTING BRIDGE, SUPPORTS AND S.E. RETAINING WALL
5. OPEN BYPASS CHANNEL TO MARINE TRAFFIC. BEGIN LOCK DEMOLITION, SEE PLATE EA-7
6. CONSTRUCT NEW BRIDGE APPROACHES AND WEST PIER
7. COMPLETE LOCK DEMOLITION, SHIFT MARINE TRAFFIC BACK TO CENTER CHANNEL
8. BUILD EAST BRIDGE PIER, INSTALL SUPERSTRUCTURE, OPEN ST. CLAUDE AVE. BRIDGE
9. REMOVE BRIDGE DETOUR



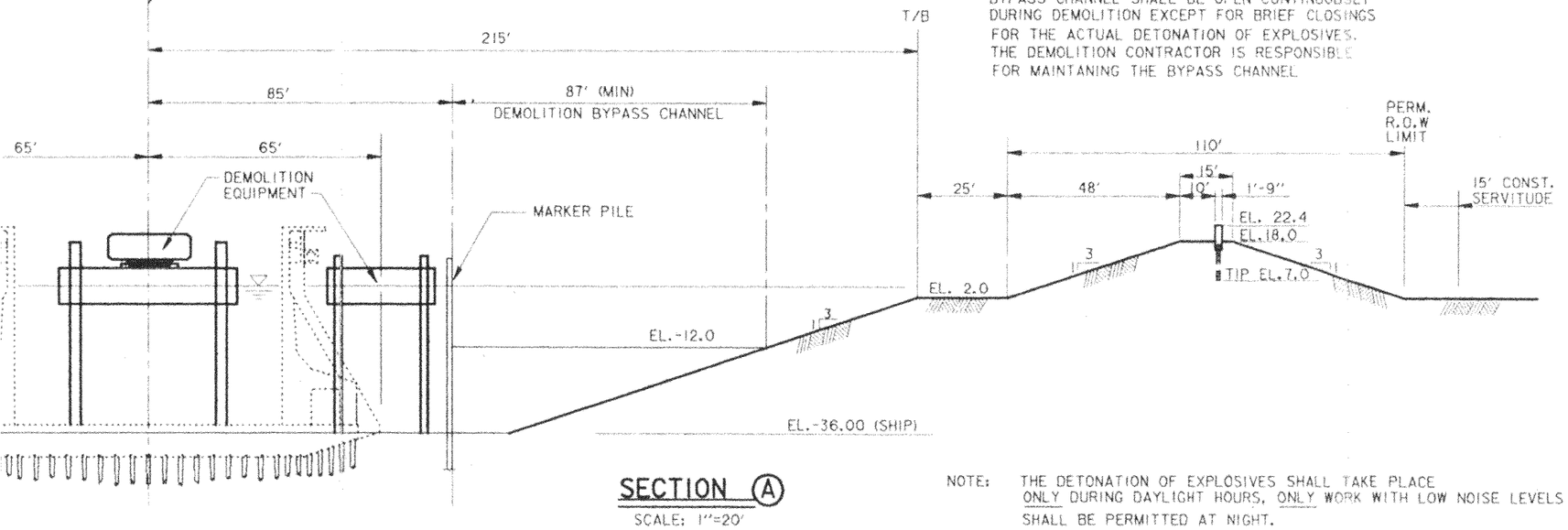
BYPASS CHANNEL EXCAVATION

PLAN

SCALE: 1"=100'

℄ EXISTING LOCK
= C/L NEW CHANNEL

BYPASS CHANNEL SHALL BE OPEN CONTINUOUSLY DURING DEMOLITION EXCEPT FOR BRIEF CLOSINGS FOR THE ACTUAL DETONATION OF EXPLOSIVES. THE DEMOLITION CONTRACTOR IS RESPONSIBLE FOR MAINTANING THE BYPASS CHANNEL



SECTION (A)

SCALE: 1"=20'

NOTE: THE DETONATION OF EXPLOSIVES SHALL TAKE PLACE ONLY DURING DAYLIGHT HOURS, ONLY WORK WITH LOW NOISE LEVELS SHALL BE PERMITTED AT NIGHT.

WATER STAGE	*BYPASS CHANNEL MIN. BOTTOM WIDTH	** SIDE CLEARANCE FOR BARGE DOUBLE TOW
EL.0.0	87'	8.5'
EL.3.0	96'	13.0'
EL.5.0	102'	16.0'
EL.10.0	117'	23.5'

* BASED ON 9' BARGE DRAFT PLUS 3' BOTTOM CLEARANCE
** DOUBLE BARGE WIDTH CONSIDERED TO BE 70', CLEARANCE EQUAL ON EACH SIDE.

NOTE: DOUBLE TOWS PERMITTED WHEN WATER STAGE EXCEEDS EL. 3.0

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK NAD CONNECTING CHANNELS
(INDUSTRIAL CANAL LOCK REPLACEMENT)
FEASIBILITY STUDY
NORTH OF CLAIBORNE AVE. SITE

DEMOLITION BYPASS CHANNEL PLAN

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

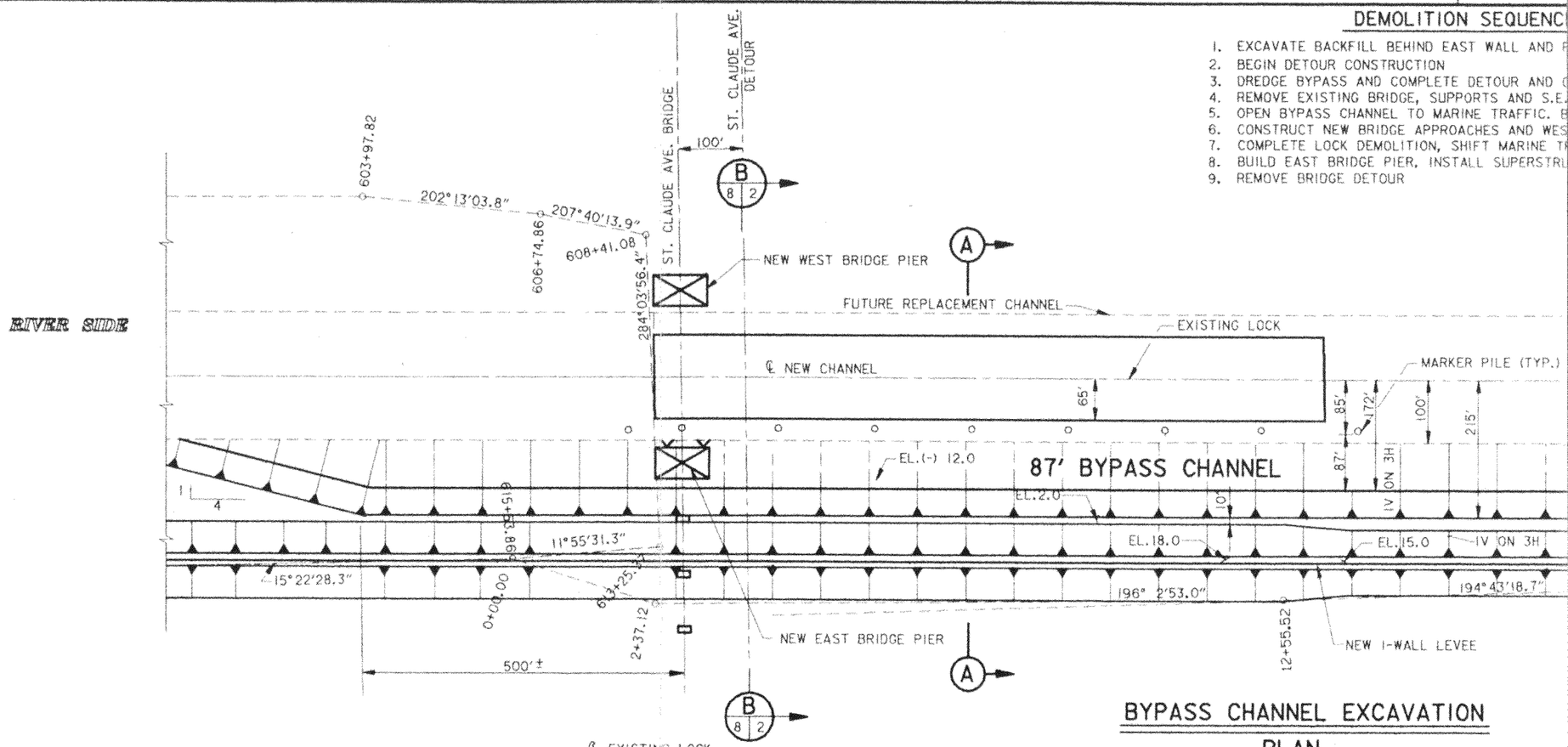
DESIGNED BY: x	PLOT SCALE: 1200	PLOT DATE: 3/11/97	CADD FILE: FSOMBYPL.DGN
DRAWN BY: x			FILE NO. H-2-40392
CHECKED BY: x	DATE: NOVEMBER 1994		

PLATE EA-8

5 4 3

DEMOLITION SEQUENC

1. EXCAVATE BACKFILL BEHIND EAST WALL AND F
2. BEGIN DETOUR CONSTRUCTION
3. DREDGE BYPASS AND COMPLETE DETOUR AND
4. REMOVE EXISTING BRIDGE, SUPPORTS AND S.E.
5. OPEN BYPASS CHANNEL TO MARINE TRAFFIC.
6. CONSTRUCT NEW BRIDGE APPROACHES AND WES
7. COMPLETE LOCK DEMOLITION, SHIFT MARINE T
8. BUILD EAST BRIDGE PIER, INSTALL SUPERSTRU
9. REMOVE BRIDGE DETOUR

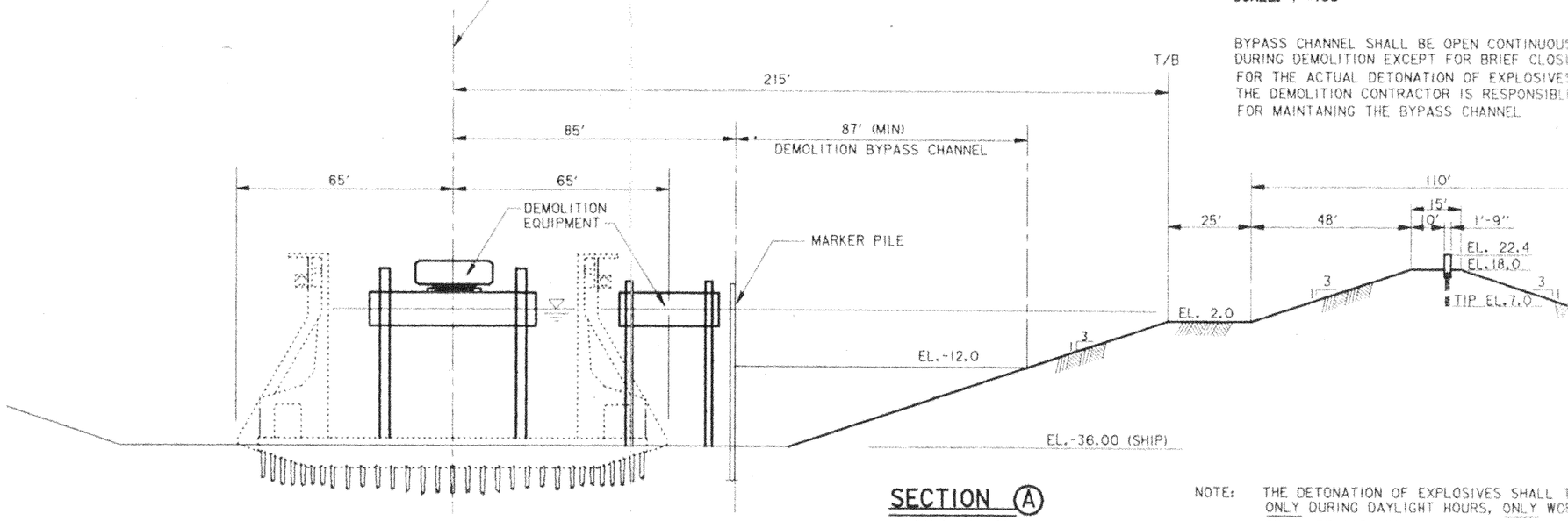


BYPASS CHANNEL EXCAVATION

PLAN

SCALE: 1"=100'

BYPASS CHANNEL SHALL BE OPEN CONTINUOU
DURING DEMOLITION EXCEPT FOR BRIEF CLOS
FOR THE ACTUAL DETONATION OF EXPLOSIVE
THE DEMOLITION CONTRACTOR IS RESPONSIBL
FOR MAINTANING THE BYPASS CHANNEL



SECTION (A)

SCALE: 1"=20'

NOTE: THE DETONATION OF EXPLOSIVES SHALL
ONLY DURING DAYLIGHT HOURS, ONLY WO
SHALL BE PERMITTED AT NIGHT.

5 4 3

FILE NO.
H-2-40392

ENGINEERING INVESTIGATIONS

November 1996

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

EXECUTIVE SUMMARY

This Engineering Appendix provides detail designs and M-CACES cost estimates for the NED Plan 110 x 900 barge lock and the Recommended Plan 110 x 1200 shiplock.

The scope of work, as envisioned, at the start of Engineering Division's support for the Feasibility Study focused primarily on the New Lock, North of Claiborne Avenue Alternative. Engineering Division was tasked to provide engineering designs and costs for the various components of this alternative. A list of major components of this alternative follows with a general description of each component and summary narrative of engineering analysis performed.

LOCK

Engineering design effort focused on a pile-founded, precast, post-tensioned, float-in concrete lock with miter gates. Prior to the feasibility effort, a conventional cast-in-place lock design was considered and not adopted for further study due to excessive costs and right-of-way required for construction cofferdaming to maintain navigation for the full construction period. Analysis, designs and cost estimates were developed for four alternative lock sites, two barge locks and two ship lock sites. The chamber width is 110 feet for both barge and ship locks, with a uniform chamber floor and sill depth of 22 feet for the barge locks and 36-foot depth sill and 40-foot chamber floor depth for the ship locks, and a 900-foot and 1200-foot usable chamber length for both barge and ship locks. The preliminary design investigated a steel hull structure that was soil-founded. The calculated differential settlement that was acceptable for the steel hull was considered to be detrimental for the less ductile concrete structure. Therefore, the soil foundation was eliminated and a pile foundation designed.

Additional engineering investigations and cost estimates were conducted and developed during plan formulation. For project optimization purposes in the economic analysis, cost estimates were developed for four additional lock sizes. Quantity take-offs were made from the 110 x 900 x 22 foot barge lock to estimate costs for 110 x 900 x 18, 110 x 900 x 25/22 floor/sill and a 90 x 900 x 22 foot barge locks. Code of accounts cost estimates for the alternative plans, except the 90 x 1200 x 22 foot barge lock, are presented in the cost estimate section of the Engineering Appendix. A cost estimate for a 90 x 1200 x 22 foot barge lock was developed more simplistically. To get the 90 x 1200 x 22 foot barge lock estimate, the 90 x 900 foot barge lock was increased by the same rate of increase that exists between the 110 x 900 and 110 x 1200 barge locks.

In support of the economic analysis, costs estimates were developed for several additional alternatives. These alternatives are described below. The engineering support for these estimates was minimal and to a lesser degree than those alternatives discussed above.

a. Rehabilitation. In lieu of a lock replacement, rehabilitation of the existing lock was considered. The design life for this alternative was estimated to be 50 years. Rehabilitation would provide a serviceable lock, but with lockages limited to the existing lock chamber capacity. The estimated cost, $21 million, is in addition to the normal O&M cost for the existing lock.

The lock elements that would be rehabilitated or replaced include four spare miter gate leaves, a spare set of miter gate machinery, a sump pump system, wall armor retrofitting, and replacing control houses and the original roofing of the Lockmaster's office. The river side timber guidewalls would be replaced with floating concrete guidewalls and fendering, and forebay and guidewall mooring dolphins would be replaced. Other work included rehabilitation of a water utility line through the existing lock, and selected electrical and mechanical system replacements. Structural repairs would be made to the concrete masonry in the miter gatebay machinery rooms.

An important element of this alternative to consider was the intermittent lock closures required to accomplish the rehabilitation work. It was estimated that nine 30-day closures would be needed within a five-year construction period.

b. Bridge only. In this alternative the St. Claude Bridge would be replaced. Lock replacement would not be considered for 50 years. The St. Claude bridge replacement is intended to benefit navigation by reducing the current delays in lock cycle time from the existing St. Claude bridge operation. The replacement bridge in this alternative would be a mid-level double bascule bridge providing a 40-foot vertical clearance and a 200-foot horizontal clearance. The cost estimate for this bridge was based on a low-level bridge design and cost developed by an A-E that also provided a 200-foot horizontal clearance. The A-E's cost was modified by adjusting their quantities from a low-level design to a mid-level design.

c. Phased construction. In this alternative the St. Claude Bridge would be replaced first assuming the replacement of the lock would be realized approximately 25 years later. This alternative would provide short-term benefits to navigation by reducing the current delays in lock cycle times from the existing St. Claude Bridge operation. The bridge in this plan is a mid-level vertical lift bridge providing a 300-foot horizontal clearance as opposed to the 200-foot clearance provided in the "Bridge only" alternative discussed above.

The 300-foot horizontal clearance is needed to facilitate future lock construction without closing the canal to navigation for extended periods of time. The cost estimate for the bridge component of this alternative was based on a bridge design and cost estimate developed by an A-E. In

the economic analysis this bridge cost was combined with the cost estimates for the various lock sizes already developed.

CHANNELS

The design channel depth is (-)36 feet NGVD for the ship lock and (-)22 feet NGVD for the barge lock with channel bottom widths of 200 and 284 feet, respectively. Bottom widths transition to 150 feet at the Claiborne Avenue Bridge for both ship and barge locks, and to 180 feet at the St. Claude Bridge, 150 feet for the ship lock, and 234 feet for the barge lock at the Florida Avenue Bridge. The channel transitions to 110 feet at the new lock for both barge and ship locks. Side slopes of 1 vertical on 3 horizontal were used. During construction at the new lock site and demolition of the existing lock, a system of by-pass channels was designed to keep navigation down time to an absolute minimum. The by-pass channel at the new lock site is to the east of the site and is a split level channel providing two 110-foot bottom width lanes of travel, one at (-)31 feet NGVD and the other at (-)22 feet NGVD. During demolition of the existing lock, a by-pass channel will be provided to the east with a (-)12-foot NGVD bottom elevation and an 85-foot bottom width.

LEVEES AND FLOODWALLS

The Mississippi River flood protection levees and Floodwalls must be extended from the existing lock north approximately 2500 feet on the east and west banks to tie into the southern end of the new lock. This MRL flood protection, dependent upon location, will consist of a combined earth/concrete topped I-wall or concrete T-wall sections. The MRL design grade at this location is 22.1 feet NGVD and will be replacing the existing hurricane protection which has a top elevation of 15 feet NGVD on the west bank and 14 feet NGVD on the east bank. Hurricane protection, a combined earth/concrete topped I-wall, will tie into the northern end of the new lock with a top elevation of 14 feet NGVD.

RELOCATIONS

Bridges. Three existing movable bridges are located on the Inner Harbor Navigation Canal between the Mississippi River and the Mississippi River Gulf Outlet: Florida Avenue (northernmost), Claiborne Avenue (LA Route 39) and St. Claude Avenue (LA Route 46) (southernmost).

a. Florida Avenue Bridge. The Florida Ave. bridge is not included in the Corps IHNC lock replacement project. Although this bridge is not part of the project, it is being assumed that the bridge is being replaced by others. Further details of this bridge are presented in the Appendix.

b. St. Claude Avenue Bridge. The existing St. Claude Ave. Bridge will be demolished and replaced by a low-level leaf double bascule bridge with a 200-foot clear horizontal span at the water surface. During plan

formulation both low and mid-level vertical lift type bridges were also considered, but were not adopted because of social impacts and slower operating times compared to the double leaf bascule bridge.

c. Claiborne Avenue Bridge. Because of its location north of the existing lock, the Claiborne Ave. Bridge is subjected to Lake Pontchartrain water levels; but with the proposed new lock location, it will be subjected to Mississippi River levels. To maintain Coast Guard mandated clearances when in the open position, the Claiborne Ave. Bridge superstructure will be replaced and the existing bridge piers retrofitted and reused. The replacement bridge is the same type as the existing bridge, a mid-level, vertical lift span bridge. The Claiborne bridge superstructure will be replaced with higher towers and a new movable span. New mechanical and electrical equipment will be installed.

UTILITIES

There are a number of utility relocations of varying types and sizes that traverse the canal or pass through the existing lock utility gallery. The project plan is to relocate these in three utility corridors, each containing one trench crossing the channel. These trenches are located south of St. Claude, north of Claiborne Ave. and south of Florida Ave. The trenches will be provided by the Government with utility owners performing relocations.

MITIGATION PLAN

Details and components of the mitigation plan are presented in the Mitigation Appendix A. Given the unique circumstances associated with this project, a shift in focus from the natural environment to the social environment requires a departure from traditional methods of environmental impact analysis and mitigation planning. The construction plan developed for the North of Claiborne Avenue site either eliminates or substantially reduces major project-related impacts in the areas of displacement of people, construction-related noise and traffic congestion. The various components of the mitigation plan and their costs are presented in code of accounts format in the cost estimate section of the appendix.

BOARD OF EXPERTS

The preliminary concept, the steel hull float-in, was rejected late in the report process. In order to meet the schedule, it was decided that the concrete float-in concept would be reviewed and revised concurrent with the design effort. The review was conducted by both an in-house Technical Review Team and a Board of Experts. The Board of Experts had the second responsibility of approving the lock structural concept. The Board was comprised of a representative from Headquarters Engineering Division, representatives from Division Engineering Division and two A/E firms experienced in the design and construction of precast concrete float-in structures. The Board members are:

Mr. Joe Hartman	CECW-ED
Mr. Terry Cox	CELMV-ET-ES
Mr. Tony Young	CELMV-ET-EG
Mr Saad Moustafa	Wiss, Janney, Elstner, Assoc., Inc.
Mr. Dale Berner	Ben Gerwick, Inc.

The vast experience of both A/E members was a vital ingredient in the accepted design. Their review and recommendations solidified this state of the art design. The CORPS members provided the expertise that assured final acceptance. The Board of Experts approved the structure at their last meeting, October 17, 1996.

FUTURE ENGINEERING & DESIGN

Upon approval of the Feasibility Report (Reevaluation Report), a series of design documents will be done. Several potential cost reduction items were discovered during preparation of the draft feasibility study. Some of the more considerable items include:

a. Removal of the backfill in the area outside of the chamber lock wall. Allow the riverside tie-in levee to act as both river and hurricane protection.

b. Revisions to the guidewall design.

c. Use of a sector gate, with an assisting filling and emptying system (i.e., ear-type sector gate, sector gates with sluice gates, around-the-gate culvert system) in lieu of miter gates.

d. Considering larger diameter piles in the foundation. Additionally, pile tests will be performed to minimize pile lengths.

e. Mechanical guidance system to hasten tow entrance and exit times.

Post-feasibility studies will focus on these issues as well as others that may result in reduced costs for the lock replacement. A CPM logic network of activities associated with producing design memorandums, plans and specifications, and construction is provided in the Project Management Plan (PMP). More details and resources associated with these efforts can also be found in the PMP. Engineering and design cost estimates are also provided in the cost estimate section of this appendix.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

TABLE OF CONTENTS

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MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

SECTION 1 - HYDROLOGY AND HYDRAULICS

GENERAL

B.1.1. This section presents information on hydraulic and hydrologic studies, including hydrology, hydraulic design and water quality, that were completed for the recommended plan (1200 ft X 110 ft ship lock, sill at -36 ft NGVD and floor at -40 ft NGVD) and the NED plan (900 ft X 110 ft barge lock, sill and floor at -22 ft NGVD) as well as for the other alternative sizes of locks that were studied in detail in this phase. Numerous alternatives were studied for a replacement lock at the Inner Harbor Navigation Canal (IHNC) site and for a replacement lock near Violet, Louisiana. In 1990 the replacement lock near Violet, LA, was determined to be environmentally unacceptable and dropped from further analysis. Alternative analyses for proposed locations in the vicinity of the existing IHNC lock led to the decision to study four alternative sizes of locks, at the North of Claiborne Avenue location, in detail during the feasibility phase of this study. All of these four alternative sizes are miter gated and have a width of 110 ft. The barge lock alternatives that were studied have usable lengths of either 900 ft or 1,200 ft, with the lock floor and sill elevation at -22 ft NGVD. The 900-ft barge lock would be adequate to handle a design vessel configuration having a draft of 11 ft and consisting of three barges wide by four barges long (each barge 35-ft wide by 195-ft long) and an 80-ft long tugboat. The 1,200-ft barge lock would be adequate to handle a design vessel configuration having a draft of 11 ft and consisting of three barges wide by five barges long and an 80-ft long tugboat. The ship lock alternatives also have usable lengths of either 900 ft or 1,200 ft. The sill elevation for the ship lock is -36 ft NGVD, and the floor elevation is -40 ft NGVD. Either of the ship lock alternatives would be adequate to handle a design ship with a beam width of 100 ft, variable lengths, and a maximum draft of 31 ft. All elevations and stages are referenced to the National Geodetic Vertical Datum (NGVD) unless otherwise noted.

HYDROLOGY

Terrain

B.1.2. The project area, located in Orleans Parish in southeastern Louisiana, is of low relief characteristic of an alluvial flood plain. Situated near the eastern bank of the Mississippi River, land elevations in the project area slope gently from about 10 feet NGVD along the natural banks of the Mississippi River to 0.5-1.0 feet NGVD in unprotected marsh areas to several feet below sea level in portions of leveed areas. Lake Borgne lies to the east of the project area, while the City of New Orleans and Lake Pontchartrain lie to the north. The project area is protected against river flooding by the Mississippi River Levee system and against hurricane flooding by the Lake Pontchartrain and Vicinity Hurricane Protection project.

CLIMATOLOGY

General Climate

B.1.3. The climate of the area is subtropical marine, with long humid summers and short moderate winters. Southerly winds prevail throughout the warmer months, producing intense thunderstorms during the summer. In the colder months the area is subjected to frontal movements which produce squalls and sudden temperature drops. Climatological data for this area are contained in monthly and annual publications of the U.S. Department of Commerce, National Climatic Center, titled "Climatological Data for Louisiana," and "Local Climatological Data, New Orleans, LA."

Temperature

B.1.4. The maximum, minimum, and mean monthly and annual normal temperatures (1961-1990) for New Orleans at Audubon Park are shown in Table B-1. The location of this temperature gage is shown on plate B-1. Over this period, the extremes recorded were a high of 102 °F occurring in August 1980 and a low of 11°F in December 1989.

TABLE B-1
NEW ORLEANS AT AUDUBON PARK
TEMPERATURE NORMALS (°F)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
NORMAL MAX	61.3	64.5	71.8	78.7	84.5	89.4	90.8	90.5	87.1	80.0	70.5	64.8	77.9
NORMAL MIN	44.1	47.1	54.2	60.9	67.5	73.0	74.9	74.8	71.7	61.8	54.1	47.6	61.0
NORMAL	52.7	55.8	63.0	69.8	76.0	81.2	82.9	82.7	79.4	70.9	62.8	56.2	69.5

Precipitation

B.1.5. Precipitation data for the stations New Orleans at Algiers, New Orleans pumping stations DPS 5 and DPS 14 represent the study area. The locations of these precipitation gages are shown on plate B-1. The average monthly and annual normals of the three stations are shown in Table B-2.

TABLE B-2
AVERAGE PRECIPITATION NORMALS
(inches) (1961-1990)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
AVG	4.89	5.45	4.75	4.59	4.90	4.92	6.09	5.90	5.30	2.98	4.09	5.20	59.07

Wind

B.1.6. Wind records are available from 1949 based at New Orleans Moisant Airport. The location of this wind gage is shown on plate B-1. The average wind velocity over the period of record is 8.2 miles per hour (mph). The predominant wind directions are north-northeast from September through February and south-southeast from March through June.

HURRICANE, STORMS AND FLOODS OF RECORD

B.1.7. Analyses of hurricanes and tropical storms along the Louisiana coast have been made for storms from 1893 to present. During that time, a total of 49 storms have either struck or affected the coastal area of Grand Isle to the Louisiana-Mississippi state line. The highest maximum observed winds at landfall came from Hurricane Camille (14-22 August 1969) and measured 160 mph near the center with gusts to 190 mph. Hurricane Florence (1988) was the last major storm to cross this area. Major floods have occurred on the Mississippi River in 1912, 1922, 1927, 1937, 1945, 1950, 1973, 1974, 1975, 1979, and 1983. The most severe flood in recent years occurred in 1973. Above normal rainfall began in the fall of 1972, proceeded through the winter, and climaxed in the early spring of 1973. Both the Morganza Floodway and the Bonnet Carre Spillway were operated. Flow passing New Orleans peaked at 1,257,000 cfs. Peak stage for the Mississippi River at the IHNC lock was 17.1 feet NGVD.

TIDES

B.1.8. Tides can influence river stages as far upstream as the head of ship navigation at Baton Rouge, Louisiana. Tides at the entrance channel to Southwest Pass are diurnal and have a mean range of 1.3 feet. Mean tide level is 0.6 feet mean low water. The spring range is 2.6 feet and the neap range is 0.1 foot.

B.1.9. The Mississippi River Gulf Outlet is a tidewater link between the IHNC and the Gulf of Mexico. Tides on this channel are essentially diurnal. The mean range varies between 1.0 foot at the IHNC and 1.5 feet at Gardner Island near the Gulf entrance in Breton Sound. The mean tide levels vary between 0.5 feet MLW at the IHNC to 0.8 feet MLW at Gardner Island. The maximum spring range at Gardner Island is 2.8 feet and is comprised of a -0.8 feet low and 2.0 feet high referenced to mean low water datum. The neap tides are semi-diurnal and have a range of 0.1 feet.

Currents

B.1.10. Currents in the Mississippi River are affected by headwater discharge and tidal action. During periods of high discharges, maximum velocities in the main channel may be as high as 12.0 feet per second (fps) with mean velocities of 9.0 fps for the same flow. At low flow in the river, velocities may be as low as 1 fps or less. During low water, the flow near the mouth is directed upstream along the bottom of the

channel and directed downstream near the surface. A fully developed saline wedge can develop in the river and proceed upstream.

B.1.11. Currents on the Mississippi River-Gulf Outlet (MR-GO) are affected by tidal action and freshwater inflows. The mean annual velocity in the channel is about 0.6 fps, but may exceed 2 fps on ebb or flood tides. During periods of low inflows into the lake, July through November, surface ebb and bottom velocities average about 0.8 and 1.7 fps, respectively. Both may exceed 2 fps.

Visibility

B.1.12. River fog forms when warm, moisture-laden air moves over the relatively cold waters of the Mississippi River during the winter and spring. The potential for widespread river fog is greatest in the adjacent wetlands of the river. River fog is uncommon from May to November.

B.1.13. Table B-3 represents the average number of days per month river fog impacts the area. The number of river fog days is determined by accumulating the average number of days the water temperature at New Orleans is below daily average dew points. This phenomenon occurs primarily during the months of February, March, and April and substantially increases the number of fog days.

TABLE B–3
AVERAGE NUMBER OF DAYS OF FOG
(1970–1989)

River Fog	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Potential	3.8	5.6	9.6	5.4	-	-	-	-	-	-	-	2.9

Datums

B.1.14. Relative sea level rise (which results primarily from land subsidence, from other geologic activity, and possibly from global sea level rise) must be appropriately considered with respect to design, construction, and operation of a navigation project. Southeast Louisiana has been subsiding at a rate of about 2 cm per year since 1962. By comparison, the central Mississippi gulf coast has been subsiding at a rate of about 0.15 cm per year.

B.1.15. Table B–4 summarizes the relative sea level rise or subsidence rates at several gage locations in the Lake Pontchartrain Basin and includes data for Biloxi and Galveston for comparison.

TABLE B-4
COMPARISON OF LAKE PONTCHARTRAIN AND GULF COAST
RELATIVE SEA LEVEL RISE OR SUBSIDENCE

Gage Location	Relative Sea Level Change MSL – NGVD cm per year
Little Woods	1.09
South Shore	1.00
Mandeville	0.48
Biloxi	0.15
Galveston	0.62

B.1.16. Table B-5 shows the relationship between MSL, NGVD, and MLG datums at the Corps gage at Shell Beach on the MR-GO.

TABLE B-5
MISSISSIPPI RIVER – GULF OUTLET AT SHELL BEACH

Datum	Height feet NGVD	Remarks
MSL (Mean Gage Record)	1.26	
Mean Low Water	0.61	Tide Range = 1.3
NGVD	0.00	1956 Leveling Epoch
MLG	-0.78	Current usage

Notes:

a. NGVD epoch is 1956
b. Approx MSL based on 0800 readings, True MSL is defined by averaging hourly ordinates over a 20 year (Metonic) cycle set by NOAA-NOS
c. MLW is equal to MSL minus half the tide range from NOAA-NOS Tide Table

B.1.17. Table B-6 shows the elevation of Mean Sea Level in feet for other locations along the MR-GO.

TABLE B-6
MEAN SEA LEVEL

Station	Feet NGVD
Lake Borgne at Rigolets	1.06
Gulf Intracoastal Waterway near Paris Road Bridge	1.51

Note: Approximate MSL based on 0800 readings, True MSL is defined by averaging hourly ordinates over a 18.6 year (Metonic) cycle as set by NOAA-NOS.

Stages

B.1.18. Table B-7 lists stage data in the immediate area of the project site. The locations of the gaging stations listed in Table B-7 are shown on plate B-1.

TABLE B-7
STAGE DATA (FEET NGVD)

STATION	PERIOD OF RECORD	MEAN	MAXIMUM	DATE	MINIMUM	DATE
Miss. R. at Carrollton	1872-1991	6.66	21.27	04/25/22	-1.60	12/27/1872
Miss. R. at Harvey Lock	1924-1991	6.63	19.42	04/24/27	-0.68	12/18/53
Miss. R. at IHNC Lock	1945-1991	6.42	17.52	03/04/50	-0.48	01/04/54
Miss. R. at Chalmette	1923-1991	6.14	17.58	04/26/27	-0.52	01/26/40
Miss. R. at Algiers Lock	1956-1991	6.11	16.11	04/07/73	-0.15	01/19/81
IWW at Harvey Lock	1925-1991	1.33	4.74	10/29/85	-1.28	01/27/40
IWW at Algiers Lock	1956-1991	1.22	4.45	10/29/85	-1.64	09/09/65
IWW at New Orleans (IHNC Lock)	1922-1991	1.37	10.61	09/10/65	-2.00	04/12/88
IWW at Seabrook Bridge	1962-1991	1.39	6.47	08/18/69	-1.89	04/12/88
IWW at Florida Ave Bridge	1944-1991	1.46	9.82	08/18/69	-2.53	12/26/89
IWW near Paris Road Bridge	1944-1991	1.55	10.04	09/10/65	-2.56	04/12/88

Notes: a. Numbers in Table do not reflect changes in datum over time
b. Means are for the period 1963 to 1991
c. IWW near Seabrook Bridge also has intermittent records between 1942 and 1960
d. Maximum stages on IWW gages caused by hurricane
e. Maximum stage at IWW at New Orleans is a highwater mark

HYDRAULIC DESIGN - GENERAL PARAMETERS

Waterway Characteristics

B.1.19. The Inner Harbor Navigation Canal is a major navigation artery linking together the Mississippi River, Gulf Intracoastal Waterway (GIWW), Mississippi River-Gulf Outlet and Lake Pontchartrain. The canal is about 425 feet wide and 35 feet deep. Flow in the canal is minimal just north of the IHNC Lock and consists primarily of lockage flows and that necessary to empty and fill the tidal prism. Thus flow velocities within this area are minimal. The canal connects with the Mississippi River at Mile 92.6 AHP; the MR-GO/GIWW about 2.0 miles to the north and Lake Pontchartrain about 5.0 miles to the north.

B.1.20. The Mississippi River is approximately 0.5 miles wide and provides navigable depths of 45 feet or more. The river serves as the major flood control outlet for the entire Mississippi River Basin. Thus flows and velocities vary over a wide range. During low flow periods, discharge approaches 100,000 cfs with velocities less than 1.0 ft/sec. During floods, flows up to 1,250,000 cfs are experienced and velocities exceed 10 ft/sec. Because of the presence of strong river currents vessels usually approach the lock from the downstream direction.

The Mississippi River-Gulf Outlet is a 36 foot deep by 500 foot wide navigation channel connecting the Gulf of Mexico to the IHNC in New Orleans. The channel carries tidal flows from the Gulf of Mexico to Lake Pontchartrain via the IHNC at velocities of 3 ft/sec or less.

Design Stages

B.1.21. The project is impacted to the south by water levels on the Mississippi River and to the north by tidal influences and surges from the Gulf of Mexico. The replacement lock must serve to function as the line of protection from the Mississippi River floods. Thus, elevations must be consistent with providing protection to the Mississippi River and Tributaries (MR&T) Project design flowline standards. The MR&T project design flood flowline at the IHNC lock site (Mile 92.6 AHP) is 17.6 feet NGVD. The authorized freeboard at this location is 4.8 feet. Thus, the net embankment grade must be 22.4 feet NGVD.

B.1.22. To the north, hurricane surges are the predominant flooding threat. Therefore, project features must be consistent with providing the level of protection associated with the Lake Pontchartrain and Vicinity Project. Under this project, design stages are based on a Standard Project Hurricane producing a stage of 13.0 feet NGVD at the IHNC lock site. A freeboard of 1.0 feet is added to this design surge level to obtain net embankment grades.

B.1.23. The riverside and lakeside stage duration curves shown on plates B-2 and B-3 are based on the riverside and lakeside stages at the existing IHNC lock for the period of record 1945 to 1989.

Design Heads

B.1.24. Maximum differential head for hydraulic design purposes is based on the occurrence of a project design flood flowline (17.6 feet NGVD) on the Mississippi River concurrent with the observed historical minimum stage of -2.0 feet NGVD on the north side of the lock. Thus, the maximum normal design head is 19.6 feet. Similarly, the maximum reverse differential head is based on the minimum historical stage of -1.6 feet NGVD on the Mississippi River at Carrollton concurrent with the project design hurricane stage of 13.0 feet NGVD. Thus, the maximum design reverse head is 14.6 feet.

B.1.25. The maximum observed normal head of 16.9 feet (riverside 16.4 feet NGVD; lakeside -0.5 feet NGVD) occurred on 23 March 1945. The maximum observed reverse head of 2.6 feet (riverside 3.9 feet NGVD; lakeside 6.5 feet NGVD) occurred on 24 Sept 1956. See plate B-4.

B.1.26. The normal and reverse differential head duration curves are based on the riverside and lakeside stages at the existing IHNC lock for a period of record from 1945-89. Corresponding graphs are shown on plates B-5 and B-6. The following data in Table 8 were obtained from these graphs:

TABLE B-8
NORMAL AND REVERSE HEADS

Normal Heads		Reverse Heads	
Head (ft)	Duration (%)	Head (ft)	Duration (%)
16.0	0.1	1.5	0.01
14.0	2.2	1.0	0.12
11.0	12.4	0.5	0.45
7.0	32.6		
3.0	54.9		

Channel Depths

B.1.27. The IHNC canal is about 35 feet deep and has sufficient depth for design barge and ship traffic. No further deepening of the IHNC canal is required. Channel depth for accessing the replacement lock alternative will be consistent with sill depths in each design.

HYDRAULIC DESIGN OF THE LOCK COMPONENTS

B.1.28. Hydraulic designs were completed for each of the four alternative sizes of locks that were studied in detail in the feasibility phase. All of these alternative sizes are miter gated, 110 ft. in width, and would use the wall culvert side port filling and emptying system. The barge lock alternatives analyzed have usable chamber lengths of either 900 ft or 1,200 ft with the lock floor and sill elevation at -22 ft NGVD. The ship lock alternatives would also have usable chamber lengths of either 900 ft

or 1,200 ft. The sill elevation for the ship lock would be -36 ft NGVD, and the lock floor elevation would be -40 ft NGVD. The references shown in paragraph B.1.172 were used during completion of the hydraulic analyses for all of these alternatives.

Miter Gated Lock for a Ship

Sill & Floor Depth; Determination of Required Length of Lock Chamber

B.1.29. Locks serving ship traffic utilize a criterion where sufficient clearance is provided between the ship keel and lock sill a majority of the time to provide for the safe entrance and exiting of vessels. Based on limited guidance and consultation with the Waterways Experiment Station (WES) in Vicksburg, Mississippi, a clearance of about 5 feet is required between the sill and the hull of the vessel. This will be available 95 percent of the time with an absolute minimum clearance of 3 feet occurring at a record low stage of -2.0 feet NGVD. In addition, sufficient clearance between vessel bottom and lock floor is necessary to provide an adequate cushion during filling or emptying operation to keep the hawser forces within allowable limits. The allowable hawser forces are between 10 and 25 tons depending on the ship size. For the design ship, the hawser forces were limited to within the range of 10 tons to 20 tons; however, a hawser force closer to 10 tons would be a preferable design condition. For the ship lock, the sill elevation was set at -36.0 feet NGVD and the floor elevation was set at -40.0 feet NGVD for the design vessel draft of 31 feet.

B.1.30. The required chamber lengths (centerline-of-pintle to centerline-of-pintle) were determined by adding to the usable lengths an amount equal to the length required for one miter gate to swing to the open position, plus a clearance of 12 feet. The chamber lengths would be 970 ft for the 900-ft lock and 1,270 ft for the 1,200-ft lock.

Filling and Emptying System

B.1.31. For the wall culvert side port system, the lock will be subjected to reverse heads and will therefore require the installation of a double set of miter gates. Rectangular culverts in each wall will extend over the full length of the lock. Multiport intakes will be connected to the upstream ends of the culverts and discharge outlet manifolds will be connected to the downstream ends. Ports in each wall of the lock chamber will connect the wall culverts to the lock chamber. The location of ports in each wall will be staggered in relation to the ports in the opposite wall for better diffusion of jets and reduction of surface turbulence. Reverse tainter valves upstream from the most upstream lock chamber port in each culvert will control the flow into the lock. Valves downstream from the most downstream lock chamber ports will control the flow out of the lock. For a ship lock 110 feet wide and a floor elevation of -40.0 feet NGVD, the chamber ports will have throats 2.54 feet wide and 3.75 feet high. The chamber ports will be spaced 28 feet (center to center) and will be located within 60 percent of the lock chamber length. The port inverts will be the same as the culvert invert (-42.0 ft NGVD). The total cross-sectional area of the ports in each wall will be 0.95 times

the cross-sectional area of the wall culvert. For the 900-ft lock, twenty-one ports will be required in each wall and the end ports will be located 205 ft from the centerline of each gate pintle. The first seven ports from the river side will have triangular deflectors and the remaining ports will have square deflectors. For the 1,200-ft lock, twenty-eight ports will be required in each wall and the end ports will be located 257 ft from the centerline of each gate pintle. The first ten ports from the river side will have triangular deflectors and the remaining ports will have square deflectors. Recommendations presented in References 1, 7, and 8 in paragraph B.1.172 indicate that a system of deflectors in the lock floor are beneficial to the reduction of the surge effect in the lock chamber. Details of these features are shown on plates B-19 (ship), B-29 (barge), B-47N and B-47T.

Intake Manifold

B.1.32. The intake manifolds will be located in the sidewalls immediately upstream from the riverside miter gate monolith. They will also serve as outlet manifolds for reverse head situations. The intake manifolds will have 6 ports each with inverts at the same elevation as the lock floor. For the 900-ft lock, each port will have a wall face opening of 7 ft wide by 14.5 ft high. For the 1,200-ft lock, each port will have a wall face opening of 7.5 ft wide by 18.2 ft high. The maximum riverside pool elevation of 17.6 ft NGVD provides 43.1 ft of submergence for the 900-ft lock and 39.4 ft of submergence for the 1,200 ft lock. The minimum riverside pool elevation of -1.6 ft NGVD provides 23.9 ft of submergence for the 900-ft lock and 20.2 ft of submergence for the 1,200-ft lock. The submergence of the top of the wall openings was checked for all possible combinations of river side and lake side stages for both lock lengths to assure that it would always be at least equal to 110% of the velocity head computed for the peak flow, during filling, through the port having the smallest throat width. The transitions in the intake manifold were designed to provide a relatively uniform increase in velocities upstream and downstream of the port to the culvert section. Details are shown on plate B-47.

Outlet Manifold

B.1.33. The outlet manifolds will be located downstream from the lakeside miter gates. They will also serve as intake manifolds for reverse head situations. They will have five ports each with inverts at the same elevation as the lock floor. Their design was patterned after a sidewall outlet manifold shown in Reference 1 of paragraph B.1.172. WES was consulted to confirm that an outlet manifold design of this type would be adequate for the feasibility phase. Details are shown on plate B-47.

Filling and Emptying Times

B.1.34. The filling and emptying times were computed using the subroutine H5320 via the "CORPS" system as explained in Reference 3 of paragraph B.1.172. Examples of computed times for normal head conditions for the 900-ft and 1,200-ft locks using a hawser limit within the range of 10 tons to 20 tons are shown below. Filling and emptying times for various valve

times are graphically displayed on plates B-7 through B-10. The minimum valve times that can be used for various lifts for a hawser limit within the range of 10 tons to 20 tons are shown graphically on plate B-11.

TABLE B-9
FILLING AND EMPTYING TIMES

Valve Time (min)	Lift (ft)	Filling Time (min)		Emptying Time (min)	
		900-ft	1,200-ft	900-ft	1,200-ft
4	3	4.12	4.14	4.18	4.21
6	7	6.28	6.31	6.41	6.43
7	11	7.67	7.70	7.84	7.88

Plate B-11 shows the relationship between valve times and lifts for keeping the hawser forces within allowable limits.

Miter Gated Lock for a Barge

Sill & Floor Depth; Determination of Required Length of Lock Chamber

B.1.35. Reference 5 in paragraph B.1.172 stipulates that the minimum lock sill depth for shallow depth barge locks should be approximately two times the design draft of the tows that use the waterway. This criterion may be relaxed if sill depths are normally greater, as will be the case at the IHNC lock. This provides for the most optimal entrance and exiting of vessels. In such situations, the requirement of two times the design draft should be available 95 percent of the time and an absolute minimum of 1.7 times the draft should be available 100 percent of the time. Providing twice the draft (22 feet of depth) over the sill 100 percent of the time would set the sill elevation at -24 feet NGVD. Using the relaxed criteria, elevation 0 ft NGVD is equalled or exceeded 95 percent of the time; therefore, a sill elevation of -22 feet NGVD would be required. Also, the absolute minimum lock sill depth for a sill elevation of -22 ft NGVD would be 1.82 times the design draft (as compared to the requirement of 1.7 times the design draft) at a stage of -2.0 ft NGVD (record low). Elevation -22 feet NGVD was selected as the sill elevation based on these criteria. Reference 5 also indicates that either a 2- or 3-foot gate sill or a floor recess in the area of the gate should be provided to provide space for gate seating, maintenance work, inspection, and to keep sediment and debris out of the chamber. A 2-foot floor recess is used in our designs. Reference 2 recommends that the floor submergence should be at least equal to the design vessel draft plus one-half of the spacing of the lock chamber ports. Since the lock chamber ports would be 28 feet apart, use of the criteria from Reference 2 would require that the floor elevation be no higher than -25 ft NGVD (design vessel draft of 11 feet, plus clear distance of 14 feet, below elevation 0 ft NGVD) in order to obtain the required submergence 95 percent of the time. The 14 feet of clear space between the bottom of the design vessel and the lock chamber floor is recommended as a safety consideration to prevent direct action of

the port jets against the bottom of the vessel. A -25 ft NGVD floor elevation would also satisfy the criteria relative to sill height from Reference 5. Based upon these factors, the initial floor elevation considered was -25 ft NGVD. However, after further consideration and consultation with higher authority, it appeared possible that a higher floor elevation could be used, which would result in savings in construction costs. This led to the consideration of a floor elevation of -22 ft NGVD, with provision of a 3-ft recess for the miter gate swing. As explained in paragraph B.1.40 below, the trade-off for the floor elevation of -22 ft NGVD may be longer filling and emptying times; however, model studies would be required to either verify the feasibility of using this floor elevation or to determine what floor elevation should be used. It is noted that the Port Allen Lock, a miter-gated lock in the Mississippi River mainline levee system that was model-tested during design, has a floor at the same elevation as the sill. The absolute minimum lock sill depth provided at the Port Allen Lock during occurrence of the record low stage is equal to 1.67 times the design draft (vs 1.82 times the design draft for the proposed IHNC Lock); however, the clear space below the design vessel (9-ft draft) is only 7.5 ft at the 95% duration tailwater stage (port spacing is also 28 ft for Port Allen Lock). Port Allen Lock has operated satisfactorily since it was constructed, but the filling and emptying times have approached twice those computed for the proposed IHNC Lock due to the relatively small amount of submergence provided for many conditions.

B.1.36. The required chamber lengths were determined using the same methodology that was used for the ship lock and will be 970 ft for the 900-ft lock and 1,270 ft for the 1,200-ft lock.

Filling and Emptying System

B.1.37. The filling and emptying system is the same as for the ship lock except that the invert elevation of the culverts and lock chamber ports will be -24.0 feet NGVD. Details are shown on plates B-19 (ship), B-29 (barge) and B-47.

Intake Manifold

B.1.38. The intake manifolds will be the same as those for the ship lock except that the inverts of the ports will be at the same elevation as the lock floor for the barge lock (-22.0 ft NGVD). The maximum riverside pool elevation of 17.6 ft NGVD provides 25.1 ft of submergence for the 900-ft lock and 21.4 ft of submergence for the 1,200-ft lock. The minimum riverside pool elevation of -1.6 ft NGVD provides 5.9 ft of submergence for the 900-ft lock and 2.2 ft of submergence for the 1,200-ft lock. The submergence of the top of the wall openings was checked for all possible combinations of river side and lake side stages for both lock lengths to assure that it would always be at least equal to 110% of the velocity head computed for the peak flow, during filling, through the port having the smallest throat width. Details are shown on plate B-47.

Outlet Manifold

B.1.39. The outlet manifolds will be the same as those for the ship lock except that the inverts of the ports will be at the same elevation as the lock floor for the barge lock (-22.0 ft NGVD). Details are shown on plate B-47.

Filling and Emptying Times

B.1.40. The same subroutine H5320 used for the ship lock was used for the barge lock in computing filling and emptying times. A 5 ton hawser limit was used to determine the minimum valve time that could be used for a given lift (see plate B-11). The filling and emptying times shown below should be applicable for a lock having a floor submergence at least equal to that recommended by Reference 2 in paragraph B.1.172. As explained in paragraph B.1.35 above, a floor elevation no higher than -25 ft NGVD would be required to provide the recommended submergence below a design vessel having a draft of 11 feet. For a floor elevation of -22 ft NGVD, somewhat longer valve times than those shown below may have to be used. It is estimated that using a floor elevation of -22 ft NGVD may increase the valve times between a minimum of one minute and a maximum of two minutes for a given lift, thereby resulting in longer filling and emptying times than those shown below. Filling and emptying times for various valve times (applicable to both floor elevations) are graphically displayed on plates B-7 through B-10.

TABLE B-10
FILLING AND EMPTYING TIMES

Valve Time (min)	Lift (ft)	Filling Time (min)		Emptying Time (min)	
		900-ft	1,200-ft	900-ft	1,200-ft
2	3	2.96	2.98	3.05	3.07
2	7	4.00	4.02	4.20	4.21
3	11	5.43	5.45	5.67	5.69

Guide Walls

B.1.41. Guide walls are placed at each end of a lock to aid a towboat pilot in aligning the tow for entry into the lock chamber. The only satisfactory means of determining the proper locations and lengths of the guide walls is by studies on a general river model of the channel, lock approaches and the lock. Guide wall lengths are often the same as the usable lock chamber length. Some guidance relative to the lengths of the guide walls is provided in Reference 12. That reference indicates that the length of the guide wall on the land side of the lock should be at least half the usable length of the lock chamber and that the length of the guide wall on the river side of the lock should be at least two-thirds of the usable length of the lock chamber. If unusually hazardous

situations are predicted during high river stages, then it may be necessary to increase the length of the guide wall. The guide wall lengths recommended in this phase for the land side of the lock are about two-thirds of the usable length of the lock chamber (645 ft) for the 900-ft lock and two-thirds of the usable length of the lock chamber (800 ft) for the 1200-ft lock. For the river side of the lock, it is recommended that the guide walls for both lock lengths extend to a point 100 ft riverward of the Claiborne Ave. bridge in order to facilitate navigation under the bridge and to minimize the lengths of time that the bridge is open during lockages. The elevation of the guide walls will be the same elevation as the top of the lock walls.

Scour Protection in the Bypass Channels

B.1.42. Standby tugboats will be used to assist vessels in navigating through the abrupt turns in the north bypass channel that will be constructed parallel to the proposed location of the new lock. Scour protection was designed to prevent erosion from propeller wash during operation of these tugboats. Riprap will be placed along the east side of the bypass channel at each of the turns (see plates B-16 (ship) and B-26 (barge). The riprap will have the following gradation:

Percent Lighter by Weight	Limits of Stone in lbs.
100	2200 - 900
50	930 - 440
15	460 - 130

Model Study Program

B.1.43. Model studies will be required in the next phase of this study in order to verify or refine design work completed on the recommended plan thus far and to evaluate all aspects of the recommended plan relative to navigability by ships and barges. Annex 1 consists of both a time and cost estimate for the proposed model studies and a detailed description of the studies envisioned at this time. The proposed model studies and associated field data required are summarized below. More specific descriptions of the various conditions for which the model studies would be performed are described in the numbered sub-paragraphs (see Annex 1).

a. Navigation Physical Model Study. Consists of tow and ship navigation tests to aid in design of river entrance to the lock canal.

(1) For tows only

(2) Tows and ships

b. Navigation Computer Simulation Study. Will concentrate on items of concern on the MRGO side of the existing lock. Vessel approaches to both sides of the new lock, navigation within the bypass channels and entrance/exit conditions at the turning basin north of the new lock will be evaluated.

(1) For tows only

(2) Tows and ships

c. Field Data Collection. Deployment of tide gages, as well as measurement of currents, on the MRGO side of the existing lock required for all conditions).

d. Lock Filling and Emptying Study. Will check all aspects of filling and emptying system to assure provision of satisfactory hydraulic characteristics.

(1) 110-ft X 900-ft non-standard (floor higher than the -25 ft NGVD elevation required by Reference 2) barge lock

(2) 110-ft X 1200-ft non-standard barge lock

Although time and cost estimates for filling and emptying studies for ship locks (900-ft and 1,200-ft lengths) are included in Annex 1, such studies will not be required for the recommended plan. The hydraulic design for the recommended plan is a conventional design based on recent model studies and guidance from WES. The traffic through this lock will be primarily tows, for which the submergence will be well in excess of that required for safe and efficient operation. Filling and emptying times for ships using this lock will not be critical to the economic analysis for this project. Since the recommended plan also provides adequate submergence for the design ship, the minimum filling and emptying times required for this lock for safe and efficient lockages of ships can be extrapolated reasonably well from existing studies and documents.

Table B-11 shows which model tests would be required for the recommended plan, the NED plan (non-standard barge lock) and the standard barge lock design.

TABLE B-11
MODEL TESTS REQUIRED FOR
VARIOUS LOCK DESIGNS

	Model Study/Condition from Above Summary								
Lock Design	a(1)	a(2)	b(1)	b(2)	c	d(1)	d(2)	d(3)	d(4)
Recommended Plan		X		X	X				
NED Plan	X		X		X	X			
Standard Barge Lock	X		X		X				

B.1.44. The estimated time and cost for the proposed model studies for the recommended plan are 12 months and $535,000, respectively. Detailed time and cost breakdowns for the recommended plan, as well as for the other alternative sizes of locks that were studied in detail in the feasibility phase, are included in Annex 1.

WATER QUALITY

Introduction

B.1.45. An analysis of the existing water quality in the study area requires a review of applicable data from the Mississippi River, the Inner Harbor Navigation Canal (IHNC), and Lake Pontchartrain. Data from each of these features were reviewed and compared to Louisiana Department of Environmental Quality (LDEQ) and US Environmental Protection Agency (EPA) water quality criteria to develop an overview of water quality conditions in the study area. These data then can be used as a basis for assessing the potential impacts of considered projects. In addition to this historic data, water samples were collected from the Mississippi River, the IHNC and the proposed disposal area to the east of the IHNC as a part of the 1993 elutriate testing effort by New Orleans District (NOD).

B.1.46. The projected water quality impacts in the study area were formulated by utilizing data from the previous investigations, detailed water and sediment analysis, and on the results of computer modeling. Sediment samples were collected in 1993 from various locations in the IHNC. These samples were mixed with the water samples collected and analyzed as elutriates. Elutriate analysis aids in determining the effects of disturbing the bottom sediment during construction, dredging and disposal. The analysis results are representative of localized, short-term, worst case scenarios.

B.1.47. During the discussion of various water quality constituents, concentrations are compared to LDEQ and EPA criteria to determine if the criteria are exceeded. Applicable criteria are listed in the tables accompanying the text, and a comprehensive listing of the criteria are contained below in the Water Quality Criteria and Standards Section. This water quality portion of this Engineering Appendix is divided into three major sections: Water Quality Criteria and Standards, Existing Water Quality, and Projected Water Quality.

Water Quality Criteria and Standards

INTRODUCTION

B.1.48. Both the Louisiana Department of Environmental Quality (LDEQ) and the US Environmental Protection Agency have established ambient water quality criteria applicable to surface waters in the State of Louisiana. These criteria are discussed in the following paragraphs.

APPLICABLE LOUISIANA STATE STANDARDS

B.1.49. The LDEQ has established general written water quality criteria which are applicable to all waters of the State of Louisiana. The general written standards relate to the condition of the water as affected by waste discharges or human activity as opposed to purely natural phenomena, and are as follows. The criteria were last revised in 1989.

DESCRIPTIVE WATER QUALITY STANDARDS

B.1.50. Aesthetics. The waters of the state shall be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualifications.

All waters shall be free from such concentrations of substances attributable to wastewater or other discharges sufficient to:

a. settle to form objectionable deposits;

b. float as debris, scum, oil, or other matter to form nuisances or to negatively impact the aesthetics;

c. result in objectionable color, odor, taste, or turbidity;

d. injure, be toxic, or produce demonstrated adverse physiological or behavioral responses in humans, animals, fish, shellfish, wildlife, or plants; or

e. produce undesirable or nuisance aquatic life.

B.1.51. Color. Water color shall not be increased to the extent that it will interfere with present usage and projected future use of the state's waterbodies.

a. Waters shall be free from significant increases over natural background color levels;

b. The source of drinking water supply should not exceed 75 color units on the platinum-cobalt scale; and

c. No increases in true or apparent color shall reduce the level of light penetration below that required by desirable indigenous species of aquatic life.

B.1.52. Floating, suspended, and settleable solids. There shall be no substances present in concentrations sufficient to produce distinctly visible solids or scum, nor shall there be any formation of long-term bottom deposits of slimes or sludge banks attributable to waste discharges from municipal, industrial, or other sources including agricultural practices, mining, dredging and the exploration for and production of oil and natural gas. Certain short-term activities, such as maintenance

dredging of navigable waterways may be exempted by the administrative authority.

B.1.53. Taste and odor. Taste- and odor- producing substances shall be limited to concentrations in the waters of the state that will not interfere with the production of potable water by conventional water treatment methods or impart unpalatable flavor to food fish, shellfish, and wildlife, or result in offensive odors arising from the waters, or otherwise interfere with the designated use of the waters.

B.1.54. Toxic substances. Toxic substances shall not be present in the waters of the state or the sediments underlying said waters in quantities that alone or in combination will be toxic to human, plant, or animal life or significantly increase health risks due to exposure to the substances or consumption of contaminated fish or other aquatic life.

B.1.55. Oil and grease. There shall be no free or floating oil or grease present in quantities large enough to interfere with the designated uses, nor shall emulsified oils be present in quantities large enough to interfere with the designated uses.

B.1.56. Foaming or frothing materials. None of a persistent nature are permitted.

B.1.57. Nutrients. The naturally occurring range of nitrogen-phosphorous ratio shall be maintained. To establish the appropriate range of ratios and compensate for natural seasonal fluctuations, the state will use site-specific studies to establish limits for nutrients. Nutrient concentrations that produce aquatic growth to the extent that it creates a public nuisance or interferes with designated water uses shall not be added to any surface waters. This shall not apply to designated intermittent streams.

B.1.58. Turbidity. Turbidity other than that of natural origin shall not cause substantial visual contrast with the natural appearance of the waters of the state or impair any designated water use. Turbidity shall not significantly exceed the natural condition of the water.

As a guideline, maximum turbidity levels, expressed as nephelometric turbidity units (NTU), are established and shall apply for the following named waterbodies and major aquatic habitat types of the state:

a. Red, Mermentau, Atchafalaya, Mississippi, and Vermilion Rivers and Bayou Teche -- 150 NTU;

b. estuarine lakes, bays, bayous, and canals -- 50 NTU;

c. Amite, Pearl, Ouachita, Sabine, Calcasieu, Tangipahoa, Tickfaw, and Tchefuncte Rivers -- 50 NTU;

d. freshwater lakes, reservoirs, and oxbows -- 25 NTU;

e. designated scenic streams and outstanding natural resource waters not specifically listed above -- 25 NTU; and

f. for other state waters not included above and in waterbody segments where natural background turbidity exceeds the values specified above, the turbidity in NTU caused by any discharges shall be restricted to the appropriate background value plus 10 percent. This shall not apply to designated intermittent streams.

Certain short-term activities, such as maintenance dredging of navigable waterways may be exempted by the administrative authority.

B.1.59. Flow. The natural flow of state waters shall not be altered to such an extent that the basic character and water quality of the ecosystem are adversely affected except in situations where alterations are necessary to protect human life or property. If alterations to the natural flow are deemed necessary, all reasonable steps shall be taken to minimize the adverse impacts of such alterations. Additionally, all reasonable steps shall be taken to mitigate the adverse impacts of unavoidable alterations.

B.1.60. Radioactive materials. Radioactive materials in the surface waters of the state designated for drinking water supply use shall not exceed levels established pursuant to the Federal Safe Drinking Water Act (P.L. 93-523 et Seq.).

B.1.61. Other materials. Limits on other substances not specified in these revised water quality standards shall be in accordance with recommendations set by the LDEQ and/or the Louisiana Department of Health and Human Resources Administration for municipal raw water sources.

NUMERICAL WATER QUALITY STANDARDS

B.1.62. Additionally, LDEQ has established numerical criteria which apply to specified waterbodies, and to their tributaries, distributaries, and interconnected streams and waterbodies if they are not specifically named therein, unless it can be shown through a use attainability analysis that unique chemical, physical, and/or biological conditions preclude the attainment of the criteria. In those cases, natural background levels of these conditions may be used to establish site-specific water quality criteria. Those waterbodies officially approved and designated by the state and EPA as intermittent streams, man-made watercourses, or naturally dystrophic waters may be excluded from some or all numerical criteria during specified seasonal periods. The numerical criteria apply specifically with respect to substances or conditions attributed to waste discharges or activities of man as opposed to purely natural phenomena. A list of surface waters in the study area for which numerical criteria are included in the published tables is shown in Table B-12. Table B-12 also includes designated use categories for the surface waters listed. Designated water uses for each stream are represented as follows:

A = Primary Contact Recreation
B = Secondary Contact Recreation
C = Propagation of Fish and Wildlife
D = Drinking Water Supply
E = Oyster Propagation
F = Agriculture
G = Outstanding Natural Resource Waters

The following is a description of the numerical water quality criteria presented in Table B-12.

B.1.63. pH. The pH represents minimum and maximum conditions throughout the segment with reasonable gradients applying toward segment boundaries.

In all cases, the pH shall fall within the range of 6.0 to 9.0 standard units (su) unless otherwise specified in the tables. No discharge of wastes shall cause the pH of the water body to vary by more than one pH unit within the specified pH range for that segment where the discharge occurs.

B.1.64. Chlorides, sulfates, and dissolved solids. Values for these parameters apply to the approximate midpoint of the stream segment with reasonable gradients applying toward segment boundaries. Values listed in the standards, in general, represent the arithmetic mean of existing data plus one standard deviation.

B.1.65. Dissolved oxygen. The following dissolved oxygen (DO) values represent minimum values for the type of water specified. These values shall apply at all times except in naturally dystrophic waters or where natural conditions cause the DO to be depressed. For short periods of time, diurnal variations below the standard specified might occur. However, no waste discharge or activity of man shall lower the DO concentration to the point where the diurnal variation falls below the specified minimum.

a. Freshwater. For a diversified population of warmwater biota including sport fish, the DO concentration shall be at or above 5 mg/L.

b. Estuarine water. DO concentrations in estuaries and tidal tributaries shall not be less than 4 mg/L at any time.

c. Coastal marine water. DO concentration in surface coastal waters shall not be less than 5 mg/L except when the upwellings and other natural phenomena might cause this value to be depressed.

B.1.66. Temperature. The temperature standards enumerated in Table B-12, in most cases, represent maximum values obtained from existing data. However, in a few cases, a limited number of unusually high temperatures in the range of 35 degrees to 36 degrees have been deleted as it is felt that these values were recorded during conditions of unseasonably high air temperatures and/or unusually low flows or water levels, and, therefore, do not represent normal maximum temperatures.

In order to protect a diversified warm water biota including game fish, the following temperature criteria shall apply (except when natural conditions cause the temperature to be raised above these limits).

The standard shall consist of two parts, a temperature differential and a maximum temperature. The temperature differential represents the maximum permissible rise above ambient conditions. There shall be no addition of artificial heat once the ambient temperature reaches the maximum temperature specified in the standards.

a. Freshwater (Temperature Differential).

(1) Maximum of 5°F [2.8° Centigrade (C)] rise above ambient for streams and rivers.

(2) Maximum of 3°F (1.7°C) rise above ambient for lakes and reservoirs.

b. Freshwater (Maximum Temperature). Ninety °F (32.2°C) except where otherwise listed in Table B-1 or due to natural conditions such as unusually hot and/or dry weather.

c. Estuarine and Coastal (Temperature Differential).

(1) Maximum of 4°F (2.2°C) rise above ambient during the period October through May.

(2) Maximum of °F (1.1°C) during the period June through September.

d. Estuarine and Coastal (Maximum Temperature). Ninety-five °F (35°C) except when natural conditions elevate temperature above this level.

These temperature criteria shall not apply to privately-owned reservoirs, or reservoirs constructed solely for industrial cooling purposes.

B.1.67. Bacterial standards. The bacterial standard applicable to a particular stream segment depends upon the use classification of that individual stream segment. Limitations are placed on either fecal coliform content, most probable number (MPN) total coliform content, or a combination of both in order to achieve the stream sanitary quality required for the most restrictive stream water usage.

Table B-12, which contains applicable criteria for each water body, designates one of the following four standards as applicable according to present and anticipated usage of the waters.

Standard #1. PRIMARY CONTACT RECREATION - Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100 Ml nor shall more than 10 percent of the total samples during any 30-day

period or 25 percent of the total samples collected annually exceed 400/100 Ml.

Standard #2. SECONDARY CONTACT RECREATION - Based on a minimum of not less than 5 samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 Ml nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected exceed 2,000/100 Ml.

Standard #3. DRINKING WATER SUPPLY - The monthly arithmetic mean of total coliform MPN shall not exceed 10,000/100 Ml, nor shall the monthly arithmetic mean of fecal coliforms exceed 2,000/100 Ml.

Standard #4. OYSTER PROPAGATION - The fecal coliform median MPN shall not exceed 14 fecal coliforms per 100 Ml, and not more than 10 percent of the samples shall exceed an MPN of 43/100 Ml for a 5-tube decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

TABLE B-12
1989 LDEQ NUMERICAL STANDARDS
APPLICABLE TO SURFACE WATERS IN THE STUDY AREA

Stream Description	A	B	C	D	E	CL mg/L	SO4 mg/L	DO mg/L	pH Range su	BAC	Temper-ature	TDS mg/L
Mississippi River: Sano Bayou to Head of Passes	X	X	X	X		75	120	5.0	6.0-9.0	1	32	400
Inner Harbor Navigation Canal - Mississippi River Lock to Lake Pontchartrain (Estuarine)	X	X	X			N/A[1]	N/A	4.0	6.5-9.0	1	35	N/A
Lake Pontchartrain - West of Highway 11 Bridge) (Estuarine)	X	X	X			N/A	N/A	4.0	6.5-9.0	1	32	N/A
Intracoastal Waterway - Inner Harbor Navigation Canal to Chef Menteur Pass (Estuarine)	X	X	X		X	N/A	N/A	4.0	6.5-9.0	4	35	N/A
Bayou Bienvenue - Headwaters to Hurricane Gate at Mississippi River Gulf Outlet (Estuarine)	X	X	X			N/A	N/A	4.0	6.5-9.0	1	35	N/A

1 N/A - not applicable at present

B.1.68. Toxic substances. The LDEQ has also established numerical criteria for several toxic substances that are of particular concern for the State of Louisiana. These substances were selected for human health considerations, taste and odor problems, persistence and bioaccumulative capabilities, and potential negative effects on aquatic biota. Table B-13 is a listing of these substances and their criteria.

TABLE B-13
1989 LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY
NUMERICAL CRITERIA FOR SPECIFIC TOXIC SUBSTANCES

(In micrograms per liter (ug/L) or parts per billion (ppb) unless otherwise stated)

	Aquatic Life Protection				Human Health	
Toxic Substance	Freshwater Acute	Freshwater Chronic	Marine Acute	Marine Chronic	Drinking Supply[1]	Non Drinking Supply[2]
Pesticides and PCB's						
Aldrin	3.00	-	1.300	-	0.04 ng/L	0.04 ng/L[3]
Chlordane	2.40	0.0043	0.090	0.0040	0.19 ng/L	0.19 ng/L
DDT	1.10	0.0010	0.130	0.0010	0.19 ng/L	0.19 ng/L
TDE (DDD)	0.03	0.0060	1.250	0.2500	-	-
DDE	52.5	10.500	0.700	0.1400	-	-
Dieldrin	2.50	0.0019	0.710	0.0019	0.05 ng/L	0.05 ng/L
Endosulfan	0.22	0.0560	0.034	0.0087	0.47	0.64
Endrin	0.18	0.0023	0.037	0.0023	0.26	0.26
Heptachlor	0.52	0.0038	0.053	0.0036	0.07 ng/L	0.07 ng/L
Hexachlorocyclohexane (gamma BHC, Lindane)	2.00	0.0800	0.160	-	0.011	0.02
Polychlorinated Biphenols, Total (PCB's)	2.00	0.0140	10.00	0.0300	0.03 ng/L	0.03 ng/L
Toxaphene	0.73	0.0002	0.210	0.0002	0.24 ng/L	0.24 ng/L
2,4-Dichlorophenoxyacetic acid (2,4-D)	-	-	-	-	100.0	-
2-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP, Silvex)	-	-	-	-	10.00	-
Volatile Organic Chemicals						
Benzene	2249	1125	2700	1350	1.1	12.5
Carbon Tetrachloride (Tetrachloromethane)	2730	1365	15000	7500	0.22	1.2
Chloroform (Trichloromethane)	2890	1445	8150	4075	5.3	70
Ethylbenzene	3200	1600	8760	4380	2.39 mg/L	8.1 mg/L[4]
1, 2-Dichloroethane (EDC)	11800	5900	11300	5650	0.36	6.8
1, 1, 1-Trichloroethane	5280	2640	3120	1560	200	31.34 mg/L
1, 1, 2-Trichloroethane	1800	900	-	-	0.56	6.9
1, 1, 2, 2-Tetrachloroethane	923	462	902	451	0.16	1.8
1, 1-Dichloroethylene	1160	580	22400	11200	0.05	0.58
Trichloroethylene	3900	1950	200	100	2.8	21
Tetrachloroethylene	850	425	130	65	0.65	2.5
Toluene	1270	635	950	475	9.1 mg/L	69.3 mg/L
Vinyl Chloride (Chloroethylene)	-	-	-	-	1.9	35.8
Bromoform (Tribromomethane)	2930	1465	1790	895	5.1	45
Bromodichloromethane	-	-	-	-	5.3	70
Methylene chloride (Dichloromethane)	19300	9650	25600	12800	4.4	87
Methyl chloride (Chloromethane)	55000	27500	27000	13500	5.3	70
Dibromochloromethane	-	-	-	-	5.3	70
1-3 Dichloropropene	606	303	79	39.5	0.18	3.0

TABLE B-13 (continued)

Toxic Substance	Aquatic Life Protection				Human Health	
	Freshwater Acute	Freshwater Chronic	Marine Acute	Marine Chronic	Drinking Supply[1]	Non Drinking Supply[2]
Acid - Extractable Organic Chemicals						
2-Chlorophenol	258	129	-	-	0.100	126.4
3-Chlorophenol	-	-	-	-	0.100	-
4-Chlorophenol	383	192	535	268	0.100	-
2, 3-Dichlorophenol	-	-	-	-	0.040	-
2, 4-Dichlorophenol	202	101	-	-	0.300	232.6
2, 5-Dichlorophenol	-	-	-	-	0.500	-
2, 6-Dichlorophenol	-	-	-	-	0.200	-
3, 4-Dichlorophenol	-	-	-	-	0.300	-
Phenol (Total)	700	350	580	290	5.000	5.000[5]
Base/Neutral Extractable Organic Chemicals						
Benzidine	250	125	-	-	0.08 ng/L	0.17 ng/L
Hexachlorobenzene	-	-	-	-	0.24 ng/L	0.24 ng/L
Hexachlorobutadiene[6]	5.1	1.02	1.6	0.32	0.09	0.11
Metals						
Arsenic	360	190	69.00	36.00	50.00	-
Chromium III (Tri)[7]	(980,1700,3100)	(120,210,370)	515	103.0	50.00	-
Chromium VI (Hex)	16	11	1.100 mg/L	50.00	50.00	-
Zinc[8]	(65,120,210)	(59,110,190)	95.00	86.00	5.000 mg/L	-

1 Applies to surface waterbodies designated as a Drinking Water Supply and also protects for primary and secondary contact recreation and fish consumption.
2 Applies to surface waterbodies not designated as a Drinking Water Supply and protects for primary and secondary contact recreation and fish consumption.
3 ng/L = nanograms per liter, parts per trillion
4 mg/L = milligrams per liter, parts per million
5 total phenol as measured by the 4 - aminoantipyrine (4AAP) method
6 Includes Hexachloro-1,3-butadiene
7 Hardness-dependent criteria for fresh water based on the following natural logarithm formulas for acute and chronic protection respectively: acute = e(0.8190[ln(hardness)]+3.688), chronic = e(0.8190[ln(hardness)]+1.561), numbers in parenthesis represent criteria in ug/L at hardness values of 50, 100, 200 mg/L $CaCo_3$ rounded off a whole numbers
8 Hardness-dependent criteria for fresh water based on the following natural logarithm formulas for acute and chronic protection respectively: acute = e(0.8473[ln(hardness)]+0.8604), chronic = e(0.8473[ln(hardness)]+0.7614), numbers in parenthesis represent criteria in ug/L at hardness values of 50, 100, 200 mg/L $CaCo_3$ rounded off to whole numbers

EPA WATER QUALITY CRITERIA

B.1.69. The EPA has established ambient water quality criteria applicable to surface waters in the study area. These criteria are shown in Tables B-14, B-15, and B-16. The numerical criteria listed in Tables B-14, B-15, and B-16 have been developed for various physical parameters, nutrients, metals, PCB's, and organic pesticides for uses of freshwater aquatic life, marine and estuarine aquatic life, and public water supply, respectively.

EPA WATER QUALITY TABLES

B.1.70. EPA water quality tables follow.

TABLE B-14
1986 EPA *FRESHWATER* AQUATIC LIFE CRITERIA
(All values in ug/L except where noted)

Parameter	Chronic (24-Hour Average)	Acute (Maximum at Any Time)	Chronic[1] (4-Day Average)	Acute[2] (1-Hour Average)
Aesthetic Qualities	(Narrative statement - SEE CRITERIA DOCUMENT)			
Aldrin[P]	-	3.0	-	-
Alkalinity	(20 mg/L MINIMUM)			
Ammonia	(Criteria are pH and temperature dependent-SEE CRITERIA DOCUMENT)			
Arsenic(III)[P]	-	-	190	360
Boron	(750 ug/L for long-term irrigation on sensitive crops)			
Cadmium[4,P]	-	-	1.1/1.6/2	3.9/6.2/8.6
Chlordane[P]	0.0043	2.4	-	-
Chlorine	-	-	11	19
Chlorpyrifos	-	-	0.041	0.083
Chromium (VI)[P]	-	-	11	16
Chromium(III)[4]	-	-	210/289/370	1700/2420/3100
Color	(Narrative statement - SEE CRITERIA DOCUMENT)			
Copper[4,P]	-	-	12/17/21	18/22/34
Cyanide[P]	-	-	5.2	22
DDT[P]	0.0010	1.1	-	-
Demeton[P]	0.1	-	-	-
Dieldrin[P]	0.0019	2.5	-	-
Endosulfan[P]	0.056	0.22	-	-
Endrin[P]	0.0023	0.18	-	-
Gases, Total Dissolved	(Narrative statement - SEE CRITERIA DOCUMENT)			
Guthion	0.01	-	-	-
Heptachlor[P]	0.0038	0.52	-	-
Hexachlorocyclohexane (Lindane)[P]	0.080	2.0	-	-
Iron	1000	-	-	-
Lead[4,P]	-	-	3.2/5.3/7.7	82/137/200
Malathion	0.1	-	-	-
Mercury[P]	-	-	0.012	2.4
Methoxychlor	0.03	-	-	-
Mirex	0.001	-	-	-
Nickel[4,P]	-	-	160/222/280	1400/1999/2500
Oil and Grease	(Narrative statement - SEE CRITERIA DOCUMENT)			
Oxygen, Dissolved	(Warmwater and Coldwater Matrix - SEE CRITERIA DOCUMENT)			
Parathion	-	-	0.013	0.065
Polychlorinated Biphenyls (PCB's)[P]	0.014	2.0	-	-
Pentachlorophenol (PCP)[3,P]	-	-	3.5/13/43	5.5/20/68
pH	(6.5 - 9.0 su)	-	-	-
Selenite (inorganic)[P]	35	260	-	-
Silver[4,P]	-	4.1/8.2/13	-	-
Solids (Suspended) and Turbidity	(Narrative statement - SEE CRITERIA DOCUMENT)			
Sulfide-Hydrogen Sulfide	2.0	-	-	-
Temperature	(Species dependent criteria - SEE CRITERIA DOCUMENT)			
Toxaphene[P]	-	-	0.0002	0.73
Zinc[4,P]	-	-	110/149/190	120/165/210

1 4-day average concentration not to be exceeded more than once every 3 years on the average.
2 1-hour average concentration not to be exceeded more than once every 3 years on the average.
3 pH dependent criteria. Values presented are for 6.5/7.8/9.0 standard pH units.
4 Hardness dependent criteria. Values presented are for 100/150/200 mg/L as $CaCO_3$.
P Priority Pollutant

TABLE B-15
1986 EPA *SALTWATER* AQUATIC LIFE CRITERIA
(All values in ug/L)

Parameter	Chronic (24-Hour Average)	Acute (Maximum at Any Time)	Chronic[1] (4-Day Average)	Acute[2] (1-Hour Average)
Aesthetic Qualities	(Narrative statement - SEE CRITERIA DOCUMENT)			
Aldrin[P]	-	1.3	-	-
Arsenic(III)[P]	-	-	36	69
Cadmium[P]	-	-	9.3	43
Chlordane[P]	0.004	0.09	-	-
Chlorine	-	-	7.5	13
Chlorpyrifos	-	-	0.0056	0.011
Chromium (VI)[P]	-	-	50	1,100
Color	(Narrative statement - SEE CRITERIA DOCUMENT)			
Copper[P]	-	-	-	2.9
Cyanide[P]	-	-	-	1.0
DDT[P]	0.0010	0.13	-	-
Demeton[P]	0.1	-	-	-
Dieldrin[P]	0.0019	0.71	-	-
Endosulfan[P]	0.0087	0.034	-	-
Endrin[P]	0.0023	0.037	-	-
Gases, Total Dissolved	(Narrative statement - SEE CRITERIA DOCUMENT)			
Guthion	0.01	-	-	-
Heptachlor[P]	0.0036	0.053	-	-
Hexachlorocyclohexane (Lindane)[P]	-	0.16	-	-
Lead[P]	-	-	5.6	140
Malathion	0.1	-	-	-
Mercury[P]	-	-	0.025	2.1
Methoxychlor	0.03	-	-	-
Mirex	0.001	-	-	-
Nickel[P]	-	-	8.3	75
Oil and Grease	(Narrative statement - SEE CRITERIA DOCUMENT)			
Polychlorinated Biphenyls (PCB's)[P]	0.030	10	-	-
Pentachlorophenol (PCP)[P]	-	-	7.9	13
pH	(6.5 - 8.5 su)	-	-	-
Phosphorus (elemental)	0.10	-	-	-
Selenite (inorganic)[P]	54	410	-	-
Silver[P]	-	2.3	-	-
Sulfide-Hydrogen Sulfide	2.0	-	-	-
Temperature	(Species dependent criteria - SEE CRITERIA DOCUMENT)			
Toxaphene[P]	-	-	0.0002	0.21
Zinc[P]	-	-	86	95

1 4-day average concentration not to be exceeded more than once every 3 years on the average.
2 1-hour average concentration not to be exceeded more than once every 3 years on the average.
P Priority Pollutant

TABLE B-16
1986 EPA *HUMAN HEALTH* CRITERIA
(Units per liter)

Parameter	Fish and Water Ingestion	Fish Consumption Only	Drinking Water M.C.L.[1]	Organo-leptic Criteria[2]
Acenapthene[P]	-	-	-	0.02 mg
Acrolein[P]	320 ug	780 ug	-	-
Acrylonitrile[P,C]	0.58/0.058/0.006 ug	6.5/0.65/0.065 ug	-	-
Aesthetic Qualities	(Narrative Statement - SEE CRITERIA DOCUMENT)		-	-
Aldrin[P,C]	0.74/0.074/0.0074 ng	0.79/0.079/0.0079 ng	-	-
Antimony[P]	146 ug	45,000 ug	-	-
Arsenic[P,C]	22/2.2/0.22 ng	175/17.5/1.75 ng	0.05 mg	-
Asbestos[P,C]	300,000/30,000/3,000 Fibers	-	-	-
Bacteria	(For Primary Recreation And Shellfish Uses - SEE CRITERIA DOCUMENT)			
Barium	-	-	1.0 mg	-
Benzene[P,C]	6.6/0.66/0.066 ug	400/40/4 ug	-	-
Benzidine[P,C]	1.2/0.12/0.01 ng	5.3/0.53/0.05 ng	-	-
Beryllium[P,C]	68/6.8/0.68 ng	1170/117/11.71 ng	-	-
Cadmium[P]	10 ug	-	0.010 mg	-
Carbon Tetrachloride[P,C]	4/0.4/0.04 ug	69.4/6.94/0.69 ug	-	-
Chlordane[P,C]	4.6/0.46/0.046 ng	4.8/0.48/0.048 ng	-	-
Chloroethyl Ether(BIS-2)[P,C]	0.3/0.03/0.003 ug	13.6/1.36/0.136 ug	-	-
Chloroform[P,C]	1.9/0.19/0.019 ug	157/15.7/1.57 ug	-	-
Chloroisopropyl Ether (BIS-2)[P]	34.7 ug	4.36 mg	-	-
Chloromethyl Ether (BIS)[C]	$[37.6/3.76/0.376]\times10^{-6}$ ug	$[18.4/1.84/.184]\times10^{-3}$ ug	-	-
2-Chlorophenol[P]	-	-	-	.1 ug
4 Chlorophenol	-	-	-	.1 ug
Chlorophenoxy Herbicides(2,4,5,-TP)(Silvex)	10 ug	-	10 ug	-
Chlorophenoxy Herbicides(2,4-D)	100 ug	-	100 ug	-
Chloro-4 Methyl-3 Phenol	-	-	-	3000 ug
Chromium (VI)[P]	50 ug	-	0.05 mg	-
Chromium(III)	170 mg	3,433 mg	-	-
Color	(Narrative statement - SEE CRITERIA DOCUMENT)		-	-
Copper[P]	-	-	-	1 mg
Cyanide[P]	200 ug	-	200 ug	-
DDT[P,C]	0.24/0.024/0.0024 ng	0.24/0.024/0.0024 ng	-	-
Dibutyl Phthalate[P]	34 mg	154 mg	-	-
Dichlorobenzenes[P]	400 ug	2.6 mg	-	-
Dichlorobenzidine[P,C]	0.103/0.01/0.001 ug	0.204/0.20/0.002 ug	-	-
1,2 Dichloroethane[P,C]	9.4/0.94/0.094 ug	2,430/243/24.3 ug	-	-
Dichloroethylenes[P,C]	0.33/0.033/0.003 ug	18.5/1.85/0.185 ug	-	-
2,4-Dichlorophenol	3.09 mg	-	-	0.3 ug
Dichloropropene[P]	87 ug	14.1 mg	-	-
Dieldrin[P,C]	0.71/0.071/0.0071 ng	0.76/0.076/0.0076 ng	-	-
Diethyl Phthalate[P]	350 mg	1.8 g	-	-
2,4-Dimethylphenol[P]	-	-	-	400 ug
Dimethyl Phthalate[P]	313 mg	2.9 g	-	-
2,4 Dinitrotoluene[C]	1.1/0.11/0.011 ug	91/9.1/0.91 ug	-	-
2,4 Dinitro-o-Cresol[P]	13.4 ug	765 ug	-	-
2,3,7,8-TCDD (Dioxin)[P,C]	$[0.13/0.013/0.0013]\times10^{-6}$ ug	$[0.14/0.014/.0014]\times10^{-6}$ ug	-	-
Diphenylhdrazine[P]	422/42/4 ng	5.6/0.56/0.056 ug	-	-
Di-2-EthylHexyl Phthalate[P]	15 mg	50 mg	-	-
Endosulfan[P]	74 ug	159 ug	-	-
Endrin[P]	1 ug	-	0.0002 mg	-
Ethylbenzene[P]	1.4 mg	3.28 mg	-	-
Fluoranthene[P]	42 ug	54 ug	-	-
Halomethanes[P,C]	1.9/0.19/0.019 ug	157/15.7/1.57 ug	-	-
Heptachlor[P,C]	2.78/0.28/0.028 ng	2.85/0.29/0.029 ng	-	-
Hexachloroethane[C]	19/1.9/0.19 ug	87.4/8.74/0.87 ug	-	-
Hexachlorobenzene[P,C]	7.2/0.72/0.072 ng	7.4/0.74/0.074 ng	-	-
Hexachlorobutadiene[P,C]	4.47/0.45/0.045 ug	500/50/5 ug	-	-
Hexachlorocycohexane-Alpha[P,C]	92/9.2/0.92 ng	310/31/3.1 ng	-	-

TABLE B-16 (continued)

Parameter	Fish and Water Ingestion	Fish Consumption Only	Drinking Water M.C.L.[1]	Organo-leptic Criteria[2]
Hexachlorocyclohexane-Beta[P,C]	163/16.3/1.63 ng	547/54.7/5.47 ng	-	-
Hexachlorocyclohexane-Gama[P,C]	186/18.6/1.86 ng	625/62.5/6.25 ng	-	-
Hexachlorocyclohexane-Technical[P,C]	123/12.3/1.23 ng	414/41.4/4.14 ng	-	-
Hexachlorocyclopentadiene[P]	206 ug	-	-	1 ug
Iron	0.3 mg	-	.3 mg	-
Isophorone[P]	5.2 mg	520 mg	-	-
Lead[P]	50 ug	-	0.05 mg	-
Manganese	50 ug	100 ug	50 ug	-
Mercury[P]	144 ng	146 ng	0.002 mg	-
Methoxychlor	100 ug	-	0.1 mg	-
Monochlorobenzene[P]	488 ug	-	-	20 ug
Nickel[P]	13.4 ug	100 ug	-	-
Nitrates	10 mg	-	10 mg	-
Nitrobenzene[P]	19.8 mg	-	-	30 ug
Nitrosodibutylamine N[P,C]	64/6.4/0.64 ng	5,868/587/58.7 ng	-	-
Nitrosodiethylamine N[P,C]	8/0.8/0.08 ng	12400/1,240/124 ng	-	-
Nitrosodimethylamine N[P,C]	14/1.4/0.14 ng	160000/16,000/1600 ng	-	-
Nitrosodiphenylamine N[P,C]	49000/4,900/490 ng	161000/16,100/1610 ng	-	-
Nitrosopyrrolidine N[P,C]	160/16/1.6 ng	919000/91,900/9190 ng	-	-
Oil And Grease	(Narrative Statement - SEE CRITERIA DOCUMENT)		-	-
PCBs[P,C]	0.79/0.079/0.0079 ng	0.79/0.079/0.0079 ng	-	-
Pentachlorobenzene	74 ug	85 ug	-	-
Pentachlorophenol[P]	1.01 mg	-	-	-
Phenol[P]	3.5 mg	-	-	0.3 mg
Polynuclear Aromatic Hydrocarbons[P,C]	28/2.8/0.28 ng	311/31.1/3.11 ng	-	-
Selenium[P]	10 ug	-	0.01 mg	-
Silver[P]	50 ug	-	0.05 mg	-
Solids(Dissolved)And Salinity	-	-	250 mg	-
Tainting Substances	(Narrative Statement - SEE CRITERIA DOCUMENT)		-	-
1,2,4,5 Tetrachlorobenzene[P]	38 ug	48 ug	-	-
1,1,2,2-tetrachloroethane[P,C]	1.7/0.17/0.017 ug	107/10.7/1.07 ug	-	-
Tetrachloroethylene[P,C]	8/0.8/0.08 ug	88.5/8.85/0.88 ug	-	-
Thalium[P]	13 ug	48 ug	-	-
Toluene[P]	14.3 mg	424 mg	-	-
Toxaphene[P,C]	7.1/0.71/0.07 ng	7.3/0.73/0.07 ng	0.005 mg	-
1,1,1-trichloroethane[P]	18.4 mg	1.03 g	-	-
1,1,2-trichloroethane[P,C]	6/0.6/0.06 ug	418/41.8/4.18 ug	-	-
Trichloroethylene[P,C]	27/2.7/0.27 ug	807/80.7/8.07 ug	-	-
2,4,5-trichlorophenol	2,600 ug	-	-	1 ug
2,4,6-trichlorophenol[P,C]	12/1.2/0.12 ug	36/3.6/0.36 ug	-	2 ug
Vinyl Chloride[P,C]	20/2/0.2 ug	5246/525/52.5 ug	-	-

1 M.C.L. is maximum contaminant level

2 To control undesirable taste and order quality of ambient water. It should be recognized that organoleptic data have limitations as a basis for establishing water quality criteria, and have no demonstrated relationship to potential adverse human health effects.

P Priority Pollutant

C Carcinogenic pollutant. For the maximum protection of human health from the potential carcingenic effects resulting from exposure to these pollutants, the ambient water concentrations should be zero. The levels presented are for $10^{-5}/10^{-6}/10^{-7}$ incremental increase of cancer risk over the lifetime.

DESCRIPTIVE WATER QUALITY CRITERIA

B.1.71. Aesthetic qualities. All waters free from substances attributable to wastewater or other discharges that:

a. settle to form objectionable deposits;

b. float as debris, scum, oil, or other matter to form nuisances;

c. produce objectionable color, odor, taste, or turbidity;

d. injure or are toxic or produce adverse physiological responses in humans, animals or plants; and

e. produce undesirable or nuisance aquatic life.

B.1.72. Color. Waters shall be virtually free from substances producing objectionable color for aesthetic purposes; the source of supply should not exceed 75 color units on the platinum-cobalt scale for domestic water supplies, and increased color (in combination with turbidity) should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.

B.1.73. Dissolved oxygen. Water should contain sufficient DO to maintain aerobic conditions in the water column and, except as affected by natural phenomena, at the sediment-water interface. Numerical criteria are available for varying aquatic life stages for coldwater and warmwater species.

B.1.74. Fecal coliform bacteria.

a. Bathing waters. Based on a minimum of five samples equally spaced over a 30-day period, the geometric mean of the E. coli density should not exceed 126 per 100 Ml for freshwater bathing. For the above sampling period, the geometric means of the enterococci density should not exceed 33 and 35 per 100 Ml for freshwater and marine bathing, respectively.

b. Shellfish harvesting waters. The median fecal coliform bacterial concentration should not exceed 14 MPN/100 Ml for the taking of shellfish, with not more than 10 percent of samples exceeding 43 MPN/100 Ml.

B.1.75. Oil and grease. For domestic water supply: virtually free from oil and grease, particularly from the tastes and odors that emanate from petroleum products. For aquatic life: (1) levels of individual petrochemicals in the water column should not exceed 0.01 times the lowest continuous flow 96-hour LC_{50} to several important freshwater or marine species, each having a demonstrated high susceptibility to oils and petrochemicals; (2) levels of oils or petrochemicals in the sediment which cause deleterious effects to the biota should not be allowed; and (3) surface waters shall be virtually free from floating nonpetroleum oils of vegetable or animal origin, as well as petroleum derived oils.

B.1.76. Settleable and suspended solids. Freshwater fish and aquatic life: settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.

B.1.77. Tainting substances. Materials should not be present in concentrations that individually or in combination produce undesirable flavors which are detectable by organoleptic tests performed on the edible portions of aquatic organisms.

The LDEQ general criteria state that "all waters of the state shall be capable of supporting desirable diversified species of fish, shellfish and wildlife." Therefore, EPA criteria for freshwater or marine aquatic life, Tables B-15 and B-16, respectively, are held to apply to all surface waters. Also, EPA criteria for the protection of human health apply to all surface waters.

GENERAL DESCRIPTION OF WATER QUALITY PARAMETERS

B.1.78. Suspended solids in urban runoff consist mainly of particulate material which has accumulated along curbs and gutters of streets and roadways, although much of it had originated in other parts of the drainage area. Some of the more important sources of solids are eroded soil particles, particularly from construction sites or other unvegetated soil surfaces but also to an important extent from grassed areas, dirt and dust, fuel residue and other material including rubber, metal and synthetic substances associated with vehicular traffic, fallout from combustion of fossil fuels and other materials, solid waste and debris from poorly managed or exposed material storage sites, dumps and landfills, animal wastes, and leaves and other plant residue. Many pollutants become attached to the accumulating solid particles, and metals and organic compounds become physically or chemically adsorbed to clay particles. Excessive suspended solids levels in water generate unsightly turbidity plumes, and may interfere with the ability of sight - dependent fish and other organisms to obtain food, or may clog their gills or feeding apparatus.

B.1.79. Turbidity in water is caused by materials that inhibit light penetration and reduce the clarity of the water. It may be caused by microorganisms or various minerals, including plant detritus, silica and sediment particles. The turbidity of a water sample is a measure of the reduction in intensity of visible light passing through the sample. Turbidity affects the aquatic system by limiting light transmission and the process of photosynthesis which is vital to biological productivity. It is sometimes used as a broad indicator of suspended solids levels.

B.1.80. The pH level of a water body is a chemical measure of its tendency toward acidity or alkalinity. A pH value of 7.0 indicates neutrality. Most natural waters are slightly basic, with pH values between 7.0 and 8.0. Technically, pH is the $\log_{10}$ of the reciprocal of the hydrogen ion concentration in water. Wide deviations of pH from the neutral or slightly basic range may signal the presence of important contaminants, particularly toxic substances. Industrial wastewater, for example, is often highly acidic.

B.1.81. Biochemical oxygen demand (BOD) is a useful indicator of biodegradable organic material, including natural materials such as simple

sugars, fats and proteins, and more complex organic chemicals synthesized by man. For the most part, biodegradable materials are not toxic to aquatic organisms. Their primary importance from a water quality perspective is that their decaying process requires either dissolved or combined oxygen, and the oxygen supply of the receiving water body may become dangerously depleted. Since certain levels of dissolved oxygen are needed to sustain life and permit normal functioning of aquatic species and to prevent the existence of undesirable anaerobic conditions, excessive BOD levels in runoff may produce oxygen deficits, depending on the assimilative capacity of the receiving water and its rate of natural reaeration. The most common BOD measurement is an oxygen consumption test over a five-day period. The ultimate BOD level may be estimated by extrapolation from test results over different time periods.

B.1.82. Chemical oxygen demand (COD) is a general indicator of the amount of potentially biodegradable material in water. Various industrial chemicals and other organic chemicals that degrade slowly or only under highly oxidized conditions are better represented by COD than by BOD. The COD test does not distinguish between stable and unstable organic matter and is therefore not directly related to BOD values in samples of industrial wastewater, urban runoff or receiving water.

B.1.83. Nutrients occur in nature in many forms. Nitrogen is an essential component of all proteins, chlorophyll and other important biological compounds. In organic matter, nitrogen decomposes from complex proteins through amino acids to ammonia, nitrites and nitrates, and is also synthesized from nitrates into plant and animal biomass (nitrogen fixation). The natural nitrogen cycle depends on microbiological activity for these processes. Nitrogen is present in urban runoff in many forms, including ammonia, organic nitrogen, nitrites and nitrates. Kjeldahl nitrogen refers to a laboratory process that is used to measure the ammonia content of a nitrogen sample.

B.1.84. Nitrates are the end product of the aerobic stabilization of organic nitrogen, but they may also result from excessive fertilizer applications or from untreated domestic wastewater. Chemical fertilizer plants produce high nitrate levels in their wastewater. Despite their many sources, nitrates do not normally persist at high levels in natural water bodies, but become converted to biomass by natural processes. When nitrate levels in runoff greatly exceed the biological requirements of a receiving water body, eutrophication (over - enrichment) may occur, resulting in algal blooms or other undesirable conditions. Nitrites are seldom present in natural surface waters at significant levels except under polluted conditions and in the presence of ammonia.

B.1.85. Phosphorus occurs most commonly in nature as phosphates and orthophosphates and is a constituent of fertile soils, plants and animal tissue. It is an essential nutrient along with nitrogen for biological productivity and also undergoes cycles of decomposition and photosynthesis. It is ordinarily more abundant in urban runoff than in natural waters, and originates in domestic and industrial wastes, detergents and fertilizers. Phosphorus is often the critical parameter in

the eutrophication of lakes and other water bodies that act as nutrient sinks.

B.1.86. Pathogenic bacteria in water may be harmful to humans, particularly if ingested while swimming. Organisms that are discharged from the intestinal tracts of humans or animals in fecal material may be pathogenic to humans or may alternatively serve as useful indicators of fecal pollution and the probable presence of pathogens. The most commonly employed pathogenic indicators are in the coliform group of bacteria, which consist predominantly of harmless organisms.

B.1.87. Fecal coliforms are measured by federal and state regulatory agencies to monitor for the presence of human and/or animal fecal pollution in water. Total coliforms are also measured as a more general indicator of fecal pollution, but these organisms may also originate in natural soils. None of the coliform group are ideal indicators of fecal pollution since they do not always exist in the same proportions to the pathogens. In order to be a reliable indicator of fecal pollution, an indicator should have a somewhat longer survival time in water than intestinal pathogens, but should nevertheless die off soon after the pathogens, so that their absence would assure the bacteriological safety of the water. The E. coli bacterial strain has been promoted as a superior indicator of fecal pollution, and has been adopted by EPA as the regulatory parameter for human health in bathing waters. E. coli is expected to eventually replace fecal coliform as the official State of Louisiana indicator organism for primary contact recreation.

B.1.88. Many metals are known to be chronically or acutely toxic to various aquatic species above certain concentration levels in saltwater and in freshwater, usually as a function of hardness, or the levels of ionized calcium and magnesium in the water expressed as the equivalent concentration of calcium carbonate. Six metals, cadmium, chromium, copper, mercury, lead and arsenic, have been regularly monitored by Jefferson Parish in the study area and also by other agencies in the receiving waters. These metals and a seventh, zinc, will be briefly discussed as they relate to this study in the following paragraphs.

B.1.89. Cadmium usually occurs at low levels in the natural freshwater environment, often below 0.01 ug/L, but waters affected by municipal and/or industrial development probably have much higher concentrations. Industrial sources include effluents from petrochemical plants, metallurgical processes and electroplating. Since it is extremely toxic to fish, its EPA chronic and acute freshwater criteria are set at 1.6 and 6.2 ug/L, respectively for a carbonate hardness level of 150 mg/L. Cadmium's chronic and acute saltwater criteria is 9.3 ug/L and 43 ug/L, respectively.

B.1.90. Chromium is more common than cadmium in natural freshwater, typically at about 0.5 ug/L. Chromium salts are used for electroplating and in cleaning agents, and are also present in paints, fungicides and wood preservatives. The EPA and Louisiana criteria for chronic and acute toxicity to freshwater aquatic life are 11 and 16 ug/L, respectively at a hardness of 150 mg/L.

B.1.91. Copper is relatively plentiful in the natural freshwater environment, ranging from about 1 to 10 ug/L. Pertinent industrial sources of copper include petroleum refineries. The EPA chronic and toxic criteria for freshwater aquatic life are 17 and 26 ug/L at a hardness of 150 mg/L. The EPA acute criterion for saltwater aquatic life is 2.9 ug/L, no chronic criterion is defined.

B.1.92. Lead occurs in most natural freshwater at 1 ug/L or less. It is much more plentiful, however, in waters in and near inhabited areas. It is used in storage batteries and other metal products, but is no longer permitted in paint pigments and gasoline additives. The EPA chronic and acute freshwater aquatic life criteria for lead are 5.3 and 137 ug/L at a hardness of 150 mg/L. The saltwater aquatic life acute and chronic criteria are 5.6 ug/L and 140 ug/L, respectively.

B.1.93. Mercury background levels in natural freshwater may range from 0.01 to 0.1 ug/L. It is used in the electrolytic preparation of chlorine and caustic soda, in mercury battery cells and thermometers, and in various other laboratory and industrial applications. The EPA freshwater aquatic life criteria for mercury are 0.012 ug/L (chronic) and 2.4 ug/L (acute). The chronic criterion was derived on the basis that all mercury discharged to the environment is methyl mercury, the form that evolves in sediment and in fish and the aquatic food chain. It is known, however, that almost all mercury discharged is mercury (II), a much less toxic form. The FDA action level for the concentration of methylmercury in the edible portions of fish is considered to be a more relevant criterion for consumable species than the referenced chronic criterion. The saltwater aquatic life acute and chronic criteria are 0.025 ug/L and 2.1 ug/L, respectively.

B.1.94. Arsenic concentrations in freshwater areas vary widely but are usually 5 ug/L or more. Arsenic is emitted to the environment by coal - fuel power plants. The EPA and Louisiana criteria for chronic and acute toxicity to freshwater aquatic life are 190 and 360 ug/L, respectively. The saltwater aquatic life criteria are 36 ug/L and 69 ug/L, respectively.

B.1.95. The chemistry of zinc is similar to that of cadmium, but it is much more abundant in the environment, with a median surface water concentration in the United States of about 20 ug/L. It is used as an oxide pigment in rubber and paint, in agricultural fertilizers and sprays and battery production. It is also used in galvanizing of metal and in the production of metal alloys. Its EPA chronic and acute criteria for freshwater aquatic life are 149 and 165 ug/L at a hardness of 150 mg/L. The saltwater acute and chronic aquatic life criteria are 86 ug/L and 95 ug/L.

EXISTING WATER QUALITY

B.1.96. An analysis of existing water quality was conducted to determine existing water resource problems and to develop a background for water quality projections. Background water quality is used to verify projection methodologies and to identify water quality problems that merit particular attention.

B.1.97. The in-situ water quality was determined using available data from various stations which are sampled at periodic intervals. Stations have been established by the US Army Corps of Engineers, US Geological Survey (USGS), the Louisiana Department of Health Services, and the Louisiana Department of Natural Resources. As previously discussed, these data were compared with appropriate state and Federal criteria to evaluate existing water quality and determine whether criteria are met.

B.1.98. Measured parameters vary with the station and sampling agency. In general, the USGS, the Corps of Engineers, and the Louisiana Department of Natural Resources analyze for a wide variety of chemical and physical parameters, including pesticides and heavy metals, while the Louisiana Department of Health Services is more biologically-oriented with emphasis on coliforms. Common parameters such as temperature, pH, dissolved oxygen (DO), and solids are recorded for most stations.

B.1.99. To more effectively analyze existing water quality, surface waters were divided into several segments. These segments along with the historic sampling stations referenced in this report, consist of the Mississippi River at and below New Orleans, the IHNC, Lake Pontchartrain in the vicinity of the IHNC, the Mississippi River-Gulf Outlet and the proposed mitigation site.

MISSISSIPPI RIVER

B.1.100. The banks of the Mississippi River from Baton Rouge to the Gulf of Mexico are lined with more than 115 industrial plants. Among these industrial complexes are the largest petroleum refineries in the United States, several smaller refineries, and numerous and diverse petrochemical and chemical manufacturers. Most of these industries utilize the Mississippi River as a source of process or cooling water and all discharge their wastes into the river. Additionally, wastes from various municipalities are discharged into the Mississippi River. Pollutants contained in these and other wastes and inflows adversely affect the water quality.

B.1.101. There are four sampling stations located in the segment of the Mississippi River considered in this study. The New Orleans station is located approximately 10 miles upstream of the IHNC, and provides an indication of the type and level of constituents in the river which might impact canal water. Values for Mississippi River water quality parameters at this station for the time frame, January 1970 through September 1988, are shown in Table B-17. This station was discontinued in 1988.

TABLE B-17
WATER QUALITY DATA
MISSISSIPPI RIVER AT NEW ORLEANS, LOUISIANA[1]
Period of Record: January 1970 through September 1988

Parameter		Units	Number Values	Percent Undetected	Mean	Maximum	Minimum
Water	Temp	Cent	152	-	18.285	31.000	1.500
Turbidity	Jkson	JTU	52	-	59.788	230.000	1.000
Color	PT-CO	Units	128	-	13.469	50.000	0.000
Conductivity	AT 25C	Micromho	154	-	405.690	608.000	257.000
DO		mg/L	142	-	8.198	13.300	5.400
BOD	5-day	mg/L	96	-	1.909	5.700	0.000
pH		SU	142	-	7.561	8.200	6.900
CO_2		mg/L	107	-	7.022	22.000	1.200
T Alkalinity	$CaCO_3$	mg/L	139	-	104.430	161.000	65.000
HCO_3 Ion	HCO_3	mg/L	107	-	124.130	172.000	79.000
Residue	Diss-105C	mg/L	3	-	233.330	270.000	180.000
Residue	Tot Nflt	mg/L	4	-	69.250	110.000	44.000
Total N	N	mg/L	65	-	2.095	4.000	0.710
Total KJEL	N	mg/L	84	-	0.785	2.300	0.200
NO_2 and NO_3	N-Total	mg/L	91	-	1.302	2.500	0.030
Phos-Tot		mg/L P	91	-	0.251	0.860	0.020
T Org C	C	mg/L	22	-	6.641	19.000	1.000
Cyanide	CN-Tot	mg/L	8	50	<0.005	<0.010	0.000
Tot Hard	$CaCO_3$	mg/L	124	-	149.070	210.000	99.000
NC Hard	$CaCO_3$	mg/L	119	-	46.042	83.000	29.000
Calcium	CA, Diss	mg/L	137	-	40.817	59.000	27.000
Magnesium	Mg, Diss	mg/L	137	-	11.804	20.000	4.600
Sodium	Na, Diss	mg/L	137	-	21.825	45.000	9.000
Sodium	Adsbtion	Ratio	116	-	0.757	1.500	0.400
Percent	Sodium	Percent	116	-	22.862	36.000	13.000
Potassium	K, Diss	mg/L	137	-	3.301	6.200	1.800
Chloride	Cl	mg/L	139	-	24.453	54.000	11.000
Sulfate	SO_4,Tot	mg/L	139	-	56.431	260.000	30.000
Fluoride	F, Diss	mg/L	135	-	0.397	1.100	0.100
Silica	Dissolved	mg/L	131	-	6.269	11.000	0.200
Arsenic	AS, Diss	ug/L	27	4	<1.482	5.000	0.000
Arsenic	AS, Susp	ug/L	11	-	<2.455	5.000	1.000
Arsenic	AS Tot	ug/L	16	-	<3.063	8.000	1.000
Cadmium	CD, Diss	ug/L	44	41	<2.045	6.000	0.000
Cadmium	CD, Susp	ug/L	15	73	<2.067	20.000	0.000
Cadmium	CD, Tot	ug/L	20	65	<3.350	20.000	0.000
Chromium	CR, Diss	ug/L	27	74	<1.259	<20.000	0.000
Chromium	CR, Susp	ug/L	12	42	<6.583	20.000	0.000
Chromium	Hex-Val	ug/L	29	79	<0.862	<10.000	0.000
Chromium	CR, Tot	ug/L	18	22	<13.111	20.000	0.000
Cobalt	Co, Diss	ug/L	33	52	<2.182	6.000	0.000
Cobalt	Co, Susp	ug/L	13	38	<9.385	<50.000	0.000
Cobalt	Co, Total	ug/L	18	39	<13.222	<100.000	0.000
Copper	Cu, Diss	ug/L	43	28	<4.488	26.000	0.000
Copper	Cu, Susp	ug/L	13	31	5.077	16.000	0.000
Copper	Cu, Tot	ug/L	18	17	8.389	20.000	0.000
Iron	FE, Tot	ug/L	18	-	3712.800	7200.000	570.000
Iron	FE, Diss	ug/L	40	-	<30.800	230.000	10.000
Lead	Pb, Diss	ug/L	43	33	<4.186	10.000	0.000
Lead	Pb, Susp	ug/L	14	7	<22.714	<97.000	0.000
Lead	Pb, Tot	ug/L	18	6	<42.222	<200.000	0.000
Manganese	Mn, Susp	ug/L	14	-	169.720	310.000	40.000
Manganese	Mn, Tot	ug/L	18	-	<181.670	330.000	10.000
Manganese	Mn, Diss	ug/L	42	5	<16.000	<100.000	0.000
Nickel	Ni, Tot	ug/L	3	-	15.000	20.000	10.000
Zinc	Zn, Diss	ug/L	44	16	<17.25	60.000	0.000
Zinc	Zn, Susp	ug/L	14	21	16.429	60.000	0.000
Zinc	Zn, Tot	ug/L	19	5	<57.369	450.000	0.000

TABLE B-17 (continued)

Parameter		Units	Number Values	Percent Undetected	Mean	Maximum	Minimum
Selenium	Se, Diss	ug/L	17	-	<2.353	8.000	1.000
Selenium	Se, Susp	ug/L	11	55	0.909	6.000	0.000
Selenium	Se, Tot	ug/L	16	-	<3.000	11.000	1.000
Beta-D	AS CS137	Pc/L	5	-	6.177	11.000	4.500
Beta-S	AS CS137	Pc/L	5	-	6.808	16.000	2.400
Ra-226-D	Radon.MT	Pc/L	5	-	0.112	0.180	0.070
U-Nat	Dissolved	ug/L	3	-	1.233	1.500	0.800
Tot Coliform	NFIMENDO	/100 Ml	31	-	3181.600	14000.000	420.000
Fec Coliform	MFM-FCBR	/100 Ml	31	-	<421.902	1800.000	5.000
Fec Coliform	M-FCAGAD	/100 Ml	30	-	362.330	660.000	120.000
Fecstrep	MFKFAGAR	/100 Ml	46	-	<871.955	6600.000	10.000
Fecstrep	MF M-Ent	/100 Ml	26	-	563.840	2400.000	100.000
Phenols	Total	ug/L	7	14	<4.714	18.000	0.000
Perthane	Whl Smpl	ug/L	9	44	<0.0356	<0.100	0.000
Napthalenes	Pc	ug/L	19	74	<0.026	<0.100	0.000
Aldrin	Tot	ug/L	26	81	<0.0019	<0.010	0.000
Gamma-BCH	Lindane	Tot ug/L	26	81	<0.0019	<0.010	0.000
Chlordane	Tech & Met	Tot ug/L	25	80	<0.0200	<0.100	0.000
DDD	Whl Smpl	ug/L	26	81	<0.0019	<0.010	0.000
DDE	Whl Smpl	ug/L	26	81	<0.0019	<0.010	0.000
DDT	Whl Smpl	ug/L	26	77	<0.0023	0.010	0.000
Dieldrin	Tot	ug/L	25	60	<0.0037	0.010	0.000
Endosulfan	Whl Smpl	ug/L	9	44	<0.0056	<0.010	0.000
Endrin	Tot	ug/L	26	73	<0.0027	0.010	0.000
Toxaphene	Tot	ug/L	21	76	<0.152	<1.000	0.000
Heptachlor	Tot	ug/L	26	81	<0.0019	<0.010	0.000
Methoxychlor	Whl Smpl	ug/L	7	29	<0.0071	<0.010	0.000
PCB'S	Whl Smpl	ug/L	25	76	<0.024	<0.100	0.000
Malathion	Whl Smpl	ug/L	25	80	<0.0020	<0.010	0.000
Parathion	Whl Smpl	ug/L	25	80	<0.0020	<0.010	0.000
Diazinon	Whl Smpl	ug/L	24	46	<0.0079	0.060	0.000
Mparathn	Whl Smpl	ug/L	25	80	<0.002	<0.010	0.000
2,4-D	Whl Smpl	ug/L	25	48	<0.0120	0.060	0.000
2,4,5-T	Whl Smpl	ug/L	25	60	<0.0056	0.040	0.000
Mirex	Whl Smpl	ug/L	13	62	<0.0038	<0.010	0.000
Silvex	Whl Smpl	ug/L	24	67	<0.0038	0.020	0.000
Trithion	Whl Smpl	ug/L	19	74	<0.0026	<0.010	0.000
Mirthion	Whl Smpl	ug/L	19	74	<0.0026	<0.010	0.000
Setteable	Matter	Ml/1/hr	6	-	<1.000	<1.000	1.000
Algae	Total	/Ml	31	-	1684.100	7500.000	57.000
Residue	Diss-180C	mg/L	133	-	243.420	348.000	145.000
Diss Sol	Sum	mg/L	121	-	224.700	315.000	139.000
Diss Sol	Tons per	Acre-ft	113		0.323	0.440	0.200
Tot N	As NO_3	mg/L	64	-	9.252	18.000	3.100
Mercury	Hg, Diss	ug/L	16	6	<0.419	<0.500	0.000
Mercury	Hg, Susp	ug/L	12	83	0.025	0.200	0.000
Mercury	Hg, Tot	ug/L	38	3	<0.466	1.800	0.000
Alpha-D	As U-Nat	ug/L	5	-	<6.300	9.600	2.300
Alpha-S	As U-Nat	ug/L	5	-	11.500	31.000	2.300
Beta-D	As SR-Y-90	Pc/L	5	-	5.420	8.700	3.600
Beta-S	As SR-Y-90	Pc/L	5	-	5.260	12.000	1.900

1 Storet Data from USEPA. (USGS STATION: 112WRD 07374508).
< Actual value is less than value shown.

B.1.102. These data indicate that compliance with criteria is generally good. Table B-18 shows a comparison of selected LDEQ stream specific criteria and EPA criteria with the recorded data. (Data from other segments will be compared to the same criteria.) The comparison indicates that the EPA criterion is exceeded for phosphorus. This criterion was established to prevent eutrophication; however, because of swift water movement and low light penetration, that problem does not exist in the Mississippi River.

TABLE B-18
SELECTED CRITERIA COMPARISONS
MISSISSIPPI RIVER AT NEW ORLEANS
Period of Record: January 1970 through September 1988

	CRITERIA		RECORDED DATA		
	STATE[1]	EPA[2]	MEAN	MAXIMUM	MINIMUM
Temperature (^{o}C)	32	--	18.3	31.0	1.5
Dissolved Oxygen (mg/L)	5.0 (min)	5.0 (min)	8.20	13.3	5.4
BOD_5 (mg/L)	--	--	1.91	5.70	0
pH	6.5-9.0	6.5-9.0	7.6	8.2	6.9
NO_3 - Nitrogen (mg/L)	--	10	0.82	2.0	0.1
Phosphorus - total (ug/L)	--	100	251	860	20
Total Coliform per 100 Ml	10,000[3]	--	3,182	14,000	420
Fecal Coliform per 100 Ml	200[4]	--	309(log)	1,800	80
Total Dissolved Solids (mg/L)	400	--	242	348	145
Chlorides (mg/L)	75	250	24	54	11
Sulfates (mg/L)	120	250	56	260	30

1 LDEQ 1989 numerical criteria for Mississippi River near New Orleans
2 EPA Quality Criteria for Water, 1986
3 Drinking Water Supply: Monthly arithmetic mean most probable number (MPN)
4 Primary Contact Recreation: Monthly log mean

B.1.103. As footnoted in Table B-17 many parameter values were reported as "actual value known to be less than value shown" because of detection limits. Also, because of the sampling interval stated in some of the criteria, exceedances can only be regarded as "possible exceedances." For metals only, EPA recommends comparing the dissolved fraction, not the total concentration to the criteria. As discussed below, for the metals listed in Table B-17 chromium, copper, lead and mercury may have exceeded the EPA freshwater aquatic life criteria. The maximum value (<20 ug/L) for dissolved chromium possibly exceeded the acute criteria level of 16 ug/L. The mean dissolved chromium concentration of <1.259 ug/L was well below the chronic criteria level of 11 ug/L. It should be noted that this criterion is for chromium VI and cannot be directly compared to chromium. The maximum dissolved copper concentration (26 ug/L) exceeded the acute criteria level of 22 ug/L. However, the mean dissolved copper concentration (<4.488 ug/L) was well below the chronic criteria level of 17 ug/L. The maximum dissolved lead concentration (10 ug/L) exceeded the chronic criteria level of 5.3 ug/L, but did not exceed the acute criteria level of 137 ug/L. However, the mean dissolved lead concentration (<4.186 ug/L) was below the chronic criteria. For dissolved mercury, both the maximum (<0.5 ug/L) and the mean (<0.419 ug/L) concentrations possibly

exceeded the chronic criteria level of 0.012 ug/L, but did not exceed the acute criteria level of 2.4 ug/L. The maximum cyanide concentration (<10 ug/L) possibly exceeded the chronic criteria level of 5.2 ug/L, but did not exceed the acute criteria of 22 ug/L. The mean cyanide concentration (<5.0 ug/L) was below this chronic criteria. For chlordane, mirex and PCB's both the maximum and mean concentrations possibly exceeded the chronic criteria as both the maximum and mean concentrations for these parameters are known to be less than the values reported. The maximum heptachlor concentration possibly exceeded the chronic criteria as the maximum is known to be less than the value reported. Both the maximum and mean concentrations for DDT, dieldrin and endrin possibly exceeded the chronic criteria, however the mean concentrations are known to be less than the values reported. The maximum toxaphene concentration (<1.0 ug/L) possibly exceeded the acute criteria level of 0.73 ug/L. The mean toxaphene concentration (<0.152 ug/L) possibly exceeded the chronic criteria level of 0.0002 ug/L.

B.1.104. Another sampling station is located approximately 9 miles downstream of the entrance to the IHNC, operated by USGS. Originally located on the east side of the river near Violet, it was moved to Belle Chasse in 1977. Water quality data from both locations were reviewed to determine if there were any significant changes as the stream flowed past New Orleans. Data from the station at Violet, which had a period of record from 1973 through 1978, showed significant increases over the New Orleans station in levels of coliform and copper. Average fecal coliform levels were approximately 5 times greater at the Violet location; the log mean of the fecal levels was over five times the LDEQ criteria (1039 vs. 200). Concentrations of total copper were over three times greater than the upstream station, however, the mean dissolved copper concentrations differed by only 1 ug/L.

B.1.105. Data from the USGS station after relocation to Belle Chasse also show higher levels of copper and fecal coliform. Observations for the period of record 1977 through 1992 show an increase in average concentrations of total copper to nearly three and a half times the New Orleans location level, however the mean dissolved copper concentrations differed by only 2 ug/L. Average metal concentrations have decreased slightly for chromium, copper, arsenic, cadmium, nickel and manganese comparing the 1977-1987 and 1988-1993 averages. Lead, zinc, and iron average concentrations have actually increased between these two time periods.

B.1.06. Table B-19 shows mean concentrations at the USGS Mississippi River at Belle Chase station (USGS 07374525). Mean values are shown in two categories: 1977-1987 and 1988-1993. These categories correspond with the onset of required disinfection of municipal wastewater discharges which began in 1988. This requirement has resulted in significantly lower average fecal coliform levels in the Mississippi River since 1988. From the time period 1977-1987, the average fecal coliform count was 1021 per 100 mL. From the time period 1988-1993, the average fecal coliform count was 298 per 100 mL, a 71% decrease from the 1977-1987 time period.

TABLE B-19
SELECTED MEAN CONCENTRATIONS

Mississippi River at Belle Chase (USGS, 07374525)

Parmeter (units)	1977-1987	1988-1993
Fecal coliform (#/100 mL)	1,021 (log 565)	298 (log 154)
Chromium (ug/L)	3.53	1.21
Copper (ug/L)	6.59	5.42
Lead (ug/L)	2.43	3.37
Mercury (ug/L)	0.11	0.10
Zinc (ug/L)	15.5	26.7
Arsenci (ug/L)	1.76	1.42
Cadmium (ug/L)	1.46	1.17
Iron (ug/L)	20.5	26.5
Nickel (ug/L)	3.14	2.69
Manganese (ug/L)	8.26	4.05

B.1.107. The Mississippi River water sample collected in 1993 confirms the existing water quality in the Mississippi River. This sample was collected upstream of the IHNC entrance near the eastbank of the river. Values are in-line with historic readings, and generally fall near the mean value recorded for the previous stations. See Table B-26 for analysis results.

B.1.108. In summary, potential water quality problems in the Mississippi River in the vicinity of New Orleans include heavy metals, pesticides and pathogens. Trace metal concentrations occasionally violate criteria levels. However, with the exception of minor increases in concentrations of lead, zinc and iron, trace metal concentrations have shown a decreasing trend with time because of improved industrial wastewater treatment. Most pesticides and other synthetic organic compounds are only detectable, if at all, at very low concentrations. Pesticide levels have been decreasing with time because of prohibitions on the most toxic and persistent compounds, and improved treatment of industrial wastewater has reduced the average concentrations of most other organic compounds. This segment of the Mississippi River is presently classified by LDEQ as fully supporting its designated uses of Secondary Contact Recreation, Fish and Wildlife Propagation, and Drinking Water Supply, but not supporting Primary Contact Recreation (Ref. 13). Fecal coliform is the primary parameter for determining Primary Contact Recreation support. If the fecal coliform levels violate the criteria <10% of the time the waterbody is said to fully support the designated use. If the level violates the criteria 11 to 25 % of the time, the waterbody is said to partially support the designated use. Likewise, greater than 25 % and the waterbody does not support the use. The data at the Mississippi River Belle Chase station for the period of 1988-1993 indicates that the fecal coliform levels violates the data approximately 16% of the time. Thus, for this time

period, this segment partially supports its Primary Contact Recreation use.

INNER HARBOR NAVIGATION CANAL

B.1.109. The water quality of the IHNC is the result of discharges directly into the canal or from connecting streams, especially the Mississippi River. Direct discharges include stormwater runoff, industrial point sources, and vessel discharges. There are no municipal waste outfalls in the IHNC, although small quantities of local domestic wastes may be discharged.

B.1.110. The Dwyer Street pumping station drains runoff from eastern New Orleans and has a capacity of 120 cubic feet per second (cfs). The Florida Avenue at IHNC pump station recently constructed and put into operation is located on the west side of the IHNC canal with a capacity of 3,650 cfs and discharges directly into the IHNC. Discharge of this runoff into the canal could introduce significant amounts of pollutants from urban runoff. An indication of the type and magnitude of pollutants can be obtained from model studies conducted for the 1981 New Orleans-Baton Rouge Metropolitan Area Urban Stormwater Assessment and the 1992 Jefferson and Orleans Parish Water Quality Management Reconnaissance Study. One of the results of these investigations was the development of predicted concentrations of stormwater contaminants, summarized in Table B-20, for Orleans Parish. A review of that data indicates discharge from the stormwater pumping stations could introduce significant levels of biological oxygen demand (BOD) and coliform during a relatively short period of time, creating a "slug" loading effect. That could cause oxygen depletion and high coliform levels to occur in the IHNC.

TABLE B-20
ORLEANS PARISH STORMWATER CONTAMINANTS

		Existing	Predicted Storm Runoff	
Parameter	Units	Dry Weather	NOBRMA[1]	Jeff-Orl[2]
TSS	mg/L	30	210	929
BOD_5	mg/L	10	40	22
COD	mg/L	75	110	123
TN	mg/L	5	5	--
TP	mg/L	1	1	--
Total Coliform	#/100 Ml	5×10^6	2×10^7	1.5×10^5
Fecal Coliform	#/100 Ml	5×10^5	2×10^6	1.5×10^4

[1] New Orleans-Baton Rouge Metropolitan Area
[2] Jefferson and Orleans Parish Water Quality Management Reconnaissance Study

B.1.111. Several industries located along the IHNC discharge waste into the canal, and significant discharges are shown in Table B-21. These industries are possibly the sources of heavy metals detected in various water samples collected in the IHNC. Historic water quality data indicate the presence of magnesium, manganese, iron, lead, zinc, chromium, cadmium, copper, mercury and nickel. Both the maximum (11 ug/L) and mean (3.42 ug/L) copper concentrations exceeded the EPA saltwater aquatic life acute criteria level of 2.9 ug/L. The maximum lead concentration (6 ug/L) exceeded the chronic criteria of 5.6 ug/L, although the mean concentration (1.0 ug/L) was well below the criteria. Both the maximum (<0.5 ug/L) and mean (<0.377 ug/L) mercury concentrations possibly exceeded the chronic criteria level of 0.025 ug/L. Thus, historically, there is an indication that the water is subject to periodic metals contamination.

B.1.112. The IHNC sample collected during the 1993 sampling effort is similar to the results of the historic sampling. Most of the same metals are present in similar concentrations. The concentration of copper at <14 ug/L possibly exceeded the EPA saltwater aquatic life criteria of 2.9 ug/L. The value of 3.3 ug/L for lead falls between the mean and maximum of the historic values of 1.0 to 6.0 ug/L, although the criterion is not exceeded. Nickel possibly exceeds the EPA saltwater aquatic life criteria of 8.3 ug/L with a value of <23 ug/L. Other IHNC water concentration values for parameters analyzed during this effort are shown in Tables B-27, B-28 and B-29.

TABLE B-21
INNER HARBOR NAVIGATION CANAL (EXISTING POINT SOURCE DISCHARGES)

Facility Name	SIC Code	Estimated Discharge	Wastewater Discharge (pounds per day)				
		MGD	BOD	COD	VS	TSS	NO_3
Standard Brands, Inc.	20	3.2	107	--	--	941	--
New Orleans Public Service Patterson	49	216	--	--	--	--	--
United States Gypsum Company	32	0.65	94	1,323	3,253	--	--
Alabama Great Southern Railroad Company	40	0.216	5.8	--	--	25.4	--
Owens-Illinois, Inc.	32	.2	--	103	134	--	0.16
Lone Star Industries	--	0.04	--	--	--	--	--
Belden Concrete	--	0.001	--	--	5.1	--	--
Ideal Cement Company	--	0.002	--	--	--	--	--
Bergeron Marine Svc, Inc.	3731		--				
Board of Commissioners of Orleans Levee District	5171						
Marmac Corp (McDonough Corporation)	3731						
Quality Reconditioning Service, Inc	7699						

B.1.113. Although no long term or continuous monitoring of water quality is available for the IHNC, numerous samples have been taken and analyzed by various agencies. Table B-22 shows a comparison of water quality data for several parameters with established state and Federal criteria. Average DO concentrations taken in 1972 through 1976 were 7.2 mg/L, which met existing criteria. Minimum DO levels were extremely low, however, with values as low as 0.1 mg/L. Such levels could result from a combination of high BOD industrial wastes, stormwater discharge from the stormwater pumping stations, and local domestic wastes all being discharged into a sluggish canal. A similar DO problem would be expected to exist at the present time. Variations in pH exceed both the upper and lower limits established by LDEQ and EPA. Such extremes can have adverse effects on aquatic life; even more so if changes from one extreme to the other occur rapidly. In 1977 and 1978, the Louisiana Department of Health and Human Resources analyzed 10 samples from the IHNC for total coliform; the average level exceeded 50,000/100 mL. Although the state bacterial standards are based on fecal coliform rather than total coliform, it would appear that fecal coliform criteria commensurate with designated uses of the IHNC are not being met. The coliform problem is in part due to coliform contamination from the municipal wastes influxing from the

Mississippi River; however, local domestic wastes from developments along the IHNC, as well as accumulated benthic deposits conducive to coliform regrowth, probably contribute most to the coliform problem in the IHNC.

B.1.114. Various studies conducted for Lake Pontchartrain also considered information on water quality in the IHNC. An environmental analysis of Lake Pontchartrain, conducted in 1980, noted that the canal showed definite evidence of a "salt wedge" which occurs during a flooding tide. This phenomenon occurs because the canal is connected to the gulf. More saline (and more dense) gulf water moves along the bottom, and probably is the primary source of chlorides shown in Table B-22.

B.1.115. An investigation of the nutrients and toxic substance chemistry of the tidal passes into Lake Pontchartrain was conducted by the University of New Orleans under a contract from the Corps of Engineers as part of the Lake Pontchartrain Hurricane Protection Study. One of the sampling stations was located in the IHNC near the entrance to Lake Pontchartrain. Nutrient data indicated that in comparison to the passes at Chef Menteur and Rigolets, the IHNC had higher average concentrations of ammonia, nitrite plus nitrate, orthophosphate, and total phosphorus. Although none of these constituents exceeded EPA criteria, the ammonia concentration indicated that certain industries along the waterway could be contributing additional quantities of ammonia above natural levels.

TABLE B-22
WATER QUALITY DATA[1]
INNER HARBOR NAVIGATION CANAL

	CRITERIA		RECORDED DATA		
	STATE[2]	EPA[3]	MEAN	MAXIMUM	MINIMUM
Temperature (^{o}C)	35	--	20.4	34.5	3.9
Dissolved Oxygen (mg/L)	4.0 (min)	5.0 (min)	7.2	13.4	0.1
BOD_5 (mg/L)	--	--	2.7	10.6	0.7
pH	6.5 - 9.0	6.5 - 9.0	7.5	9.8	3.4
NO_3 - Nitrogen (mg/L)	--	--	0.87	2.0	0.06
Phosphorous - Total (ug/L)	--	50	189	310	30
Total Coliform per 100 Ml	--	--	9,050	333,000	0
Fecal Coliform per 100 Ml	200[4]	200[4]	8,119	240,000	0
Total Dissolved Solids (mg/L)	--	--	8,515	22,068	16
Chlorides (mg/L)	--	--	4,916	12,000	16
Sulfates (mg/L)	--	--	119	540	29

1 Composite of data from various sampling stations 1970-1982
2 LDEQ 1989 numerical criteria for IHNC - Mississippi River Lock to Lake Pontchartrain (Estuarine)
3 EPA Quality Criteria for Water, 1986
4 Primary Contact Recreation: Monthly log mean

B.1.116. Another portion of the study analyzed Phase I sediment and tissue samples. The analyses conducted on these samples were for base-neutral extractable organic priority pollutants and other toxic substances. There was a total of 23 EPA base-neutral organic priority pollutants identified in replicate IHNC sediment samples. Twenty-one additional base-neutral organics were identified at least to chemical class. Samples of oysters also were analyzed and a total of 19 EPA base

neutral organic priority pollutants was identified. Five other specific base-neutral organic compounds of probable anthropogenic origin were detected among the 136 individual base-neutral extractable organics identified to chemical class. The majority of the pollutants detected were polynuclear aromatic hydrocarbons (PAH's), the major source of which is considered to be the combustion of fossil fuels and/or other organic combustibles. The presence of such compounds as low molecular weight alkylated aromatics suggests the occurrence of direct inputs of some low boiling petroleum distillates such as gasoline. Four of the PAH's were carcinogenic: methyl phenanthrene, benzo(a) anthracene, chrysense, and benzo(k) flouranthene. Analyses of the water column indicated diethylphthalate and dibutylphthalate were present in concentrations that may be toxic to chronically exposed aquatic organisms. This study indicated that of the three tidal passes into Lake Pontchartrain, the IHNC has the highest general organic pollutant burden, the highest level of PAH contamination, and the highest level of industrial organics pollution. This organic pollution occurs from industries along the bank, urban and rural air particulate matter fallout, terrestrial runoff, and ship traffic.

B.1.117. In summary, water quality problems in the IHNC include DO, coliform, pH, heavy metals, organics, and some pesticides. This has resulted in the LDEQ classifying the IHNC as "Water Quality Limited."

LAKE PONTCHARTRAIN

B.1.118. The water in Lake Pontchartrain near the entrance of the IHNC is affected by water from the canal, especially the water of the IHNC north of the MR-GO confluence. A sampling station is located in the lake near the canal entrance, and provides an indication of water quality in the area. Values for selected parameters are shown in Table B-23. These data show high average DO levels, high phosphorus concentrations, low BOD levels, and occasional pH levels above and below state or EPA criteria. Mean fecal coliform levels exceeded the state criteria of 200 counts/100 mL. The maximum copper concentration (9 mg/L) exceeded the saltwater EPA acute criteria level of 2.9 ug/L, but the mean copper concentration (2.6 ug/L) was below this criteria. The maximum lead concentration (10 ug/L) exceeded the EPA chronic criteria level of 5.6 ug/L, but the mean lead concentration (0.8 ug/L) was well below this criteria level. Both the maximum (0.2 ug/L) and mean (<0.28 ug/L) mercury concentration possibly exceeded the chronic criteria level of 0.025 ug/L. The maximum cyanide concentration (30 ug/L) exceeded the acute criteria level of 1 ug/L, but the mean cyanide concentration (0.3 ug/L) was below this criteria level. Several pesticides were detected in Lake Pontchartrain. The maximum concentration of chlordane (<0.1 ug/L) possibly exceeded the acute criteria level of 0.09 ug/L. The mean chlordane concentration (0.002 ug/L) was less than the chronic criteria level of 0.004 ug/L. The maximum mirex concentration (0.01 ug/L) exceeded the chronic criteria level of 0.001 ug/L, but the mean mirex concentration (0.0004 ug/L) was well below this level. The maximum PCB concentration (<0.1 ug/L) possibly exceeded the chronic criteria level of 0.03 ug/L. The mean PCB concentration

(0.003 ug/L) was well below the chronic criteria. Both the maximum (<0.1 ug/L) and mean (<0.002 ug/L) toxaphene concentrations possibly exceeded the chronic criteria level of 0.0002 ug/L. As noted in a preceding paragraph, the IHNC near the entrance in the lake contains a significant number of organic compounds. Nevertheless, Lake Pontchartrain near the IHNC exhibits reasonably good water quality.

TABLE B-23
WATER QUALITY DATA
LAKE PONTCHARTRAIN (Vicinity of IHNC)
Period of Record: April 1967 through January 1981

	CRITERIA		RECORDED DATA		
	STATE[1]	EPA[2]	MEAN	MAXIMUM	MINIMUM
Temperature (^{o}C)	32	--	21.2	32.0	6.1
Dissolved Oxygen (mg/L)	4.0 (min)	5.0 (min)	8.2	13.6	1.1
BOD_5 (mg/L)	--	--	2.1	17.6	0.0
pH	6.5 - 9.0	6.5 - 8.5	7.6	9.7	4.1
NO_3 - Nitrogen (mg/L)	--	--	0.640	2.6	0.00
Phosphorous - Total (ug/L)	--	25	97	600	10
Total Coliform per 100 Ml	--	--	1,785	26,000	4
Fecal Coliform per 100 Ml	200[3]	200[3]	269	12,000	0
Total Dissolved Solids (mg/L)	--	--	6,477	16,333	5
Chlorides (mg/L)	--	250	2,882	8,750	18
Sulfates (mg/L)	--	250	190	1,100	18

1 LDEQ 1989 numerical criteria for Lake Pontchartrain - West of Highway 11 Bridge (Estuarine)
2 EPA Quality Criteria for Water, 1986
3 Primary Contact Recreation: Monthly log mean

MISSISSIPPI RIVER-GULF OUTLET (GIWW)

B.1.119. There are no active sampling stations located along the Mississippi River-Gulf Outlet, with the exception of a Corps of Engineers station along the IWW near the Paris Road Bridge (MR-GO). Table B-24 shows the water quality parameters at this station for the time period 1967-1981.

TABLE B-24
WATER QUALITY DATA
IWW NEAR PARIS RD BRIDGE N.O., LA.[1]
Period of Record: 9/13/67 through 4/6/81

PARMETER				NOBS	AVE	MAX	MIN	BEG-DATE	END-DATE
10	WATER	TEMP	CENT	616	22.2	42.0	3.1	67/09/13	81/01/29
20	AIR	TEMP	CENT	250	22.4	36.0	3.9	67/09/13	73/04/06
64	DEPTH OF	STREAM	MEAN(FT)	75	20.3	55.0	11.0	72/01/04	73/03/21
70	TURB	JKSN	JTU	38	44.2	200.0	0.0	72/10/20	73/06/28
80	COLOR	PT-CO	UNITS	38	59	260	10	72/10/20	73/06/28
81	AP COLOR	PT-CO	UNITS	38	130	440	20	72/10/20	73/06/28
94	CNDUCTVY	FIELD	MICROMHO	92253	12850	51600	20	67/10/03	81/04/06
95	CNDUCTVY	AT 25C	MICROMHO	31	11890	13200	9700	79/01/01	79/01/02
299	DO	PROBE	MG/L	420	7.1	11.8	0.9	67/09/13	81/01/29
310	BOD	5 DAY	MG/L	39	2.3	8.6	0.1	72/10/20	73/06/28
400	PH		SU	680	7.56	13.60	4.10	67/09/13	81/01/29
410	T ALK	CACO3	MG/L	38	85	112	40	72/10/20	73/06/28
515	RESIDUE	DISS-105	C MG/L	39	45	176	4	72/10/20	73/06/28
549	RESIDUE	VOL NSET	MG/L	39	11	53	0	72/10/20	73/06/28
550	OIL-GRSE	TOT-SXLT	MG/L	17	4.3	14.1	0.0	73/04/20	73/06/28
610	NH3+NH4-	N TOTAL	MG/L	40	0.236	1.320	0.080	72/10/20	73/06/28
620	NO3-N	TOTAL	MG/L	39	0.922	3.000	0.000	72/10/20	73/06/28
680	T ORG C	C	MG/L	17	6.6	18.3	2.6	73/04/20	73/06/28
900	TOT HARD	CACO3	MG/L	39	1155	4263	140	72/10/20	73/06/28
940	CHLORIDE	TOTAL	MG/L	475	5737	15211	42	67/09/13	73/06/28
945	SULFATE	SO4-TOT	MG/L	26	202	748	40	73/04/10	73/06/28
1002	ARSENIC	AS,TOT	UG/L	26	< 14	37	< 10	73/04/10	73/06/28
1045	IRON	FE,TOT	UG/L	39	< 208	1300	< 100	72/10/20	73/06/28
1051	LEAD	PB,TOT	UG/L	8	< 500	< 500	< 500	72/10/20	72/12/29
1092	ZINC	ZN,TOT	UG/L	8	< 100	< 100	< 100	72/10/20	72/12/29
31504	TOT COLI	MFIM LES	/100ML	38	3833	53000	0	72/10/20	73/06/28
31616	FEC COLI	MFM-FCBR	/100ML	36	275	1000	0	72/10/20	73/06/28
32240	TANNIN	LIGNIN	MG/L	39	0.3	4.1	0.0	72/10/20	73/06/28
32260	CTE		MG/L	17	0.02	0.02	0.02	73/04/20	73/06/28
32270	CHLORO-	FORM EXT	MG/L	17	0.0	0.0	0.0	73/04/20	73/06/28
39330	ALDRIN		TOT UG/L	17	< 0.025	< 0.025	< 0.025	73/04/20	73/06/28
39380	DIELDRIN		TOTUG/L	17	< 0.025	< 0.025	< 0.025	73/04/20	73/06/28
70301	DISS SOL	SUM	MG/L	449	11108	27973	3310	67/09/13	72/06/27
70507	PHOS-T	ORTHO	MG/L P	39	0.328	3.200	0.000	72/10/20	73/06/28
71900	MERCURY	HG,TOTAL	UG/L	6	< 1.5	4.0	< 1.0	72/10/20	72/12/14

1 STORET Data from USEPA. (USACE Station: 11COELMN, 76042)
< Actual value is less than value shown.

B.1.120. The minimum DO level of 0.9 mg/L is below the LDEQ minimum criteria of 4.0 mg/L, but the average is 7.1 mg/L. Of the 420 observations for DO, 46 (or 11% of the total) were below the LDEQ minimum criteria of 4.0 mg/L. Such low levels could result from a combination of high BOD industrial wastes, stormwater discharge, and local domestic waste. A similar DO problem would be expected to exist at the present time.

B.1.121. The maximum temperature recorded was 42°C, also violating the 35°C LDEQ criteria. Numerous excursions both above and below the state criteria for pH are noted. Such extremes can have adverse effects on aquatic life, even more so if changes from one extreme to the other occur rapidly. Conductivity ranged from a minimum of 20 micromhos/cm to a maximum of 51,600 micromhos/cm during the period of record (92,253 observations from 1967 through 1981).

B.1.122. Since the segment is designated for Oyster Propagation, the bacterial standard #4 applies. It states that the fecal coliform median MPN shall not exceed 14 fecal coliforms per 100/mL, and not more than 10% of the samples shall exceed an MPN of 43/100mL for a 5-tube decimal dilution test in those portions of the are most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions. Given the limited data ranging from October 1972 through June 1973, it appears probable that this criteria is violated quite frequently. The average of 275/100mL exceeds the 14/100mL criteria and 58% (21 of the 36 values) exceed the 43/100mL criteria when only a 10% exceedance is allowed. Again, as in the IHNC, the coliform problem is in part due to coliform contamination from the municipal wastes influxing from adjacent waterways, local domestic wastes, as well as accumulated benthic deposits conducive to coliform regrowth.

B.1.123. Metals and pesticides were also analyzed periodically at this station between 1972 and 1973. Of the metals with criteria, only lead, zinc, and mercury exceeded or possibly exceeded their respective criteria. All eight samples were measured to be <500 ug/L for lead; possibly exceeding the EPA acute criteria of 140 ug/L. All eight zinc values were measured to be <100 ug/L; possibly exceeding the EPA acute criteria of 95 ug/L. One value in six exceeded the 2.1 ug/L EPA acute criteria for mercury at 4.0 ug/L. One value in 26 exceeded the 36 ug/L EPA chronic criteria for arsenic with a value of 37 ug/L. Pesticides were below the applicable saltwater acute criteria.

B.1.124. This segment of the IWW from the Inner Harbor Navigation Canal to Chef Menteur Pass (MR-GO) is currently classified by LDEQ as fully supporting it's overall designated uses (primary contact recreation, secondary contact recreation, fish and wildlife propagation, and oyster propagation). Separately, LDEQ classifies this segment as threatened for primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Suspected sources are channelization and upstream sources. Suspected causes are organic enrichment/low DO, salinity/TDS/chlorides, pathogen indicators, and oil and grease.

B.1.125. Given the limited data available for the Mississippi River-Gulf Outlet, it appears that the MR-GO exhibits water quality similar to the IHNC, with higher salinity levels due to saltwater intrusion from the Gulf of Mexico.

PROPOSED MITIGATION SITE

B.1.126. There are no sampling stations located in the proposed mitigation site. The area is located to the northeast of the new lock construction site, in the large triangular shaped body of shallow, brackish water. The triangular area is bounded by Bayou Bienvenue (Main Outfall Canal) on the north and west, the Back Protection Levee of the 9th Ward on the south, and a landfill and sewerage treatment plant on the east. Water samples collected near the mitigation site as a part of the 1993 sampling program are presented in Tables 30-36. Copper possibly exceeded the 1986 EPA saltwater aquatic life criteria of 2.9 ug/L, with a value of <14 ug/L. Nickel possibly exceeded the EPA saltwater chronic

criteria of 8.3 ug/L with a value of <23 ug/L. Other metals detected in the proposed disposal area were cadmium, lead, zinc, aluminum, iron, manganese, and magnesium. Since there was only a single sample analyzed, a generalization cannot be made as to the existing water quality in the area. However, the water quality appears to be similar to the quality of water in the IHNC, although fluctuations do exist.

SUMMARY AND DISCUSSION

B.1.127. The information reviewed and analyzed in this report is sufficient to characterize the general water quality of the study area, and to provide a basis for assessing the impacts of the considered alternatives. This discussion is based not only on specific station data as set forth in previous paragraphs, but also considers information available in various reports and documents which address a portion or all of the study area.

B.1.128. In general, DO in the study area is high and BOD low, however, there are some problem areas. DO depression generally occurs in the IHNC and MR-GO. Industrial, stormwater and nonpoint source discharges, low flushing actions and stagnant conditions, result in BOD values as high as 10.6 mg/L and DO values as low as 0.1 mg/L. Water flowing from the IHNC into the GIWW combines with industrial discharges, stormwater, and nonpoint sources resulting in similar problems; however, these problems decrease as the GIWW flows eastward.

B.1.129. An analysis of total and fecal coliform values indicates high levels of coliform throughout most of the study area. The Mississippi River had average levels (over a 10-year period of record) of 3,182 and 392 for total and fecal coliform, respectively. Both were less than state criteria. In the IHNC, and adjacent MR-GO, urban runoff, storm water discharge, and small amounts of domestic sewage, all combine with a sluggish flow to yield the highest coliform levels in the study area. The characteristics of New Orleans stormwater runoff are such that high levels of bacterial contamination are present. Sewer line settlement and fracture has occurred to the degree that much of the runoff is contaminated with domestic sewage. A composite of data from various measurements made in the IHNC for total and fecal coliform counts yielded average values of 9,050 and 8,119/100 mL, respectively. The maximum measured value for fecal coliform was 240,000/100 mL. From the limited data on fecal coliform in the MR-GO, it appears that levels are elevated in this water body also with an average of 275/100 mL.

B.1.130. Most of the water from the IHNC flows through the GIWW; however, the canal connects with Lake Pontchartrain and some discharge travels to that body of water. A review of data from the lake near the IHNC entrance indicates fecal coliform levels exceed the state criteria by 30 percent.

B.1.131. Heavy metals were present in most of the waters tested. In the Mississippi River, metals possibly violating the criteria included chromium, copper, mercury, and lead. The IHNC contained copper, mercury, and lead which possibly exceeded the EPA criteria. In the MR-GO lead,

zinc and mercury exceeded or possiblly exceeded the EPA criteria. Copper and mercury were the two metals with the most potential to violate the criteria in the waters sampled.

B.1.132. Other contaminants detected at various sampling stations included pesticides, high nutrients, base-neutral organic priority pollutants, and organic compounds.

B.1.133. Thus, water in the study area may be classified as occasionally polluted by bacterial contamination, heavy metals, and some pesticides, high nutrients, and organic compounds.

B.1.134. The freshwater that flows into the IHNC comes from local rainfall, freshwater sources of Lake Pontchartrain, and the flow of Mississippi River waters through the IHNC lock. Saltwater intrusion into the surface water and marshlands occurs as a result of tidal flows, long term geological processes associated with subsidence of the delta, and the presence of the MR-GO.

B.1.135. Salinity increases in the areas adjacent to the MR-GO have occurred because the MR-GO provides a more direct route of flow from the high salinity waters of the Gulf of Mexico into the upper areas of the estuarine system. The MR-GO is a straight and deep channel in comparison with the natural meandering shallow lagoons and characteristically sluggish water movement found in the area. Greater volumes, more rapid mixing, and deeper penetration of saltwater are responsible for higher salinities in surface waters and marsh areas adjacent to the MR-GO.

B.1.136. Conductivity is a measure of dissolved ionized solids in water, and provides a means for estimating salinity. Although there are no clear demarcations between fresh, brackish, and saltwater, freshwater is generally considered to have a conductance of less than 7,700 micromhos/cm, saltwater a conductance more than 20,000 micromhos/cm, and brackish water the range between the two figures. Table B-25 lists average, maximum, and minimum conductivity measurements for the sampling stations located in the study area. Salinity intrusion into Lake Pontchartrain has occurred through the IHNC from the MR-GO.

B.1.137. Data from the sampling stations were reviewed to determine if any salinity trends were evident. The location with the most available data was the Mississippi River at Belle Chasse station. Although all stations showed some increases in conductivity over time, there was insufficient data to indicate a definite trend.

TABLE B-25
WATER QUALITY DATA
CONDUCTIVITY

Station[1]	Waterway	Conductivity (Micromhos/cm) Mean	Maximum	Minimum
1	Mississippi River at New Orleans	406	608	257
2	Mississippi River at Belle Chasse, Louisiana	429	1640	260
3	IHNC Forebay	540	862	368
4	Lake Pontchartrain at IHNC Entrance	4,755	21,700	292
5	IWW near Paris Road Bridge	12,850	51,600	20

[1] Period of Record — Station

January 1970 to September 1988	1
October 1977 to July 1992	2
November 1975 to July 1979	3
June 1974 to January 1981	4
October 1967 to April 1981	5

PROJECTED WATER QUALITY

INTRODUCTION

B.1.138. This section sets forth the projected impacts to water quality in the study area which might be reasonably expected as a result of the implementation of each of the considered alternatives, including the no-project alternative. These impacts utilize data from previous investigations, detailed studies conducted to obtain information on specific aspects of potential water quality impacts, and on the results of computer modeling.

B.1.139. Elutriate analyses conducted in 1979, 1981, and 1982 were utilized in writing this report, as was the elutriate analysis conducted in 1993. The latter appears in Tables B-26 through B-36 following this section.

B.1.140. The elutriate test is a simplified simulation of the dredging and disposal process wherein predetermined amounts of dredging site water and sediment are mixed together to approximate a dredged material slurry. The test provides an indication of the chemical constituents likely to be released to the water column during a dredging/disposal operation.

B.1.141. In general, elutriate data was compared to the LDEQ or EPA freshwater acute aquatic life criteria for the Mississippi River and the

LDEQ or EPA saltwater acute aquatic life criteria for the IHNC and the proposed mitigation site. The acute criteria was employed due to the localized, short-term water quality effects which dredging/disposal operations typically produce. In cases where no criteria for aquatic life criteria exists and there is a significant increase from ambient water concentration to elutriate concentration, the parameter as well as its effects will be discussed. This writeup only focuses on obvious violations of criteria or increases in concentrations, Tables B-26 through B-36 provide the data in its entirety. Increases where the values for ambient water and elutriate concentrations are both known to be less than the value shown are not discussed. As previously discussed, direct comparisons between measured values and criteria are not always possible. In particular, many parameters are "known to be less than the value shown". Exceedances should thus be regarded as "possible exceedances".

B.1.142. Samples were collected on May 10 and 11, 1993 by NOD personnel. Analysis for the 1993 elutriate analysis utilized sediment samples taken from the IHNC at 4 sites, which were mixed with the appropriate water source. (See plate B-11A).

B.1.143. Site A is in the IHNC channel south of the existing lock between the St. Claude Avenue crossing and the Mississippi River. This sediment was mixed with Mississippi River water to form the elutriate. All material dredged from this location will be used as random backfill or discharged into the Mississippi River. The results are shown in Table B-26, which shows one composite sediment sample compared to the applicable freshwater acute aquatic life criteria.

B.1.144. Site C is located in the IHNC channel north of the existing lock and south of North Claiborne Avenue. This sediment was mixed with the IHNC water sample and is compared to the applicable saltwater acute aquatic life criteria in Tables B-27, B-28 and B-29. The material dredged from this location will be used as random backfill or discharged into the Mississippi River. The depths of the sediment sample at Site C are as follows: CR1-AT (0-1 feet depth) , CR1-AM (1-5 feet depth) , and CR1-AB (4-9 feet depth). This elutriate is an indicator of the effects of dredging activities as opposed to disposal activities.

B.1.145. Site G is located adjacent to the Galvez Street Wharf in the IHNC between North Claiborne Avenue and Florida Avenue. This sediment was mixed with the proposed mitigation site water and is compared to the applicable criteria in Tables B-30, B-31 and B-32. The material dredged from this location will be pmped to the MR-GO disposal site. The depths of each sediment samples at Site G are as follows: GR1-AT (0-1 feet depth), GR1-AM (1-4 feet depth), and GR1-AB (4-9 feet depth).

B.1.146. Site E is located in the IHNC near the turning basin at Florida Avenue. The sediment from these samples was also mixed with the proposed mitigation site water. The material dredged from the location will be pumped to the MR-GO disposal site. Tables B-33, B-34, B-35 and B-36 show the elutriate analysis and comparison to the applicable saltwater acute aquatic life criteria. ER1-AT (1-1.5 feet depth), ER1-AB (1.5-6 feet

depth), ER2-BT (0-8 feet depth), and ER2-BB (8-12 feet depth) were analyzed. Two vibracore samples were collected for site E.

FUTURE WITHOUT-PROJECT CONDITIONS

B.1.147. Projected future water quality conditions for the study area were modeled in conjunction with the New Orleans-Baton Rouge Metropolitan Area Water Resources Study, completed by the New Orleans District Corps of Engineers in 1981. Data from that study, combined with additional information, provides an overview of future conditions.

B.1.148. Occasional DO and fecal coliform violations would likely occur in the Mississippi River during periods of low flow. Such violations could be eliminated by instituting improved sewage treatment practices. Pesticide exceedances of EPA criteria should be greatly reduced due to prohibitions on the most toxic and persistent compounds. Occasional Mississippi River criteria violations for chromium, copper, mercury, and lead would likely continue, as would the IHNC criteria violations for copper, mercury and lead. Criteria violations along the MR-GO would also be expected to continue. Continued implementation and enforcement of EPA effluent limitation requirements should result in a gradual reduction of heavy metals and the number of carcinogens, but it is unlikely they would be completely eliminated.

B.1.149. In the IHNC and MR-GO a continuation of fecal coliform violations is expected, and occasional DO violations are anticipated. DO, pH, and fecal coliform violations are expected to continue along the southern shore of Lake Pontchartrain. Jefferson Parish has recently constructed and began operation of a regional wastewater treatment facility which has an outfall in the Mississippi River rather than stormwater drainage canals leading to the lake. This will significantly reduce municipal related pollution. The southern portion of Lake Pontchartrain has been identified as eutrophic, and the condition is expected to remain the same.

FUTURE WITH-PROJECT CONDITIONS

B.1.150. There are currently four replacement plans under consideration during this phase of study. All four plans include: cutting a bypass channel on the east bank of the IHNC between North Claiborne Avenue and Florida Avenue, construction of a temporary construction site for off-site construction of lock modules (graving site) and construction of the new lock north of North Claiborne Avenue. The four plans have the following lock dimensions, ship lock at 36 foot depth, barge lock at 22 foot depth:

Width	Depth	Length
110'	22'	900'
110'	22'	1200'
110'	36'	900'
110'	36'	1200'

B.1.151. The primary differences between the water quality impacts for the four plans is the amount of excavated material which would require disposal and the location and amounts of disposal. No new turning basin is required since the existing turning basin is of sufficient size. Vessel traffic will not be interrupted through the existing lock during construction of the new lock. The existing lock is to be demolished after construction of the new lock is completed. Vessel traffic will be halted for short periods (up to one month) during the construction period. The bypass channel would be constructed, the lock constructed at a temporary construction site (graving site), the channel work completed, and the existing lock would be demolished. Water quality impacts could result from the new lock construction; removal, transport, and disposal of dredged material; demolition of the existing lock; construction of graving site; and other construction related activities.

B.1.152. Water quality impacts could result from the placement of steel sheet piles, transportation and placement of material, and operation of the equipment used during construction. Dredged material will be used in one of many ways: random backfill, pumped to MR-GO disposal site (between Bayou Bienvenue and the MR-GO, near the intersection of the MR-GO and the IHNC); pumped to the proposed mitigation site (between Bayou Bienvenue and the Back Protection Levee); pumped into the Mississippi River; or stockpiled and used for backfill. Placement and driving of the piles would cause slight localized short term impacts by increasing turbidity in the immediate construction area. Material spillage may cause local impacts, however, this could be minimized or eliminated by proper hauling/dumping techniques. Since minimal closure of the existing lock would be required during construction, general water quality in the IHNC and beyond should not be affected, other than for turbidity adjacent to the disposal and construction area.

Water quality impacts from construction of the graving site could also be expected. This site is located along the north bank of the MR-GO/GIWW, immediately west of the Paris Road bridge. The proposed work consists of excavation in a dry condition behind the current line of flood protection. Flood protection along the MR-GO will follow the present line of levee protection and tie into the graving site hurricane protection levees. Floodside protection of the site will consist of a tie-in dike, a cofferdam cell and a sand or crushed stone closure with sheetpile protection to protect against high tides. The closure shall be removed after a lock module is completed and ready for transfer to another site, and the closure reinstalled to facilitate the construction of other modules. Water quality impacts due to construction and operation at the graving site are expected to be similar to those impacts described in the previous paragraph.

B.1.153. Total excavation varies depending upon the project alternative. Total excavation quantities follow and include dredging of: the north bypass channel, the new lock, the main channel north of the new lock, the south bypass channel, the main channel south of the new lock, utility corridors, and the existing lock forebay from the Mississippi River to St. Claude Avenue.

Lock Alternative	Total Excavation (cubic yards)
900' X 36'	2,832,000
1200' X 36'	3,043,000
900' X 22'	1,533,000
1200' X 22'	1,633,000

B.1.154. Of these amounts, an estimated 873,000 cubic years for the ship lock alternatives or 690,000 cubic yards for the barge lock alternatives would be dredged for the North Bypass Channel. The portion of this material excavated to a depth of 5 feet will be pumped to the MR-GO site. The remaining portion of this material excavated below a depth of 5 feet will be pumped to the mitigation site for wetland restoration.

An estimated 1,100,000 cubic yards for the 1200 foot by 36 foot alternative; 883,000 cubic yards for the 900 foot by 36 foot alternative; 310,000 cubic yards for the 1200 foot by 22 foot alternative; and 210,000 cubic yards for the 900 foot by 22 foot alternative would be required for the new lock construction. This material would be disposed of in the MR-GO site.

Dredging of the main channel north of the new lock is estimated to be 58,000 cubic yards for the 1200 foot by 36 foot alternative and 56,000 cubic yards for the 900 foot by 36 foot alternative. This material would be disposed of in the MR-GO site. No excavation for the barge lock alternatives are expected for the main channel north of the new lock.

Excavation estimates for the south bypass channel are 145,000 cubic yards for all four alternatives. The excavated material is to be used as random backfill. Excavation estimates for the main channel south of the new lock are 440,000 cubic yards, 110,000 cubic yards, 213,000 cubic yards and 213,000 cubic yards for the 1200 foot by 36 foot, 900 foot by 36 foot, 1200 foot by 22 foot, 900 foot by 22 foot alternatives, respectively. This material would be used as random backfill.

For both ship lock alternatives, 227,000 cubic yards of material will be dredged from St. Claude to the river. For the 1200 foot by 36 foot alternative 55,000 cubic yards of the total 227,000 cubic yards will be used for random backfill. The remainder will be pumped to the river. For the 900 foot by 36 foot alternative the total 227,000 cubic yards will be pumped to the river. For both of the barge lock alternatives 150,000 cubic yards of material will be dredged and used for random backfill. Utility corridors to be dredged expect to yield approximately 200,000 cubic yards for the ship lock alternatives and 125,000 cubic yards for the barge lock alternatives. All material dredged from the utility corridors will be stockpiled and used as backfill. Thus, the primary water quality impacts from this plan would result from the handling and disposal of this dredged material. The following paragraphs discuss the impacts associated with the dredging/disposal operations.

Existing Tailbay and Sites C, G, & E (1993 Elutriate Testing)

B.1.155. Three sites from the 1993 elutriate analysis are in the existing tailbay area, sites C, G, and E. Site C was analyzed using IHNC water, G and E were analyzed using water from the proposed mitigation site. Thus, site C can be analyzed to determine the impacts of dredging the IHNC, while sites G and E can be analyzed to determine the impacts of disposal in the proposed mitigation site and the MR-GO disposal site.

B.1.156. Three depths of the sample collected at Site C in 1993 were mixed with IHNC water and analyzed as elutriates (See Para. B.1.144). These data were compared to the EPA or LDEQ saltwater acute criteria (See Tables B-27, B-28, and B-29). Two metals were shown to increase to a concentration above the stated criteria; copper and zinc. Copper increased from an ambient water concentration of <14 ug/L to 110 ug/L for the 0-1 foot elutriate mixture, 200 ug/L for the 1-5 foot elutriate mixture, and 81 ug/L for the 5-9 foot elutriate mixture. Elutriates prepared from all three depth levels, and possibly the ambient water, exceeded the acute saltwater aquatic life criteria of 2.9 ug/L for copper. Zinc concentrations rose from an ambient water concentration of <20 ug/L to 82 ug/L for the 0-1 foot elutriate mixture, 220 ug/L for the 1-5 foot elutriate mixture, and 120 ug/L for the 5-9 foot elutriate mixture. The acute saltwater aquatic life criteria for zinc is 95 ug/L.

B.1.157. Other parameters showing significant increases from ambient water concentration to elutriate concentrations were: barium (66 ug/L ambient water to 140 ug/L, 250 ug/L, and 420 ug/L, respectively), magnesium (250,000 ug/L ambient water to 290,000 ug/L, 260,000 ug/L, and 260,000 ug/L, respectively), manganese (180 ug/L ambient water to 2,300 ug/L, 310 ug/L, and 81 ug/L, respectively), and bis(2-ethylexyl)phthalate (1 ug/L ambient water to 2 ug/L, 7 ug/L, and 1 ug/L, respectively). Elutriate samples listed above are for 0-1 foot depth, 1-5 foot depth, and 5-9 foot depths, respectively. No saltwater aquatic life criteria exists for the above parameters. The physical and chemical properties of barium generally will preclude the existence of the toxic soluble form under usual marine and fresh water conditions. Calcium and magnesium are the two most common cations defining the hardness of a waterbody. In general, these metal ions are not cause for concern to health, although there are some indications that they may influence the effect of other metal ions on some organisms. Few data are available on the toxicity of manganese to marine organisms. The major problem with manganese may be concentration (bioaccumulation) in the edible portions of molluscs. The available data for phthalate esters indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2,944 ug/L and would occur at lower concentrations among species that are more sensitive than those tested (Ref. 14 and 15).

B.1.158. Two site locations, G and E, were mixed with water samples from the proposed disposal location area and are presented in Tables B-30 through B-36 Site G samples, GR1-AT, GR1-AM, and GR1-AB were taken from 0-1 foot depth, 1-4 foot depth, and 4-9 foot depth of sediment, respectively. These data were compared to the EPA or LDEQ saltwater acute criteria (Tables B-30, B-31 and B-32. Two metals showed an increase in

elutriate concentration over ambient water concentration to a concentration above the stated criteria; namely copper and zinc. Copper concentrations increased from an ambient water concentration of <14 ug/L to 28 ug/L for the 0-1 foot elutriate mixture, 38 ug/L for the 1-4 foot elutriate mixture, and <100 ug/L for the 4-9 foot elutriate mixture. The acute saltwater aquatic life criteria for copper is 2.9 ug/L. Zinc concentrations rose from an ambient water level of <20 ug/L to 81 ug/L for the 0-1 foot elutriate mixture, 86 ug/L at 1-4 foot elutriate mixture, and 310 ug/L at 4-9 foot elutriate mixture. The acute saltwater aquatic life criteria for zinc is 95 ug/L.

B.1.159. Other parameters, which have no saltwater aquatic life criteria, but show significant increases from ambient water concentrations to elutriate mixture concentrations for Site G were: barium (120 ug/L ambient water to 190 ug/L, 740 ug/L, and 810 ug/L, respectively), iron (530 ug/L ambient water to 680 ug/L, 1,600 ug/L, and 170 ug/L, respectively), manganese (250 ug/L ambient water to 1,300 ug/L, 400 ug/L, and 260 ug/L, respectively), and bis(2-ethylexyl)phthalate from 1 ug/L ambient water to 1 ug/L, 75 ug/L, and <3 ug/L, respectively. All elutriate samples listed are for 0-1 foot elutriate mixture, 1-4 foot elutriate mixture, and 4-9 foot depth elutriate mixtures, respectively. Barium, manganese and phthalate esters are discussed in Para. B.1.157. Iron, because it is complexed or relatively inactive chemically or physiologically, has little effect on aquatic life (Ref. 16).

B.1.160. Site E samples ER1-AT and ER1-AB were taken from the first vibracore run at depths of 1-1.5 foot and 1.5-6 feet sediment depths, respectively. Samples ER2-BT and ER2-BB were taken from a second vibracore run at depths of 0-8 feet and 8-12 feet sediment depth, respectively.

B.1.161. Concentrations are shown in the following order: ER1-AT, ER1-AB, ER2-BT, and ER2-BB. These data were compared to the EPA or LDEQ saltwater acute criteria (Tables B-33, B-34, B-35 and B-36). Two metals are shown to increase to a concentration above the stated criteria; namely copper and zinc. Copper increased from an ambient water concentration of <14 ug/L to 34 ug/L, 29 ug/L, 18 ug/L, and 60 ug/L, respectively. Elutriates prepared from all 4 depths, and possibly the ambient water, exceeded the acute saltwater aquatic life criteria for copper of 2.9 ug/L. Zinc concentrations increased from an ambient water concentration of <20 ug/L to 100 ug/L, 95 ug/L, 69 ug/L, and 120 ug/L, respectively. Therefore, two of the four elutriate samples exceeded the saltwater acute saltwater aquatic life criteria of 95 ug/L for zinc.

B.1.162. Other parameters, which have no saltwater aquatic life criteria, but show increases in concentrations of the elutriate at Site E over the ambient water sample were: barium (120 ug/L ambient water to 890 ug/L, 810 ug/L, 730 ug/L, and 820 ug/L, respectively), and calcium (100,000 ug/L ambient water to 170,000 ug/L, 300,000 ug/L, 150,000 ug/L, and 140,000 ug/L, respectively). A few parameters showed significant increases in one elutriate sample while the concentration did not significantly increase or even decreased in another sample. These are iron (530 ug/L ambient water to 86 ug/L, 440 ug/L, 210 ug/L, and 1,500 ug/L, respectively), manganese

(250 ug/L to 180 ug/L, 25 ug/L, 1,300 ug/L, and 480 ug/L, respectively), acenaphthene (10 ug/L ambient water to 7 ug/L, 15 ug/L, 70 ug/L, and 13 ug/L, respectively), and 2-methylnaphthalene (10 ug/L ambient water to 3 ug/L, 2 ug/L, 30 ug/L, and 13 ug/L, respectively). The available data for acenaphthene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 970 ug/L and would occur at lower concentrations among species that are more sensitive than those tested. The available data for naphthalene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2.350 ug/L and would occur at lower concentrations among species that are more sensitive than those tested (Ref. 15).

B.1.163. In summary, the water quality impacts in the IHNC, proposed mitigation site and the MR-GO disposal site are expected to be minimal, mostly related to the potential of temporary increased concentrations of ammonia, copper, manganese, and zinc. The existing tailbay would be excavated with a hydraulic dredge (pipeline) and pumped to the MR-GO disposal site and used as random backfill. Excavation of part of the IHNC east bank would also be conducted, with the excavated material to be disposed of in the proposed mitigation site and the MR-GO disposal site. At the IHNC connecting area, sediment would be expected to contain constituents deposited in the bottom over a period of time. Elutriate data from a mixture of IHNC water and sediment taken from the bottom in 1982 indicate the only potential problem constituents would be ammonia, copper, and manganese. Elutriate data from 1993 indicated copper, manganese, and zinc were potential problem constituents, ammonia was not considered in 1993 effort. The concentration of ammonia as NH_4 is approximately 50% higher than the level which contains the criterion amount of un-ionized ammonia. Copper is relatively plentiful in the natural environment and is the result of industrial sources including petroleum refiners. Copper criterion is based upon the protection of animal species and does not appear to bioaccumulate in animal tissues. Although the 1982 elutriate copper concentrations were about six times the level of the ambient mixture water and range from two to fourteen times for the 1993 elutriate data, most were still generally within the range of concentrations normally found in the Mississippi River, the IHNC and surrounding areas. Historic monitoring shows that copper levels in the waters of the project area frequently exceed the applicable acute criteria under ambient conditions. Manganese is normally imported to the United States, and is used in metal alloys, dry-cell batteries, fertilizer additives, and chemical reagents. Available data indicate manganese is a cargo transported on the GIWW and MR-GO, and spillage during offloading could be a source of the high levels in the sediments. Some of the industries located in the area may be users of manganese, and spillage or discharge could lead to the pollution levels. In addition, manganese tends to flocculate and settle out of the water column. Elutriate samples from 1982 and 1993 showed levels of manganese ranging from 13 to 2,300 ug/L, with greater concentrations in the upper sediment levels. The relatively small amount of material containing high levels of manganese would be dredged in a short time frame, and its effluent would be diluted by the effluent from continued placement of dredged material. Zinc is abundant in surface water and is used as an oxide pigment in rubber and paint, in agricultural fertilizers and sprays and battery production.

Zinc is known to bioaccumulate in animal tissue. Elutriate testing showed zinc concentration levels ranging from 69 ug/L to 310 ug/L, the upper end of which exceeds the acute criteria of 95 ug/L. Additional localized, short-term pollution, primarily turbidity, would occur during the actual dredging and disposal operations.

Existing Forebay and Site A (1993 Elutriate Testing)

B.1.164. Water quality impacts would also be likely to occur from the hydraulic dredging in the lock forebay. Material from this operation would be discharged into the Mississippi River and used as random backfill. Slight increases in ammonia concentrations could occur, depending upon the time of disposal. A criterion has been established for un-ionized ammonia, and the amount of this parameter in total ammonia is dependent upon temperature and pH. Discharging the dredged material at lower temperatures would reduce the potential for the formation of un-ionized ammonia. However, the estimated amount of material containing higher levels of ammonia as NH_4 is low. The impact to the Mississippi River water would be slight.

B.1.165. A composite sample from Site A (between Mississippi River and St. Claude Avenue) was analyzed for the 1993 elutriate testing which was mixed with Mississippi River (Table B-26). These data were compared to the applicable freshwater acute aquatic life criteria. Three metals were shown to increase to a concentration above the stated criteria: chromium, copper and zinc. Total chromium increased from 4 ug/L for ambient Mississippi River water to 17 ug/L for the elutriate mixture. This concentration exceeds the acute criteria of 16 ug/L for Chromium (VI). It should be noted that the criteria is for Chromium VI and not total chromium and therefore should be interpreted only as a possible criteria violation. Copper increased from <14 ug/L to 190 ug/L which exceeds the acute criteria of 22 ug/L. Zinc criteria of 120 ug/L is exceeded by the elutriate concentration of 190 ug/L, up from an ambient water concentration of 100 ug/L.

B.1.166. Other parameters, which have no freshwater aquatic life criteria, but show a significant increase from the ambient water to the elutriate mixture were: aluminum (4,200 ug/L to 12,000 ug/L), iron (3,900 ug/L to 12,000 ug/L), magnesium (14,000 ug/L to 34,000 ug/L), manganese (160 ug/L to 2,400 ug/L) and potassium (4,000 ug/L to 14,000 ug/L). As noted in Table B-26, the elutriate mixtures were not analyzed for a large percentage of the listed parameters due to breakage of the sample jars. Aluminum, magnesium, and potassium are also common cations defining the hardness of a waterbody. In general, these metal ions are not cause for concern to health, although there are some indications that they may influence the effect of other metal ions on some organisms. For example, freshwater criteria levels for metals become less stringent as the hardness of a waterbody increases.

B.1.167. As with excavation from the tailbay, there is a potential for increased concentrations of manganese. A 1982 elutriate test showed dissolved manganese concentrations of only 4 and 6 ug/L, while an elutriate test taken in 1979 indicated an extremely high level of

dissolved manganese (4,200 ug/L). The 1993 elutriate test showed a manganese level of 2,400 ug/L with an ambient water concentration of 160 ug/L.

B.1.168. A review of water quality data for the Mississippi River indicates average manganese levels of 191 ug/L were noted at the Carrollton gage upstream of the IHNC entrance, and 240 ug/L at Belle Chasse downstream of the entrance.

B.1.169. As the nearest downstream water intake is 4.7 miles from the IHNC lock, no impact to that public water supply is expected for the following reasons:

a. A study of the disposal of hydraulic dredged material in the New Orleans Harbor indicated constituents settled out of the water within 100 yards downstream of the dredge (Ref. 17).

b. The manganese would be discharged in a highly sediment-laden mixture into a stream which contains a large amount of sediment, providing an excellent environment for adsorption of the manganese.

c. Water in the Mississippi River presently contains levels of manganese which are three to seven times the criterion for domestic water supplies.

d. Manganese does not cause acute water column impacts under normal dilution and mixing conditions (Ref. 15).

B.1.170. During the period of disposal into the river, suspended sediment would increase and DO would tend to decrease. The average daily sediment load in the Mississippi River at Tarberts Landing, Mississippi, is 630,000 tons per day. Based on the projected excavation rate, the amount of material disposed into the river would be 27,000 tons per day, or about 4 percent of the average load.

B.1.171. Suspended sediment loads at New Orleans normally are less than at Tarberts Landing, so the added amount would be a higher percentage, about 7 percent. Considering the variation in flow conditions, a range of 3 to 7 is more appropriate. Thus, suspended sediment loads would be increased over the period of dredging (estimates range from 4 to 5 days dependent upon the alternative selected). During the same period of time, DO levels would decrease in the disposal area; however, studies conducted in 1975-1976 indicated DO levels rapidly returned to pre-disposal concentrations. For example, DO levels 100 yards downstream of the disposal site were 93 percent of those levels upstream of the site.

B.1.172. In summary, the water quality impacts in the Mississippi River are expected to be minimal, mostly related to the potential temporary increased concentrations of ammonia, copper and zinc. The forebay would be excavated with a hydraulic dredge and used as backfill or discharged into the Mississippi River. Ammonia increases could occur, depending upon the time of disposal. Discharging the dredged material at a lower

temperature would reduce the potential for un-ionized ammonia. Copper, which is industrially generated, was elevated to 190 ug/L in the elutriate, exceeding the acute criteria of 22 ug/L, for an increase 13 times the ambient water concentration. Copper concentrations in the Mississippi River are not normally this high, but because of the swift water movement in the river and the large area of the mixing zone, adverse impacts are not expected. Zinc, used for industrial purposes, increased to 190 ug/L, nearly twice the ambient water concentration of the Mississippi River. Zinc concentrations have not historically been this high but again due to the large mixing zone of the Mississippi River and the swift movement of the water, no adverse effects are expected.

SUMMARY OF OVERALL EFFECTS

B.1.173. No significant, long-term changes in water quality will result from implementation of this project. Existing water quality conditions show that the Mississippi River possibly violates aquatic life criteria for chromium, copper, mercury and lead. Likewise, the IHNC possibly violates copper, mercury and lead aquatic life criteria. The MR-GO possibly violates lead, zinc, and mercury criteria. Most water samples contain levels of copper and mercury in exceedance of the aquatic life criteria.

B.1.174. Elutriate testing shows that elevated concentrations above acute aquatic life criteria can possibly be expected during dredging and disposal operations. Historic testing shows that copper levels periodically exceed the applicable acute aquatic life criteria for ambient water conditions. Levels of zinc in ambient waters of the project area generally do not exceed the chronic or acute aquatic life criteria levels. However, the elutriate testing shows that zinc and copper levels will possibly increase above the acute aquatic life criteria in the Mississippi River, IHNC, and the waters adjacent to the MR-GO disposal area and the proposed mitigation site.

B.1.175. Because dredging and disposal activities have only localized, short-term effects, long-term water quality impacts are not expected. Slight increases in concentration of other parameters may be expected as a result of dredging activities, although no long-term changes in water quality will result since dredging is a short-term, localized action.

B.1.176. Increases in concentrations of suspended sediments during the dredging period would also be expected. Because of the normal heavy sediment load carried by the Mississippi River, the increase in suspended solids would not cause any significant adverse impacts. Increased suspended solids in the IHNC and the waters adjacent to the MR-GO disposal area and the proposed mitigation site are also expected, but due to the short duration of dredging and disposal, impacts would not be significant. Once project construction is complete, all water quality constituents, with the exception of turbidity, are expected to return to normal levels and no long-term changes in water quality are expected.

B.1.177. The highest turbidity levels will occur during disposal into the proposed mitigation site and the MR-GO disposal site. Confinement dikes

would be erected around the border of the site to confine the dredged material in the proposed mitigation sites, but turbidity levels could remain elevated inside the dikes until the created marsh is established with vegetation. Likewise, low-level dikes would be constructed to confine the dredged material in the MR-GO disposal site. Turbidity affects water quality in several ways. The suspended sedimentary particles decrease the light penetration and interferes with the photosynthetic production of oxygen. At the same time these particles absorb solar energy from the sunlight and transform this energy into heat, thus elevating the temperature of the water. The fact that oxygen is less soluble in warm water than in cold water coupled with the decreased photosynthetic oxygen production can result in decreased oxygen levels.

B.1.178. Further testing as required by LDEQ may be conducted to supplement the data provided in this report.

TABLE B-26
ELUTRIATE ANALYSIS
SITE AR1-1C, mixed with Mississippi River water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Mississippi Water	Elutriate	Applicable Acute Criteria
Antimony	<12,000	<3	<60	
Arsenic (total)	7,700	<3	15	360
Arsenic (III)				360
Beryllium	920	<0.6	0.67	
Cadmium	<1,000	0.3	0.3	6.2
Chromium (total)	19,000	4	17	
Chromium (VI)				16
Chromium (III)				1700
Copper	23,000	<14	190	22
Lead	27,000	6.3	11	137
Mercury	<100		<0.20	2.4
Nickel	25,000	<23	<23	1999
Selenium	<600	<3	<3	
Silver	<1,800	<0.4	<0.4	8.2
Thallium	<400	<2	<2	
Zinc	95,000	100	190	120
Aluminum	13,000,000	4,200	12,000	
Barium	160,000	94	150	
Boron	20,400	<100	140	
Calcium	7,600,000	44,000	31,000	
Cobalt	12,000	<11	<11	
Iron	23,000,000	3,900	12,000	
Magnesium	5,900,000	14,000	34,000	
Manganese	1,200,000	160	2,400	
Molubdenum	<20,400	<1	<100	
Potassium	2,200,000	4,000	14,000	
Vanadium	29,000	<13	27	
TRP Hydrocarbons	14,000	<1,000	broken	
Aldrin	<3.5		broken	3.0
A-BHC	<3.5	<0.05	broken	
B-BHC	<3.5	<0.05	broken	
G-BHC	<3.5	<0.05	broken	2.0
D-BHC	<3.5	<0.05	broken	
PPDDD	<6.9	<0.01	broken	0.03
PPDDE	<6.9	<0.1	broken	52.5
PPDDT	<6.9	<0.1	broken	1.1
Heptachlor	<3.5	<0.05	broken	0.52
Dieldrin	<6.9	<0.1	broken	2.5
A-Endosulfan	<3.5	<0.05	broken	
B-Endosulfan	<6.9	<0.1	broken	
Endosulfan				0.22
Endosulfan sulfate	<6.9	<0.1	broken	
Endrin	<6.9	<0.1	broken	0.18
Endrin Aldehyde	<6.9	<0.1	broken	
Heptachlor Epoxide	<3.5	<0.05	broken	
Methoxychlor	<3.5	<0.5	broken	
Chlordane	<3.5	<0.05	broken	2.4
Toxaphene	<350	<5	broken	0.73
PCB-1016	<67	<1	broken	2.0
PCB-1221	<135	<2	broken	2.0
PCB-1232	<67	<1	broken	2.0
PCB-1242	<67	<1	broken	2.0
PCB-1248	<67	<1	broken	2.0
PCB-1254	<67	<1	broken	2.0
PCB-1260	<67	<1	broken	2.0
Phenol	<670	<10	broken	700
2-Chlorophenol	<670	<10	broken	258
2-Nitrophenol	<670	<10	broken	
2,4-Dimethylphenol	<670	<10	broken	
2,4-Dichlorophenol	<670	<10	broken	202
4-Chloro-3-Methylphenol	<670	<10	broken	
2,4,6-Trichlorophenol	<670	<10	broken	

TABLE B-26 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Mississippi Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<3,300	<50	broken	
4-Nitrophenol	<3,300	<50	broken	
2-Methyl-4,6-Dinotrophenol	<3,300	<50	broken	
Pentachlorophenol	<3,300	<50	broken	20
Benzoic Acid	<3,300	<50	broken	
2-Methylphenol	<670	<10	broken	
4-Methylphenol	<670	<10	broken	
2,4,5-Trichlorophenol	<3,300	<50	broken	
Benzyl Alcohol	<670	<10	broken	
N-Nitrosodimethylamine			broken	
Bis(2-Chloroisopropyl)Ether	<670	<10	broken	
N-Nitroso-Di-N-Propylamine	<670	<10	broken	
Nitrobenzene	<670	<10	broken	
Isophorone	<670	<10	broken	
Bis(2-Chloroethoxy)Methane	<670	<10	broken	
2,6-Dinitrotoluene	<670	<10	broken	
2,4-Dinitrotoluene	<670	<10	broken	
1,2-Diphenylhydrazine			broken	
Benzidine			broken	250
3,3'Dichlorobenzidine	<1,300	<20	broken	
Bis(2-Chloroethyl)Ether	<670	<10	broken	
1,3-Dichlorobenzene	<670	<10	broken	
1,4-Dichlorobenzene	<670	<10	broken	
1,2-Dichlorobenzene	<670	<10	broken	
Hexachloroethane	<670	<10	broken	
1,2,4-Trichlorobenzene	<670	<10	broken	
Naphthalene	<670	<10	broken	
Hexachlorobutadiene	<670	<10	broken	5.1
Hexachlorocyclopentadiene	<670	<10	broken	
2-Chloronaphthalene	<670	<10	broken	
Acenaphthylene	<670	<10	broken	
Dimehtyl Phthalate	<670	<10	broken	
Acenaphthene	<670	<10	broken	
Fluorene	<670	<10	broken	
Diethyl Phthalate	<670	<10	broken	
4-Chlorophenyl Phenyl Ether	<670	<10	broken	
N-Nitrosodiphenyl Amine	<670	<10	broken	
4-Bromophenyl Ether	<670	<10	broken	
Hexachlorobenzene	<670	<10	broken	
Phenathrene	140	<10	broken	
Anthracene	<670	<10	broken	
Dibutylphthalate	160	<10	broken	
Fluoranathene	<670	<10	broken	
Pyrene	380	<10	broken	
Butylbenzylphthalate	<670	<10	broken	
Chrysene	200	<10	broken	
Benzo(a)Antharacene	130	<10	broken	
Bis(2-Ethylexyl)Phthalate	100	1	broken	
Di-N-Octyphthalate	<670	<10	broken	
Benxo(a)Fluoranthene	290	<10	broken	
Benzo(k)Fluoranthene	<670	<10	broken	
Benzo(a)Pyrene	86	<10	broken	
Indeno(1,2,3-C,D)Pyrene	69	<10	broken	
Dibenzo(A,H)Anthracene	<670	<10	broken	
Benzo(G,H,I)Perylene	<670	<10	broken	
Aniline			broken	
4-Chloroaniline	<670	<10	broken	
Dibenzofuran	<670	<10	broken	
2-Methylnaphthalene	<670	<10	broken	
2-Nitroaniline	<3,300	<50	broken	
3-Nitroaniline	<3,300	<50	broken	
4-Nitroaniline	<3,300	<50	broken	

< Actual value is less than value shown

TABLE B-27
ELUTRIATE ANALYSIS
SITE CR1-AT, mixed with IHNC water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
Antimony	<17,700	<3	<3	
Arsenic (total)	9,000	<3	3.8	69
Arsenic (III)				69
Beryllium	1,160	<0.6	<0.6	
Cadmium	<1,500	<3	<0.3	43
Chromium (total)	29,000	<2	3.3	
Chromium (III)				515
Chromium (VI)				1,100
Copper	59,000	<14	110	2.9
Lead	49,000	3.3	3.4	140
Mercury	<100		0.2	2.1
Nickel	32,000	<23	<23	75
Selenium	<900	<3	<6	
Silver	<2,700	<0.4	<0.4	2.3
Thallium	<600	<2	<2	
Zinc	180,000	<20	82	95
Aluminum	18,000,000	900	84	
Barium	530,000	66	140	
Boron	30,400	900	890	
Calcium	4,300,000	100,000	97,000	
Cobalt	13,000	<11	<11	
Iron	31,000,000	860	130	
Magnesium	7,700,000	250,000	290,000	
Manganese	760,000	180	2,300	
Molubdenum	<29,500	<1	<100	
Potassium	4,200,000	91,000	89,000	
Vanadium	40,000	<13	<13	
TRP Hydrocarbons	26,000	<1,000	<1,000	
Aldrin	<5	<0.05	<0.05	1.3
A-BHC	<5	<0.05	<0.05	
B-BHC	<5	<0.05	<0.05	
G-BHC	<5	<0.05	<0.05	0.160
D-BHC	<5	<0.05	<0.05	
PPDDD	<10	<0.01	<0.1	1.25
PPDDE	<10	<0.1	<0.1	0.7
PPDDT	<10	<0.1	<0.1	0.13
Heptachlor	<5	<0.05	<0.05	0.053
Dieldrin	<10	<0.1	<0.1	0.71
A-Endosulfan	<5	<0.05	<0.05	
B-Endosulfan	<10	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<10	<0.1	<0.1	
Endrin	<10	<0.1	<0.1	0.037
Endrin Aldehyde	<10	<0.1	<0.1	
Heptachlor Epoxide	<5	<0.05	<0.5	
Methoxychlor	<50	<0.5	<0.5	2.1
Chlordane	<5	<0.05	<0.05	0.09
Toxaphene	<500	<5	<5	0.21
PCB-1016	<97	<1	<1	10
PCB-1221	<190	<2	<2	10
PCB-1232	<97	<1	<1	10
PCB-1242	<97	<1	<1	10
PCB-1248	<97	<1	<1	10
PCB-1254	<97	<1	<1	10
PCB-1260	<97	<1	<1	10
Phenol	<970	<10	<14	580
2-Chlorophenol	<970	<10	<14	
2-Nitrophenol	<970	<10	<14	
2,4-Dimethylphenol	<970	<10	<14	
2,4-Dichlorophenol	<970	<10	<14	
4-Chloro-3-Methylphenol	<970	<10	<14	
2,4,6-Trichlorophenol	<970	<10	<14	

TABLE B-27 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<4,700	<50	<68	
4-Nitrophenol	<4,700	<50	<68	
2-Methyl-4,6-Dinotrophenol	<4,700	<50	<68	
Pentachlorophenol	<4,700	<50	<68	13
Benzoic Acid	<4,700	<50	<68	
2-Methylphenol	<970	<10	<14	
4-Methylphenol	<970	<10	<14	
2,4,5-Trichlorophenol	<4,700	<50	<68	
Benzyl Alcohol	<970	<10	<14	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<970	<10	<14	
N-Nitroso-Di-N-Propylamine	<970	<10	<14	
Nitrobenzene	<970	<10	<14	
Isophorone	<970	<10	<14	
Bis(2-Chloroethoxy)Methane	<970	<10	<14	
2,6-Dinitrotoluene	<970	<10	<14	
2,4-Dinitrotoluene	<970	<10	<14	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,900	<20	<27	
Bis(2-Chloroethyl)Ether	<970	<10	<14	
1,3-Dichlorobenzene	<970	<10	<14	
1,4-Dichlorobenzene	<970	<10	<14	
1,2-Dichlorobenzene	<970	<10	<14	
Hexachloroethane	<970	<10	<14	
1,2,4-Trichlorobenzene	<970	<10	<14	
Naphthalene	<970	<10	<14	
Hexachlorobutadiene	<970	<10	<14	1.6
Hexachlorocyclopentadiene	<970	<10	<14	
2-Chloronaphthalene	<970	<10	<14	
Acenaphthylene	<970	<10	<14	
Dimehtyl Phthalate	<970	<10	<14	
Acenaphthene	<970	<10	<14	
Fluorene	<970	<10	<14	
Diethyl Phthalate	<970	<10	<14	
4-Chlorophenyl Phenyl Ether	<970	<10	<14	
N-Nitrosodiphenyl Amine	<970	<10	<14	
4-Bromophenyl Ether	<970	<10	<14	
Hexachlorobenzene	<970	<10	<14	
Phenathrene	<970	<10	<14	
Anthracene	<970	<10	<14	
Dibutylphthalate	<970	<10	<14	
Fluoranathene	<970	<10	<14	
Pyrene	170	<10	<14	
Butylbenzylphthalate	<970	<10	<14	
Chrysene	<970	<10	<14	
Benzo(a)Antharacene	<970	<10	<14	
Bis(2-Ethylexyl)Phthalate	290	1	2	
Di-N-Octyphthalate	<970	<10	<14	
Benxo(a)Fluoranthene	170	<10	<14	
Benzo(k)Fluoranthene	<970	<10	<14	
Benzo(a)Pyrene	<970	<10	<14	
Indeno(1,2,3-C,D)Pyrene	<970	<10	<14	
Dibenzo(A,H)Anthracene	<970	<10	<14	
Benzo(G,H,I)Perylene	<970	<10	<14	
Aniline				
4-Chloroaniline	<970	<10	<14	
Dibenzofuran	<970	<10	<14	
2-Methylnaphthalene	<970	<10	<14	
2-Nitroaniline	<4,700	<50	<68	
3-Nitroaniline	<4,700	<50	<68	
4-Nitroaniline	<4,700	<50	<68	

< Actual value is less than value shown

TABLE B-28
ELUTRIATE ANALYSIS
SITE CR1-AM, mixed with IHNC water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
Antimony	<14,800	<3	<3	
Arsenic (total)	11,000	<3	3.5	69
Arsenic (III)				69
Beryllium	1,120	<0.6	<0.6	
Cadmium	<1,200	<3	<0.3	43
Chromium (total)	26,000	<2	2.8	
Chromium (VI)				1,100
Chromium (III)				515
Copper	38,000	<14	200	2.9
Lead	90,000	3.3	13	140
Mercury	200		<0.2	2.1
Nickel	29,000	<23	<23	75
Selenium	<800	<3	<6	
Silver	<2,200	<0.4	<0.4	2.3
Thallium	<500	<2	<2	
Zinc	230,000	<20	220	95
Aluminum	16,000,000	900	210	
Barium	1,600,000	66	250	
Boron	<24,600	900	870	
Calcium	4,800,000	100,000	88,000	
Cobalt	13,000	<11	<11	
Iron	29,000,000	860	500	
Magnesium	6,600,000	250,000	260,000	
Manganese	650,000	180	310	
Molubdenum	<24,600	<1	<100	
Potassium	3,700,000	91,000	91,000	
Vanadium	38,000	<13	<13	
TRP Hydrocarbons	15,000	<1,000	<1,000	
Aldrin	<4.2	<0.05	<0.05	1.3
A-BHC	<4.2	<0.05	<0.05	
B-BHC	<4.2	<0.05	<0.05	
G-BHC	<4.2	<0.05	<0.05	0.160
D-BHC	<4.2	<0.05	<0.05	
PPDDD	<8.5	<0.01	<0.1	1.25
PPDDE	<8.5	<0.1	<0.1	0.7
PPDDT	<8.5	<0.1	<0.1	0.13
Heptachlor	<4.2	<0.05	<0.05	0.053
Dieldrin	<8.5	<0.1	<0.1	0.71
A-Endosulfan	<4.2	<0.05	<0.05	
B-Endosulfan	<8.5	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<8.5	<0.1	<0.1	
Endrin	<8.5	<0.1	<0.1	0.037
Endrin Aldehyde	<8.5	<0.1	<0.1	
Heptachlor Epoxide	<4.2	<0.05	<0.5	
Methoxychlor	<42	<0.5	<0.5	2.1
Chlordane	<4.2	<0.05	<0.05	0.09
Toxaphene	<420	<5	<5	0.21
PCB-1016	<82	<1	<1	10
PCB-1221	<160	<2	<2	10
PCB-1232	<82	<1	<1	10
PCB-1242	<82	<1	<1	10
PCB-1248	<82	<1	<1	10
PCB-1254	<82	<1	<1	10
PCB-1260	<82	<1	<1	10
Phenol	<820	<10	<12	580
2-Chlorophenol	<820	<10	<12	
2-Nitrophenol	<820	<10	<12	
2,4-Dimethylphenol	<820	<10	<12	
2,4-Dichlorophenol	<820	<10	<12	
4-Chloro-3-Methylphenol	<820	<10	<12	
2,4,6-Trichlorophenol	<820	<10	<12	

TABLE B-28 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<4,000	<50	<60	
4-Nitrophenol	<4,000	<50	<60	
2-Methyl-4,6-Dinotrophenol	<4,000	<50	<60	
Pentachlorophenol	<4,000	<50	<60	13
Benzoic Acid	<4,000	<50	<60	
2-Methylphenol	<820	<10	<12	
4-Methylphenol	<820	<10	<12	
2,4,5-Trichlorophenol	<4,000	<50	<60	
Benzyl Alcohol	<820	<10	<12	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<820	<10	<12	
N-Nitroso-Di-N-Propylamine	<820	<10	<12	
Nitrobenzene	<820	<10	<12	
Isophorone	<820	<10	<12	
Bis(2-Chloroethoxy)Methane	<820	<10	<12	
2,6-Dinitrotoluene	<820	<10	<12	
2,4-Dinitrotoluene	<820	<10	<12	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,600	<20	<24	
Bis(2-Chloroethyl)Ether	<820	<10	<12	
1,3-Dichlorobenzene	<820	<10	<12	
1,4-Dichlorobenzene	<820	<10	<12	
1,2-Dichlorobenzene	<820	<10	<12	
Hexachloroethane	<820	<10	<12	
1,2,4-Trichlorobenzene	<820	<10	<12	
Naphthalene	<820	<10	<12	
Hexachlorobutadiene	<820	<10	<12	1.6
Hexachlorocyclopentadiene	<820	<10	<12	
2-Chloronaphthalene	<820	<10	<12	
Acenaphthylene	<820	<10	<12	
Dimehtyl Phthalate	<820	<10	<12	
Acenaphthene	160	<10	<12	
Fluorene	160	<10	<12	
Diethyl Phthalate	110	<10	<12	
4-Chlorophenyl Phenyl Ether	<820	<10	<12	
N-Nitrosodiphenyl Amine	<820	<10	<12	
4-Bromophenyl Ether	<820	<10	<12	
Hexachlorobenzene	<820	<10	<12	
Phenathrene	540	<10	<12	
Anthracene	110	<10	<12	
Dibutylphthalate	84	<10	<12	
Fluoranathene	1,400	<10	<12	
Pyrene	1,100	<10	<12	
Butylbenzylphthalate	<820	<10	<12	
Chrysene	270	<10	<12	
Benzo(a)Antharacene	220	<10	<12	
Bis(2-Ethylexyl)Phthalate	300	1	7	
Di-N-Octyphthalate	<820	<10	<12	
Benxo(a)Fluoranthene	430	<10	<12	
Benzo(k)Fluoranthene	<820	<10	<12	
Benzo(a)Pyrene	150	<10	<12	
Indeno(1,2,3-C,D)Pyrene	140	<10	<12	
Dibenzo(A,H)Anthracene	<820	<10	<12	
Benzo(G,H,I)Perylene	<820	<10	<12	
Aniline				
4-Chloroaniline	<820	<10	<12	
Dibenzofuran	<820	<10	<12	
2-Methylnaphthalene	<820	<10	<12	
2-Nitroaniline	<4,000	<50	<60	
3-Nitroaniline	<4,000	<50	<60	
4-Nitroaniline	<4,000	<50	<60	

< Actual value is less than value shown

TABLE B-29
ELUTRIATE ANALYSIS
SITE CR1-AB, mixed with IHNC water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
Antimony	<10,300	<3	<3	
Arsenic (total)	9,500	<3	<3.0	69
Arsenic (III)				69
Beryllium	900	<0.6	<0.6	
Cadmium	<900	<3	<0.3	43
Chromium (total)	16,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	20,000	<14	81	2.9
Lead	18,000	3.3	7.9	140
Mercury	100		<0.2	2.1
Nickel	24,000	<23	<23	75
Selenium	<500	<3	<6	
Silver	<1,500	<0.4	<0.4	2.3
Thallium	<300	<2	<2	
Zinc	72,000	<20	120	95
Aluminum	11,000,000	900	120	
Barium	110,000	66	420	
Boron	<17,100	900	900	
Calcium	13,000,000	100,000	96,000	
Cobalt	9,500	<11	<11	
Iron	20,000,000	860	250	
Magnesium	8,100,000	250,000	260,000	
Manganese	620,000	180	81	
Molubdenum	<17,100	<1	<100	
Potassium	3,400,000	91,000	87,000	
Vanadium	25,000	<13	<13	
TRP Hydrocarbons	11,000	<1,000	<1,000	
Aldrin	<2.9	<0.05	<0.05	1.3
A-BHC	<2.9	<0.05	<0.05	
B-BHC	<2.9	<0.05	<0.05	
G-BHC	<2.9	<0.05	<0.05	0.160
D-BHC	<2.9	<0.05	<0.05	
PPDDD	<5.9	<0.01	<0.1	1.25
PPDDE	<5.9	<0.1	<0.1	0.7
PPDDT	<5.9	<0.1	<0.1	0.13
Heptachlor	<2.9	<0.05	<0.05	0.053
Dieldrin	<5.9	<0.1	<0.1	0.71
A-Endosulfan	<2.9	<0.05	<0.05	
B-Endosulfan	<5.9	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<5.9	<0.1	<0.1	
Endrin	5.9	<0.1	<0.1	0.037
Endrin Aldehyde	<5.9	<0.1	<0.1	
Heptachlor Epoxide	<2.9	<0.05	<0.5	
Methoxychlor	<29	<0.5	<0.5	2.1
Chlordane	<2.9	<0.05	<0.05	0.09
Toxaphene	<290	<5	<5	0.21
PCB-1016	<57	<1	<1	10
PCB-1221	<110	<2	<2	10
PCB-1232	<57	<1	<1	10
PCB-1242	<57	<1	<1	10
PCB-1248	<57	<1	<1	10
PCB-1254	<57	<1	<1	10
PCB-1260	<57	<1	<1	10
Phenol	<570	<10	<12	580
2-Chlorophenol	<570	<10	<12	
2-Nitrophenol	<570	<10	<12	
2,4-Dimethylphenol	<570	<10	<12	
2,4-Dichlorophenol	<570	<10	<12	
4-Chloro-3-Methylphenol	<570	<10	<12	
2,4,6-Trichlorophenol	<570	<10	<12	

TABLE B-29 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	IHNC Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<2,800	<50	<60	
4-Nitrophenol	<2,800	<50	<60	
2-Methyl-4,6-Dinotrophenol	<2,800	<50	<60	
Pentachlorophenol	<2,800	<50	<60	13
Benzoic Acid	<2,800	<50	<60	
2-Methylphenol	<570	<10	<12	
4-Methylphenol	<570	<10	<12	
2,4,5-Trichlorophenol	<2,800	<50	<60	
Benzyl Alcohol	<570	<10	<12	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<570	<10	<12	
N-Nitroso-Di-N-Propylamine	<570	<10	<12	
Nitrobenzene	<570	<10	<12	
Isophorone	<570	<10	<12	
Bis(2-Chloroethoxy)Methane	<570	<10	<12	
2,6-Dinitrotoluene	<570	<10	<12	
2,4-Dinitrotoluene	<570	<10	<12	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,100	<20	<24	
Bis(2-Chloroethyl)Ether	<570	<10	<12	
1,3-Dichlorobenzene	<570	<10	<12	
1,4-Dichlorobenzene	<570	<10	<12	
1,2-Dichlorobenzene	<570	<10	<12	
Hexachloroethane	<570	<11	<12	
1,2,4-Trichlorobenzene	<570	<10	<12	
Naphthalene	<570	<10	<12	
Hexachlorobutadiene	<570	<10	<12	1.6
Hexachlorocyclopentadiene	<570	<10	<12	
2-Chloronaphthalene	<570	<10	<12	
Acenaphthylene	<570	<10	<12	
Dimehtyl Phthalate	<570	<10	<12	
Acenaphthene	<570	<10	<12	
Fluorene	<570	<10	<12	
Diethyl Phthalate	<570	<10	0.3	
4-Chlorophenyl Phenyl Ether	<570	<10	<12	
N-Nitrosodiphenyl Amine	<570	<10	<12	
4-Bromophenyl Ether	<570	<10	<12	
Hexachlorobenzene	<570	<10	<12	
Phenathrene	<570	<10	<12	
Anthracene	<570	<10	<12	
Dibutylphthalate	84	<10	<12	
Fluoranathene	<570	<10	<12	
Pyrene	<570	<10	<12	
Butylbenzylphthalate	<570	<10	<12	
Chrysene	<570	<10	<12	
Benzo(a)Antharacene	<570	<10	<12	
Bis(2-Ethylexyl)Phthalate	190	1	1	
Di-N-Octyphthalate	<570	<10	<12	
Benxo(a)Fluoranthene	<570	<10	<12	
Benzo(k)Fluoranthene	<570	<10	<12	
Benzo(a)Pyrene	<570	<10	<12	
Indeno(1,2,3-C,D)Pyrene	<570	<10	<12	
Dibenzo(A,H)Anthracene	<570	<10	<12	
Benzo(G,H,I)Perylene	<570	<10	<12	
Aniline				
4-Chloroaniline	<570	<10	<12	
Dibenzofuran	<570	<10	<12	
2-Methylnaphthalene	<570	<10	<12	
2-Nitroaniline	<2,800	<50	<60	
3-Nitroaniline	<2,800	<50	<60	
4-Nitroaniline	<2,800	<50	<60	

< Actual value is less than value shown

TABLE B-30
ELUTRIATE ANALYSIS
SITE GR1-AT, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediment (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<16,200	<3	<60	
Arsenic (total)	11,000	3	<3	69
Arsenic (III)				69
Beryllium	1,130	<0.6	<0.6	
Cadmium	<1,400	<3	<0.3	43
Chromium (total)	31,000	<2	2.2	
Chromium (VI)				1,100
Chromium (III)				515
Copper	45,000	<14	28	2.9
Lead	100,000	8.7	3.2	140
Mercury	300		<0.2	2.1
Nickel	29,000	<23	<23	75
Selenium	<800	<3	<6	
Silver	<2,400	<0.4	<0.4	2.3
Thallium	<500	<2	<2	
Zinc	270,000	<20	81	95
Aluminum	16,000,000	340	73	
Barium	1,700,000	120	190	
Boron	<27,100	980	1,100	
Calcium	5,100,000	100,000	100,000	
Cobalt	12,000	<11	<11	
Iron	28,000,000	530	680	
Magnesium	6,800,000	280,000	290,000	
Manganese	500,000	250	1,300	
Molubdenum	<27,100	<1	<100	
Potassium	4,000,000	96,000	100,000	
Vanadium	36,000	<13	<13	
TRP Hydrocarbons	30,000	<1,000	<1,000	
Aldrin	<4	<0.05	<0.05	1.3
A-BHC	<4	<0.05	<0.05	
B-BHC	<4	<0.05	<0.05	
G-BHC	<4	<0.05	<0.05	0.160
D-BHC	<4	<0.05	<0.05	
PPDDD	<9	<0.01	<0.1	1.25
PPDDE	<9	<0.1	<0.1	0.7
PPDDT	<9	<0.1	<0.1	0.13
Heptachlor	<4	<0.05	<0.05	0.053
Dieldrin	<9	<0.1	<0.1	0.71
A-Endosulfan	<4	<0.05	<0.05	
B-Endosulfan	<9	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<9	<0.1	<0.1	
Endrin	<9	<0.1	<0.1	0.037
Endrin Aldehyde	<9	<0.1	<0.1	
Heptachlor Epoxide	<4	<0.05	<0.05	
Methoxychlor	<47	<0.5	<0.5	2.1
Chlordane	<4	<0.05	<0.05	0.09
Toxaphene	<470	<5	<5	0.21
PCB-1016	<92	<1	<1	10
PCB-1221	<180	<2	<2	10
PCB-1232	<92	<1	<1	10
PCB-1242	<92	<1	<1	10
PCB-1248	<92	<1	<1	10
PCB-1254	<92	<1	<1	10
PCB-1260	<92	<1	<1	10
Phenol	<920	<10	<14	580
2-Chlorophenol	<920	<10	<14	
2-Nitrophenol	<920	<10	<14	
2,4-Dimethylphenol	<920	<10	<14	
2,4-Dichlorophenol	<920	<10	<14	
4-Chloro-3-Methylphenol	<920	<10	<14	
2,4,6-Trichlorophenol	<920	<10	<14	

TABLE B-30(continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediment (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<4,400	<50	<14	
4-Nitrophenol	<4,400	<50	<68	
2-Methyl-4,6-Dinotrophenol	<4,000	<50	<68	
Pentachlorophenol	<4,000	<50	<68	13
Benzoic Acid	<4,000	<50	<68	
2-Methylphenol	<920	<10	<14	
4-Methylphenol	<920	<10	<14	
2,4,5-Trichlorophenol	<920	<50	<68	
Benzyl Alcohol	<920	<10	<14	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<920	<10	<14	
N-Nitroso-Di-N-Propylamine	<920	<10	<14	
Nitrobenzene	<920	<10	<14	
Isophorone	<920	<10	<14	
Bis(2-Chloroethoxy)Methane	<920	<10	<14	
2,6-Dinitrotoluene	<920	<10	<14	
2,4-Dinitrotoluene	<920	<10	<14	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,800	<20	<27	
Bis(2-Chloroethyl)Ether	<920	<10	<14	
1,3-Dichlorobenzene	<920	<10	<14	
1,4-Dichlorobenzene	<920	<10	<14	
1,2-Dichlorobenzene	<920	<10	<14	
Hexachloroethane	<920	<10	<14	
1,2,4-Trichlorobenzene	<920	<10	<14	
Naphthalene	<920	<10	<14	
Hexachlorobutadiene	<920	<10	<14	1.6
Hexachlorocyclopentadiene	<920	<10	<14	
2-Chloronaphthalene	<920	<10	<14	
Acenaphthylene	<920	<10	<14	
Dimehtyl Phthalate	<920	<10	<14	
Acenaphthene	150	<10	<14	
Fluorene	110	<10	<14	
Diethyl Phthalate	<920	<10	<14	
4-Chlorophenyl Phenyl Ether	<920	<10	<14	
N-Nitrosodiphenyl Amine	<920	<10	<14	
4-Bromophenyl Ether	<920	<10	<14	
Hexachlorobenzene	<920	<10	<14	
Phenathrene	480	<10	<14	
Anthracene	120	<10	<14	
Dibutylphthalate	120	<10	<14	
Fluoranathene	<920	<10	<14	
Pyrene	1,300	<10	<14	
Butylbenzylphthalate	<920	<10	<14	
Chrysene	600	<10	<14	
Benzo(a)Antharacene	390	<10	<14	
Bis(2-Ethylexyl)Phthalate	610	1	1	
Di-N-Octyphthalate	<920	<10	<14	
Benxo(a)Fluoranthene	990	<10	<14	
Benzo(k)Fluoranthene	<920	<10	<14	
Benzo(a)Pyrene	480	<10	<14	
Indeno(1,2,3-C,D)Pyrene	280	<10	<14	
Dibenzo(A,H)Anthracene	<920	<10	<14	
Benzo(G,H,I)Perylene	<920	<10	<14	
Aniline				
4-Chloroaniline	<920	<10	<14	
Dibenzofuran	<920	<10	<14	
2-Methylnaphthalene	<920	<10	<14	
2-Nitroaniline	<4,400	<50	<68	
3-Nitroaniline	<4,400	<50	<68	
4-Nitroaniline	<4,400	<50	<68	

< Actual value is less than value shown

TABLE B-31
ELUTRIATE ANALYSIS
SITE GR1-AM, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<10,600	<3	<60	
Arsenic (total)	6,700	3	<3	69
Arsenic (III)				69
Beryllium	1,070	<0.6	<0.6	
Cadmium	<900	<3	<0.3	43
Chromium (total)	20,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	26,000	<14	38	2.9
Lead	36,000	8.7	3.6	140
Mercury	200		<0.2	2.1
Nickel	27,000	<23	<23	75
Selenium	<500	<3	<6	
Silver	<1,600	<0.4	<0.4	2.3
Thallium	<400	<2	<2	
Zinc	110,000	<20	86	95
Aluminum	14,000,000	340	120	
Barium	170,000	120	740	
Boron	17,100	980	940	
Calcium	9,600,000	100,000	110,000	
Cobalt	11,000	<11	<11	
Iron	22,000,000	530	1,600	
Magnesium	7,600,000	280,000	270,000	
Manganese	510,000	250	400	
Molubdenum	<17,000	<1	<100	
Potassium	3,300,000	96,000	78,000	
Vanadium	31,000	<13	<13	
TRP Hydrocarbons	53,000	<1,000	<1,000	
Aldrin	<3.1	<0.05	<0.05	1.3
A-BHC	<3.1	<0.05	<0.05	
B-BHC	<3.1	<0.05	<0.05	
G-BHC	<3.1	<0.05	<0.05	0.160
D-BHC	<3.1	<0.05	<0.05	
PPDDD	<6.1	<0.01	<0.1	1.25
PPDDE	<6.1	<0.1	<0.1	0.7
PPDDT	<6.1	<0.1	<0.1	0.13
Heptachlor	<3.1	<0.05	<0.05	0.053
Dieldrin	<6.1	<0.1	<0.1	0.71
A-Endosulfan	<3.1	<0.05	<0.05	
B-Endosulfan	<6.1	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<6.1	<0.1	<0.1	
Endrin	<6.1	<0.1	<0.1	0.037
Endrin Aldehyde	<6.1	<0.1	<0.1	
Heptachlor Epoxide	<3.1	<0.05	<0.05	
Methoxychlor	<31	<0.5	<0.5	2.1
Chlordane	<3.1	<0.05	<0.05	0.09
Toxaphene	<310	<5	<5	0.21
PCB-1016	<61	<1	<1	10
PCB-1221	<120	<2	<2	10
PCB-1232	<61	<1	<1	10
PCB-1242	<61	<1	<1	10
PCB-1248	<61	<1	<1	10
PCB-1254	<61	<1	<1	10
PCB-1260	<61	<1	<1	10
Phenol	<610	<10	<13	580
2-Chlorophenol	<610	<10	<13	
2-Nitrophenol	<610	<10	<13	
2,4-Dimethylphenol	<610	<10	<13	
2,4-Dichlorophenol	<610	<10	<13	
4-Chloro-3-Methylphenol	<610	<10	<13	
2,4,6-Trichlorophenol	<610	<10	<13	

TABLE B-31 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<3,000	<50	<13	
4-Nitrophenol	<3,000	<50	<66	
2-Methyl-4,6-Dinotrophenol	<3,000	<50	<66	
Pentachlorophenol	<3,000	<50	<66	13
Benzoic Acid	<3,000	<50	<66	
2-Methylphenol	<610	<10	<13	
4-Methylphenol	<610	<10	<13	
2,4,5-Trichlorophenol	<610	<50	<66	
Benzyl Alcohol	<610	<10	<13	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<610	<10	<13	
N-Nitroso-Di-N-Propylamine	<610	<10	<13	
Nitrobenzene	<610	<10	<13	
Isophorone	<610	<10	<13	
Bis(2-Chloroethoxy)Methane	<610	<10	<13	
2,6-Dinitrotoluene	<610	<10	<13	
2,4-Dinitrotoluene	<610	<10	<13	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,200	<20	<27	
Bis(2-Chloroethyl)Ether	<610	<10	<13	
1,3-Dichlorobenzene	<610	<10	<13	
1,4-Dichlorobenzene	<610	<10	<13	
1,2-Dichlorobenzene	<610	<10	<13	
Hexachloroethane	<920	<10	<13	
1,2,4-Trichlorobenzene	<920	<10	<13	
Naphthalene	<920	<10	<13	
Hexachlorobutadiene	<920	<10	<13	1.6
Hexachlorocyclopentadiene	<61	<10	<13	
2-Chloronaphthalene	<61	<10	<13	
Acenaphthylene	<61	<10	<13	
Dimehtyl Phthalate	<61	<10	<13	
Acenaphthene	<61	<10	<13	
Fluorene	<6.1	<10	<13	
Diethyl Phthalate	<61	<10	<13	
4-Chlorophenyl Phenyl Ether	<61	<10	<13	
N-Nitrosodiphenyl Amine	<610	<10	<13	
4-Bromophenyl Ether	<610	<10	<13	
Hexachlorobenzene	<610	<10	<13	
Phenathrene	650	<10	<13	
Anthracene	<610	<10	<13	
Dibutylphthalate	<610	<10	<13	
Fluoranathene	<610	<10	<13	
Pyrene	150	<10	<13	
Butylbenzylphthalate	<610	<10	<13	
Chrysene	65	<10	<13	
Benzo(a)Antharacene	<610	<10	<13	
Bis(2-Ethylexyl)Phthalate	<610	1	75	
Di-N-Octyphthalate	<610	<10	<13	
Benxo(a)Fluoranthene	81	<10	<13	
Benzo(k)Fluoranthene	<610	<10	<13	
Benzo(a)Pyrene	460	<10	<13	
Indeno(1,2,3-C,D)Pyrene	<610	<10	<13	
Dibenzo(A,H)Anthracene	<610	<10	<13	
Benzo(G,H,I)Perylene	<610	<10	<13	
Aniline				
4-Chloroaniline	<610	<10	<13	
Dibenzofuran	<610	<10	<13	
2-Methylnaphthalene	<610	<10	<13	
2-Nitroaniline	<3,000	<50	<66	
3-Nitroaniline	<3,000	<50	<66	
4-Nitroaniline	<3,000	<50	<66	

< Actual value is less than value shown

TABLE B-32
ELUTRIATE ANALYSIS
SITE GR1-AB, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<10,800	<3	<60	
Arsenic (total)	11,000	3	<3	69
Arsenic (III)				69
Beryllium	920	<0.6	<0.6	
Cadmium	<900	<3	<0.4	43
Chromium (total)	16,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	17,000	<14	<100	2.9
Lead	18,000	8.7	29	140
Mercury	<100		0.2	2.1
Nickel	21,000	<23	<23	75
Selenium	<600	<3	<6	
Silver	<1,600	<0.4	<0.4	2.3
Thallium	<400	<2	<2	
Zinc	66,000	<20	310	95
Aluminum	11,000,000	340	93	
Barium	85,000	120	810	
Boron	<18,100	980	890	
Calcium	9,000,000	100,000	110,000	
Cobalt	9,200	<11	<11	
Iron	19,000,000	530	170	
Magnesium	7,400,000	280,000	260,000	
Manganese	380,000	250	260	
Molubdenum	<18,100	<1	<100	
Potassium	3,600,000	96,000	87,000	
Vanadium	26,000	<13	<13	
TRP Hydrocarbons	10,000	<1,000	<1,000	
Aldrin	<3.2	<0.05	<0.05	1.3
A-BHC	<3.2	<0.05	<0.05	
B-BHC	<3.2	<0.05	<0.05	
G-BHC	<3.2	<0.05	<0.05	0.160
D-BHC	<3.2	<0.05	<0.05	
PPDDD	<6.2	<0.01	<0.1	1.25
PPDDE	<6.2	<0.1	<0.1	0.7
PPDDT	<6.2	<0.1	<0.1	0.13
Heptachlor	<3.2	<0.05	<0.05	0.053
Dieldrin	<6.2	<0.1	<0.1	0.71
A-Endosulfan	<3.2	<0.05	<0.05	
B-Endosulfan	<6.2	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<6.2	<0.1	<0.1	
Endrin	<6.2	<0.1	<0.1	0.037
Endrin Aldehyde	<6.2	<0.1	<0.1	
Heptachlor Epoxide	<3.2	<0.05	<0.05	
Methoxychlor	<32	<0.5	<0.5	2.1
Chlordane	<3.2	<0.05	<0.05	0.09
Toxaphene	<320	<5	<5	0.21
PCB-1016	<62	<1	<1	10
PCB-1221	<130	<2	<2	10
PCB-1232	<62	<1	<1	10
PCB-1242	<62	<1	<1	10
PCB-1248	<62	<1	<1	10
PCB-1254	<62	<1	<1	10
PCB-1260	<62	<1	<1	10
Phenol	<620	<10	<13	580
2-Chlorophenol	<620	<10	<13	
2-Nitrophenol	<620	<10	<13	
2,4-Dimethylphenol	<620	<10	<13	
2,4-Dichlorophenol	<620	<10	<13	
4-Chloro-3-Methylphenol	<620	<10	<13	
2,4,6-Trichlorophenol	<620	<10	<13	

TABLE B-32 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<3,000	<50	<13	
4-Nitrophenol	<3,000	<50	<66	
2-Methyl-4,6-Dinotrophenol	<3,000	<50	<66	
Pentachlorophenol	<3,000	<50	<66	13
Benzoic Acid	<3,000	<50	<66	
2-Methylphenol	<620	<10	<13	
4-Methylphenol	<620	<10	<13	
2,4,5-Trichlorophenol	<3,000	<50	<66	
Benzyl Alcohol	<620	<10	<13	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<620	<10	<13	
N-Nitroso-Di-N-Propylamine	<620	<10	<13	
Nitrobenzene	<620	<10	<13	
Isophorone	<620	<10	<13	
Bis(2-Chloroethoxy)Methane	<620	<10	<13	
2,6-Dinitrotoluene	<620	<10	<13	
2,4-Dinitrotoluene	<620	<10	<13	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,200	<20	<27	
Bis(2-Chloroethyl)Ether	<620	<10	<13	
1,3-Dichlorobenzene	<620	<10	<13	
1,4-Dichlorobenzene	<620	<10	<13	
1,2-Dichlorobenzene	<620	<10	<13	
Hexachloroethane	<620	<10	<13	
1,2,4-Trichlorobenzene	<620	<10	<13	
Naphthalene	<620	<10	<13	
Hexachlorobutadiene	<620	<10	<13	1.6
Hexachlorocyclopentadiene	<620	<10	<13	
2-Chloronaphthalene	<620	<10	<13	
Acenaphthylene	<620	<10	<13	
Dimehtyl Phthalate	<620	<10	<13	
Acenaphthene	<620	<10	<13	
Fluorene	<620	<10	<13	
Diethyl Phthalate	1,000	<10	9	
4-Chlorophenyl Phenyl Ether	<620	<10	<13	
N-Nitrosodiphenyl Amine	<620	<10	<13	
4-Bromophenyl Ether	<620	<10	<13	
Hexachlorobenzene	<620	<10	<13	
Phenathrene	<620	<10	<13	
Anthracene	<620	<10	<13	
Dibutylphthalate	<620	<10	<13	
Fluoranathene	<620	<10	<13	
Pyrene	<62	<10	<13	
Butylbenzylphthalate	<620	<10	<13	
Chrysene	<620	<10	<13	
Benzo(a)Antharacene	<620	<10	<13	
Bis(2-Ethylexyl)Phthalate	150	1	<13	
Di-N-Octyphthalate	<620	<10	<13	
Benxo(a)Fluoranthene	<620	<10	<13	
Benzo(k)Fluoranthene	<620	<10	<13	
Benzo(a)Pyrene	<620	<10	<13	
Indeno(1,2,3-C,D)Pyrene	<620	<10	<13	
Dibenzo(A,H)Anthracene	<620	<10	<13	
Benzo(G,H,I)Perylene	<620	<10	<13	
Aniline				
4-Chloroaniline	<620	<10	<13	
Dibenzofuran	<620	<10	<13	
2-Methylnaphthalene	<620	<10	<13	
2-Nitroaniline	<3,000	<50	<66	
3-Nitroaniline	<3,000	<50	<66	
4-Nitroaniline	<3,000	<50	<66	

< Actual value is less than value shown

TABLE B-33
ELUTRIATE ANALYSIS
SITE ER1-AT, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<13,400	<3	<60	
Arsenic (total)	8,400	3	<3	69
Arsenic (III)				69
Beryllium	800	<0.6	<0.6	
Cadmium	<1,100	<3	<0.3	43
Chromium (total)	26,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	40,000	<14	34	2.9
Lead	150,000	8.7	2.4	140
Mercury	500		<0.2	2.1
Nickel	22,000	<23	<23	75
Selenium	<700	<3	<6	
Silver	<2,000	<0.4	<0.4	2.3
Thallium	<500	<2	<2	
Zinc	190,000	<20	100	95
Aluminum	10,000,000	340	47	
Barium	410,000	120	890	
Boron	<22,400	980	940	
Calcium	22,000,000	100,000	170,000	
Cobalt	8,400	<11	<11	
Iron	27,000,000	530	86	
Magnesium	9,300,000	280,000	230,000	
Manganese	540,000	250	180	
Molubdenum	<22,400	<1	<100	
Potassium	2,900,000	96,000	89,000	
Vanadium	28,000	<13	<13	
TRP Hydrocarbons	31,000	<1,000	<1,000	
Aldrin	<4.0	<0.05	<0.05	1.3
A-BHC	<4.0	<0.05	<0.05	
B-BHC	<4.0	<0.05	<0.05	
G-BHC	<4.0	<0.05	<0.05	0.160
D-BHC	<4.0	<0.05	<0.05	
PPDDD	<7.7	<0.01	<0.1	1.25
PPDDE	<7.7	<0.1	<0.1	0.7
PPDDT	<7.7	<0.1	<0.1	0.13
Heptachlor	<4.0	<0.05	<0.05	0.053
Dieldrin	<7.7	<0.1	<0.1	0.71
A-Endosulfan	<4.0	<0.05	<0.05	
B-Endosulfan	<7.7	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<7.7	<0.1	<0.1	
Endrin	<7.7	<0.1	<0.1	0.037
Endrin Aldehyde	<7.7	<0.1	<0.1	
Heptachlor Epoxide	<4.0	<0.05	<0.05	
Methoxychlor	<40	<0.5	<0.5	2.1
Chlordane	<4.0	<0.05	<0.05	0.09
Toxaphene	<400	<5	<5	0.21
PCB-1016	<77	<1	<1	10
PCB-1221	<150	<2	<2	10
PCB-1232	<77	<1	<1	10
PCB-1242	<77	<1	<1	10
PCB-1248	<77	<1	<1	10
PCB-1254	700	<1	<1	10
PCB-1260	<77	<1	<1	10
Phenol	<770	<10	<11	580
2-Chlorophenol	<770	<10	<11	
2-Nitrophenol	<770	<10	<11	
2,4-Dimethylphenol	<770	<10	<11	
2,4-Dichlorophenol	<770	<10	<11	
4-Chloro-3-Methylphenol	<770	<10	<11	
2,4,6-Trichlorophenol	<770	<10	<11	

TABLE B-33 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<3,700	<50	<11	
4-Nitrophenol	<3,700	<50	<57	
2-Methyl-4,6-Dinotrophenol	<3,700	<50	<57	
Pentachlorophenol	<3,700	<50	<57	13
Benzoic Acid	<3,700	<50	<57	
2-Methylphenol	<770	<10	<11	
4-Methylphenol	<770	<10	<11	
2,4,5-Trichlorophenol	<3,700	<50	<57	
Benzyl Alcohol	<770	<10	<11	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<770	<10	<11	
N-Nitroso-Di-N-Propylamine	<770	<10	<11	
Nitrobenzene	<770	<10	<11	
Isophorone	<770	<10	<11	
Bis(2-Chloroethoxy)Methane	<770	<10	<11	
2,6-Dinitrotoluene	<770	<10	<11	
2,4-Dinitrotoluene	<770	<10	<11	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,500	<20	<23	
Bis(2-Chloroethyl)Ether	<770	<10	<11	
1,3-Dichlorobenzene	<770	<10	<11	
1,4-Dichlorobenzene	<770	<10	<11	
1,2-Dichlorobenzene	<770	<10	<11	
Hexachloroethane	<770	<10	<11	
1,2,4-Trichlorobenzene	<770	<10	<11	
Naphthalene	750	<10	<11	
Hexachlorobutadiene	<770	<10	<11	1.6
Hexachlorocyclopentadiene	<770	<10	<11	
2-Chloronaphthalene	<770	<10	<11	
Acenaphthylene	<770	<10	<11	
Dimehtyl Phthalate	<770	<10	<11	
Acenaphthene	1,100	<10	7	
Fluorene	1,200	<10	3	
Diethyl Phthalate	<770	<10	<11	
4-Chlorophenyl Phenyl Ether	<770	<10	<11	
N-Nitrosodiphenyl Amine	<770	<10	<11	
4-Bromophenyl Ether	<770	<10	<11	
Hexachlorobenzene	<770	<10	<11	
Phenathrene	3,900	<10	3	
Anthracene	230	<10	<11	
Dibutylphthalate	130	<10	<11	
Fluoranathene	<770	<10	1	
Pyrene	3,300	<10	1	
Butylbenzylphthalate	<770	<10	<11	
Chrysene	1,700	<10	<11	
Benzo(a)Antharacene	930	<10	<11	
Bis(2-Ethylexyl)Phthalate	240	1	1	
Di-N-Octyphthalate	<770	<10	<11	
Benxo(a)Fluoranthene	25,000	<10	<11	
Benzo(k)Fluoranthene	<770	<10	<11	
Benzo(a)Pyrene	12,000	<10	<11	
Indeno(1,2,3-C,D)Pyrene	8,300	<10	<11	
Dibenzo(A,H)Anthracene	1,800	<10	<11	
Benzo(G,H,I)Perylene	770	<10	<11	
Aniline				
4-Chloroaniline	<770	<10	<11	
Dibenzofuran	620	<10	1	
2-Methylnaphthalene	250	<10	3	
2-Nitroaniline	<3,700	<50	<57	
3-Nitroaniline	<3,700	<50	<57	
4-Nitroaniline	<3,700	<50	<57	

< Actual value is less than value shown

TABLE B-34
ELUTRIATE ANALYSIS
SITE ER1-AB, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<20,300	<3	<60	
Arsenic (total)	10,000	3	<3	69
Arsenic (III)				69
Beryllium	1,290	<0.6	<0.6	
Cadmium	<1,700	<3	<0.3	43
Chromium (total)	22,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	24,000	<14	29	2.9
Lead	79,000	8.7	5.1	140
Mercury	400		0.2	2.1
Nickel	23,000	<23	<23	75
Selenium	<1,000	<3	<6	
Silver	<3,000	<0.4	<0.4	2.3
Thallium	<700	<2	<2	
Zinc	110,000	<20	95	95
Aluminum	17,000,000	340	360	
Barium	190,000	120	810	
Boron	<33,800	980	500	
Calcium	72,000,000	100,000	300,000	
Cobalt	7,900	<11	<11	
Iron	20,000,000	530	440	
Magnesium	31,000,000	280,000	180,000	
Manganese	620,000	250	25	
Molubdenum	<33,800	<1	<100	
Potassium	2,900,000	96,000	72,000	
Vanadium	37,000	<13	<13	
TRP Hydrocarbons	30,000	<1,000	<1,000	
Aldrin	<5.9	<0.05	<0.05	1.3
A-BHC	<5.9	<0.05	<0.05	
B-BHC	<5.9	<0.05	<0.05	
G-BHC	<5.9	<0.05	<0.05	0.160
D-BHC	<5.9	<0.05	<0.05	
PPDDD	<11	<0.01	<0.1	1.25
PPDDE	<11	<0.1	<0.1	0.7
PPDDT	<11	<0.1	<0.1	0.13
Heptachlor	<5.9	<0.05	<0.05	0.053
Dieldrin	<11	<0.1	<0.1	0.71
A-Endosulfan	<5.9	<0.05	<0.05	
B-Endosulfan	<11	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<11	<0.1	<0.1	
Endrin	<11	<0.1	<0.1	0.037
Endrin Aldehyde	<11	<0.1	<0.1	
Heptachlor Epoxide	<5.9	<0.05	<0.05	
Methoxychlor	<59	<0.5	<0.5	2.1
Chlordane	<5.9	<0.05	<0.05	0.09
Toxaphene	<590	<5	<5	0.21
PCB-1016	<110	<1	<1	10
PCB-1221	<230	<2	<2	10
PCB-1232	<110	<1	<1	10
PCB-1242	<110	<1	<1	10
PCB-1248	<110	<1	<1	10
PCB-1254	<110	<1	<1	10
PCB-1260	<110	<1	<1	10
Phenol	<1,100	<10	<11	580
2-Chlorophenol	<1,100	<10	<11	
2-Nitrophenol	<1,100	<10	<11	
2,4-Dimethylphenol	<1,100	<10	<11	
2,4-Dichlorophenol	<1,100	<10	<11	
4-Chloro-3-Methylphenol	<1,100	<10	<11	
2,4,6-Trichlorophenol	<1,100	<10	<11	

TABLE B-34 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<5,500	<50	<11	
4-Nitrophenol	<5,500	<50	<57	
2-Methyl-4,6-Dinotrophenol	<5,500	<50	<57	
Pentachlorophenol	<5,500	<50	<57	13
Benzoic Acid	<5,500	<50	<57	
2-Methylphenol	<1,100	<10	<11	
4-Methylphenol	<1,100	<10	<11	
2,4,5-Trichlorophenol	<5,500	<50	<57	
Benzyl Alcohol	<1,100	<10	<11	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<1,100	<10	<11	
N-Nitroso-Di-N-Propylamine	<1,100	<10	<11	
Nitrobenzene	<1,100	<10	<11	
Isophorone	<1,100	<10	<11	
Bis(2-Chloroethoxy)Methane	<1,100	<10	<11	
2,6-Dinitrotoluene	<1,100	<10	<11	
2,4-Dinitrotoluene	<1,100	<10	<11	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<2,300	<20	<23	
Bis(2-Chloroethyl)Ether	<1,100	<10	<11	
1,3-Dichlorobenzene	<1,100	<10	<11	
1,4-Dichlorobenzene	<1,100	<10	<11	
1,2-Dichlorobenzene	<1,100	<10	<11	
Hexachloroethane	<1,100	<10	<11	
1,2,4-Trichlorobenzene	<1,100	<10	<11	
Naphthalene	210	<10	6	
Hexachlorobutadiene	<1,100	<10	<11	1.6
Hexachlorocyclopentadiene	<1,100	<10	<11	
2-Chloronaphthalene	<1,100	<10	<11	
Acenaphthylene	<1,100	<10	<11	
Dimehtyl Phthalate	<1,100	<10	<11	
Acenaphthene	650	<10	15	
Fluorene	480	<10	6	
Diethyl Phthalate	<1,100	<10	4	
4-Chlorophenyl Phenyl Ether	<1,100	<10	<11	
N-Nitrosodiphenyl Amine	<1,100	<10	<11	
4-Bromophenyl Ether	<1,100	<10	<11	
Hexachlorobenzene	<1,100	<10	<11	
Phenathrene	1,900	<10	8	
Anthracene	140	<10	1	
Dibutylphthalate	160	<10	<11	
Fluoranathene	<1,100	<10	1	
Pyrene	1,200	<10	1	
Butylbenzylphthalate	<1,100	<10	<11	
Chrysene	390	<10	<11	
Benzo(a)Antharacene	310	<10	<11	
Bis(2-Ethylexyl)Phthalate	230	1	<11	
Di-N-Octyphthalate	<1,100	<10	<11	
Benxo(a)Fluoranthene	740	<10	<11	
Benzo(k)Fluoranthene	<1,100	<10	<11	
Benzo(a)Pyrene	130	<10	<11	
Indeno(1,2,3-C,D)Pyrene	<1,100	<10	<11	
Dibenzo(A,H)Anthracene	<1,100	<10	<11	
Benzo(G,H,I)Perylene	<1,100	<10	<11	
Aniline				
4-Chloroaniline	<1,100	<10	<11	
Dibenzofuran	<1,100	<10	<11	
2-Methylnaphthalene	180	<10	2	
2-Nitroaniline	<5,500	<50	<57	
3-Nitroaniline	<5,500	<50	<57	
4-Nitroaniline	<5,500	<50	<57	

< Actual value is less than value shown

TABLE B-35
ELUTRIATE ANALYSIS
SITE ER2-BT, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<11,800	<3	18	
Arsenic (total)	9,400	3	<3	69
Arsenic (III)				69
Beryllium	1,580	<0.6	<0.6	
Cadmium	<1,000	<3	<0.3	43
Chromium (total)	24,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	64,000	<14	18	2.9
Lead	200,000	8.7	2.0	140
Mercury	900		<0.2	2.1
Nickel	31,000	<23	<23	75
Selenium	<600	<3	<6	
Silver	<1,800	<0.4	<0.4	2.3
Thallium	<400	<2	<2	
Zinc	330,000	<20	69	95
Aluminum	14,000,000	340	120	
Barium	270,000	120	730	
Boron	<19,600	980	840	
Calcium	10,000,000	100,000	150,000	
Cobalt	11,000	<11	<11	
Iron	25,000,000	530	210	
Magnesium	7,400,000	280,000	250,000	
Manganese	500,000	250	1,300	
Molubdenum	<19,600	<1	<100	
Potassium	2,700,000	96,000	73,000	
Vanadium	34,000	<13	<13	
TRP Hydrocarbons	480,000	<1,000	<1,000	
Aldrin	<3.4	<0.05	<0.05	1.3
A-BHC	<3.4	<0.05	<0.05	
B-BHC	<3.4	<0.05	<0.05	
G-BHC	<3.4	<0.05	<0.05	0.160
D-BHC	<3.4	<0.05	<0.05	
PPDDD	<6.8	<0.01	<0.1	1.25
PPDDE	<6.8	<0.1	<0.1	0.7
PPDDT	<6.8	<0.1	<0.1	0.13
Heptachlor	<3.4	<0.05	<0.05	0.053
Dieldrin	<6.8	<0.1	<0.1	0.71
A-Endosulfan	<3.4	<0.05	<0.05	
B-Endosulfan	<6.8	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<6.8	<0.1	<0.1	
Endrin	<6.8	<0.1	<0.1	0.037
Endrin Aldehyde	<6.8	<0.1	<0.1	
Heptachlor Epoxide	<3.4	<0.05	<0.05	
Methoxychlor	<34	<0.5	<0.5	2.1
Chlordane	<3.4	<0.05	<0.05	0.09
Toxaphene	<340	<5	<5	0.21
PCB-1016	<68	<1	<1	10
PCB-1221	<130	<2	<2	10
PCB-1232	<68	<1	<1	10
PCB-1242	<68	<1	<1	10
PCB-1248	<68	<1	<1	10
PCB-1254	<68	<1	<1	10
PCB-1260	<68	<1	<1	10
Phenol	<3,300	<10	<16	580
2-Chlorophenol	<3,300	<10	<16	
2-Nitrophenol	<3,300	<10	<16	
2,4-Dimethylphenol	<3,300	<10	<16	
2,4-Dichlorophenol	<3,300	<10	<16	
4-Chloro-3-Methylphenol	<3,300	<10	<16	
2,4,6-Trichlorophenol	<3,300	<10	<16	

TABLE B-35 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<16,000	<50	<16	
4-Nitrophenol	<16,000	<50	<78	
2-Methyl-4,6-Dinotrophenol	<16,000	<50	<78	
Pentachlorophenol	<16,000	<50	<78	13
Benzoic Acid	<16,000	<50	<78	
2-Methylphenol	<3,300	<10	<16	
4-Methylphenol	<3,300	<10	<16	
2,4,5-Trichlorophenol	<16,000	<50	<78	
Benzyl Alcohol	<3,300	<10	<16	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<3,300	<10	<16	
N-Nitroso-Di-N-Propylamine	<3,300	<10	<16	
Nitrobenzene	<3,300	<10	<16	
Isophorone	<3,300	<10	<16	
Bis(2-Chloroethoxy)Methane	<3,300	<10	<16	
2,6-Dinitrotoluene	<3,300	<10	<16	
2,4-Dinitrotoluene	<3,300	<10	<16	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<6,600	<20	<31	
Bis(2-Chloroethyl)Ether	<3,300	<10	<16	
1,3-Dichlorobenzene	<3,300	<10	<16	
1,4-Dichlorobenzene	<3,300	<10	<16	
1,2-Dichlorobenzene	<3,300	<10	<16	
Hexachloroethane	<3,300	<10	<16	
1,2,4-Trichlorobenzene	<3,300	<10	<16	
Naphthalene	<3,300	<10	<16	
Hexachlorobutadiene	<3,300	<10	<16	1.6
Hexachlorocyclopentadiene	<3,300	<10	<16	
2-Chloronaphthalene	<3,300	<10	<16	
Acenaphthylene	<3,300	<10	2	
Dimehtyl Phthalate	<3,300	<10	<16	
Acenaphthene	17,000	<10	70	
Fluorene	13,000	<10	12	
Diethyl Phthalate	<3,300	<10	<16	
4-Chlorophenyl Phenyl Ether	<3,300	<10	<16	
N-Nitrosodiphenyl Amine	<3,300	<10	<16	
4-Bromophenyl Ether	<3,300	<10	<16	
Hexachlorobenzene	<3,300	<10	<16	
Phenathrene	50,000	<10	4	
Anthracene	7,700	<10	10	
Dibutylphthalate	<3,300	<10	<16	
Fluoranathene	<3,300	<10	14	
Pyrene	30,000	<10	15	
Butylbenzylphthalate	<3,300	<10	<16	
Chrysene	7,300	<10	3	
Benzo(a)Antharacene	9,100	<10	3	
Bis(2-Ethylexyl)Phthalate	<3,300	1	2	
Di-N-Octyphthalate	<3,300	<10	<16	
Benxo(a)Fluoranthene	13,000	<10	3	
Benzo(k)Fluoranthene	<3,300	<10	<16	
Benzo(a)Pyrene	5,800	<10	2	
Indeno(1,2,3-C,D)Pyrene	1,600	<10	<16	
Dibenzo(A,H)Anthracene	<3,300	<10	<16	
Benzo(G,H,I)Perylene	2,300	<10	<16	
Aniline				
4-Chloroaniline	<3,300	<10	<16	
Dibenzofuran	<3,300	<10	<16	
2-Methylnaphthalene	7,600	<10	30	
2-Nitroaniline	<5,500	<50	<78	
3-Nitroaniline	<5,500	<50	<78	
4-Nitroaniline	<5,500	<50	<78	

< Actual value is less than value shown

TABLE B-36
ELUTRIATE ANALYSIS
SITE ER2-BB, mixed with disposal area water

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
Antimony	<11,300	<3	<60	
Arsenic (total)	8,000	3	<3	69
Arsenic (III)				69
Beryllium	1,020	<0.6	<0.6	
Cadmium	<900	<3	<0.3	43
Chromium (total)	17,000	<2	<2.0	
Chromium (VI)				1,100
Chromium (III)				515
Copper	25,000	<14	60	2.9
Lead	22,000	8.7	7.2	140
Mercury	<100		<0.2	2.1
Nickel	24,000	<23	<23	75
Selenium	<500	<3	<6	
Silver	<1,700	<0.4	0.4	2.3
Thallium	<400	<2	<2	
Zinc	82,000	<20	120	95
Aluminum	11,000,000	340	1,600	
Barium	140,000	120	820	
Boron	<18,800	980	760	
Calcium	12,000,000	100,000	140,000	
Cobalt	9,300	<11	<11	
Iron	20,000,000	530	1,500	
Magnesium	7,800,000	280,000	240,000	
Manganese	630,000	250	480	
Molubdenum	<18,800	<1	<100	
Potassium	3,200,000	96,000	79,000	
Vanadium	27,000	<13	<13	
TRP Hydrocarbons	20,000	<1,000	<1,000	
Aldrin	<3.2	<0.05	<0.05	1.3
A-BHC	<3.2	<0.05	<0.05	
B-BHC	<3.2	<0.05	<0.05	
G-BHC	<3.2	<0.05	<0.05	0.160
D-BHC	<3.2	<0.05	<0.05	
PPDDD	<6.2	<0.01	<0.1	1.25
PPDDE	<6.2	<0.1	<0.1	0.7
PPDDT	<6.2	<0.1	<0.1	0.13
Heptachlor	<3.2	<0.05	<0.05	0.053
Dieldrin	<6.2	<0.1	<0.1	0.71
A-Endosulfan	<3.2	<0.05	<0.05	
B-Endosulfan	<6.2	<0.1	<0.1	
Endosulfan				0.034
Endosulfan sulfate	<6.2	<0.1	<0.1	
Endrin	<6.2	<0.1	<0.1	0.037
Endrin Aldehyde	<6.2	<0.1	<0.1	
Heptachlor Epoxide	<3.2	<0.05	<0.05	
Methoxychlor	<32	<0.5	<0.5	2.1
Chlordane	<3.2	<0.05	<0.05	0.09
Toxaphene	<320	<5	<5	0.21
PCB-1016	<62	<1	<1	10
PCB-1221	<130	<2	<2	10
PCB-1232	<62	<1	<1	10
PCB-1242	<62	<1	<1	10
PCB-1248	<62	<1	<1	10
PCB-1254	<62	<1	<1	10
PCB-1260	<62	<1	<1	10
Phenol	<620	<10	<13	580
2-Chlorophenol	<620	<10	<13	
2-Nitrophenol	<620	<10	<13	
2,4-Dimethylphenol	<620	<10	<13	
2,4-Dichlorophenol	<620	<10	<13	
4-Chloro-3-Methylphenol	<620	<10	<13	
2,4,6-Trichlorophenol	<62	<10	<13	

TABLE B-36 (continued)

(Units are ug/L unless otherwise specified.)

Constituent	Bulk Sediments (ug/kg)	Disposal Water	Elutriate	Applicable Acute Criteria
2,4-Dinitrophenol	<3,000	<50	<13	
4-Nitrophenol	<3,000	<50	<65	
2-Methyl-4,6-Dinotrophenol	<3,000	<50	<65	
Pentachlorophenol	<3,000	<50	<65	13
Benzoic Acid	<3,000	<50	<65	
2-Methylphenol	<620	<10	<13	
4-Methylphenol	<620	<10	<13	
2,4,5-Trichlorophenol	<3,000	<50	<65	
Benzyl Alcohol	<620	<10	<13	
N-Nitrosodimethylamine				
Bis(2-Chloroisopropyl)Ether	<620	<10	<13	
N-Nitroso-Di-N-Propylamine	<620	<10	<13	
Nitrobenzene	<620	<10	<13	
Isophorone	<620	<10	<13	
Bis(2-Chloroethoxy)Methane	<620	<10	<13	
2,6-Dinitrotoluene	<620	<10	<13	
2,4-Dinitrotoluene	<620	<10	<13	
1,2-Diphenylhydrazine				
Benzidine				125
3,3'Dichlorobenzidine	<1,200	<20	<26	
Bis(2-Chloroethyl)Ether	<620	<10	<13	
1,3-Dichlorobenzene	<620	<10	<13	
1,4-Dichlorobenzene	<620	<10	<13	
1,2-Dichlorobenzene	<620	<10	<13	
Hexachloroethane	<620	<10	<13	
1,2,4-Trichlorobenzene	<620	<10	<13	
Naphthalene	<620	<10	<13	
Hexachlorobutadiene	<620	<10	<13	1.6
Hexachlorocyclopentadiene	<620	<10	<13	
2-Chloronaphthalene	<620	<10	<13	
Acenaphthylene	<620	<10	<13	
Dimehtyl Phthalate	<620	<10	<13	
Acenaphthene	<620	<10	<13	
Fluorene	<620	<10	<13	
Diethyl Phthalate	<620	<10	<13	
4-Chlorophenyl Phenyl Ether	<620	<10	<13	
N-Nitrosodiphenyl Amine	<620	<10	<13	
4-Bromophenyl Ether	<620	<10	<13	
Hexachlorobenzene	<620	<10	<13	
Phenathrene	<620	<10	<13	
Anthracene	<620	<10	<13	
Dibutylphthalate	290	<10	<13	
Fluoranathene	<620	<10	<13	
Pyrene	<620	<10	<13	
Butylbenzylphthalate	<620	<10	<13	
Chrysene	75	<10	<13	
Benzo(a)Antharacene	6.4	<10	<13	
Bis(2-Ethylexyl)Phthalate	700	1	1	
Di-N-Octyphthalate	<620	<10	<13	
Benxo(a)Fluoranthene	140	<10	<13	
Benzo(k)Fluoranthene	<620	<10	<13	
Benzo(a)Pyrene	370	<10	<13	
Indeno(1,2,3-C,D)Pyrene	<620	<10	<13	
Dibenzo(A,H)Anthracene	<620	<10	<13	
Benzo(G,H,I)Perylene	<620	<10	<13	
Aniline				
4-Chloroaniline	<620	<10	<13	
Dibenzofuran	<620	<10	<13	
2-Methylnaphthalene	<620	<10	<13	
2-Nitroaniline	<3,000	<50	<65	
3-Nitroaniline	<3,000	<50	<65	
4-Nitroaniline	<3,000	<50	<130	

< Actual value is less than value shown

References

B.1.179.

1. John P. Davis: Hydraulic Design of Navigation Locks, Miscellaneous Paper HL-89-5, Sept. 1989.

2. Thomas E. Murphy: Lock Design, Sidewall Port Filling and Emptying System, Miscellaneous Paper H-75-7, July 1975.

3. Martin T. Hebler, Frank M. Neilson: Lock Filling and Emptying Symmetrical System, Miscellaneous Paper H-76-13, June 1976.

4. Jackson H. Ables, Jr.: Filling and Emptying System New Ship Lock, Mississippi River-Gulf Outlet, LA, Technical Report H-78-16, Sept. 1978.

5. Corps of Engineers: Navigation Lock Sill Depths and Hydraulic Loads on Gates, ETL 1110-2-223, June 1977.

6. Corps of Engineers, New Orleans District: Sector Gated Lock Filling and Emptying Program, Aug 1984.

7. Corps of Engineers, Little Rock District: Filling and Emptying Systems Low-Lift Locks, Arkansas River Project, Technical Report 2-743, Nov 1966.

8. Corps of Engineers: Hydraulic Design of Navigation Locks, EM 1110-1604, Apr 1979.

9. Corps of Engineers: Hydraulic Design of Deep-Draft Navigation Projects, EM 1110-2-1613, Apr 1983.

10. Corps of Engineers: Filling and Emptying Systems Old River Navigation Lock, LA, Technical Report 2-549, June 1960.

11. G. N. Willems: Final Report of the International Commission for the Study of Locks, Apr 1982.

12. John J. Franco: Development of Navigation with Locks and Dams, Miscellaneous Paper H-76-15, June 1976.

13. Emelise Cormier, editor. 1992. State of Louisiana Water Quality Management Plan. Volume 5, Water Quality Inventory. Louisiana Department of Environmental Quality, Office of Water Resources, Water Quality Management Division. Baton Rouge, LA.

14. USEPA. Water Quality Criteria, 1972.

15. USEPA. Quality Criteria for Water, 1986.

16. USEPA, Quality Criteria for Water, 1976.

17. Corps of Engineers, New Orleans District: New Orleans Harbor Water Quality Report, (LMNED-HH-QW1), July 1976.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

SECTION 2 - DESIGN

INTRODUCTION

B.2.1. This section covers the Lock North of Claiborne site including the general lock geometry and IHNC site data, structural design and design criteria, and a description of features of the replacement lock. A description of the Government provided graving site is included in Section 3. Details of the replacement lock "float-in" type construction, foundation and installation are presented. Also, the bypass channels required to maintain navigation during construction including canal limitations and closure periods are described. The existing lock will be demolished upon completion of the replacement. The controlled demolition plan for the existing lock removal is given. The permanent IHNC channel and dredge disposal details are presented. Levee and floodwall revisions are included, as well as construction sequencing. St. Claude and Claiborne Avenue bridge retrofitting or replacement information is given, including temporary detour route details.

GENERAL LOCK AND IHNC SITE DATA

General

B.2.2. The replacement lock site is located near the east bank of the Mississippi River at mile 92.6 AHP. The lock will be located in the Inner Harbor Navigation Canal (IHNC) at the North of Claiborne site approximately one mile north of the Mississippi River, and about one-half mile north of the existing lock. The replacement lock centerline will be approximately 40 feet west of the centerline of the existing canal.

Lock Geometry

B.2.3. A precast, post-tensioned, float-in concrete lock design is presented. The top of the replacement lock wall is elevation 22.4 feet NGVD. The lock chamber sizes studied are 900 and 1200 feet usable length, and 110 feet in width. The final lock chamber size is being optimized in studies by the Economics Branch of CELMN-PD, included in Volume 7 of this report. The lock has miter gates as shown on plates B-38 and B-39, and lock culvert (tainter) valves as shown on plates B-40N, B-40T, B-41N and B-41T. The lock culvert is 14.5 feet square for the 900-foot lock and 15 feet wide by 18.25 feet high for the 1200-foot lock. Emergency and maintenance bulkheads are as shown on plates B-36 and B-37.

B.2.4. Two lock depths were studied at this site: a replacement barge lock with a sill elevation (-)22 feet NGVD, and a replacement ship lock with a sill elevation (-)36 feet NGVD. A shallower, GIWW-type barge lock option, with a sill elevation (-)15 feet NGVD, was also considered in lock

size optimization engineering studies, but was not adopted. The lock chamber depth must be twice the draft of the design vessel to maintain an adequate water cushion above the lock floor. This prevents excessive hawser forces on the lock walls during lockage.

B.2.5. The filling and emptying system analyzed, i.e., an interior, ported culvert and manifold system with 14.5 feet square culverts, will be used for the 22 and 36-foot lock depths, for the 900-foot usable chamber, as shown on plate B-29 for the barge lock. For the 1200-foot long usable chamber, the culvert size is 15-by-18.25 feet, as shown on plate B-19 for the ship lock.

B.2.6. The lock structure is pile-founded. The pile design is described in this section, and the pile soil capacity is detailed in Section 3. The amount of calculated differential settlement eliminated any consideration for soil founding the concrete structure. The pile foundation shall be grouted to the concrete base with tremie concrete.

STRUCTURAL DESIGN CRITERIA

Scope

B.2.7. The analysis and design concepts for the structural components are presented in the following text. A general layout of the structure is presented on plates B-19 and B-20 for the 1200' Ship Lock and plates B-29 and B-30 for the Barge Lock.

References

B.2.8. The structural components shall be designed according to the applicable portions of the Corps of Engineers (COE) manuals for engineering and design and other reference material.

a. COE Publications

(1) EM 1110-2-2000, Standard Practice for Concrete (Sep 85).

(2) EM 1110-2-2102, Waterstops and Other Joint Materials (May 93).

(3) EM 1110-2-2104, Strength Design for Reinforced - Concrete Hydraulic Structures (June 92).

(4) EM 1110-2-2105, Design of Hydraulic Steel Structures (May 93).

(5) EM 1110-2-2502, Retaining and Floodwalls (Sep 89).

(6) EM 1110-2-2602, Planning and Design of Navigation Locks (Sep 95).

(7) EM 1110-2-2703, Lock Gates and Operating Equipment (Jun 84).

(8) EM 1110-2-2906, Design of Pile Foundations (Jan 91).

(9) EM 1110-2-8152, Planning and Design of Temporary Cofferdams and Braced Excavations (Aug 94).

(10) ER 1110-2-1806, Earthquake Design and Evaluation for Civil Works Projects (Jul 95).

(11) ETL 1110-2-256, Sliding Stability for Concrete Structures (Jun 81).

(12) ETL 1110-2-307, Flotation Stability Criteria for Concrete Hydraulic Structures (Aug 87).

(13) ETL 1110-2-338, Barge Impact Analysis (April 93).

(14) ETL 1110-2-355, Structural Analysis and Design of U-Frame Lock Monoliths (Dec 93).

(15) SL-80-4, Strength Report of Reinforced Concrete Hydraulic Structures, Report 3 - T-Wall Design (Jan 82)

b. Technical Publications

(1) American Concrete Institute, Building Code Requirements for Reinforced Concrete, (ACI 318R-89).

(2) American Concrete Institute, Guide for the Design and Construction of Fixed Offshore Structures, (ACI 357R-84).

(3) American Concrete Institute, State-of-the-Art Report on Barge-Like Concrete Structures, (ACI 357.2R-88)

(4) American Institute of Steel Construction (AISC), Manual of Steel Construction, 9th Edition, 1989.

(5) American Welding Society, Structural Welding Code, Steel, (AWS-D 1.1-88).

(6) Concrete Reinforcing Steel Institute, CRSI Handbook, (1984).

(7) American Petroleum Institute, Planning, Designing and Constructing Offshore Platforms - Load and Resistance Factor Design, (API RP-2A), 1993.

(8) Precast/Prestressed Concrete Institute, PCI Design Handbook, 4th Edition (1992)

(9) Post-Tensioning Institute, Post Tensioning Manual, 5th Edition, (1990).

(10) American Association of State Highway and Transportation Officials, Standard Specifications for Highway Bridges, 14th Edition (1992).

c. Computer Programs

(1) "Pile Group Analysis (CPGA)", WES Program No. X0080.

(2) "Pile Group Graphics Display (CPGG)", WES Program No. X0081.

(3) "Two Dimensional Analysis of U-Frame and W-Frame Structures (CWFRAM)", WES Program No. X0091.

(4) "C-Frame", WES Program No. X0030.

(5) "CWALSHT", WES Program No. X0031.

(6) "GT STRUDL", Georgia Institute of Technology.

(7) "CGSI", WES Program No. X0061.

Design Criteria

B.2.9. Design criteria shall be according to the referenced EM's, ETL's, and technical publications.

B.2.10. The following material weights were used in the design:

Material Weights

Item	PCF	
Water	62.5	
Select Sand	120.0	Ko=0.50
Semi-Compacted Sand	110.0	Ko=0.80
Silt	117.0	
Stone	132.0	
Concrete	150.0	
Steel	490.0	

B.2.11. Design Stresses. The following are discussions of the design stresses used in the structural analysis for the various components of the lock design.

a. Concrete. The Strength Design Method is used in the design of conventionally reinforced concrete in accordance with the requirements of the ACI 318R-89 Building Code. Values contained in the Code will be modified as required in EM 1110-2-2104. The appropriate Load Factors are stated in para. (8). The transportation and setting load cases shall be analyzed by both the Strength Design Method (USD) and Working Strength Design (WSD) as directed in Section 4.4 of ACI 357. The WSD allowables

for the reinforcement are specified in ACI 357. The concrete compressive stress for the temporary loadings shall not exceed 0.45 f'c. Crack width is controlled by limiting the stress in the tension reinforcement. The crack widths are calculated in accordance with formulas in ACI para. 10.6.4 Commentary. In that the structure is precast, the dead load of the structure was included in the calculation of flexural stresses at service load. The base section is prestressed in the longitudinal direction; tension is not permitted in the concrete, therefore, concerns for cracks are eliminated. In the lock upper wall the flexural stresses are low, and cracking will not be a problem. Although the reinforcement was increased to reduce stress, an upper limit was maintained to assure a ductile failure. The maximum steel ratio does not exceed 0.25pbal. (for members with compression steel pmax = 0.25pbal. + p'x(fs/fy)). Service load deflections and the effects of deformation loads (i.e. temperature) shall be investigated during the FDM. The base concrete will have a minimum design strength (f'c) of 6,000 psi at 28 days, the upper walls will be constructed of concrete with a minimum 28-day strength of 4,000 psi, and the ballast concrete will have a design strength of 3,000 psi.

b. Reinforcement. The design strength of conventional reinforcement shall be based on the use of ASTM Grade 60 steel, having a yield strength of 60,000 psi. Development length shall be based on the full yield strength of 60,000 psi.

c. Prestressed Concrete. Criteria is based on the procedures presented in Section 9 of AASHTO Standard Specifications, the Post-Tensioning Manual and Chapter 18 of ACI 318. Prestressed members and composite members will be designed to satisfy both strength (Ultimate Strength Design-USD) and serviceability requirements (Working Strength Design-WSD). Allowable stresses are listed below. The Load Factors required in USD are specified in para. (8). The tendon system will be fully bonded. This Feasibility Design will only consider the threaded bar post-tensioning system. The concrete compressive strength f'c is 6,000 psi at 28 days; the concrete compressive strength at the time of transfer f'ci is 4,500 psi. The ultimate tensile strength (fpu) of the bars is 160 ksi.

ALLOWABLE STRESSES - PRESTRESSED CONCRETE

PRESTRESSING STEEL (Post-Tensioned Members)

Maximum Jacking	0.75 fpu
Maximum at Transfer	0.66 fpu
Effective (After Losses)	0.60 fpu**

** It is recognized that losses due to shrinkage, elastic shortening and creep of concrete as well as steel relaxation and friction should be considered. However, for this level of design an approximate value will be used, in the absence of a detailed analysis.

CONCRETE

AT TRANSFER (Before Losses)

Compression	0.55 f'ci
Tension	0

AT SERVICE LOADS (After Losses)

Compression	0.40 f'c
Tension	0

BEARING (Anchorage)

Compression	3,000 psi

d. Structural Steel. For this Feasibility Report all members shall be designed using Allowable Stress Design (ASD). Permissible stresses for structural steel members are specified in Chapter 4 of EM 1110-2-2105. The main steel components are classified by type, in para. g below. For Feasibility Report analysis, the miter gate was analyzed using ASD. The miter gate will be reanalyzed using LRFD as required in EM 1110-2-2105 during FDM design.

e. Welds. Allowable stresses for the design of welds shall be according to the latest AWS Welding Code as modified by EM 1110-2-2105.

f. Steel Pipe Piles. Allowable compressive stresses are given for both the lower and upper regions of the pile.

Axial Compression or Tension - Lower Region

$$Fa = 1/3 \times Fy \times 5/6$$

Combined Bending and Axial Compression - Upper Region:

$$\frac{fa}{Fa} \pm \frac{fbx}{Fb} \pm \frac{fby}{Fb} \leq 1.0$$

where:

fa = computed axial unit stress, kips per sq. in. (ksi)
Fa = 5/6 x 3/5 x Fy
fbx and fby = computed bending unit stress (ksi)
Fb = 5/6 x 2/3 x Fy (Compact Section)

B.2.16. Additional Load Factors. The following additional load factors were considered and applied as described below:

a. Sand backfill is assumed throughout the wall height, except for a negligible clay blanket, for all load cases except Load Case 5.

b. The effects of siltation are considered negligible.

c. Drag on the outer walls was added when the effects were conservative. Drag Force = at rest lateral earth pressure x 0.5 x (Tangent of the internal angle of friction)

FLOTATION

B.2.17. Flotation will be evaluated in accordance with ETL 1110-2-307. For the Maintenance Dewatering Case, the dead weight of the structure alone will exceed buoyancy by a Factor of Safety equal to 1.05. Tension connections to an adequate number of piles will be utilized to develop the minimum required Factor of Safety. Drag force is neglected. The minimum factor of safety for load conditions will be as follows:

Load Condition	Minimum Factor of Safety
Normal Operation	1.5
Maximum Operation	1.5
Maintenance Dewatering	1.05 without tension piles
	1.30 with tension piles
Hurricane	1.3
Setting	N/A

SLIDING

B.2.18. Since this foundation is grouted to the base, a check for sliding will be performed. The analysis will conservatively assume no embedment of the piles into the U-Frame base. The shear strength of the pile tension connections is also neglected. The sliding resistance considered is developed by the friction between the concrete base and the tremied 4 foot pile cap. The factor of safety will be calculated in accordance with ETL 1110-2-256. A friction factor of 0.60 is used. A minimum factor of safety equal to 2.0 is required for all load conditions. Deep seated failure is discussed in Section 3.

PILE FOUNDATION DESIGN

Design Criteria

B.2.19. The pile foundation shall be designed in accordance with EM 1110-2-2906. The minimum factors of safety, based on performing pile tests in the future, for the loading conditions are as follows:

Loading Condition	Category	Soil Case	Pile Capacity Compression	Factor of Safety Tension
Normal Operation	Usual	S	2.0	2.0
Maximum Operation	Usual	Q	2.0	2.0
Maintenance Dewatering	Unusual	Q	1.5	1.5
Hurricane	Unusual	Q	1.5	1.5
Setting (Constr.)	Unusual	Q	1.5	1.5

Pile Selection

B.2.20. The structure foundation for the replacement lock was designed as a pile-founded lock. The initial design was a soil-founded steel hull structure. Extensive work was done justifying the use of a soil foundation in spite of the fact that 10 inches of differential settlement was predicted. With the ballast concrete added, the weight of the steel hull and precast concrete structure is similar. However, the 10 inches of differential settlement was considered to be detrimental to the less ductile concrete lock. The possibility of excessive cracking created by the settlement, compounded by stress-induced cracking, eliminated the use of a soil foundation. The selected piles are 48-inch diameter by 5/8-inch wall steel pipe piles. The piles are 160 feet long for the ship lock and 140 feet long for the barge lock. Ultimate compression and tension pile capacity versus tip elevation were developed for 36-inch, 42-inch and 48-inch diameter steel pipe piles. The 48-inch was selected as the most economical pile.

General

B.2.21. The use of large diameter pipe piles was first recommended by EBASCO, Inc. in their work with the steel-hull lock. The use of larger pipe piles (versus steel H-Piles) with greater capacity was also considered given the difficulty of aligning piles that will be driven 50 feet underwater. The piles were analyzed for Load Cases 1 thru 4 as is specified in para. B.2.15. Pile tests will be performed, to determine

capacity and noise levels, during the FDM phase. The pile reactions were developed assuming a rigid base. In the transverse direction, the reactions on the piles beneath the lock walls were increased to 125% of the uniform load. This assumption was based on the results of monitoring at the Port Allen Lock. The monitoring is reported in Technical Report S-68-7, by Sherman and Trahan, dated Sept 1968. This assumption was in close agreement with the pile reactions generated by the CASE program "CWFRAM". "CWFRAM" treats piles as elastic elements that develop resistance proportional to the displacement of the pile. The resistance is calculated from the axial and lateral stiffness of the soil. Additionally, the foundation was analyzed considering the effects of lateral and eccentric loadings using the CASE program "CPGA". Only two loadings, the Maximum Operation and Maintenance Dewatering Cases, which develop the most significant lateral forces, were considered. The combined bending and axial stress factor was low, and bending stress was a small portion of the total. The pile size and length needed for the maximum load were used throughout the foundation. A minimum spacing of three pile diameters required no reduction for group effects. The pile group effect was calculated in accordance with EM 1110-2-2906.

Pile Layout

B.2.22. The layout of the ship lock foundation is shown on plate B-24A; the barge lock foundation is shown on plate B-34A. The piles, all the same size, fall into three categories. The majority of piles act only as compression piles. In each module, three setting pads are required. Basically, the piles located beneath the pads are compression piles that are driven to a more stringent tolerance. In addition to the setting and compression piles, there are piles that offer a tension resistance by being anchored to the U-Frame. These piles provide tension capacity when the lock is dewatered; for all other load cases they act in compression. Design considerations for each of the three pile types are as follows:

COMPRESSION ONLY PILES

B.2.23. The required pile lengths were governed by the compression piles beneath the lock walls. The maximum combined stress factor is low, however, the 5/8 inch wall was needed to comply with the local buckling requirements as specified in AISC Table B5.1. The piles are connected to the structure base by the 4-foot thick tremie concrete cap.

SETTING PILES

B.2.24. The setting pads are required for module alignment. The tripod support was recommended by the Board of Experts as optimum for level placement and full contact with support pads. The selected longitudinal location developed the lowest moment in the U-Frame section with the fewest required number of piles. The ultimate pile capacity was reduced by the permitted factor of safety equal to 1.5. The setting piles withstand an applied load that is 5% greater than buoyant forces with the water stage at El. 3.0 NGVD. This load was increased by 2 feet of water

head assuming that the water stage could drop to El 1.0 NGVD. The pile capacity was limited to that which could be provided by the length required for the governing compression only piles. Details for the setting piles are shown on plate B-24B.

TENSION PILES

B.2.25. For the Maintenance Dewatering load case, the modules are ballasted to achieve a factor of safety against flotation of 1.05 without tension pile anchors. With the tension piles, the factor of safety exceeds the required 1.3 minimum. The use of tension piles permits a reduction in the overall structure weight, thus permitting a shorter pile length. The tension connection also reduce the shear and moment of the base slab in the transverse direction. There are three tension piles per transverse row.

Future Study

B.2.26. In order to assure a more economical engineering solution, the following recommendations will be studied in the FDM:

a. The use of larger pipe piles will be investigated. Our design considered only pipe pile sizes commonly used in offshore oil structures. We will investigate 60-inch, 72-inch and 96-inch diameter pipe piles as was recommended by the Board of Experts. Noise levels and economics will dictate the pile size.

b. The use of multiple pile sizes will be considered. Using larger piles beneath, or in lieu of, the setting pads will be explored. Additionally, we will investigate varying sizes between the lock wall area versus the chamber area.

c. Pile designs will be optimized by using a flexible base analysis with bracketed soil coefficients. These results will be confirmed by finite element analysis.

Precast, Post-Tensioned Float-In Concrete Lock Structural Design Methodology

General

B.2.27. The precast float-in concrete lock will be constructed in four pieces, as shown on plates B-19 for the ship lock and B-29 for the barge lock. All modules incorporate the U-Frame structure. The base section and lock walls achieve their structural integrity from a continuous series of I-Beams. In the base section the I-Beams span both directions with the bottom slab and floor slab acting as the flanges. The lock wall I-Beam utilizes the chamber wall and outer wall as the flanges. The ship lock floor is at El. -40; the barge floor/sill is at El. -22. The lock wall top elevation, El. 22.4, meets the river protection design grade. Beyond the northernmost gate the lock wall is reduced to the lakeside hurricane protection grade. Each module base acts independent of the others. The

completed lock plan is shown on plates B-17 and B-18 for the ship lock and B-27 and B-28 for the barge lock.

Base Section

B.2.28. The base section will be constructed of 6,000 psi strength concrete at the graving site. The higher concrete strength was used to accommodate prestressing and to resist the high shear stress in the transverse web. The effective flange width complies with ACI 8.10. The flexural stresses could be resisted by conventional reinforcement, however, it was decided to post-tension the longitudinal direction to minimize cracking that could be created in the 434-foot direction during transport. This was the recommendation of the Board of Experts; Japanese Rules for prestressed barges require prestressing for lengths in excess of 300 feet. The maximum moment is created by the six-foot design wave. The wave-induced moment was calculated by methods recognized by the American Bureau of Shipping (ABS). The threaded bar post tensioning system is used, and the use of higher strength strand will be investigated in the FDM. Conventional reinforcement, capable of resisting the wave moment was also included as a "belt and suspenders" design. There are numerous other more economical methods that will be investigated (See Future Studies below). Strength in the longitudinal direction is only critical during the construction phase. In the transverse direction conventional reinforcement was used even though the shear force and bending moment are larger than the post-tensioned longitudinal direction. A significant amount of steel was needed to limit the tensile stresses in an effort to control cracking. Note that it is the recommendation of the Board of Experts' A-E members to use prestress in the transverse direction also. The moments created by lock operations, were the larger of flexible and rigid base conditions (see Pile Foundation Design). Shear and moment diagrams were created considering both rigid and flexible base pile design. The reinforcement required by the governing moment was conservatively used in both flanges and extended throughout the chamber span. Moments created by the heavier end walls (cantilevered about the center) during transport and setting were limited to that of normal operation by installing a strut. The strut will be a threaded post-tensioning bar. A second row of bars will be installed as the upper wall is added. The axial load was too small to use to increase the concrete strength for both concrete shear and flexural capacity. The shear force on the I-Beam web required increasing the web thickness and required a significant amount of stirrup reinforcement. The maximum stirrup size is limited to a No. 8 bar by ACI para. 7.1.3 Commentary. In addition to the I-Beam member design, each component was analyzed as a fixed plate. Obviously, the fixed plate analysis was only needed for loadings prior to ballasting. In addition to the shear and flexural requirements, the reinforcement meets or exceeds Corps criteria for temperature and shrinkage steel and ACI para. 10.6.7 requirements for web horizontal steel.

Lock Walls

B.2.29. The culvert walls are constructed of 6,000 psi concrete. The longitudinal direction is post-tensioned and acts monolithically with the base. The transverse section was considered as a rigid frame fixed at the floor with the culvert roof thick enough to provide rigid links in the corners. The culvert walls act as 10 foot deep I-Beams, 14 feet O.C., resisting the axial force due to wall weight and the overturning moment created by lateral forces. As with the base slab, the I-Beam components were checked as rectangular plates experiencing hydrostatic load prior to ballasting.

Module Joints

B.2.30. The joints act as expansion joints with no transfer of load. An adjustable J-Bulb waterstop assembly is mounted to the perimeter during construction. This waterstop is only needed to form an outer seal during the construction of the inner seal and seals around the culvert and gallery. The inner seal embeds a 3-Bulb waterstop in each module. The exposed joint surface is protected by a UHMW pad that permits movement.

Future Studies

B.2.31. The design presented is conservative. During FDM, alternate designs/systems will be explored to provide a more economical end product. Some revisions to be considered are:

a. Accept the use of bonded prestressed systems for the intended design life. The use of post-tensioning in both directions of the base has been recommended by both A-E members on the Board of Experts. Prestressing the base will permit a smaller section and will eliminate flexural cracking.

b. Investigate the corrosion potential for a bonded high strength strand. Strand provides greater capacity and is easier to install than the threaded bar.

c. Consider the use of partial prestress, utilizing the prestress to develop the needed strength for normal operation and resisting the difference for rare loadings with conventional reinforcement.

d. Increase the shear strength of the transverse web by:

- Post-tensioning the web in the vertical direction.

- Utilize the strength of the ballast concrete. Use corrugated forms to transfer shear or insert dowels in the web that extend into the ballast concrete forming a composite web.

- Use an anchor plate in lieu of the 90 degree hook to develop adequate bond for stirrups larger than No. 8 (limited by ACI 7.1.3).

e. As described in the Pile Foundation Design, para. B.2.22, use a flexible base analysis to take some conservatism out of the base design.

f. Use pneumatic seals in lieu of the conventional J-Bulb and 3-Bulb Waterstops.

DESCRIPTION OF LOCK NORTH OF CLAIBORNE AVENUE STUDIES

General

B.2.32. Two construction techniques were studied:

a. A precast, post-tensioned, float-in concrete lock seated on a prepared foundation (i.e., "float-in" construction), and

b. A conventional cast-in-place lock construction with a dewatered excavation (i.e., construction "in the dry").

Either technique will be a miter-gated lock, with direct head and reverse head gates. The "in the dry" plan was not adopted due to excessive costs and rights of way required for construction cofferdamming to maintain navigation in a two-way navigation bypass channel for the full construction period. Thus, the "float-in" plan was adopted, and is presented herein.

PRECAST FLOAT-IN CONCRETE LOCK STRUCTURE

B.2.33. The precast, concrete float-in lock structure requires a graving site. The Government furnished graving site is located on the MRGO approximately six miles from the lock site. The graving site will consist of an earthen excavation and closure berm. A pile-founded work platform is provided with a slab elevation of EL. -26 NGVD. The voided lock module base section will be fabricated and floated to the Galvez Street staging area. Onsite, the north bypass channel, lock foundation (excavation and pile-driving) and Galvez Street staging area will be constructed. The pile foundation will be installed concurrent with the construction of the first module. The staging area will be used to finish the upper lock walls. Completed lock modules will be installed by positioning, partially ballasting and then lowering the module onto the setting pads. After proper alignment is obtained on the pads, the base grouting and lock wall ballasting will be completed. The lock chamber will remain dry throughout construction. Lock module joints will be completed. The lock will be opened to navigation traffic as a pass-through only. Lock backfill will be placed and levee tie-ins completed. Lock guidewalls will be completed, and the lock will be opened to navigation. It is estimated that the 900' barge lock will take approximately 4.5 years to construct; the 1200' ship lock will require 5.5 years. A bar chart for the construction sequence will be included in the Project Management Plan (PMP) for this project. Details of the lock construction are given below, in the general order of the construction sequence.

CONSTRUCTION DESCRIPTION

Graving Site Construction

B.2.34. A graving site will be used to construct the lock module base section. The proposed site is located in New Orleans East, approximately six miles from the existing lock, where the Paris Road Bridge (Interstate 510/Louisiana Highway 47) crosses the MRGO. The voided base structure will have 23 feet of draft; 3 feet additional draft is provided to assure lift off. The MRGO channel bottom from the graving site to the staging area is elev. -30 feet NGVD (or deeper), which is sufficient draft for transporting all modules. The graving site and details are shown on plates B-12, B-12B and B-12C. Note: The graving site furnished is not mandatory. Alternately, the Contractor may select a different graving site, however, each module requires a minimum draft of 26 feet and is designed for inland waterway wave forces only.

B.2.35. The site must be cleared of brush and small trees. A small drainage canal (five feet deep by 15-feet wide) must be rerouted around the proposed graving site.

B.2.36. Two cofferdam cells and a sheet pile I-wall (see plate B-12B) must be driven before excavation. The cofferdam cells and I-wall will provide a removable closure dam. The upper 20 feet of the cells will be filled with lightweight stone. Natural ground can be used in the closure dam for the first closure; subsequent closures will be reconstructed of stone. The initial excavation will be done in the wet, using land-based equipment. Of the 225,000 cubic yards of material excavated, about 83,000 cubic yards will be used to construct the hurricane protection and tie-in levees. All levee work will be shaped, but not compacted. The levees will be overbuilt to account for settlement. The remaining excavated material will be hauled adjacent to the graving site (approx. 1/4 mile) and stockpiled.

B.2.37. The excavated area will be dewatered using wells and/or a wellpoint dewatering system. The dewatering system will remain in place for a four to five year period. Piezometers will be installed to assure that the water level is maintained at five feet below the work surface.

B.2.38. Once dewatered, the excavation will be lowered another 16 inches. A 4-inch perforated concrete stabilization slab will be placed above a 12-inch compacted gravel base. Concrete piles, 12-inches by 12-inches and approximately 70 feet long, with a two-by-three foot reinforced concrete pile cap each, will be used to support the lock module base section during construction. The 4-inch perforated concrete stabilization slab and pile caps will be covered with a 6-mil polyethylene bond breaker.

B.2.39. After the project is completed, the graving site will be turned over to the Locals for their use as a dock facility. Therefore, the Contractor will only be required to remove the tie-in levee I-Wall and cell sheet piling and stone closure, and backfilling the site is not necessary.

North Bypass Channel Construction

B.2.40. Prior to dredging for the lock foundation, the north bypass channel must be opened. The north bypass channel is for two-way traffic, and is composed of a transit bypass channel and a laying bypass channel, as shown on plates B-14N and 15N for the barge lock and plates B-14T and 15T for the ship lock. Three 78-foot diameter protection cells will be constructed at the south end of the bypass channel, concurrent with bypass excavation. The channel corner riprap protection will be placed. Prior to opening the bypass, the 1860 linear foot timber guidewall will be installed. The guidewall supports will be 12-inch diameter treated timber piles with 12-inch by 12-inch treated timber fenders.

B.2.41. Tug assistance vessel contracts will be set up to begin when the north bypass channel is opened to navigation. Tug assistance vessels (push boats) will be stationed at each end of the bypass to assist tows through the bypass channel. Two push boats will be required (24 hours per day and 7 days a week) at each end for a period of 4-1/2 years of lock construction.

Lock Foundation Construction

B.2.42. Once the bypass channel is opened, lock foundation excavation will commence, as shown on plates B-16 for the ship lock and B-26 for the barge lock. All excavation will be by dredging, with a base dredge tolerance of plus or minus 6 inches. It is anticipated that a minimal amount of slope dressing will be required after dredging. A barge mounted dragline will be used to obtain the required slopes. For estimating purposes, it was assumed that two feet was removed along the sloped portion of the lock excavation for approximately 2000 feet in length. Prior to pile driving, the Contractor will complete the 78-foot diameter protection cells, located at both ends of the excavation, as shown on plate B-12A.

B.2.43. The stone base will be placed prior to pile installation. The three-foot thick stone base will be placed by lowering a hopper box to the bottom and opening a bottom chute. Guide cables and spud piles must be installed to guide a work barge which lowers the hopper. Hoppers are approximately 20-feet by 20-feet. In lieu of the hopper box, a stone tremie tube positioned by a submerged frame may be used.

B.2.44. The lock piles, 48-inch diameter steel pipe piles, will be continuously installed in two steps. Above the water surface, a vibratory hammer will be used. Below the water surface, a hydro-hammer will be used to bring the pile to grade. The setting piles will be driven to a tolerance of minus one-inch; all other piles will be driven within a tolerance of plus or minus six inches. Flat jacks and precast concrete setting pads will be installed by divers; after leveling, the pads will be grouted into place as shown on plate B-24B for both the ship lock and the barge lock.

B.2.45. The cutoff sheet piling will be driven to a tolerance of plus or minus six inches with the use of a vibratory hammer. The Contractor will install cutoff piling in advance of the setting pads to avoid disturbance.

Galvez Street Staging Area Construction

B.2.46. Concurrent with north bypass channel dredging (or sooner), the existing Galvez St. Wharf must be demolished and removed.

B.2.47. The Contractor is anticipated to need a work platform to finish the upper lock walls. Note: This work platform is not mandatory; the Contractor may elect to use another method and finishing location. The Contractor may construct a work platform at any time after the Galvez St. Wharf is removed and before the first lock module (GB-1) is completed. The work platform, that is included in the cost estimate, will be a concrete deck, 60-feet by 400-feet in base area, and supported on steel H-Piles. The work platform will act as a deck, and as a mooring facility for each lock base module under construction. A sufficient number of battered piles must be installed to resist the wind and wave lateral load imposed by the moored module. Sheet piling will be driven and anchored to the landslide of the work platform. A void, 160-feet by 400-feet in base area, between the work platform and the west side floodwall, will be filled with earth, and will act as an access ramp and storage area. We assume that the Contractor will use a crawler-mounted crane with a minimum 25-ton capacity, and a 180-foot boom on the deck, and at least one barge mounted crane.

B.2.48. The western protection cell, at the north end, shall be removed to permit entrance of the float-in base sections. After the cell is removed, a 220' corridor is available for module passage. The removable cell must be pulled and redriven each time a new module enters the Galvez Street staging area.

B.2.49. A clear area of 350-feet by 350-feet is available less than one-half mile away for the Contractor's batch plant and stockpile area. The batch plant must be capable of producing at least 125 cubic yards of concrete per hour. This production rate will require two portable batch plants.

Construct Lock Module Base Section

B.2.50. The south (riverside) gatebay module (GB-1) must be constructed first. The entire concrete base section will be constructed from 6,000 psi minimum compressive strength at 28 days concrete. A batch plant or plants will be erected at the site, and have a minimum production rate of 150 cubic yards per hour. Ample right of way exists for batch plant and material stockpiles. Modules CM-2 (chamber riverside), CM-3 (chamber lakeside) and GB-4 (gatebay lakeside) will be constructed in that order.

B.2.51. The embedded metals required for cutoff piling and module joints and waterstops will be positioned during forming as shown on plates B-23 for the ship lock and B-33 for the barge lock. Each module will be post-tensioned in the longitudinal direction. The 1-3/8 inch diameter threaded

post-tensioning bars will be coupled at 60-foot intervals. A larger duct is required at the coupler. The threaded bar will be fully bonded with a high strength grout. Transfer of stress to the bonded bars will not occur until the grout has obtained its full compressive strength. The base section culvert walls will be constructed with slip forms. The main steel reinforcement details are shown on plates B-21 and B-22 for the ship lock; B-31 and B-32 for the barge lock.

B.2.52. Concurrent with lock base module construction, the permanent emergency bulkheads and temporary end dam bulkheads will be fabricated. The end dam closure, needed for flotation at the graving site, will consist of one emergency bulkhead (10 feet high) at the lowest position and one temporary bulkhead 10 feet high (for construction only). The end dams will be installed just prior to flooding. The culvert openings will be sealed with steel bulkheads. Two modules will be floating concurrently, thus, four lower temporary bulkheads are required at this phase of construction. Three upper bulkheads per end dam (9 feet high each) are added as the upper wall is constructed at the Galvez Street staging area. (a total of five bulkheads per end dam). The maximum bulkhead weight is 130 tons.

B.2.53. Tension struts are needed to counteract the moment induced by the heavy lock walls during transport, as shown on plates B-21 for the ship lock and B-31 for the barge lock. The struts will span the transverse direction at the culvert top elevation. Post-tensioning bars 1-3/8 inches in diameter will be used as the struts, which will be located at each bulkhead wall (14 feet on centers). The struts will be encased by standard weight pipe sleeves. These struts will remain in place until the module is set and grouted to the pile foundation.

Transport Lock Base Modules

B.2.54. Prior to transport of each module, the graving site will be control-flooded and the I-Wall and berm closure removed. Closure materials will be stockpiled nearby and reinstalled once the module has been towed out. The graving site will be dewatered again and prepared for the next module.

B.2.55. It is anticipated that six tug boats are needed to pull the module along the six mile route to the Galvez Street staging area. The MRGO will be closed to marine traffic during the one-day haul. To complete transport, each module will be moored to the work platform.

Construct Upper Wall Section

B.2.56. The upper walls will be constructed of conventionally reinforced concrete, and no vertical or transverse post-tensioning is required. The concrete in the upper walls will have a minimum compressive strength of 4,000 psi at 28 days.

B.2.57. Wall armor and joint seals will be installed. Additional end dam bulkheads will be installed as wall construction progresses. A second row of temporary tension struts is needed to counteract the weight of the upper wall. The upper row of tension struts are the same as ones placed at the graving site. All temporary tension struts will be removed after the module is properly positioned on the setting pads.

B.2.58. Miter and culvert gates and machinery will be installed at the work platform. A barge-mounted crane with a 200-ton capacity is needed to install the miter gates. The base slab will be ballasted with concrete while moored at the Galvez Street staging area work platform. Ballast concrete will have a minimum compressive strength of 3,000 psi at 28 days.

Lock Module Installation

B.2.59. Positioning guides shall be installed while the upper wall is nearing completion. The completed concrete module is then transported to the foundation site.

B.2.60. Mooring lines will be attached to the structure. The structure position is horizontally adjusted by tensioning the guide lines. Tolerances of less than 3 inches have been achieved on similar structures.

B.2.61. The chamber will remain dry until the entire lock is completed. The base and outer culvert wall voids will be filled with ballast concrete prior to setting. With this partial amount of ballasting, the module is still buoyant. The final lowering will be accomplished by ballasting the lock wall mid-height compartments with water. Should the first attempt be out of tolerance, the module can readily be refloated and lowered again. A ballasting scheme shall be provided to the contractor to insure that each module is lowered in a trim position. Once properly positioned on the setting pads, sufficient ballast concrete will be added to achieve a minimum flotation factor of safety of 1.05.

B.2.62. Exterior containment sheet piling will be driven three to five feet into the underlying clay strata. The foundation tremie concrete will then be injected through the base via prepositioned four-six inch diameter grout pipes. Each tube will be valved. A set of pipes is located in each base compartment and along the containment piling at 14' O.C.. Each set will contain an intake pipe, a spare intake pipe, and an outlet pipe that will extend above the piezometric head. (Installation notes are included on plate B-25 for the ship lock and B-35 for the barge lock). Concurrent with the base grouting operation will be the installation of the tension anchors. Each tension pile will be connected by four tension anchors. An outer pipe sleeve and O-ring seal, compressed by the weight of the lower base, prevents water and tremie concrete from entering the tension pile. The pile cap and anchors are then grouted. The installation procedure is included on plate B-24B.

B.2.63. The remaining lock wall ballast will be pumped in after the foundation concrete and tension anchors have cured.

B.2.64. Complete all wall armor. Construct lock wall control houses. Complete module mechanical and electrical installation.

B.2.65. Install the southwest guidewall and dolphin after the riverside gatebay (GB-1) is complete.

B.2.66. Repeat steps 4 thru 7 for the next three modules, CM-2, CM-3 and GB-4, respectively.

B.2.67. Construct the module joint once the next module is installed and fully ballasted. Alternately, the joint may be constructed prior to tremieing the foundation 4 foot void of the following module. By aligning the module on the setting pads, and dewatering the joint void, the water pressure will compress the free module against the grouted module forming a tight seal. The outer seals are temporary and only needed to permit the installation of the inner seals. The outer vertical seals will be adjusted by divers to form a tight seal. Once the outer seal is adjusted, the space between the adjoining end dams will be dewatered. The inner wall, culvert and gallery 3-bulb waterstops will be grouted to the abutting module. The exposed joint surface will be protected with ultra-high-molecular-weight (UHMW) pads. The UHMW pad is slotted on one side to permit movement in the joint.

B.2.68. After the module joint is complete, the inner module end dams will be removed and transported to the graving site for use with the third (CM-3) and fourth (GB-4) modules.

B.2.69. Install the northwest guidewall after the last module (GB-4) is complete.

Open Lock as Pass-Through Lock

B.2.70. Test all machinery and flood lock chamber.

B.2.71. Remove the channel protection cells at both ends. Place channel riprap at lock ends. Close bypass channel and open new lock to marine traffic. (Water stage still controlled by old lock).

B.2.72. Remove the bypass timber fender. The three south end bypass channel protection cells and riprap will remain.

B.2.73. Construct the east side guidewalls at both ends. All work will be done in the wet by barge mounted equipment located behind the traffic channel. End and intermediate piers for the south end floating guidewall will be constructed from within a braced excavation.

Backfill Structure and Levee Tie-Ins

B.2.74. Construct the tie-in levees at both ends. The sand backfill must be barged in and deposited with a clam shell. Fill will be brought up to El. 5.0. The sand backfill will then be placed along the lock wall (fill will be placed uniformly on both sides).

B.2.75. The remaining lock backfill will be dredged material. Sufficient dredging operations required south of the new lock, including the bypass channel at the existing lock, will be delayed so that disposed material is used as lock fill.

B.2.76. The tie-in levee clay crown and I-Wall will be constructed. The I-wall will be overbuilt 6 inches to account for future settlement. Once the tie-in levees are complete the new lock will be operated to control water stage. The old lock will now be demolished.

B.2.77. Complete site work.

REQUIRED CLEARANCES AT FLORIDA AVENUE FOR THE FLOAT-IN LOCK PLAN

B.2.78. The float-in lock construction is contingent upon removal by local interests of the width restriction of about 90 feet at the existing Florida Avenue Bridge. Plans for replacing this bridge are complete, and construction of the new low level vertical lift bridge is scheduled for 1997. The replacement railroad bridge includes two at-grade lanes for vehicular traffic. The new bridge provides 156 feet of vertical clearance and 300 feet of horizontal clearance. A total of $11 million has been appropriated for construction of this bridge. Additional funding is expected to complete bridge construction. If construction of this bridge fails to be realized, the alternate measure is to construct smaller modules. Removal of existing timber fendering at Florida Avenue widens the opening to 105 feet. The smaller units would be substantially more time-consuming and expensive. The alternate lock construction would require fourteen units (in lieu of four).

B.2.79. Note also that the Sewerage and Water Board siphon structure located adjacent to the existing Florida Avenue Bridge has a 105-foot clear width (without fenders) and 90 feet clear (with fenders). It must also be removed for the four-piece float-in plan to be workable. Removal of the siphon is a local interest responsibility in conjunction with replacement of the Florida Avenue bridge. A replacement siphon is not required.

B.2.80. The Louisiana Department of Transportation and Development (LDOTD) was designing (in mid-1993) a high-level, four-lane vehicular crossing with a 300-foot minimum horizontal clearance to suit United States Coast Guard requirements. The 300-foot clearance meets and actually exceeds the Corps' requirements for the float-in lock plan. However, the LDOTD has stopped work on this project and turned it over to the City of New Orleans. The project's final status is undetermined, but local discussion is still on going. Although somewhat impacting detour plans, the bridge status does not affect available clearance for the float-in modules.

BYPASS CHANNELS AND OPERATIONS PLAN

Bypass Channel for Continued Navigation During Construction

B.2.81. As closing of the Inner Harbor Navigation Canal would cause a severe hardship to vessels traveling along the Gulf Intracoastal Waterway and those traveling from within the canal to the Mississippi River, the need for a bypass channel was recognized. Consideration was given to both the east and west sides of the new lock construction with the east side being selected due to the railroads and turning basin along the west side.

B.2.82. The Lock North of Claiborne Avenue site plan will permit passage of most navigation during construction (see plates B-13 thru B-15T). Some limitations are required as a compromise between navigation and construction interests. This provides the minimum area needed for lock construction, while having as little effect as possible on navigation's passage through the narrow Industrial Canal corridor.

B.2.83. The construction plan will designate areas either as navigation priority or construction priority. These areas will be planned not to conflict to the greatest extent possible. To achieve this, the Corps is planning to develop the construction plan with input from all stakeholders, and will, by extensive construction sequencing, allow both navigation and construction to co-exist within tolerable limitations during replacement of the lock.

B.2.84. Navigation priority areas will be available to navigation first and construction activities must yield to navigation in these areas. For example, the transit and laying bypass channels will be navigation priority areas. Similarly, construction priority areas will be available to construction first, and navigation must yield to construction in these areas. For example, the lock construction area between the protection cells will be a construction priority area. We will construct physical barriers to keep navigation safely away from construction areas to the extent practicable (see plate B-16 for the ship lock and plate B-26 for the barge lock). The specifics of the rights and responsibilities of navigation and construction will be developed prior to construction with input from all stakeholders.

SUMMARY OF CANAL LIMITATIONS AND CANAL CLOSURE

B.2.85. The Corps' intent is to reduce canal CLOSURE to an absolute minimum because of the extreme cost of CLOSURE to navigation. Alternate routes such as through Baptiste Collette, will provide temporary passage during CLOSURE periods. Ample advance notices of the effects of construction activities on navigation will be issued.

B.2.86. Note that the lock and related construction are built over an estimated 10-11 year construction period. We must distinguish LIMITATIONS on the canal use from CLOSURE of the canal. The construction and existing lock demolition will place LIMITATIONS on the canal for an estimated 6-7 years. These limitations include items such as a two-way (laying/transit)

bypass channel, a one-way demolition phase bypass channel, tug assistance, and limits on vessel size and tow configuration as detailed herein. Although navigation will be slowed somewhat by these limitations, the canal will NOT be CLOSED.

B.2.87. The canal will have to be CLOSED as follows:

a. Prior to opening the demolition bypass channel to navigation, with navigation passing through the existing channel and lock: Removal of the St. Claude bridge foundation (east side only) and tie-in of demolition bypass channel to existing approach channel (riverside); estimated duration is less than 30 days.

b. After opening the demolition bypass channel to navigation: during detonation of explosives in demolishing existing lock; estimated duration is a series of about 8-10 shutdowns, about 2-4 hours long each, occurring intermittently during an 18-24 month long lock demolition and debris removal operation by the demolition contractor. This is a safety measure for explosives.

B.2.88. Certain construction equipment, for dredging, bridge construction, installation of pipelines and utility crossings, and similar work will be in the canal from time to time throughout construction. Some construction activities will be completed prior to opening the transit and laying bypass channels to avoid conflicts with navigation entering and exiting the bypass channels. For example, pipeline and utility crossings at Claiborne and Florida Avenues must be placed in a trench at the same location as the vessels' entrance and exit from the north bypass channel. This trenching is sequenced such that it is completed prior to opening the north bypass channel.

B.2.89. Two types of bypass channel are required at different phases of the lock replacement: 1) a two-way bypass channel between Claiborne and Florida Avenues on the east side of the canal during new lock construction and, 2) a one-way, demolition phase bypass channel between St. Claude and Claiborne Avenues on the east side, after the replacement lock is in operation and during demolition of the existing lock.

<u>North (Two-Way) Transit and Laying Bypass Channel</u>

B.2.90. The two-way bypass channel consists of a TRANSIT bypass channel and a LAYING bypass channel as shown on plates B-13 Thru B-15T. Each channel is 110-feet wide; the laying channel depth is 20 feet, and the transit channel depth is 31 feet (below low water elevation 0 NGVD). Three protection cells will be placed at the south end of the bypass channel to shield the Claiborne Bridge piers. Navigation aid markers and lighting will be provided for safe channel passage. Tug assistance vessels will be stationed at the north and south protection cells and will have two-way, marine radio communication with vessels.

B.2.91. Two-way traffic was considered for vessels no wider than 70'(two barge widths). A 220-foot bottom width was chosen to provide 40 feet in between passing vessels and 20 feet of clearance on both sides. A depth

of (-)22 NGVD was used for the barge lock option, consistent with the main channel depth. A split level channel with one deeper lane to(-)31 NGVD was used for the ship lock option to continue to pass any vessel which could pass through the existing lock. Due to limited space, the bypass channel angles sharply back into the main channel at each end of the new lock construction without adequate length for safe, unassisted vessel maneuvering. A plan was developed for 24-hour vessel assistance to be provided by two picket boats. These tugs would be contracted from outside the Corps and radio dispatched to intercept and assist tows and vessels through the bypass channel while it was in use.

North (Two-Way) Bypass Channel Operation

B.2.92. Lock operations at the existing lock are conducted in groups, i.e., 3-5 northbound tows (2-3 lockages) are passed and then operations are reversed to pass 3-5 southbound tows. The proposed bypass channels will permit lock operations to continue in this pattern with the following limitations:

B.2.93. Northbound Operations - About 3-5 southbound tows can line up end-to-end in the LAYING bypass channel while northbound tows pass through in the TRANSIT bypass channel. Note that tug assistance would be used to help vessels negotiate the tight corners of the bypass channel. Navigation in the TRANSIT bypass channel is to a depth of 31 feet, which allows a draft of up to 25 feet with six feet of freeboard. However, deep draft vessel sizes are limited as described below.

B.2.94. Southbound Operations - About 3-5 northbound tows can line up end-to-end in the LAYING bypass channel (awaiting the Florida Bridge opening). Navigation in the LAYING bypass channel is limited to a depth of 22 feet, allowing a draft of 16 feet with six feet freeboard.

Vessel Size and Configuration Limitations - North Bypass

B.2.95. The maximum vessel size will be limited during construction. Due to operational problems anticipated for deep draft navigation, we recognize that many deeper draft vessels (over 16 feet) cannot safely enter and exit the north bypass channel and thus must use other routes throughout construction. Some vessels over 16-foot draft may safely pass with tug assistance, but several factors dictate whether safe passage can occur. These factors include weather conditions (wind speed and direction, visibility, etc.), exposed sail area of vessel, vessel tonnage and maneuverability limitations of tug assistance. For instance, the inability of tug assistance to "see over" the vessel being pushed into the bypass channel is a limiting factor.

B.2.96. For shallow draft navigation, a maximum length of 470 feet and a maximum beam width of 70 feet are necessary. This will accommodate up to a 4-barge (2-by-2) tow of barges each 35 feet by 195 feet with a tug length of 80 feet. The length restriction of approximately 470 feet is required because of the bypass channel entrance at Claiborne Avenue. A total length of 700 feet (See plate B-13) is available from the entrance to the bypass channel near the bridge pier at Claiborne Avenue to the

protection cells for the lock construction. The 700-foot space allows a 450-foot vessel with 150 feet forward of the vessel and 100 feet aft to clear the Claiborne Bridge pier and to reach the elevation (-)12 foot contour. In the 700-foot length, the vessel must decelerate to a stop (or near stop) to permit tug assistance to hook up and maneuver them into the bypass channel. We anticipate that smaller tows may be able to maneuver into the bypass channel without tug assistance, depending on the weather and condition factors listed above for deeper draft vessels.

B.2.97. In the vicinity of the Florida Avenue Bridge, a total length of 900-feet (See plate B-13) is available for maneuvering into and out of the bypass channel. Some utility pipeline work will be located between the end of the bypass channel and the Florida Avenue bridge. Utility and pipeline work will be sequenced to be constructed prior to opening the bypass channel to the extent practicable. Note also that the 900-foot length generally coincides with the opening to the existing turning basin, and thus tug assistance for vessels being pushed into the bypass channels must be done so as to minimize the effects on access to the turning basin.

BYPASS CHANNEL FOR OLD LOCK DEMOLITION (Demolition Phase (South) Bypass Channel)

B.2.98. To maintain navigation during the demolition process, navigation interests requested, and the Corps developed a separate "demolition phase bypass channel" between the Mississippi River and the north end of the existing lock as shown on plate B-50. The south bypass channel will be a one-way bypass, 12-foot depth (at low river), approximately 85' wide (see plate B-50) and will only be operated after the new lock is completed. The Corps has consulted with an expert in demolition to minimize the canal closure time required to demolish the existing lock.

B.2.99. The need for a "demolition" bypass channel was confirmed when the duration for demolishing the existing lock was estimated to exceed 4 to 6 months. The east side of the existing lock appeared to be the logical location as it was free of development outside of the Corps' reservation. Room existed within the template of the future "post-demolition" main channel to provide a 12 X 85 foot bypass channel during demolition. This would be adequate for one-way tow traffic, one barge wide.

B.2.100. Insufficient room exists on the east side to permit construction of the new bridge pier, concurrent with demolition bypass channel operation.

B.2.101. The demolition bypass channel will be open for approximately 18-24 months while the existing lock chamber is being demolished. Deep draft vessels must use an alternate route for the 18-24 month period. At this point in construction, river stages will be present in the demolition bypass channel. The average low river elevation is about 3 feet NGVD, thus a 15-foot depth occurs with an elev (-)12 bottom.

B.2.102. The demolition bypass channel will start about 450 feet from the existing lock in the Mississippi River forebay. The existing channel

transitions on a 1 on 4 slope into the bypass channel; the bypass channel transitions on a 1 on 1 slope back into the existing channel. Navigation buoys will guide operators.

CHANNEL DESIGN AND REPLACEMENT

Permanent Channel Alignment

B.2.103. The concept of the "North of Claiborne Avenue Site" initially included placing the new lock along the existing centerline of the Inner Harbor Navigation Canal (IHNC), the same alignment as the existing lock. However, the Port of New Orleans (Port) requested a 40-foot westward shift of the centerline at Florida Avenue to accommodate mooring limits north of Florida Avenue. Upon review, we decided that the shift could be incorporated into our design (see plates B-13 Thru B-15T). The new centerline was laid out using coordinates provided by the Port and field measurements through the existing lockwalls and bridge piers. The centerline segment north of the Florida Avenue Bridge was shifted parallel, 40 feet west. This segment was tied back into the southern segment at a point 5,000 feet to the south of Florida Avenue, approximately 1600 feet south from the proposed lock's entrance. Since the deflection angle calculated to approximately ½ of a degree, simple points of intersection were considered adequate in lieu of calculating curves.

Channel Dimensions

B.2.104. The depth of cut is (-)36 NGVD for the ship lock option, and (-)22 feet NGVD for the barge lock option, with channel bottom widths of 200 and 284 feet, respectively. These bottom widths provide the same top edge of cut for the respective options and provide safe two-way traffic for any vessels up to 17 feet in draft. The bottom width transitions to 180 feet at the St. Claude Bridge, 150 feet at the Claiborne Avenue bridge, and 110 feet at the new lock, for both options. At the Florida Avenue Bridge the bottom width narrows to 150 feet for the ship lock option, and to 234 feet for the barge lock option. Side slopes of 1 vertical on 3 horizontal were used.

B.2.105. The new centerline ties into a point 200 feet south of the existing Florida Avenue bridge. The centerline continues past Florida Avenue, along the 40-foot offset, parallel to the existing centerline, as shown on plates B-13, B-15N and B-15T. This centerline is aligned with the Port of New Orleans navigation fairway between the existing wharf facilities located north of Florida Avenue.

Channel Surveys and Quantities

B.2.106. Dredging quantity computations for this study were largely based on surveys taken in August 1992, from the south end of the existing lock to the Florida Avenue Bridge. Existing levee surveys from April 1992 were used for the forebay of the existing lock.

B.2.107. A digital terrain model was created from the surveys and quantities were run using InRoads software. Channel quantities vary only slightly for the 900 foot lock option to the 1200 foot lock option.

Dredging Activities Sequence and Disposal Areas

B.2.108. Sequencing of the dredging activities was developed with relocations impacts, construction of the new lock, and demolition of the existing lock in mind.

B.2.109. The first phase of dredging would occur in the area between the Claiborne and Florida Avenue bridges. A prerequisite to this work is completion of the site preparation contract which removes all existing facilities along the east bank and the southern portion of the Galvez Street Wharf along the west bank. First order of work would be to remove the channel material at the Claiborne and Florida Avenue Bridge utility relocation corridors. The material will be stockpiled in the immediate vicinity for backfilling of the two relocation trenches. The Contractor would then proceed with the north bypass channel allowing the relocations to take place. Concurrent with bypass dredging will be the excavation and proper disposal of approximately 26,000 CY of contaminated material. Once the north bypass channel is in operation, the contractor would be free to perform the excavation for the new lock without being hindered by marine traffic. The dredging will then continue in the main channel north of the new lock. The dredged material from the lock excavation, main channel north of the new lock, and top five feet of the north bypass channel will be pumped to the confined disposal area located on the south bank of the MRGO. The balance of the bypass channel excavation will be pumped to the Mitigation Site.

B.2.110. The second phase of dredging will be at the last remaining utility relocation corridor located just south of the St. Claude bridge. Material dredged from this area will be stockpiled in the immediate vicinity and used as backfill. Any excess would be disposed of in the Mississippi River, below the (-)50 foot contour.

B.2.111. The third phase of work will not occur until the new lock structure is complete, including the installation of the riverside tie-in levee. This phase of dredging concentrates on removing material between the Claiborne Avenue bridge and the demolition bypass channel. Some material adjacent to the existing lock, above elevation 2.0, will have already been removed and used for levee construction. At this phase, MRL flood protection will be completed. Also, the St. Claude bridge removal would have to be substantially complete so as not to obstruct the demolition bypass channel. Material dredged from the main channel south of the new lock and the south bypass shall be deposited behind the new lock as random backfill.

B.2.112. A fourth phase will occur from the St. Claude Bridge to the river. Approximately 55,000 CY of main channel dredged material will be deposited as random backfill at the new lock. The remaining main channel material and material dredged in the vicinity of the old lock site, after

demolition is complete, will be disposed of in the Mississippi River, below the (-)50 foot contour.

LEVEES AND FLOODWALLS

B.2.113. The Mississippi River flood protection levees and floodwalls for this plan must be extended from the existing lock downstream approximately 2500 feet on the east and west banks to tie into the new lock as shown on plates B-42 and B-43. The MRL design grade at this location is elevation 22.4 feet NGVD.

B.2.114. The existing hurricane protection floodwall cross-section on the east bank is a concrete-capped I-wall with top elevation 14.0 feet NGVD on the east bank. The west bank floodwall is a concrete T-wall with top elevation 15.0 feet NGVD. The existing hurricane protection floodwalls will serve as hurricane flood protection during project construction, but will have to be selectively demolished as required to construct the new MRL levee/floodwall to elevation 22.4 feet NGVD.

B.2.115. Construction plans and specifications will provide a contingency plan to close gaps in the flood protection due to construction of the new MRL levee floodwall. Also, scheduling the floodwall construction contracts during non-hurricane season will avoid problems with gaps in the flood protection. The new MRL floodwall design sections are:

B.2.116. A combined earth/concrete-capped I-wall section with backfill on both sides of the wall to elevation 18.0 NGVD as shown on plate B-43. Elevation 18.0 feet NGVD is approximately 0.5 feet above the MRL flowline at this location. The intent of the earth fill up to elevation 18.0 feet NGVD is to cause a marine vessel to run aground prior to reaching and damaging the floodwall. One levee reach on the east side will have a crown elevation 15.0 for soil stability. Further studies will address whether sufficient marine impact protection exists since the floodwalls are located behind, and thus are shielded by, permanent mooring facilities.

B.2.117. A combination earth/pile-supported T-wall section with earth backfill to elevation 18.0 feet NGVD floodside and elevation 9.0 feet NGVD landside. This cross-section will eliminate the need to relocate railroad tracks on the west side of the existing IHNC between St. Claude and Claiborne Avenues.

B.2.118. A concrete T-wall with top elevation 22.4 and backfill to natural ground elevation approximately 2.0 feet NGVD. This will be used under the existing bridge at Claiborne Avenue. Note that the existing (and to be reused) Claiborne Bridge east and west approaches present an overhead clearance restriction for pile driving at this location. Steel H-pile and sheet pile cutoff lengths must be driven within the available vertical clearance.

B.2.119. Existing MRL forebay levees will be maintained as an all-earth section and will be shaped where needed to a crown elevation 22.4 feet NGVD, with 1 vertical on 3 horizontal side slopes landside and floodside.

DEMOLITION OF EXISTING LOCK

General.

B.2.120. The existing lock will be demolished after the new lock is in place and in operation. Demolition requires a partial shutdown of the existing lock to navigation for the barge lock, and a complete, temporary shutdown of the existing lock for the ship lock. The disruption to navigation will be kept to the minimum possible time to complete demolition and debris removal. A shutdown time estimate and schedule is given below and in the construction sequence section of this report.

B.2.121. The bottom elevation of the existing lock chamber is about elevation (-)33.6 feet NGVD. Thus, for the barge lock (elevation (-)22 feet NGVD), only the concrete walls of the existing lock (including machinery, miter gates, etc.) will be removed. The ship lock (elevation (-)36 feet NGVD) will require removal of the concrete base slab of the existing lock, which is 9-12 feet thick.

Demolition Plan

B.2.122. After the replacement lock and tie-in levees are in place and the pool is raised, the existing lock will be demolished as shown on plate B-49. The existing lock must be removed in its entirety for completion of the 200-foot bottom width replacement channel to full width. The demolition phase bypass channel depth of (-)12 feet is contained in the (-)36 foot final channel cross-section for the ship lock and within the (-)22 foot cross-section for the barge lock as shown on plate B-50.

B.2.123. A demolition expert was consulted to find the best demolition method for the existing lock. Methods were considered to demolish the lock using: 1) conventional (non-explosive) demolition methods, and, 2) explosive methods or 3) a combination. Also, the demolition was considered as either "in the wet" or "in the dry". Site preparation costs were determined to cofferdam and dewater the lock, as well as the estimated cost of downtime to navigation. Debris removal costs were also developed. Duration of demolition was developed for wet and dry plans.

Comparison of "In the Dry" and "In the Wet" Demolition Plans

B.2.124. In the Dry" Plan - This requires cofferdamming and dewatering of the entire existing lock structure for demolition in dry conditions. This speeds demolition operations since lock features are visually accessible and construction equipment can work at a higher production rate. Debris removal will be by truck to barge loading areas outside the cofferdam. Navigation must be shut down for the duration of debris removal operations, plus any cofferdam installation and removal time. No navigation bypass channel is provided, thus alternate routes such as

Baptiste Collette must be used for navigation. To provide a bypass channel in this option would require major degrading of an MRL mainline levee, thus no bypass channel is practical.

B.2.125. "In the Wet" Plan - No cofferdam or dewatering system is required; all demolition operations are done in wet conditions. Demolition operations are slower than "in the dry" due to drilling of holes in locations not visually accessible and thus the production rate is lower. Debris removal will be by barging to a suitable disposal site. Heavier construction equipment is required for debris removal since pieces may be larger and less accessible. Diver operations will be needed for many features.

B.2.126. A one-way, approximately 85-foot wide bypass channel to elevation (-)12 NGVD (shallow draft only) will be constructed to allow navigation to continue during most of demolition operations. Navigation is stopped only for a matter of hours during actual detonation. Demolition in segments would proceed probably from the (south) river end.

B.2.127. The demolition expert, DYKON, Inc. of Tulsa, OK, recommended an "in the wet" demolition method because it was less costly overall. The following chart is a comparison of the methods:

Description	"In the Dry" ($ million)	"In the Wet" ($ million)
Demolition Costs	5.0	12.5
Other Costs to Facilitate Demolition/Navigation:		
Demolition Bypass Channel	0.0	1.0
Dewatering & Cofferdamming	10.0	0.0
Navigation Losses (Months x $M/Month)	33.0 (6 x 5.5)	22.5 (18 x 1.25)
Total Demolition Cost	48.0	36.0

DEMOLITION SCHEDULE IN MONTHS

	"In the Wet"	"In the Dry"
Site Preparation for Demolition	9	1
St. Claude Bridge Removal	6	6
Actual Demolition Duration	6	18
Total Duration for Demolition	15	24

Summary - Existing Lock Demolition Plan

B.2.128. The "In the Dry" plan offers the lower cost for lock demolition alone. But the additional cost of dewatering and cofferdamming the old lock as well as a greater financial loss to navigation due to rerouting makes this the more costly alternative. The "In the Wet" plan will take longer to complete, however, the bypass channel called for by this plan will allow the IHNC to remain open during demolition except for the periods of actual detonation. Thus, the "In the Wet" plan is recommended.

B.2.129. DYKON recommends demolition by a combination of explosive and conventional (non-explosive) methods. The above-ground portion of the lock will be demolished using conventional methods such as a hoe-ram and/or wrecking ball. The underwater portion will be demolished with explosives. Debris removal will be using heavy crane equipment to handle the larger pieces of an "In the Wet" operation.

EXISTING ST. CLAUDE AVENUE BRIDGE DEMOLITION PLAN

B.2.130. The St. Claude bridge demolition will be done prior to demolition of the lock concrete as shown on plate B-51. Bridge demolition will be done after completion of the replacement lock and raising of the pool. Navigation traffic will continue to pass through the existing lock as it will be used as a "pass-through" lock only (no lockages or head differential). The demolition bypass channel will be constructed on the east side of the existing lock. The east side bridge pier and retaining walls within the limits of the demolition bypass channel must be demolished. The demolition bypass channel will be dredged to elev. (-) 12, which requires only partial removal of the east side bridge pier (plate B-51).

B.2.131. The length of CLOSURE of the canal to navigation during removal of the St. Claude Bridge will be minimal. Demolition of the steel superstructure will be limited to the minimum time required by the contractor to take down the bridge. Bridge demolition equipment shall work without occupying the lock chamber. The canal will be closed only when safety hazards exist to navigation. This is expected to be only a few hours per day, during actual debris removal operations, within a 30-day time frame for the steel superstructure. Concrete masonry removal and earth excavation down to the cantilever slab (approx. elev. (-) 20, top of slab) will require an estimated 30 additional days during which navigation will be impeded only minutes per day (work is underwater) for actual safety hazards during debris removal operations.

B.2.132. Navigation will use the existing lock chamber while the St. Claude Bridge foundation is being excavated and masonry removed. On the east side bridge pier, only 20 feet of the cantilever slab, and the two easternmost columns need to be removed prior to opening the demolition bypass channel. The southeast and northeast wingwalls forming the present bridge approaches of the St. Claude bridge must be demolished within 220 feet of the canal centerline to accommodate the demolition bypass

channel. After the entire lock is demolished, and navigation returned to the main channel, the remaining piece of the cantilever can be removed.

LOCK GUIDEWALLS AND PROTECTION CELLS

B.2.133. Fixed timber guidewalls are provided on the lakeside as shown on plates B-44 thru B-46. The lakeside eastern guidewalls will extend 800 feet and 645 feet for the ship and barge locks respectively. Placing the guidewall on the east side avoids obstructing entrance into the turning basin south of Florida Avenue. The riverside (south) guidewall is also located on the east side. The ship lock guidewall is 1200 feet long; the barge lock guidewall is 645 feet. If selected, post-feasibility studies will consider the need for extending the barge lock south guidewall through the existing Claiborne Avenue Bridge for navigation. Navigation interests will be consulted to see if the guidewall is acceptable for safe navigation into the replacement lock.

B.2.134. The riverside (south) guidewalls were designed as floating guidewalls (See plates B-44 [ship lock] and B-45 [barge lock]) for feasibility cost estimates. This will be reviewed in post-feasibility studies to see if a more cost effective alternative exists, such as fixed guidewalls. Sheet piling cells will be used at the ends of the fixed timber guidewalls, ends of guardwalls, at the south end of the bypass channel, and outside the lock construction area.

CONSTRUCTION SEQUENCE - LOCK

B.2.135. The detailed construction sequence and bar chart will be furnished in the Project Management Plan (PMP). See also paragraphs B.2.33 to B.2.77, for additional details of the lock construction sequence.

REPLACEMENT OF ST. CLAUDE AND CLAIBORNE AVENUE BRIDGE CROSSINGS

General

B.2.136. Three existing movable bridges are located on the Inner Harbor Navigation Canal between the Mississippi River and the Mississippi River Gulf Outlet: Florida Avenue (northernmost), Claiborne Avenue (LA Route 39), and St. Claude Avenue (LA Route 46)(southernmost).

B.2.137. The Florida Avenue bridge is not included in the Corps IHNC lock replacement project. This bridge is operated and maintained by the Port of New Orleans. The existing Florida Avenue bridge is a single leaf bascule with two vehicular lanes (one eastbound, one westbound) and two railroad lines. The status of the bridge is described in paras. B.2.78 to B.2.80.

St. Claude Bridge Replacement

B.2.138. The existing St. Claude Bridge will be demolished and replaced with a low-level, double bascule bridge with a 200-foot clear horizontal span as shown on plates B-61 thru B-63. The replacement bridge is intended to give priority to navigation traffic (no curfews); vehicular traffic is intended to remain about status quo (post-construction). The bridge will have an unlimited vertical clearance within the 200-foot clear span.

B.2.139. The bridge will be replaced to meet the United States Coast Guard requirements. The Coast Guard agreed to permit a 200-foot clear span at this location in view of its acceptance by the deep draft industry, the LDOTD and the Port of New Orleans. Limiting channel widths in the permanent mooring area between St. Claude and Claiborne Avenues (planned after lock demolition) make 200 feet a reasonable maximum width, even in view of the 300-foot horizontal clearance being used at the Florida Avenue replacement bridges.

B.2.140. The bridge design concept involves constructing the replacement bridge along the same alinement as the existing bridge. Also, it includes partial reuse of the existing bridge approach ramps. Design criteria for low steel is a minimum elevation 22.4 feet NGVD, which will provide five feet of vertical clearance in the closed position. The vertical clearance is above maximum high water elev. 17.4 feet NGVD in the Mississippi River.

B.2.141. The bridge approaches must conform to LDOTD "UA-1" design standards (for urban arterials). The overall width of approach ramps will be kept within the existing structure to prevent encroachment into the residential area. The replacement approach ramps are four-lane divided roadway, that matches the existing cross-section and avoids roadway transitions. Shoulders are provided although they are not required. Two 12-foot travel lanes are provided in each direction, with a four-foot outside shoulder in each direction. A Jersey barrier divides the seven-foot wide median, for a total roadway width of 63'-0". This matches the existing roadway width (See plate B-63).

B.2.142. Construction of the bridge will require an estimated 18 months. Traffic will be detoured to Claiborne and Florida Avenues. A temporary bridge would be impractical because of marine traffic. The existing bridge will have to be demolished in a sequenced construction. Combined demolition and removal operations, in conjunction with the demolition phase (south) bypass channel, will result in an estimated 24-27 month shutdown of the bridge. See DETOUR ROUTES for details.

B.2.143. The replacement is designed for a design life of 50 years. Since the bridge is estimated to be opened 12 times per day, design will consider fatigue stresses caused by stress reversals. The steel thickness will be increased to allow for corrosion, and vibrations will be dampened to limit their effect on the structure. The main damage exposure to the bridge is by collision. Fender systems and protection cells will be installed to minimize collision risk.

B.2.144. The plan and profile of the main bascule bridge and approaches are shown on plate B-61. A 4.0% grade is used to reach the crown of the bridge (at the canal centerline) at elev. 39.0. Five percent is the limiting grade commonly used by LDOTD for bridge approaches. This grade accommodates the 23-foot vertical clearance required over the New Orleans Public Belt Railroad tracks on the west side of the canal. It also provides symmetry for the overall structure, and avoids a change in grade within the length of the approaches. The resulting project is 892 feet long on each side of the centerline, with 679 feet of open structure on the east side with 213 feet of revised retaining wall approach roadway, and 684 feet of open structure on the west side with 208 feet of revised retaining wall approach roadway.

B.2.145. Mitigation measures will be required to avoid undesirable social impacts to the adjacent neighborhoods in the underbridge structure on the east and west sides of the canal. Some type of recreational or community development facilities must be included to prevent this area from becoming an eye sore and collector for debris, abandoned cars and other detractors to the neighborhood.

B.2.146. Note also that some visual impacts will result from the higher roadway surface above the existing bridge. The crown elevation is 39.0, which is about 17.5 feet above the existing roadway. This is about the lowest bridge deck possible to provide five feet clearance of low steel above the maximum high water elevation 17.4 feet NGVD, and to avoid changing to a vertical lift type bridge with undesirable towers. Residences on the east side of the canal begin 400 feet from the canal centerline. The new bridge profile at that point is about ten feet higher than the existing profile, but tapers to zero in one city block. Residences on the west side begin about 500 feet from the canal centerline, where the new bridge profile is seven feet higher than the existing profile, but tapers to zero in less than one city block. Some mitigation is advisable for the affected residences.

B.2.147. The open approaches consist of a concrete deck supported by Type IV precast, prestressed concrete girders spanning approx. 86 feet. The girders are supported on two-column concrete bents on 14-inch square precast, prestressed pile foundations.

B.2.148. The bascule will be constructed of composite welded plate girders combining high strength steel with structural grade steel. The bridge deck will be open steel grating deck to minimize the weight of the bridge leaves.

B.2.149. The trunnion type bascules will take about 90 seconds to fully open or close. Four leaves (See plate B-62) are used (in lieu of two) to facilitate smaller movable spans and quicker openings. The adjacent spans on either side of the main span will be welded plate girders with stringers supporting a concrete deck. Steel is required in these sections to facilitate counterweight clearance. These spans will provide clearance for the planned MRL levee/floodwall at this location. It is recommended that the floodwall sheet piling be driven prior to bridge construction so that overhead clearance is not restricted.

B.2.150. The bridge pier is designed with a "pit" to permit tailswing of the counterweight. The bridge pier foundation is designed to have no net tension in the piles. HP 14x89 piles 5'-8" on centers in one direction and approx. 9-foot centers in the other direction are used in a 48-foot by 83-foot base foundation pile cap. The top of the concrete cap is at elevation (-)36 feet NGVD for the ship lock, and will be raised to elev (-)22 for the barge lock. Each pier will be constructed in a cofferdam. The east bridge pier must be constructed in accordance with the construction sequence for the south bypass channel to avoid impacts to navigation.

B.2.151. The main span will cost an estimated $19,900,000, including operating machinery, movable traffic barriers, power plant and the operator's house. The overall cost of the replacement bridge is $25,300,000. This cost has a 25% contingency factor and is based on February 1993 price levels.

Claiborne Avenue Bridge Superstructure Replacement and Pier Retrofit

B.2.152. The Claiborne Avenue bridge superstructure will be replaced and the existing bridge piers retrofitted and reused as shown on plates B-64 thru B-66. The replacement bridge is the same type as the existing bridge type--a mid-level, vertical lift span bridge. The Claiborne bridge superstructure will be replaced with higher towers and a new movable span. New mechanical and electrical equipment will be installed.

B.2.153. Previous discussions with the LDOTD have ruled out the possibility of raising the existing superstructure and towers. This is because the increased high water levels from exposure to river stages make bridge openings more frequent. Since the structure is over 35 years old (constructed 1955-1958), the more frequent openings would place a greater demand on aged components and quickly reduce any remaining service life.

B.2.154. The existing Claiborne Avenue Bridge carries LA Route 39 over the Inner Harbor Navigation Canal. The main vertical lift span provides a four-lane roadway (without shoulders) divided by a median barrier, with a 26'-0" clear roadway on either side, and a total width of 59-3" inside-to-inside of handrails (See plate B-65). The 360'-0" lift span results in a navigation channel horizontal clearance of 305 feet (145 feet west and 160 feet east of the existing lock centerline).

B.2.155. The existing Claiborne Avenue bridge has a nominal clearance of 40 feet above average high water elevation 5.0 NGVD (lakeside). The extension of MRL levees into the new lock will increase the average high water from elevation 5 feet NGVD to a maximum elevation 17.4 feet NGVD. The replacement bridge will have a minimum clearance of low steel at extreme highwater of 27.6 feet in the closed position, and 156 feet (per Coast Guard regulations) in the open position. The acceptability of a low steel clearance in the closed position must be agreed to by consensus of Corps, state and other interested parties. The decision will consider the number of bridge openings, vessel height ranges per bridge tender records, economics and other data for anticipated marine traffic. The Corps proposes to maintain the existing finish roadway grade in the closed

position. LDOTD has proposed a comprehensive study of all three IHNC bridges (St. Claude, Claiborne and Florida Avenues) including possibly raising the finish grade (roadway surface) elevation at Claiborne Avenue. This will be addressed further in post-feasibility studies and in coordination with the Regional Planning Commission and other interested agencies.

B.2.156. The replacement superstructure and pier and foundation retrofit were designed in accordance with the AASHTO Standard Specifications for Movable Highway bridges (See plate B-66). The bridge is designed for the greater of HS20-44 or Alternate Military Loading. A wind load based on a maximum wind speed of 120-mph is applied to the structure. This was proportioned from the AASHTO maximum of 100 mph. The structure was designed for seismic category A. The truss design is based on the AASHTO Guide Specifications for Strength of Truss Bridges.

B.2.157. The replacement main lift span provides 28'-0" clear roadway width (2-12'-0" lanes and a 4'-0" outside shoulder) in each direction separated by a 2'-0" median barrier. Outside barrier rails are 1'-5" each, resulting in an out-to-out bridge width of 60'-10".

B.2.158. The superstructure consists of a vertical lift span with new towers and a retrofitted pile foundation on the existing pier (plates B-64 and B-65). The movable span is a parallel chord Warren Truss, with no vertical members, spanning 360 feet. The distance between centerlines of the trusses is 68 feet and the truss depth is constant at 32 feet. The truss chords and diagonals are simple box sections with simple H-sections as bracing. The floor system is an open steel grid floor with 5" open grating supported on rolled stringers 9'-10" on center. The floor beams are welded plate girders four feet deep spanning 66 feet between trusses. Low steel elevation is approximately 46.0 feet NGVD resulting in a 28.6 feet vertical clearance above elevation 17.4 feet NGVD. The centerlines of the new tower columns will be placed in the location of the existing tower centerlines so no modifications to the substructure will be required. The new towers will be approximately 14 feet higher than the existing towers to accommodate the greater vertical clearance that is required.

B.2.159. The tower machinery consists of an individual drive assembly located in a machinery room atop each lift tower. Steel counterweight ropes attach to the main trusses of the lift span at each corner. The ropes pass over grooved counterweight sheaves at the lift span side of each tower. Each rope is anchored into the counterweight.

B.2.160. The bridge substructure and piers are founded on untreated timber pile groups spaced 3 feet on centers. Piles are either vertical or on a very slight batter of 1/2 to 1-1/2 on 12. The piles are designed to elevation (-)90 feet NGVD. This corresponds to pile lengths of 55 feet at pier one and 50 feet at pier 2. No actual pile length data of the in-place, driven piles is available, nor any pile driving records. Pile load data on the bridge drawings indicates pile loads of 16-18 tons per pile, but no actual load capacity is available. Some construction test

pile data is available but is of limited value in determining current load capacities. Thus, it is difficult to determine the adequacy of the in-place foundation which must be certified for another 50 years of future life. Both vertical and lateral load capacity are required and a comprehensive inspection, sampling and testing program would be needed if the present piers and foundation are reused without a retrofit.
Feasibility level cost studies are based on a full foundation retrofit with new piling driven outside of, and a prestressed, post-tensioned concrete pier mated to the existing pier.

B.2.161. The retrofitted pier will consist of 30-inch diameter steel pipe piles located about 5-1/2 feet on centers in each direction (plate B-66). The number of piles will be determined based on ship impact and other design loadings. Post-tensioning ducts approximately 5 feet on centers in each direction are used to secure the retrofit to the existing pier in a rectangular collar. The collar extends about 25 feet outside the existing pier on four sides. The retrofitted footing will carry the existing loads as well as any additional loads from the replacement superstructure.

B.2.162. The construction sequence assumes the existing truss will need to be removed prior to driving new piles for the foundation retrofit. This results in a vehicular outage of approximately FIFTEEN MONTHS. It is recommended that the bridge be closed to traffic prior to driving new piles. The pile driving operations may disturb the existing soils and may cause shifting or settling of the existing foundation. This may prevent the lift span from operating correctly. During this time, marine traffic will have free access to the channel. Construction activity will be concentrated around the piers which are clear of the shipping channel.

B.2.163. During erection of the truss, construction vessels may periodically block the channel, but their activity can be scheduled around peak marine use. Prefabrication of truss elements will reduce the amount of time required to erect the superstructure. The truss will be erected in the "up" position so as not to restrict navigation.

B.2.164. The new foundation will cost an estimated $5,312,000, the superstructure including towers is estimated at $6,982,000. The overall cost of the retrofit, including new mechanical and electrical components is $18,220,000. This cost has a 33% contingency factor and is based on February 1993 price levels. The contingency factor was increased due to the uncertainty of the existing structure condition.

MECHANICAL DESIGN

General

B.2.165. The machinery and mechanical systems presented here and on the plates are preliminary and forms the bases for estimating the cost of the mechanical equipment and systems for a replacement ship lock and barge lock near the present site of the existing IHNC Ship Lock.

Miter Gate Machinery

B.2.166. The miter gate machinery consist of the Modified Ohio River linkage mechanism driven by an hydraulic cylinder. The Modified Ohio River linkage is characterized by a 0 degree angularity between the strut and sector arm with the gate mitered and something other than 0 degree angularity when the gate is in the recessed position. Linkage and drive machinery sizes for both locks are shown on plate B-53. Two load cases were considered, normal operating loads based on Waterways Experiment Station Technical Report No. 2-651 dated June 1964, titled Operating Forces On Miter-Type Lock Gates and temporal hydraulic loads as per ETL 1110-2-223, dated 30 June 1977, titled Navigation Lock Sill Depths And Hydraulic Loads On Gates as shown on plate B-54.

Tainter Valves

B.2.167. The tainter valves operating machinery consist of a cylinder driving a bell crank with a strut connecting the bell crank to the valve. Details of the machinery considered in preparing the cost estimates are shown on plates B-55N & B-55T. The machinery loads are based on the estimate weight of the valve plus 10% for contingencies and the load resulting from the hydraulic cylinder and system with the tainter valve jammed.

Hydraulic System

B.2.168. The hydraulic system consist of two identical hydraulic power units, 3" supply and return line on each side of the lock and hydraulic control valves at each gate and valve cylinder and at each lowering carriage machine. The hydraulic power units will consist of a multiple speed hydraulic pump with a minimum rating of 85 GPM at 2,000 psi driven by a single speed electric motor rated for 125 horsepower. Normally one pump will power the gates and valves on the west side of the lock and the other pump will power gates and valves on the east side of the lock. The pumps will have a cross over valves so that either pump can be used to operate both sides of the lock. Pressure piping of 3" in diameter will be Sch 160 Grade B and return line piping Sch 40 Grade B. Pipe fittings will be socket welded. Special cleaning requirements for the piping was estimated and included in the cost of the hydraulic piping. Plate B-52 shows a schematic drawing of the basic lock hydraulic system.

Compressed Air System

B.2.169. The compressed air system consist of a single 400 SCFM, 125 psi compressor driven by a 100 horsepower motor, a 300 gallon receiver, 3" Sch 40 supply air line on one side of the lock and bubblers on the direct head miter gates.

Washdown Pump System

B.2.170. The washdown pump system consist of two 15 Hp, 100 GPM at 100 psi turbine pumps, 14 hose stations, each with 100' of 1.5" diameter hose and an adjustable fire nozzle. Each side of the lock will have its own

pump and 7 hose stations. The water washdown system design will be in accordance with EM 1110-2-2608 dated 30 March 1962.

Sump Pumps

B.2.171. Sump pumps piping and float controls will be required for the cross over gallery. It is anticipated that two pumps will be required, each 7-1/2 hp and rated for 50 GPM at a 125' head. The sump pumps will be the submersible type and located in a common sump at one end of the gallery.

Bulkhead Crane

B.2.172. The bulkhead crane considered for the lock will be either a diesel powered stiff leg derrick or pedestal type crane with a capacity of 175 tons at an operating radius of 85'.

Lowering Carriage Machinery

B.2.173. The lowering carriage machinery for the bulkhead will have to have a capacity of 250 tons per side for the barge lock per side and 350 tons per side for the ship lock. The lowering carriage machinery will be powered by the lock's hydraulic system.

ELECTRICAL DESIGN

General

B.2.174. This section presents the a preliminary design of the electrical system for the lock and appurtenant facilities. The purpose of this design is for general material and cost estimation. Final design may vary from this preliminary design. The electrical system will comply with appropriate provisions of the current National Electrical Code. The electrical system includes the power supply, power distribution system, control system, closed circuit TV, lock and control house lighting, signal and communication system, grounding system, and cathodic protection system described generally herein. A one-line electrical diagram is shown on plates B-56.

Power Supply

B.2.175. Normal Supply. Commercial power will be used for normal operations. Power will be supplied by New Orleans Public Service Incorporated (NOPSI). The power company will connect to a transformer pad located on the lock property. Service to the equipment building will be at 480 volts, 3-phase, 60-Hz.

B.2.176. Emergency Supply. A diesel engine driven generating unit will be installed in the equipment building on the reservation area to provide emergency power for lock operation. The unit will be of sufficient capacity to operate the lock machinery and to supply necessary power for the equipment building, control houses, and the lock lighting. The

generator is estimated to be rated at 300 Kw, 0.8 power factor, 480 volts, 3-phase, 60-Hz. Fuel supply for the engine generator will be sufficient for 5 days of continuous operation.

Power Distribution System

B.2.177. General. Power will be supplied to the main distribution switchboard in the equipment building through cable placed in conduit encased in concrete from the main service transformer or from the engine generator. Power for the operation of the lock machinery, lighting, and auxiliary equipment will be distributed from the main switchboard to the motor control center in the equipment building.

B.2.178. Motor Control Center. he motor control center will include emergency generator service switch, normal service switch, automatic transfer switch and control panel, control house feeders, programmable logic controller cabinet, panelboards, transformers, starters, motor circuit protectors, contactors, circuit breakers, and control accessories.

B.2.179. Electrical Cable. Minimum wire size will be #12 AWG for power and lighting, #10 AWG for current transformer secondary circuits, #12 AWG for potential transformer, relaying, and control circuits; #16 for annunciator, video and RTD circuits and #19 AWG for alarm and detection circuits. Insulation, generally, will be XLPE or EPR.

Control Systems

B.2.180. There will be two full control consoles, capable of operating all gates, valves, cameras etc, and two local control consoles with limited controls. All control consoles will be constructed of 14 gage, cold rolled, smooth, select steel sheets assembled on a rigid steel framework. Control consoles will be designed for indoor use and be freestanding.

B.2.181. Lock Operation. The lock machinery will be controlled from two main control consoles each located in the two larger control houses at both ends on the west lock wall and from two local control consoles located at both ends on the east lock wall.

Closed Circuit Television System

B.2.182. A closed circuit television system consisting of two cameras operable under low and high light levels and two monitors. Both cameras will be equipped with pan, tilt, zoom, and focus controls. Both units will be self contained and sealed, environmental resistant TV cameras, and will be operated from the main control console in the control houses. Both monitors will be installed in the main control houses on the west side and will be equipped with controls for their respective camera.

Lock Lighting System

B.2.183. High Mast Lighting. High mast lighting will consist of the pole, cable keeper with power cable, supporting ring with luminaries,

lowering system, power disconnect switch, 3 phase, 3 wire lightning arrester and air terminal.

B.2.184. Floating Mooring Bitt Lights. Marine light fixtures, 120V, 150 W HPS.

B.2.185. Navigation Guard Lights. Double fixture obstruction lights with traffic signal rated bulbs, and Fresnel lenses.

B.2.186. Control House Lighting. Control house lighting will consist of fluorescent fixtures controlled by wall-mounted light switches. Emergency and exit lights consisting of self-contained battery charger units with sealed beam lights will be provided at strategic locations in the control houses.

Signal and Communication System

B.2.187. Navigation Signal and Traffic Lights. Navigation signal lights will be provided on the east side of the lock at each end of the lock chamber. Navigation signal lights will be photo-controlled, gate position dependent, with Fresnel fixtures and mounted on 25 foot tapered aluminum poles.

B.2.188. Loudspeaker System. The loudspeaker system will consist of four loudspeaker trumpets. Microphones and the necessary pre-amplifiers and amplifiers will be provided.

B.2.189. Horn Signals. Air horns will be installed on both lock ends and will be connected to the lock compressed air system.

B.2.190. Radio Equipment. Radio equipment for communication with land stations and with boats will be provided.

B.2.191. Sound Powered Telephone System. A sound-powered-common-talking selective-ringing telephone system with five stations will be provided. One station will be located in the Administration Bldg., Equipment Bldg., and one in each of the control houses.

B.2.192. Telephone System. Conduits will be provided in the Administration building for future telephone service. Conduit will also be provided for underground telephone service entrance to the lock.

Grounding System

B.2.193. A grounding system will be provided to which all steel conduit and electrical equipment will be connected. Ground rods will be driven under the base slab of the lock. The grounding system will be specified to have a ground resistance of 30 ohms or less.

Corrosion Mitigation System

B.2.194. Corrosion mitigation of the lock miter gates and tainter valves, will be accomplished by means of paint system supplemented by a cathodic protection system.

DETOUR ROUTES

B.2.195. Traffic on St. Claude and Claiborne Avenues alternately will be closed and traffic rerouted to the replacement bridge at Florida Avenue and either remaining open bridge. The bridges will be tied into commuter routes in Orleans Parish and St. Bernard Parish.

B.2.196. During feasibility, the Corps coordinated with the Regional Planning Commission (RPC), which is an umbrella planning agency for four parishes: Orleans, Jefferson, St. Bernard and St. Tammany. The RPC has a 21-member commission with five representatives from each parish and an LDOTD representative. The members include a variety of backgrounds including elected officials, business and economic development interests, transportation planners and engineers, among others. RPC serves as the Metropolitan Planning Officer (MPO) for federal and state transportation funds.

B.2.197. RPC maintains a transportation computer model that includes the project area for the lock replacement. The model considers data on population volume and density, location of major employers, income levels, school enrollment and similar items affecting traffic patterns and volumes. The model subdivides the project area into units and sub-units to develop trip origins and destinations and their effects on traffic patterns and volumes. The 1990 U.S. Census records were recently added to the model database. The model can predict general patterns in traffic volumes and volume shifts that will occur during bridge closures at St. Claude or Claiborne Avenues during lock replacement. This data will be used to develop suitable detour routes.

COST ESTIMATES

B.2.198. Project cost estimates are shown in Section 4.

RIGHTS OF WAY

B.2.199. The rights of way for the lock North of Claiborne Avenue site are shown on plates B-57 thru B-59.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

SECTION 3 - FOUNDATIONS AND GEOLOGY

PART 1

LOCK AND FLOOD PROTECTION

FOUNDATIONS INVESTIGATION

GENERAL

B.3.1. This report addresses design assumptions and parameters for a new canal lock and associated Mississippi River levee protection. Initial construction will require a bypass channel next to the existing IHNC lock and pipeline relocation at possibly three sites along the channel. After relocation of the pipelines is complete, permanent flood protection can be built. Flood protection will basically follow the present line of levee protection and tie into the first module of the new lock.

B.3.2. The new lock will be pile founded. Excavation of the lock site will be done in the wet down to approximate elev. -61.0 N.G.V.D. Steel pipe piles (48-inch dia.) will be driven for the lock foundation, a grout stabilization slab poured onto which the lock modules will be positioned. Once all the lock modules are in position, sand backfill will be placed against the lock walls. Lock settlement will be discussed in later paragraphs.

FIELD EXPLORATION AND LABORATORY INVESTIGATION

Soil Borings

B.3.3. A total of twenty-four soil borings (18 undisturbed and 6 general type) were used in the foundation analyses for the lock, flood protection and channels. Logs of these borings are presented on plates B-67 thru B-85B. Boring locations are shown on the general plan presented on plates B-13, B-14 and B-15. All borings were made by the rotary drilling method. General samples were taken with a 1-7/8-inch ID core barrel sampler and a 1-3/8-inch ID (2-inch O.D.) split spoon utilizing a 140 pound hammer with a 30-inch drop. Undisturbed samples were taken with a 5-inch diameter steel tube piston-type sampler.

B.3.4. Soils Design Reach I, which encompassed all work riverward of the Claiborne Bridge, was based on 15 undisturbed and 6 general type borings taken between Jun 68 and Sep 83. These borings are located along the Industrial Canal corridor between the Mississippi river and midway between the St. Claude and Claiborne Bridges.

B.3.5. Soils Design Reach II was based on the three undisturbed borings (NC-1U, NC-2U and NC-3U) taken in the channel during May of 1992 through

the foot print of the new lock. The first two (NC-1U and NC-2U) were bored to approximately 215 feet of depth while NC-3U was taken to 40 feet of depth.

Laboratory Tests

B.3.6. General. Visual classifications were made on all boring samples. Water content determinations were performed on all cohesive samples. Standard Penetration Resistance blow counts were recorded when sampling in granular strata. Unconfined compression (UC) shear tests and grain size analyses were made on selected samples of cohesive and granular soils, respectively. Unconsolidated-undrained (Q), consolidated-undrained (R) triaxial compression shear tests and consolidation (C) tests were performed on selected undisturbed samples and included Atterberg limits.

Shear Strength Tests

B.3.7. Unconfined Compression Tests. Unconfined compression (UC) tests were performed on representative specimens of cohesive soil from both undisturbed and undisturbed borings. UC test data is presented on the boring logs and shear strength plates.

B.3.8. Triaxial Tests. Unconsolidated-undrained (Q) triaxial tests, consolidated-undrained (R) triaxial test with pore pressure measurements and consolidated-drained (S) triaxial test were performed on selected undisturbed samples. Triaxial test data is presented on the undisturbed boring logs and shear strength plates.

B.3.9. Consolidation Tests. Consolidation (C) tests were obtained on selected samples and used to predict settlement of the new lock. The pressure-void ratio curves for the C-tests are presented in Annex 3. Values for the preconsolidation pressure, pc, were determined graphically as presented in NAVFAC DM-7.1 (MAY 92). It should be noted that before dredging of the channel for the present lock, natural ground was approximately elev. 2.0. In lieu of presenting consolidation test-time curves, values of the coefficient of consolidation, Cv, was determined by the logarithm of time method as presented in "Foundation Analysis and Design" by Bowles. The values for Cv can be found on the e-log p curves presented in Annex 3.

Design Parameters

B.3.10. Shear strength and wet density test results versus elevation for Design Reach I are plotted on plates B-86 and B-87. Reach I has a strength line for both the channel and the existing protection. The shear strength plots reflect the results of all UC tests, Q-tests and R-tests available from boring samples tested.

B.3.11. Reach II design parameters (shown on plate B-88) were derived from two sources of information, the "Lake Pontchartrain, LA & Vicinity, Chalmette Area Plan -DM #3, General Design" and the borings taken in the footprint of the lock. Parameters for the upper strata were derived from borings taken in connection with from the "Lake Pontchartrain, LA &

Vicinity, Chalmette Area Plan - DM #3, General Design", while a composite of the footprint borings was employed for data below the channel bottom. Based on the facts that the Chalmette Area Plan starts just north of the Florida Ave. Bridge and that shear strength decreases as the distance from the river increases the use the upper strata parameters from this project is a conservative approach to analyzing the lock. Pleistocene deposits were assumed below elev. -65. The pleistocene parameters are derived from borings NC-1U, NC-2U, NC-3U, and deep boring 4-IU (see plates B-78 thru B-85).

EXISTING FACILITIES

B.3.12. The flood protection levees cross three (3) pipeline locations. The three pipeline corridors are adjacent to existing bridges, St. Claude (MRL sta. 619+22), Claiborne (B/L sta. 29+00) and Florida Ave. (B/L sta. 67+35). The relocated pipelines will be buried 10 feet below the bottom of the channel.

DESIGN REACHES

B.3.13. The job was divided into two design reaches based on boring data. The reaches are as follows:

Reach I - Mississippi River to Lock B/L Sta. 12+55

Reach II - Lock B/L Sta. 12+55 to Florida Ave. Bridge

SOIL CONDITIONS

B.3.14. Soil conditions in the vicinity of this project consist of the following:

a. Natural ground to approx. elev. -32.0 - natural levee deposits underlain by marsh and intradelta deposits. These deposits consist of very soft to medium clays and some silt lenses.

b. Elev. -32.0 to approx. elev. -70.0 - Interdistributary deposits underlain by prodelta deposits consisting of very soft to stiff clays, silt lenses and sand layers near the bottom.

c. Elev. -70.0 to approx. elev. -350.0 - Pleistocene deposits consisting of clays (stiff to very stiff), silts and sands.

STABILITY OF LEVEES

B.3.15. Using cross-sections representative of existing conditions along the proposed alignment, the slopes and berm distances for the proposed levee were designed for the (Q) construction case. The stability analyses are presented as plates B-89 thru B-95. A "Factor of Safety" (F.S.) of

1.3 is required for the levee stability. The pipeline crossing excavation trenches were also designed for a F.S. of 1.3.

B.3.16. A riverside flowline of elev. 17.6 and a low water elev. of -2.0 was used for design and analysis. Lake side flood elevations are 16.3 (Hurricane level) and 14.3 (SWL). All elevations used are N.G.V.D.

STRUCTURE EXCAVATION

B.3.17. The excavation requires deepening and reshaping the existing channel bottom with a hydraulic dredge. Since the excavation is in the existing channel and the structure will be in place prior to relocation of any flood protection, stability analysis addressing failure into the excavation are not presented.

CANTILEVER I-WALL

B.3.18. I-wall stability and required penetration were determined by the "Method of Planes". A "Factor of Safety" was applied to the soil parameters. For the friction angle, the F.S. was applied as follows:

$$\phi_d = \tan^{-1} \frac{\tan \phi_a}{\text{factor of safety}}$$

where ϕ_a = available friction angle
ϕ_d = developed friction angle

The developed friction angle was used in determining lateral earth pressure coefficients.

B.3.19. Using the resulting shear strengths, net horizontal water and earth pressure diagrams were determined for movement toward each side of the sheet pile. From the earth pressure diagrams, the summation of horizontal forces were equated to zero and the summation of overturning moments were determined for various tip penetrations. The depth of necessary penetration is the point of zero summation of moments.

B.3.20. The following design cases were analyzed for determining required penetration for the levee/I-walls.

No significant wave load on I-wall:

Q-Case

F.S. = 1.5 with static water at still water level (SWL)
F.S. = 1.0 with static water at (SWL) plus 2 feet
General: If the penetration to head ratio is less than 3:1, then increase it to 3:1.

Results of the cantilevered sheetpile stability run are presented on plate B-96.

SHEETPILE COFFERDAM

B.3.21. The temporary protection cells will be sand filled sheetpile cofferdams with an approximate diameter of 78 feet.

FAILURE MODE	F.S. (required)	F.S. (actual)
BURSTING	2.0	17.0
SHEAR FAILURE ALONG CENTERLINE	1.25 *	1700
HORIZONTAL SHEAR (CUMMING'S METHOD)	1.8	4.9
PULLOUT OF OUTBOARD SHEETING	1.5	850
PENETRATION OF INBOARD SHEETING	1.5 **	1.14
BEARING FAILURE OF THE FOUNDATION	1.5	1.5
SLIDING ON THE BASE	1.25 *	236
INTERLOCK TENSION (HOOP)	2.0	4.7

* for temporary construction
**for permanent construction

Design of the sheetpile cofferdam can be found in Annex 4.

PILE CURVES

B.3.22. The pile capacity curves for 14-inch square concrete piles, 14-inch H-piles and 48-inch steel pipe piles are presented on plates B-97 thru B-99. The curves presented indicate ultimate pile capacity.

SETTLEMENT

B.3.23. An analysis of estimated consolidation of the lock (pile group analysis) will be addressed in a future DM. Consolidation tests were performed on soil samples from borings NC-1U, NC-2U, NC-3U and deep boring 4-IU. For each consolidation test, the compression index, Cc vs. elevation was plotted (see plate B-100) to show the range of values at various depths. Also plotted was the preconsolidation pressure vs. elevation and is shown on plate B-101. Consolidation test results are included in Annex 3.

SEEPAGE CONTROL

B.3.24. A sheetpile cutoff extending into the pleistocene will surround the perimeter of the lock. A cutoff will also be placed across the back of each control house.

Project: Industrial Canal Lock Replacement
Subject: BEARING CAPACITY:

Base Slab Underlain by Clay

Foundation Soil Properties: $c = 800$ psf, $\gamma = 107$ pcf
Backfill Soil Properties: $c = 0$ psf, $\gamma = 122$ pcf

For a 180' x 1460' slab: (assume continuous)

$$q_{ult} = 1.3\ cN_c + \gamma' D$$

$$= 1.3(800)(5.53) + 60(54)$$

$$q_{ult} = 5750 + 3250 = 9000 \text{ psf}$$

$$q_a = q_{ult}/3 = 3000 \text{ psf}$$

FIGURE B-1

PART 2

GRAVING SITE AND FLOOD PROTECTION

FOUNDATIONS INVESTIGATION

GENERAL

B.3.25. This report addresses design assumptions and parameters for a graving site for a new canal lock and associated Mississippi River Gulf Outlet (MRGO) levee protection. Construction of a precast ship lock will require a graving site to float the precast lock sections into place at the new lock site. This report addresses the feasibility of a graving site Northwest of the Paris Road Bridge located in eastern New Orleans, LA. Flood protection along the MRGO will follow the present line of levee protection and tie into the graving site hurricane protection levees. Excavation of the graving site will be done in a dry condition to approximate elev. -27.5 N.G.V.D. Concrete grade beams spaced on 6-foot intervals supported by 74-foot long 12 x 12-inch concrete piles will provide a working foundation. Between the grade beams, a 1-foot sand base will be placed over the bottom of the excavation and overlain by a 4-inch unreinforced concrete stabilization slab to facilitate the fabrication of the lock modules. Flood side protection of the site will consist of a tie-in dike to elev. 7.0, a 45-foot dia. cofferdam cell and crushed stone closure at elev. 0.0 with sheetpile protection to elev. 8.0 to protect against high tides. The closure shall be removed after a lock module is completed and ready for transfer to another site, and the closure reinstalled to facilitate the construction of other modules.

FIELD EXPLORATION AND LABORATORY INVESTIGATION

Soil Borings

B.3.26. At the proposed new graving site, three undisturbed borings were made in March and April of 1983. These borings, taken for the MRGO hurricane protection levee (Citrus Back Levee), were Bor. 9-CBU, 10-CBU and 12-CBU. The borings were approximately 75 feet deep. A geologic profile of the borings are shown on Plate b-103C.

Design Parameters

B.3.27. Shear strength and wet densities for various soil stratification layers were based on a 1984 Soils Report of Lake Pontchartrain, LA and Vicinity, Citrus Back Levee, Third Lift, Sta. 0+00 to Sta. 398+00 C/L (specifically, Reach IIB). Boring locations are shown on the geologic profile Plate B-103C.

Soil Conditions

B.3.28. Soil conditions in the vicinity of this project consist of the following:

a. Natural ground is at approx. elev. 0.0 and natural levee deposits are underlain by swamp and interdistributary deposits. These deposits consist of soft to medium clays and silts.

b. Elev. -32.0 to approx. elev. -48.0 - Prodelta deposits consisting of medium clays.

c. Elev. -48.0 to approx. elev. -53.0 - Nearshore gulf deposits consisting of silty sands.

d. Elev. -53.0 and below - pleistocene deposits consisting primarily of clays (stiff) and lenses of silts down past elev. -70.0 (maximum boring depth).

STABILITY OF LEVEES

B.3.29. Using existing conditions along the proposed alignment, the slopes and berm distances for the proposed levee were designed for the (Q) construction case. A "Factor of Safety" (F.S.) of 1.3 is required for levee stability. A channelside flowline of elev. 6.0 and a low water elev. of 0.0 was used for design and analysis. All elevations used are N.G.V.D. Stability analyses are presented as Plates B-102A and B-103A. Plate B-103A presents a stability analysis of the hurricane protection levee relevant to the dewatered excavation. Plate B-102A presents an analysis of the sheetpile/closure protection for a dewatered excavation condition.

EXCAVATION

B.3.30. The excavation is designed for construction in a dry condition. Material excavated will be used to construct the hurricane levee protection surrounding the graving site and the tie-in dikes between the channel closure and the main levees. Approximately 177,000 cubic yards of material is to be excavated from the graving site initially. The initial closure excavation will yield an additional 48,000 cy of soil. Approximately 90,000 cy of the excavated material will be used for construction of the new hurricane levee surrounding the site. An additional 50,000 cy of crushed stone will be required to rebuild the closure after the first module is floated out. As additional modules are floated off site, an additional 10,000 cy of crushed stone will be required to rebuild the closure.

DEWATERING

B.3.31. The excavation will require a well and/or wellpoint dewatering system to keep the slopes and base dry. Piezometric levels should be lowered a minimum of 5 feet below the slopes and the bottom of the excavation. Piezometers will be required for monitoring water levels below the slopes and the excavation base.

CANTILEVER I-WALL

B.3.32. I-wall stability for the closure and tie-in levees and required penetration were determined by the "Method of Planes". A "Factor of Safety" was applied to the soil parameters. For the friction angle, the F.S. was applied as follows:

$$\phi_d = \tan^{-1} \frac{\tan \phi_a}{\text{factor of safety}}$$

where ϕ_a = available friction angle
ϕ_d = developed friction angle

The developed friction angle was used in determining lateral earth pressure coefficients.

B.3.33. Using the resulting shear strengths, net horizontal water and earth pressure diagrams were determined for movement toward each side of the sheet pile. From the earth pressure diagrams, the summation of horizontal forces were equated to zero and the summation of overturning moments were determined for various tip penetrations. The depth of necessary penetration is the point of zero summation of moments.

B.3.34. The following design cases were analyzed for determining required penetration for the levee/I-walls.

No significant wave load on I-wall:

Q-Case

F.S. = 1.5 with static water at still water level (SWL)
F.S. = 1.0 with static water at (SWL) plus 2 feet
General: If the penetration to head ratio is less than 3:1, then increase it to 3:1.

B.3.35. An I-wall analyses for the crushed stone channel closure is presented on Plate B-102B. Final penetration was ultimately based on seepage cutoff considerations. Soil pressures are based on water to elev. 7 and a Factor-of-Safety of 1.5. I-wall sheetpile (PSA-28) will be utilized for the closure and tie-in levees.

COFFERDAM CELLS

B.3.36. At each end of the sand or stone closure a 45-foot dia. sheetpile cofferdam cell (PSA-28) will tie together the dike and closure. Cell dimensions are shown on Plate B-102C. The cell was analyzed for the following modes of failure.

FAILURE MODE	F.S. (required)	F.S. (actual)
BURSTING 2.0 17.0		
SHEAR FAILURE ALONG CENTERLINE	1.25 *	2.7
HORIZONTAL SHEAR (CUMMING'S METHOD)	1.8	4.9
PULLOUT OF OUTBOARD SHEETING	1.5	7.4
PENETRATION OF INBOARD SHEETING	1.5	12.0
BEARING FAILURE OF THE FOUNDATION	1.5	2.0
SLIDING ON THE BASE	1.25 *	1.6

* for temporary construction

PILE CURVES

B.3.37. The pile capacity for a 12-inch square concrete pile is presented on Plate B-99A. The pile will have a tip elevation of -100 N.G.V.D. and will support the grade beams that the lock modules will be constructed upon.

GRADE BEAMS AND STABILIZATION PAD

B.3.38. Concrete grade beams (3' deep x 2' wide x 220' long) will facilitate fabrication of the lock modules. The grade beams will be set on 12-inch piles and run the length of the excavation base. Between the grade beams, a 4-inch stabilization slab underlain by 1-foot of sand will be poured to provide a good working base.

SETTLEMENT

B.3.39. The new hurricane levee surrounding the graving site will experience some consolidation during and after construction and it will therefore be necessary to retain an elevation close to 15.0 as settlement occurs. The graving site grade beams will be pile founded and, depending on the weight of the modules constructed, should not experience significant settlement.

SEEPAGE CONTROL

B.3.40. A sheetpile seepage cutoff will extend into the pleistocene along the length of the channel closure. The tip of the sheetpile will be driven to approximate elevation -55 to substantially slow down seepage from the channel.

PART 3

GEOLOGY

PHYSIOGRAPHY

B.3.41. The project area is located within the Central Gulf Coastal Plain. Specifically, the project is on the eastern flank of the Mississippi River Deltaic Plain. Dominant physiographic features include natural levees, inland swamp, and marshes; however, urban development has masked these features in the immediate project area. This is an area of low relief ranging from a maximum of +6 feet NGVD on the landside slopes of natural levee near the river to a minimum of -2 feet NGVD in the drained areas and marshes.

GENERAL GEOLOGY

B.3.42. Only recent geologic events are pertinent to this project. Approximately 5,000 years ago sea level reached its present level after being lowered by the last glaciation and the Mississippi River began to migrate across the alluvial valley depositing several different deltaic lobes. Approximately 4,500 years ago the first Recent deltaic sediments were carried into the project area when the Mississippi River was depositing the St. Bernard Delta sequence. Several cycles of deposition and erosion have occurred in the project area as the Mississippi River shifted back and forth across the deltaic plain. Approximately 2,000 years ago the Mississippi River shifted west and begin building the Lafourche Delta sequence. The project area was not subjected to a heavy influx of sediments again until approximately 1000 years ago when the Mississippi River shifted eastward to the present Plaquemines Delta sequence. Construction of levees and other development has eliminated any further deposition of fluvial/deltaic sediments in the project area.

SUBSIDENCE

B.3.43. Regional subsidence and geosynclinal downwarping have been occurring since the end of the Pleistocene epoch. The long-term rate of subsidence in the project area is approximately 0.48 feet per century. In addition, man induced subsidence of the ground surface has occurred in reclaimed marsh and swampland due to the shrinking of highly organic soils after drainage.

INVESTIGATIONS PERFORMED

B.3.44. Previous geologic profiles and reports on the project, as well as other reports, maps and publications, were used for the interpretation of physiography and the surface and subsurface conditions of the area. A geologic profile of borings in the lock vicinity are shown on Plate B-103B.

SUBSURFACE CONDITIONS

B.3.45. The project area contains natural levee, inland swamp, and marsh deposits. The natural levee is located at the southern end of the project area near the river. These deposits consist of interbedded soft to stiff clays and average 10 to 15 feet thick. Natural levee deposits are bordered by inland swamp and marsh deposits which may underlie part of the natural levee. Swamp and marsh deposits consist of interbedded very soft clays with organic matter and occasional lenses and layers of peat and average 8 to 10 feet thick. Underlying the natural levee, swamp, and marsh are interdistributary deposits which consist of soft to very soft clays with occasional lenses and layers of silt and sand, and are approximately 25 feet thick. A layer of sand with shells and shell fragments occurs below the interdistributary deposits. This deposit averages 10 feet thick and is probably a relict beach sand. Below the sand layer a thin layer of prodelta clays may be present or the beach sand may lie directly upon Pleistocene deposits. The prodelta deposits consist of interbedded medium to stiff clays and average 6 feet thick. Pleistocene underlies the prodelta and beach sand, extends to an unknown depth, and consists of interbedded stiff to very stiff oxidized clays, silt, silty sand, and sand. The contact with the Pleistocene surface averages 65 feet in depth.

SOILS

B.3.346. Soils in the area have been classified as being level, poorly drained and somewhat poorly drained having a clayey or loamy surface layer and a clayey subsoil or are loamy throughout. (Trahan, Larry J. et al, 1989)

GROUND WATER

B.3.47. There are four principle aquifers in the project area. The shallow Holocene aquifers consist of point bars, distributary channel sands, and beach sands and are formed by river migrations and delta building. These aquifers are generally of a discontinuous limited extent. The 200 foot sand is a zone of discontinuous layers and lenses and generally contains salt water in the project area. The 700 foot sand is continuous over most of Orleans Parish and contains fresh and salt water. The 1200 foot sand is continuous but is slightly saline to brine with less than 10000 ppm dissolved solids in the project area.

EARTHQUAKE ACTIVITY

B.3.48. Although some faults have been mapped in this region, no significant seismic activity is expected in this area. (Krinitzsky, 1950)

MINERAL RESOURCES

B.3.49. Oil and gas production is not found in the immediate vicinity of the project. However, future exploration and production of these natural resources will not be adversely affected by the project.

CONCLUSIONS

B.3.50. Because of the low shear strength and compressibility of some of the sediments in the study area, stability and settlement are major concerns. Also, because of urban development and drainage in much of the study area, settlement in this area is higher than the natural rate of subsidence. The existence of a large sand deposit in the subsurface is conducive to seepage and uplift problems.

REFERENCES

B.3.51.

Fisk, H. N., 1944, "Geological Investigation of the Alluvial Valley of the Lower Mississippi River", conducted for Mississippi River Commission.

Krinitzsky, E. L. et al, 1950, "Geologic Investigation of Faulting in the Lower Mississippi Valley", Waterways Experiment Station, Technical Memorandum No. 3-331.

Rollo J. R., 1966, "Ground-Water Resources of the Greater New Orleans Area, Louisiana", Louisiana Department of Conservation, Geological Survey and Louisiana Department of Public Works in cooperation with the United States Geological Survey, Water Resources Bulletin No. 9.

Trahan, Larry J. et al, 1989, "Soil Survey of Orleans Parish, Louisiana", United States Department of Agriculture, Soil Conservation Service in cooperation with Louisiana Agricultural Experiment Station and Louisiana Soil and Water Conservation Committee.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

SECTION 4 - FACILITY RELOCATIONS

GENERAL

B.4.1. We present the information contained in this section in detail required for this feasibility report. We gathered data on location of roads, railroads, and utilities by searching permits, visiting sites and initial contacts with owners. We generated in-house relocation plans from design criteria which we identified and owners gave us. Included are the facility relocation cost estimates for the two lock sizes, i.e., 900 feet long and 1200 feet long each with two alternatives, i.e., a barge lock and ship lock, see section 5. The relocations cost estimates are the same for both lock sizes and differ only for the alternative of the barge lock verses ship lock. Affected lengths shown in this report are for the ship lock.

AUTHORITY FOR ACCOMPLISHING RELOCATIONS

B.4.2. The Water Resources Development Act of 1986 (PL 99-662), Section 844, identifies the cost sharing of the project. The cost of the project will be funded 50% from the general fund of the U.S. Treasury and 50% from the Inland Waterway Trust Fund for a barge lock. The cost sharing for the ship lock, for depths up to 45 feet deep, for that portion above the cost of the barge lock is 75% Federal cost and 25% State of Louisiana.

B.4.3. With receipt of contributed monies from the Inland Waterways Trust Fund and from the State of Louisiana, we will take ownership on coordinating for and reporting on the facility relocation plans and the appropriate cost responsibility. Specifically, we will prepare a relocation design memorandum (RDM) for each bridge, detour route and the utility relocations. These RDM's will detail the relocation plans, the procedure for accomplishing the relocation, the owner's compensability and the Federal cost responsibility.

DESCRIPTION OF EXISTING FACILITIES AFFECTED BY THE PROJECT

B.4.4. Facilities affected by the project are categorized as roads, railroads and utilities and shown on plates B-104 thru B-106.

Roads

B.4.5. Louisiana State Highway #46. Louisiana State Highway #46 is routed along the city streets of New Orleans, i.e., St. Claude Ave. and includes the St. Claude Ave. Bridge. The bridge only, a low level truss bascule designated B-1, is owned by the Commission of the Port of New Orleans (PNO) and was constructed in 1921. The project only affects Highway #46 in the vicinity of and including the St. Claude Ave. Bridge.

The Bridge requires replacement due to direct impacts of the project, i.e., channel widening and horizontal clearance requirements. Other portions of Highway #46 are impacted due to geometry changes to the bridge approach and from the need to provide detour routes.

B.4.6. Louisiana State Highway #39. Louisiana State Highway #39 is routed along the city streets of New Orleans, i.e., Claiborne Ave and Robertson Street, and includes the Claiborne Ave. Bridge. The bridge only, a steel vertical lift designated B-2, is owned by the Louisiana Department of Transportation and Development (LADOTD) and was constructed in 1957. The project only affects Highway #39 in the vicinity of and including the Claiborne Ave. Bridge. The Bridge requires replacement due to direct impacts of the project, i.e., vertical clearance requirements in the open position. Other portions of Highway #39 are impacted due to the need to provide detour routes.

B.4.7. Detour Routes. Numerous city streets, designated D-1, will be affected. Streets within the project right-of-way will be closed to public use. Streets associated with the detour route will be improved to carry the vehicular traffic normally destined to either one of the above affected bridges to the other, i.e., non-affected bridge, including the new Florida Ave. Bridge.

B.4.8. Florida Ave. Vehicular Bridge. The Florida Ave. Vehicular Bridge (B-3) is not impacted by our project and is addressed in paragraph B.4.37.

Railroads

B.4.9. New Orleans Public Belt (NOPB) owns track on the west side of the lock channel. The track services the Galvez Street Wharf (i.e., Galvez Marginal Tracks and Galvez No. 3, designated R-3 and R-4, respectively) and the marshalling yard (designated R-5) from the main running track/fiber optic cable (designated R-2 and FOC-1). Tracks R-2 and R-5 with FOC-1 are outside the project ROW and are not impacted by our new lock project. The new lock project calls for the demolition of the Galvez Street Wharf resulting in the removal of the tracks, i.e., R-3 (2-lines) and R-4 (1-line). The tracks are shown on plates B-104 thru B-106. The project affects approximately 6740 linear feet of the tracks for R-3 and affects approximately 2760 linear feet of track for R-4.

B.4.10. The Florida Ave. Bridge (R-1) is not impacted by our project and is addressed in paragraph B.4.37.

Utilities

B.4.11. South Central Bell (SCB). SCB owns three cable crossings, and no interruption of service will be allowed.

B.4.12. One crossing is in the vicinity of Marais Street and passes through the existing lock's utility gallery. The line provides inter-office (trunk) services to the downriver east bank communities. The date of installation is unknown. The line is a single sheath, 24 single mode fibers in a four duct structure. The line is shown on plate B-104

and designated T-4. The project affects approximately 900 linear feet of the line (excluding the facility length contained in the existing lock gallery).

B.4.13. The second cable crossings is a submarine crossing in the vicinity of North Claiborne Avenue. The line provides telecommunications to the entire lower Ninth Ward Community and provides inter-office (trunk) services to the downriver east bank communities. The date of installation is unknown. The line is a combination of 2 sheaths, 3000-pair 26 gauge; and a 1 sheath, 900-pair 22 gauge in a twelve duct structure. The line is shown on plate B-106 and designated T-6. The project affects approximately 1060 linear feet of the line.

B.4.14. The third cable crossings is a submarine crossing in the vicinity of North Robertson Street. The line provides telecommunications to the entire lower Ninth Ward Community and provides inter-office (trunk) services to the downriver east bank communities. The date of installation is unknown. The line is a combination of 3 sheaths, 1500-pair 24 gauge; a 1 sheath, 2700-pair 26 gauge; and a 1 sheath, 900-pair 26 gauge in a twelve duct structure. The line is shown on plate xx and designated T-7. The project affects approximately 1328 linear feet of the line.

B.4.15. Cox Cable TV of Orleans Parish. COX owns one cable crossing, and no interruption of service will be allowed. The crossing is in the vicinity of Marais Street and passes through the existing lock's utility gallery. The line provides cable television signals to subscribers to the downriver east bank communities. The date of installation is 1982. The line is four 3/4" coaxial cables in a four duct structure. The line is shown on plate B-105 and designated T-3. The project affects approximately 880 linear feet of the line (excluding the facility length contained in the existing lock gallery).

B.4.16. New Orleans Public Service/Louisiana Power and Light Company (NOPSI). NOPSI provides both electric and gas service in the project area. Electric service consists of two active submarine cable crossings. No interruption of this service will be allowed. In addition, our records indicate the presence of two abandoned power cables and one abandoned communication cable. Gas service consisted of two-dual natural gas pipeline crossings, one of which is no longer in service.

B.4.17. Electric Service. NOPSI's first electric service crossing is in the vicinity of Marais Street and passes through the existing lock's utility gallery. NOPSI installed this line in 1920 and consists of four 24Kv primary feeders housed in 14 conduits. The primary feeder is constructed of 3-750KCM Al. XPCNXP 24KV. The line is shown on plate B-105 and designated E-2. The project affects approximately 890 linear feet of the line (excluding the facility length contained in the existing lock gallery).

B.4.18. Electric Service. NOPSI's second crossing is a submarine cable, primary feeder #805 and #621. This crossing is in the vicinity of Florida Ave. and passes under the existing navigation channel. NOPSI installed this line in 1943 and upgraded the line in recent years and consists of

two 24Kv feeders housed in 2 concrete coated conduits. The primary feeder is constructed of 3-750KCM Al. XPCNXP 24KV. The line is shown on plate B-106 and designated E-13. The project affects approximately 1020 linear feet of the line.

B.4.19. Electric Service. NOPSI's first abandoned submarine power cable is north of the existing lock. The line is shown on plate B-106 and designated E-4. The project affects approximately 1134 linear feet of the line.

B.4.20. Electric Service. NOPSI's second abandoned submarine power cable is south of the Florida Ave. Siphon. The line is shown on plate B-106 and designated E-14. The project affects approximately 890 linear feet of the line.

B.4.21. Electric Service. NOPSI's abandoned submarine communication cable is north of the Florida Ave. Bridge. The line is shown on plate B-106 and designated T-10. The project affects approximately 600 linear feet of the line.

B.4.22. Gas Service. NOPSI's active natural gas pipeline is a dual crossing in the vicinity of North Robertson Street. This dual line passes under the existing navigation channel and no interruption of service will be allowed. NOPSI installed these lines in 1928 and consists of two 16 inch high pressure, steel wrapped, natural gas distribution pipelines with valves in manholes on both banks. The lines are shown on plate B-105 and designated G-3 and G-4. The project affects approximately 994 linear feet of the line for G-3 and approximately 1054 linear feet of the line for G-4.

B.4.23. Gas Service. NOPSI's second crossing is in the vicinity of Marais Street and passes through the existing lock's utility gallery. This crossing consists of two 16 inch gas lines but are no longer in service. The lines are shown on plate B-105 and designated G-1 and G-2. The project affects approximately 585 linear feet of the line for G-1 and approximately 585 linear feet of the line for G-2 (excluding the facility length contained in the existing lock gallery).

B.4.24. Sewerage & Water Board of New Orleans (SWB). The SWB owns facilities that carry electric, water and sewer service. These facilities consist of four electric submarine cable crossings, three water main pipeline crossings, four sewer pipeline crossings and a sewer lift station with accompanying pipeline. At various locations small diameter water and sewer lines will be removed. These lines are service lines to the abandoned offices on both sides of the IHNC.

B.4.25. Electric Service. Three of the four crossings are located at Florida Ave. and no interruption of service will be allowed. The fourth line, E-3, is located in the vicinity north of the existing lock and is out of service. Each Florida Ave. line consists of 15Kv - 25Hz service. Each line was designed for a sixty year service life. Manholes are located on each bank line.

B.4.26. Electric Service. Item E-10 installed in 1966, feeder #410 primary power from sewer pumping station D to drainage station number 5. The feeder is a 500 MCM, three-conductor, rubber insulated, lead jacketed, steel wire armored cable. The project affects approximately 1490 linear feet of the line for E-10 and shown on plate B-106.

B.4.27. Electric Service. Item E-11 installed in 1964, feeder #20 primary power from sewer pumping station D to drainage station number 5. The feeder is a 500 MCM, three-conductor, rubber insulated, lead jacketed, steel wire armored cable. The project affects approximately 1520 linear feet of the line for E-11 and shown on plate B-106.

B.4.28. Electric Service. Item E-12 installed in 1963, is feeder #510 primary power from sewer pumping station D to drainage station number 5. The feeder is a 500 MCM, three single conductors, EPR insulation, s/shielded with PVC jacket overall. The project affects approximately 1420 linear feet of the line for E-12 and shown on plate B-106.

B.4.29. Electric Service. SWB's forth crossings, feeder #502, is a submarine cable no longer in use. This crossing is in the vicinity of Claiborne Ave. and passes under the existing navigation channel. The line is shown on plate B-105 and designated E-3. The project affects approximately 734 linear feet of the line.

B.4.30. Water Service. SWB owns three water main pipeline crossings, and no interruption of service will be allowed. Two cast iron pipelines, 20 inch diameter each, are located 146 feet and 550 feet lakeside of St. Claude Ave. Both crossings pass through the existing lock's utility gallery. SWB installed these lines in 1928. These lines are shown on plates B-104 and B-105 and designated W-2 and W-3. The project affects approximately 1065 linear feet of the line for W-2 and approximately 830 linear feet of the line for W-3 (excluding the facility length contained in the existing lock gallery).

B.4.31. Water Service. The third water line is a 48 inch diameter main. This pipeline is located 190 feet south of the Florida Ave Siphon. SWB installed this line in 1965. The pipe in the channel is constructed of 48 inch inner diameter steel pipe with a 3/4 inch wall thickness, coal tar lined with an additional 2 inch coating of "WATE-KOTE" and on the land the pipe has the same construction except with a 1/2 inch wall thickness. The line is shown on plate B-106 and designated W-6. The project affects approximately 1074 linear feet of the line.

B.4.32. Sewer Service. Two of SWB's four lines are reinforced concrete gravity sewer main pipelines, 30 inch diameter each, are located 560 feet lakeside of St. Claude Ave. These two lines cross through the existing lock's utility gallery. SWB installed these lines in 1920. The lines are shown on plate B-105 and designated S-2 and S-3. The project affects approximately 830 linear feet of the line for S-2 and approximately 830 linear feet of the line for S-3 (excluding the facility length contained in the existing lock gallery).

B.4.33. Sewer Service. SWB's third sewer pipeline is a 66 inch diameter steel sewer force main pipeline and is located 225 feet south of the Florida Ave. Siphon. SWB installed this line in 1975. The pipe in the channel is constructed of 66 inch inner diameter concrete steel pipe with a 3/4 inch wall thickness, with an additional 2 inch concrete coating and on the land the pipe has the same construction except with a 3/8 inch wall thickness. This line is shown on plate B-106 and designated S-7. The project affects approximately 1104 linear feet of the line.

B.4.34. Sewer Service. SWB's forth sewer pipeline is a 54 inch diameter steel sewer force main pipeline and is located 180 feet south of the Florida Ave. Siphon. SWB installed this line in 1964. The pipe in the channel is constructed of 54 inch inner diameter steel pipe with a 3/4 inch wall thickness, coal tar lined with an additional 2½ inch coating of "WATE-KOTE" and on the land the pipe has the same construction except with a 1/2 inch wall thickness. The line is shown on plate B-106 and designated S-8. The project affects approximately 1064 linear feet of the line.

B.4.35. Sewer Service. SWB's sewer lift station and 8 inch diameter forced sewer main pipeline, designated S-11 and shown on plates B-106 and B-106, located at Surekote Road and North Galvez St. This facility is inside the Corps project ROW and requires removal along with 3100 linear feet of pipe. The sewer lift station and pipeline service companies located within the project ROW. These companies and item S-11 are required to permanently relocate to make room for the construction of the by-pass channel, between the Claiborne and Florida Ave. Bridges.

DESCRIPTION OF EXISTING FACILITIES NOT AFFECTED BY THE PROJECT

B.4.36. Facilities not affected by the project are categorized as roads, railroads and utilities.

Roads

B.4.37. Florida Ave. Combination Railroad and Vehicular Bridge. The bridge, designated B-3 and R-1, is co-owned by the LADOTD and PNO. Our project will not impact this bridge. Before we start construction of our project the LADOTD and the PNO will replace this bridge. LADOTD will replace the vehicular bridge, as required by needed improvements in its highway system and will fund it under State of Louisiana Highway Funds. The PNO will replace the railroad bridge, because the bridge horizontal clearance is hazardous to current navigation traffic and will relocate using Truman-Hobbs Act funds. The demolition of the existing bridge is necessary for the plan to float the new lock from the ship yard to the construction site.

Railroads

B.4.38. New Orleans Public Belt (NOPB). See paragraph B.4.9. for track description. There are no impacts to tracks designated R-2 and R-5 and

fiber optic line FOC-1 since they are outside our ROW. The tracks are shown on plates B-104 thru B-106 .

B.4.39. Florida Ave. Combination Railroad and Vehicular Bridge. See paragraph B.4.37. Our project does not impact this bridge designated R-1 and B-3. The bridge is shown on plate B-106.

Utilities

Sewerage & Water Board of New Orleans (SWB)

B.4.40. SWB's 8mgd sewage pump station, designated S-1 and shown on plate B-104, located north of the St. Claude Ave. Bridge east approach ramp. This facility is outside of the Corps project ROW and is not impacted.

B.4.41. SWB's Florida Ave. Siphon, designated S-9 and shown on plate B-106, is not impacted by this project. The siphon removal is required by the PNO. A condition of funding of the replacement of Florida Ave. Railroad Bridge is the removal of the siphon, i.e., due to inadequate horizontal clearance. The siphon removal is not funded by this project, but will be accomplished under separate funding through PNO. The demolition of the siphon is necessary for the plan to float the new lock from the ship yard to the construction site.

B.4.42. SWB's storm drain, designated S-10 and shown on plates B-105 and B-106, is a boxed concrete culvert. The storm drain is located near and parallel to the protected side toe, on the east side of the IHNC's hurricane protection along Jordan Ave. This facility is outside the project ROW and is not impacted. The hurricane protection in this area will be redesigned to accommodate MRL flood protection. Upon completion of the project this facility will be at the toe of MRL protection and not be impacted.

New Orleans Public Service/Louisiana Power and Light Company (NOPSI)

B.4.43. NOPSI owns an electrical transmission aerial crossing at Florida Ave. The owner indicates the 40 feet westward shift of the new channel centerline, fairway and channel sideslopes does not impact either of the two tower foundation. The transmission lines' vertical clearance meets the United States Coast Guard requirements. The line is shown on plate B-106 and designated E-15 is outside of the projects ROW.

CRITERIA FOR RELOCATING FACILITIES

B.4.44. The Corps with owner's concurrence will design the roads and bridges using the current standards of LADOTD. The Corps will construct within existing highway rights-of-way or project right of way with the exception of the detour routes.

B.4.45. The Corps with owner's concurrence will design the railroad relocations, i.e., track removal, using the owner's criteria. The owner

and the Corps will remove track of the railroad within existing railroad rights-of-way or project right-of-way.

B.4.46. Utility owners will remove all existing facilities except where the work is incidental to lock demolition. Owners will be contacted of our intent to remove their lines contained in the lock gallery and a hold harmless statement will be obtained. Owners will design and construct powerlines, telephone cables, and pipelines to the current capacities of the existing facilities.

B.4.47. Utility relocations will be constructed within project ROW or public servitude within the city streets. If the criteria furnished by the owner results in a betterment, we will discuss the betterment with the owner and we will not allow payment for betterments as a Federal expense.

DESCRIPTION OF PROPOSED RELOCATIONS

Roads

B.4.48. General. All roads and bridges are presented and designed by contract provided A-E's. Bridge designs are currently based on our overall project design goals and cooperation with the local communities. The detour routes were reviewed by the A-E and alternative routes provided for our evaluation. Owners for these impacted facilities have not endorsed our plan but do recognize the potential severe social impacts associated with other plans. Studies we have conducted and will conduct will be used to resolve differences and provide solutions as required with the owners.

St. Claude Ave. Bridge.

B.4.49. We studied the design of both mid-level and low level height bridges at St. Claude Ave. During our neighborhood working group meetings we found the low level bridge to be preferred by the communities. The low level bridge is preferred because there are no unsightly towers, can allow pedestrian crossing and does not encourage higher traffic volumes into the neighborhoods. We considered the low level bridge at St. Claude as the only implementable design.

B.4.50. We will temporarily detour traffic from highway #39 at the St. Claude Bridge (B-1) while the lock demolition is in progress and the replacement bridge is under construction. The existing bridge substructure is part of the lock walls and foundation. Construction of a lock demolition by-pass channel will cut the eastside bridge approach and stop vehicular traffic. We plan to construct a low level double bascule bridge using the current LADOTD standards. The current design and maximum industry standard horizontal clearance for this bridge type is approximately 200 feet. The vehicular detour route will be in operation prior to the disruption of any bridge traffic and St. Claude bridge work will commence only after the Claiborne Bridge is completed. Only one bridge will be out of service at a time. The Corps contracted with N-Y

Associates to study the bridge design. For additional information see paragraphs B.2.73 through B.2.90.

Claiborne Ave. Bridge.

B.4.51. In an effort not to impact residences in the area we investigated different bridge designs. The alignment of our new project channel cross section does not impact the bridge. However, the new lock location places the Claiborne Ave. Bridge on the Mississippi River side of the lock, subjecting the bridge to Mississippi River stages which are normally higher than the MRGO side of the lock. Therefore an economical design, short construction duration and no residential impact, bridge solution is to replace the piers, towers, lift span and machinery. The approach grade would remain intact.

B.4.52. The Claiborne Bridge (B-2) construction will commence prior to St. Claude Bridge (B-1) and after the completion of the detour route. The detour route will be used during this closure to allow for the modification of the bridge towers, foundation, machinery and lift span. The modifications are required to provide the U.S. Coast Guard required vertical clearance of 156 feet above the MRL project design flow line of 17.4 feet NGVD. The Claiborne Ave Bridge was influenced by the hurricane mean high water of 5.0 feet NGVD with the existing lock. The LADOTD has expressed concern as to the effect of the higher stages reducing the bridge's vertical clearance, with the lift span in the lowered position, on the increased frequency of openings. The Corps contracted with Parson Brinckerhoff to study the bridge design. For additional information see paragraphs B.2.91 through B.2.113.

B.2.152 THRU B.2.164

Detour Route Plan

B.4.53. General. A detour route plan is necessitated by the relocation of the new bridges (B-1) and (B-2). As a bridge is taken out of service, severe demands will be placed on the existing local streets. The detour route plan is designed to minimize the inconveniences in the neighborhoods and to reduce commuter driver time delays. The detour route will be constructed by enhancing existing city streets (see plate B-117). The detour route will incorporate the new Florida Ave Vehicular Bridge (B-3). The purpose of the detour route is to shift the traffic patterns during a bridge shutdown to the remaining two bridges. The Corps contracted with the Regional Planning Commission (RPC) to study the detour route design. The RPC provided us with details and several alternative routes. The following assumptions were provided the RPC as a basis for their analysis:

a. Bridge construction scheduled sequentially.

b. New Florida Ave. vehicular four lane bridge completed.

c. Florida Ave. Expressway not constructed.

d. The new St. Claude Bridge is low level.

e. The new Claiborne Ave. Bridge is mid-level.

Details of Detour Route Common to the Areas East and West of the IHNC.

B.4.54. The RPC provided us with specific details and location for signage and signalization, shown on plates B-117 thru B-120. Periodic traffic patrols are provided for security on routes in high crime areas. Truck route designation will be used to eliminate impacts to residents. The incident management plan (IMP) is a method to reduce delays resulting from accidents and breakdowns in this congested corridor. The IMP will consist of tow trucks and police patrols in the vicinity of each bridge on each side of the IHNC.

Details of Detour Route for the Area East of the IHNC.

B.4.55. The east side detour route includes street work in both Orleans and St. Bernard Parishes. Movement of traffic in the east-west direction will be accomplished on existing streets. The key to the success of the East side Detour Route is the north-south roads providing access to the Florida Ave. Bridge interchange at Florida Ave. and Tupelo Ave. The north-south movement of local traffic in close proximity to the IHNC will be directed towards Tupelo and Caffin Avenues. The RPC provided three alternative routes for the north-south movement of traffic originating in St. Bernard Parish. One alternative utilizes the existing Angela and Mehle Streets. The second alternative was along Aycock Street and existing railroad right-of-way. The third alternative is through the undeveloped, privately owned Meraux Tract. Each of these three alternatives require acquisition of new ROW for these roads.

B.4.56. The Angela/Mehle alternative, primarily consists of asphalt overlay on existing city streets. New ROW for the road is required at the north end of the route through the St. Bernard School Bus facility. This alternative is the least costly but is considered not implementable due to its heavily residential characteristics. The Aycock railroad ROW and the Meraux Tract are nearly comparable in cost. However, the Aycock route passes behind a heavily residential neighborhood and requires extensive construction. The Aycock alternative consists of constructing new roadway by covering a drainage canal using a seven feet diameter culvert running adjacent to Norfolk Southern Railway tracks. New ROW for the road is required at the north end of the route through the St. Bernard School Bus facility and Browning Ferris Incorporated (BFI). This alternative is considered not implementable because of the residential impacts and difficulties likely to be imposed by the railroad. The Meraux Tract is undeveloped private land and should have the least objections towards roadway development. We are aware of interest in developing this north-south route by St. Bernard Parish for their port expansion. The new roadway in the Meraux Tract is likely to be implementable but is the most costly. This route is the furthest from the IHNC and would require development of a new Florida Ave east-west route. The new route would extend from Meraux, the east limit, to approximately the Orleans/St. Bernard Parish border, the west limit. This new roadway connects at its west limit with the existing Florida Avenue. New ROW for the road is required at the Meraux Tract, for the north-south road, and at the St. Bernard Drainage back levee, and Browning Ferris Incorporated

(BFI) for the east-west road. We have included in our cost estimate the Meraux Tract road alternate.

B.4.57. The new access road will be constructed generally parallel to the Guerenger Canal in St. Bernard Parish (See plate B-116) in an essentially undeveloped area of land known as the Meraux tract. The road starts at St. Bernard Highway near the St. Bernard Port, Harbor and Terminal District access road from the Chalmette Slip. The new road then extends northerly to Judge Perez Drive, where a new at-grade, signalized crossing will be constructed. The road continues northerly to a new bridge across the Florida Walk Canal and then ties into the east-west extension of Florida Avenue. A second bridge crossing is required across the canal flowing into the marsh and located near a curve in the Norfolk Southern Railroad tracks adjacent to Aycock Street.

B.4.58. The roadway will be four-lane, urban arterial and will have two 12-foot travel lanes in each direction. The roadway cross-section includes an 8-foot shoulder on each side with a median Jersey barrier in a 90-foot right of way. The bridges will have two 12-foot travel lanes in each direction without shoulders. Barrier curbs will be provided in areas without shoulders. A cross-section of the roadway is shown on plate B-116.

B.4.59. The new St. Bernard access road is a temporary road, but it must be in place for approximately three to four years during bridge construction. An asphalt type roadway surface was considered by the Corps as adequate for this duration. The cost estimate includes a 1-inch asphalt base course with a 1½-inch surface course underlain by a 12-inch crushed stone base and 12-inch sand subbase. A maintenance course of 1-inch surfacing will be completed at some point during the 3-4 year period, whenever resurfacing is needed. Lighting, drainage and roadway safety features such as signage, signalization and guardrail are also included. The canal crossings will be constructed of two-lane, commercial precast deck slab founded on precast concrete cap beams and timber piling.

B.4.60. Preliminary discussions with the LADOTD District office indicate that the a 3-4 year duration requires a permanent roadway. They suggested that the Corps consider such a roadway, of concrete or asphaltic concrete. The additional costs might be justified as a mitigation measure. This cost should be studied in post-feasibility stages. Also, LADOTD indicates that the Norfolk-Southern railroad crossings and the Guerenger Canal crossing on Judge Perez Drive are requirements, with which the Corps must also comply.

Details of Detour Route for the Area West of the IHNC.

B.4.61. The west side route utilizes all existing streets. The primary east-west routes are St. Claude Ave and Claiborne and Robertson Avenues. The primary north-south routes include Poland Ave, Almonaster Blvd, Franklin Ave. and Elysian Fields. The Florida Ave Bridge touches down near Louisa Street. Florida Ave extends westward beyond Louisa with, one lane of traffic in each direction, to Almonaster Blvd, Franklin Ave and Elysian Fields. We investigated widening Florida Ave to twc lanes of

traffic in each direction from Louisa Street of each of the primary north-south routes. Just to the west of the first primary route, Florida and Almonaster Blvd, is a complex interchange of rail lines and drainage canals. The cost to provide a widened Florida Ave roadway through this area was obviously prohibitive. Therefore, to disperse traffic, we recommend traveling north on Louisa St. from Florida Ave to Higgins, Almonaster and I-10. The Florida Ave Bridge also has an interchange at Poland/Alvar St. The Interchange does not cloverleaf to include all direction access, but street level U-turns can accommodate this deficiency. The recommended north-south truck route is the Poland-Alvar exit of the Florida bridge, to I-10 eastbound or westbound.

Railroads

B.4.62. The new MRL floodwall designs have been accomplished with no impacts to the main running line/fiber optic cable or the marshalling yard (R-2/FOC-1 & R-5). Track removal, i.e., Galvez Marginal Tracks (R-3) and Galvez No.3 (R-4), including switches from the main line is required. Tracks R-3 and R-4 service the Galvez Street Wharf. The project requires the demolition of the wharf; rail service on and to the wharf will no longer be required and we propose removing the tracks because there is no need for them. No other track relocations is required.

Utilities

B.4.63. General. We developed conceptual relocation plans. Owners have been individually contacted for their preliminary input. All owners have independently accepted our conceptual plan. The conceptual plan is a development from our anticipation of conflicts and coordination problems both the Corps and owners are likely to experience. Some of the difficulties result from the narrow channel crossing, congested construction corridor, owners' need for non-interruption of existing service and sequence of project construction. The plan consists of constructing three utility corridors, each containing one trench, crossing the channel. Corridor/trench locations, indicated on plates xx-yy, are at section A-A, south of St. Claude Ave; section C-C, north of the Claiborne Ave Bridge; and section E-E, south of the Florida Ave Bridge. These trenches, shown in typical profile on plates B-107 thru B-109, will be shared with different owners;, i.e., gas, electric, water, sewage and communications. The utility lines in the trench, will be in close proximity to each other. Details of construction, compatibility and spacing of the lines will be addressed in RDM's. The Corps will coordinate with owners and determine the "how and who" will construct the trenches and "gang" lay the utilities. Other coordination between owners and the Corps for the land based relocation of utilities through our new flood protection will require the use of pipe sleeves. The sequence of construction permits the use of "no work areas" during the construction of new floodwalls at the location of existing facilities. Prior to the dredging the south (existing lock) by-pass channel, all relocations will be completed and existing facilities abandoned and removed by their owners, thereby allowing the construction of the floodwalls in the above mentioned "no work areas". This sequence eliminates the need for temporary relocations and the inconveniences associated with their

construction. Owner surveys of existing facilities were either not available or of such poor detail, we assumed all facility crossings require relocation. Owners will be asked for as-built or current surveys of their facilities prior to the RDM. The owners relocation plan is the same for the ship lock and barge lock, with differences in relocation costs resulting from differences in effected lengths of utilities and dredge quantities. All owners will be responsible for the removal of all lines in service after relocations are complete. A brief summary of the projects construction sequence and relocations is as follows:

a. Dredge channel to design grade.

b. Cut utility corridors to receive utilities.

c. Gang together utilities for each corridor and lay into corridor.

d. Corps constructs new flood protection. Corps will provide "no work areas" at the location of existing utilities.

e. Owners complete new utility hook-ups, debugging and place new lines in service.

f. Owners remove existing utilities.

g. Corps constructs floodwalls at the location of "no work areas" (prior to dredging the south by-pass channel).

South Central Bell (SCB)

B.4.64. SCB plans to relocate their three crossings into two of our corridor/trenches. SCB provides the following elements in their preliminary relocation plan:

a. Needs a two year construction interval

b. A three foot separation from any other utility

c. Non-interruption of service

d. A desire to upgrade to fiber optic cable and electronics in lieu of existing copper cable. Input provided is for an in-kind replacement.

B.4.65. The T-1 crossing, replacing T-4, is proposed to be relocated to section A-A. The relocation of this line requires the following elements:

a. 1-4 duct structure 2055 linear feet

b. 1-5 inch casing with 4 ducts channel crossing (900 linear feet)

c. 3 1-inch innerducts in 1 duct of new structure (8,985 linear feet)

d. 3-manholes.

B.4.66. SCB proposes to combine the T-8 & T-9, replacing T-6 and T-7, crossings to section C-C. The relocation of these lines requires the following elements:

a. 1-20 duct structure 1600 linear feet

b. 1-8 duct structure 410 linear feet

c. 1-8 duct structure reinforcement 650 linear feet

d. 1-30 inch casing with 24 ducts channel crossing (1000 linear feet)

e. 1-30 inch casing with 24 ducts railroad crossing (120 linear feet).

f. 6-manholes.

Cox Cable TV of Orleans Parish

B.4.67. COX will reroute their existing lines, T-3, from the existing lock gallery to section "A-A". This new line is identified as T-2, constructed of 3/4 inch coaxial cable. COX proposes to run a 1/2" fiber optic cable.

New Orleans Public Service/Louisiana Power and Light Company (NOPSI).

B.4.68. Electric Service. For different owners to share corridor/ trenches, NOPSI and other must comply with the National Electric Safety Code. NOPSI's proposed relocation plan follows:

a. The owner will install, at section A-A, 4-5 inch conduits, designated E-1 and replaces E-2, will house 2-24KV feeders. Other pertinent structures include 2-10 feet by 10 feet manholes located at the ROW limits.

b. The owner will install, at section C-C, 4-5 inch conduits, designated E-5 and replaces E-2, will house 2-24KV feeders. Other pertinent structures include, 4-10 feet by 10 feet manholes; 2 located at the ROW limits and 2 located at intermediate points.

c. The owner will install, at section E-E, 4-5 inch conduits, designated E-9 and replaces E-13, and house 2-24KV feeders. Other pertinent structures include 3-10 feet by 10 feet manholes; 2 located at the ROW limits and 1 located at an intermediate point.

d. Rearrangement of existing overhead facilities on both sides of the IHNC in order to realign the existing system ties with the new crossings.

B.4.69. Gas Service. The owner will install at section C-C, dual high pressure, steel, gas distribution pipeline, designated G-5 & G-6, are lines from the approach main and connect to existing distribution system

on both sides of the channel. The installation includes a new valve on each bank. The new lines will replace G-3 and G-4.

Sewerage & Water Board of New Orleans (SWB)

B.4.70. Electric Service. The owner will install items E-6, E-7 and E-8, replacing items E-10, E-11 and E-12, will be relocated to corridor "E" located near Florida Ave. Manholes associated with these crossings on each bankline will require enlargement.

B.4.71. Water Service.

a. At section A-A, SWB plans to relocate item W-1 a 20 inch water main pipeline and replaces item W-2, from the approach main and connects to existing system on both sides of the channel.

b. At section C-C, SWB plans to relocate item W-4, a 20 inch water main pipeline and replaces item W-3, from the approach main and connects to existing system on both sides of the channel.

c. At section E-E, SWB plans to relocate item W-5, a 48 inch water main pipeline and replaces item W-6, from the approach main and connect to existing system on both sides of the channel.

B.4.72. Sewer Service.

a. The owner will install, item S-6 and replaces items S-2 and S-3, is a 20 inch forced sewer main and pump station on the west side of the IHNC. Adequate land, i.e., at least 4000 square feet, with a 50 foot frontage and 7060 linear feet of 20 inch forced sewer main. The sewer main will run on the west side of the IHNC, north from the existing line crossing to the Florida Ave. corridor's 66 inch sewer forced sewer main (S-4). The required sewer pump station capacity is 13,000 gpm.

b. At section E-E, SWB plans to relocate item S-4, a 66 inch sewer forced main pipeline and replaces item S-7, from the approach main and connect to existing system on both sides of the channel.

c. At section E-E, SWB plans to relocate item S-5, a 54 inch sewer forced main pipeline and replaces item S-8, from the approach main and connect to existing system on both sides of the channel.

FACILITY RELOCATION COST ESTIMATES

B.4.73. We developed cost estimates in-house from the owners' preliminary input. Owners did submit material types and utility routings. We modified the routing to fit our project. Included in our construction cost estimates Relocations 02 Account are the utility owners' engineering design (12%) and contract administration and supervision (10%) and owners' administrative costs (2%, only for bridges and detour routes). See section 5 for relocation cost estimates for roads, railroads and utilities.

MISSISSIPPI RIVER - GULF OUTLET
NEW LOCK AND CONNECTING CHANNELS

SECTION 5 - COST ESTIMATES

B.5.1. The cost estimates for the IHNC Lock were prepared utilizing the M-CACES computer system. However, all data for equipment, labor (crew sizes, labor burden production rates) and materials were manually inputted in lieu of referencing the M-CACES unit price book and data base. Thus the cost estimate reflects current and applicable pricing and addresses specific construction procedures for the various line items in the estimate.

B.5.2. The estimated costs were based upon an analysis of each line item evaluating the quantity, production rate, and time, together with the appropriate equipment, labor and material costs. In addition, these costs were based on actual in-house knowledge and experience by NOD cost engineers who either personally designed or estimated large navigation structures such as Red River Lock and Dam Nos. 1, 2, 4 and 5, and the Old River Auxiliary Control Structure.

B.5.3. Two procedures were used in estimating each line item. For the majority of the line items where details and quantities were available, the estimated costs were prepared analyzing the method of construction for that item in computing its direct costs. In items where specific details were limited, the estimated costs were based upon construction work on the most recent Red River Lock and indexed to current price levels per the Civil Works Construction Cost Index System.

B.5.4. The IHNC construction is located in the existing Inner Harbor Navigation Canal just north of the existing lock. The specific construction procedure for the lock consists of fabrication at an off-site facility with segments of the entire lock transported and floated into place. While this procedure may represent a challenge to both construction and estimating, it is not unique and has been done on a similar scale in the construction of the Vidalia, Louisiana, Hydropower Plant.

B.5.5. Other than this unusual feature of work - the float-in procedure - the IHNC Lock project remains similar to conventional lock construction: dredging, by-pass channels, site demolition and tie-in levees and floodwalls.

B.5.6. Since the project is located in the Metropolitan New Orleans Area and is in a navigation channel, accessibility presents no problem. Logistically, the project can be accessed by land from I-10 in the east-west direction, I-55 from the north and by water via either the mississippi River, GIWW or Lake Pontchartrain.

B.5.7. In obtaining contingencies, the cost estimate was subjected to a risk analysis to determine the degree of uncertainty associated with each line item in the estimate. The Range Estimating computer program, which

incorporates risk analysis by varying both quantities and costs, was performed on the cost estimate. Both design engineers and cost engineers contributed to the input of the program with the senior cost engineer consulting with project managers for the recommended contingency costs and percentages.

B.5.8. The contingency percentages for the IHNC Lock represent the following: 20% for the structure, earthwork and channel dredging; 15% for the levees and floodwalls; and 25% for the relocations (with 30% for the Claiborne Avenue Bridge).

B.5.9. Contingencies for Engineering and Design are based on uncertainties involved in the preparation of DM's, P&S and in engineering during construction. These include cost of field data collection, unanticipated design problems, changes in design based on the review of the report, changes in design criteria and changes in overhead rates. Considering the scope and complexity of this project, a contingency of 20% was used for all E&D estimates.

B.5.10. The 20% contingencies for Construction Management are based on using a historical average of time growth for similar type contracts in this area. The 20% time growth includes additional duration for unusually severe weather, high water and unknown changes to the contracts.

B.5.11. The final construction costs were reviewed and approved by the Chief of Cost Engineering Branch, Charles E. Settoon.

COST ESTIMATE
1200 X 110 X 36
RECOMMENDED PLAN

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Apprisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,001	$17,001	$4,250	$21,251
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,721		
01------	Contingencies					$8,644,180	
01------	Contingency - round off						($20,901)
01------	TOTAL REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02---	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,554
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilities, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$423,340	$423,340	$105,835	$529,175
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$888,160	$888,160	$222,040	$1,110,200
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$854,000	$854,000	$213,500	$1,067,500

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$367,220	$367,220	$91,805	$459,025
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$827,160	$827,160	$206,790	$1,033,950
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$713,700	$713,700	$178,425	$892,125
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$538,020	$538,020	$134,505	$672,525
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$577,060	$577,060	$144,265	$721,325
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LIN	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,577,460	$1,577,460	$394,365	$1,971,825
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,515,240	$1,515,240	$378,810	$1,894,050
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,257,820	$1,257,820	$314,455	$1,572,275
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$46,360	$46,360	$11,590	$57,950
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,469,280	$2,469,280	$617,320	$3,086,600
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,431,060	$1,431,060	$357,765	$1,788,825
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,141,366		
02---	Contingencies					$15,381,246	
02---	Contingency - round off						($22,611)
02---	TOTAL: RELOCATIONS						$72,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05------	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000.00	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	270,500	CY	$3.00	$811,500	$162,300	$973,800
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee / I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS 27.5 Piling	205,800	SF	$14.40	$2,963,520	$592,704	$3,556,224
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,860	LF	$3,315.00	$6,165,900	$1,233,180	$7,399,080
	Lakeside Protective End Cell						
	PS 27.5 Piling	32,200	SF	$11.00	$354,200	$70,840	$425,040
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Dolphins 4X	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
		LUMPSUM					
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	5,000	SY	$18.00	$90,000	$18,000	$108,000
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,200	CY	$16.00	$99,200	$19,840	$119,040
	Landscaping - 29 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures						
05001002	Site Work						
	Excavation (To El. -61)						
	Dressing Exacavated Slopes	60,000	CY	$1.40	$84,000	$16,800	$100,800
05001003	Lock Site-Backfill						
	Granular Backfill	730,000	CY	$13.75	$10,037,500	$2,007,500	$12,045,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	104,500	CY	$20.85	$2,178,825	$435,765	$2,614,590
05001004	Foundation Protection						
	36" Riprap	60,000	TN	$23.50	$1,410,000	$282,000	$1,692,000
	12" Gravel Bedding	12,000	CY	$18.00	$216,000	$43,200	$259,200
	Filter Fabric	36,000	SY	$3.00	$108,000	$21,600	$129,600
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	26,100	SF	$14.00	$365,400	$73,080	$438,480
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	19,200	LF	$190.00	$3,648,000	$729,600	$4,377,600
	Precast Pad & Flat Jacks	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	60,480	LF	$180.00	$10,886,400	$2,177,280	$13,063,680
	Tension Anchors	LUMPSUM	LS	$558,000.00	$558,000	$111,600	$669,600
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	182,400	LF	$170.00	$31,008,000	$6,201,600	$37,209,600
	3' Crushed Stone Base	34,500	CY	$30.00	$1,035,000	$207,000	$1,242,000
	Furnishing/Handling of Underwater Screeding Frame	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	46,000	CY	$70.00	$3,220,000	$644,000	$3,864,000
	Piping for Grout	LUMPSUM	LS	$1,100,000.00	$1,100,000	$220,000	$1,320,000
	Containment Sheet Piling PZ-22	84,000	SF	$15.00	$1,260,000	$252,000	$1,512,000
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,964,800	LBS	$2.00	$5,929,600	$1,185,920	$7,115,520
	Emer. Bulkheads	1,600,000	LBS	$1.80	$2,880,000	$576,000	$3,456,000
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	30,800	SF	$13.80	$425,040	$85,008	$510,048
	Wale System (5 Tiers)	430,000	LB	$1.15	$494,500	$98,900	$593,400
	Guidewall						
	Piling, HP 14X73	10,200	LF	$28.25	$288,150	$57,630	$345,780
	Precast Concrete Pontoons	2,500	CY	$370.00	$925,000	$185,000	$1,110,000
	Concrete, In-Place	2,000	CY	$200.00	$400,000	$80,000	$480,000
	Sand Fill	800	CY	$11.50	$9,200	$1,840	$11,040
	Pontoon Timbers(12X12)	7,800	LF	$35.00	$273,000	$54,600	$327,600
	Miscellaneous Metals	135,000	LB	$1.90	$256,500	$51,300	$307,800

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	44,500	LF	$36.00	$1,602,000	$320,400	$1,922,400
	12"X12"Treated Timber Fenders	6,920	LF	$30.50	$211,060	$42,212	$253,272
	3"X12" Treated Timber Planks	16,680	LF	$16.50	$275,220	$55,044	$330,264
	End Cells						
	Piling, Steel Sheet PS-27.5	73,000	SF	$13.75	$1,003,750	$200,750	$1,204,500
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	26,000	CY	$11.50	$299,000	$59,800	$358,800
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	53,100	CY	$270.00	$14,337,000	$2,867,400	$17,204,400
	Reinf. Conc. Slab (Fc = 6000 psi)	54,500	CY	$160.00	$8,720,000	$1,744,000	$10,464,000
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	855,100	LF	$6.00	$5,130,600	$1,026,120	$6,156,720
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	19,900	CY	$260.00	$5,174,000	$1,034,800	$6,208,800
	Rein. Conc. Slab (Fc = 4000 psi)	42,000	CY	$150.00	$6,300,000	$1,260,000	$7,560,000
	Ballast Concrete	125,600	CY	$70.00	$8,792,000	$1,758,400	$10,550,400
	Piping for Ballast Concrete	LUMPSUM	LS	$1,100,000.00	$1,100,000	$220,000	$1,320,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	624,000	LBS	$3.00	$1,872,000	$374,400	$2,246,400
	Floating Mooring Bits	175,000	LBS	$2.50	$437,500	$87,500	$525,000
	Miscellaneous Metals	1,090,000	LBS	$1.90	$2,071,000	$414,200	$2,485,200
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,688,000	LBS	$1.80	$4,838,400	$967,680	$5,806,080
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$223,500.00	$223,500	$44,700	$268,200
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	195,900	LBS	$1.90	$372,210	$74,442	$446,652
	Culvert Bulkhead	213,500	LBS	$2.00	$427,000	$85,400	$512,400
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$860,000.00	$860,000	$172,000	$1,032,000
050065--	Piping Systems:						
05006515	Mechanical						
	Hydraulic System	LUMPSUM	LS	$959,000.00	$959,000	$191,800	$1,150,800
	Compressed Air System	LUMPSUM	LS	$210,000.00	$210,000	$42,000	$252,000
	Washdown System	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$322,000.00	$322,000	$64,400	$386,400
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$526,000.00	$526,000	$105,200	$631,200
	Raceway System	LUMPSUM	LS	$724,000.00	$724,000	$144,800	$868,800
	Wire and Cable	LUMPSUM	LS	$744,500.00	$744,500	$148,900	$893,400
	Lighting Systems	LUMPSUM	LS	$361,500.00	$361,500	$72,300	$433,800
	Signal & Comm. Systems	LUMPSUM	LS	$115,500.00	$115,500	$23,100	$138,600
	Lighting Protection and Ground System	LUMPSUM	LS	$135,000.00	$135,000	$27,000	$162,000
	Elec. Testing	LUMPSUM	LS	$179,000.00	$179,000	$35,800	$214,800
	Generator	LUMPSUM	LS	$143,000.00	$143,000	$28,600	$171,600
	Other Electrical Work	LUMPSUM	LS	$182,000.00	$182,000	$36,400	$218,400
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Lock Slab Demolition	LUMPSUM	LS	$3,679,000.00	$3,679,000	$735,800	$4,414,800
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Dolphin Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
0500993-	Site Work						
	Permanent Mooring Facil.						
	Cells						
	PSA 23 Sheet Piling	144,600	SF	$13.80	$1,995,480	$399,096	$2,394,576
	PS 27.5	26,000	SF	$13.75	$357,500	$71,500	$429,000
	Sand Fill	27,000	CY	$11.75	$317,250	$63,450	$380,700
	Concrete Cap	1,850	CY	$121.50	$224,775	$44,955	$269,730
	Timber Fenders						
	18" Dia. Treated Piles	48,000	LF	$36.00	$1,728,000	$345,600	$2,073,600
	12"X12"Treated Tim. Fenders	22,000	LF	$72.50	$1,595,000	$319,000	$1,914,000
	3"X12" Treated Tim. Bracing	28,000	LF	$63.00	$1,764,000	$352,800	$2,116,800
05——	Subtotal: Locks				$211,071,205		
05——	Contingencies					$42,214,241	
05——	Contingency - round off						$14,554
05——	TOTAL: LOCKS						$253,300,000

Account Number	Account Number Description	Estimated Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09——	CHANNELS AND CANALS						
0901——	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	873,000	CY	$1.85	$1,615,050	$323,010	$1,938,060
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	60	MO	$120,000.00	$7,200,000	$1,440,000	$8,640,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	1,100,000	CY	$1.75	$1,925,000	$385,000	$2,310,000
	Dredge, Main Chann. North of New Lock	58,000	CY	$3.00	$174,000	$34,800	$208,800
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	440,000	CY	$2.65	$1,166,000	$233,200	$1,399,200
	Dredge, River to St. Claude (Use Material as Random Fill)	55,000	CY	$3.05	$167,750	$33,550	$201,300
	Dredge, River to St. Claude	172,000	CY	$1.85	$318,200	$63,640	$381,840
	Dredge, 3 Utility Crossings	200,000	CY	$2.50	$500,000	$100,000	$600,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36" Riprap	36,000	TN	$23.50	$846,000	$169,200	$1,015,200
	12" Gravel Bedding	7,500	CY	$18.00	$135,000	$27,000	$162,000
	Filter Fabric	22,000	SY	$3.00	$66,000	$13,200	$79,200
09——	Subtotal: Channels and Canals				$18,354,250		
09——	Contingencies:					$3,670,850	
09——	Contingency-round off						($25,100)
09——	TOTAL: CHANNELS AND CANALS						$22,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11------	LEVEES AND FLOODWALLS						
1101----	LEVEES						
110101--	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199--	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	85,230	SF	$10.95	$933,268	$139,990	$1,073,259
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11------	Subtotal: Levees and Floodwalls				$9,418,694		
11------	Contingencies:					$1,412,804	
11------	Contingency - round off						($31,498)
11------	TOTAL: LEVEES AND FLOODWALLS						$10,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25----	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593---	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25---	Subtotal: Mitigation				$26,956,400		
25---	Contingencies					$6,051,600	
25---	Contingency - round off						($8,000)
25---	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$3,240,486	$3,240,486	$648,097	$3,888,583
	Cost Estimates	LUMPSUM	LS	$45,268	$45,268	$9,054	$54,322
	Report Preparation	LUMPSUM	LS	$18,348	$18,348	$3,670	$22,018
	VE Investigations	LUMPSUM	LS	$26,325	$26,325	$5,265	$31,590
	AE Contracts	LUMPSUM	LS	$1,270,600	$1,270,600	$254,120	$1,524,720
	Programs & Project Management	LUMPSUM	LS	$123,000	$123,000	$24,600	$147,600
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$176,860	$176,860	$35,372	$212,232
	Cost Estimates	LUMPSUM	LS	$3,140	$3,140	$628	$3,768
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$33,200	$33,200	$6,640	$39,840
300205-	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$785,703	$785,703	$157,141	$942,844
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$13,761	$13,761	$2,752	$16,513
	VE Investigations	LUMPSUM	LS	$25,730	$25,730	$5,146	$30,876
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$61,086	$61,086	$12,217	$73,303
300206-	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$200,481	$200,481	$40,096	$240,577
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	Report Preparation	LUMPSUM	LS	$15,000	$15,000	$3,000	$18,000
	AE Contracts	LUMPSUM	LS	$60,000	$60,000	$12,000	$72,000
	Programs & Project Management	LUMPSUM	LS	$155,728	$155,728	$31,146	$186,874
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003—	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004—	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,345	$70,345	$14,069	$84,414
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005---	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$358,060	$358,060	$71,612	$429,672
	Cost Estimates	LUMPSUM	LS	$32,198	$32,198	$6,440	$38,638
	Engineering During Construct.	LUMPSUM	LS	$151,771	$151,771	$30,354	$182,125
	Construction Project Mgmt	LUMPSUM	LS	$160,250	$160,250	$32,050	$192,300
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$171,141	$171,141	$34,228	$205,369
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$160,097	$160,097	$32,019	$192,116
	Construction Project Mgmt	LUMPSUM	LS	$138,759	$138,759	$27,752	$166,511
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$141,225	$141,225	$28,245	$169,470
	Cost Estimates	LUMPSUM	LS	$12,019	$12,019	$2,404	$14,423
	Engineering During Construct.	LUMPSUM	LS	$45,344	$45,344	$9,069	$54,413
	Construction Project Mgmt	LUMPSUM	LS	$14,477	$14,477	$2,895	$17,372
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$173,994	$173,994	$34,799	$208,793
	Cost Estimates	LUMPSUM	LS	$7,915	$7,915	$1,583	$9,498
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$14,186	$14,186	$2,837	$17,023
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$7,222,740	$7,222,740	$1,444,548	$8,667,288
	Cost Estimates	LUMPSUM	LS	$88,436	$88,436	$17,687	$106,123
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,628,903	$1,628,903	$325,781	$1,954,684
	Construction Project Mgmt	LUMPSUM	LS	$463,354	$463,354	$92,671	$556,025

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$181,122	$181,122	$36,224	$217,346
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$5,662	$5,662	$1,132	$6,794
	Construction Project Mgmt	LUMPSUM	LS	$23,955	$23,955	$4,791	$28,746
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$316,644	$316,644	$63,329	$379,973
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Engineering During Construct.	LUMPSUM	LS	$197,408	$197,408	$39,482	$236,890
	Construction Project Mgmt	LUMPSUM	LS	$545,251	$545,251	$109,050	$654,301
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$197,465	$197,465	$39,493	$236,958
	Cost Estimates	LUMPSUM	LS	$12,019	$12,019	$2,404	$14,423
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$56,714	$56,714	$11,343	$68,057
	Construction Project Mgmt	LUMPSUM	LS	$68,659	$68,659	$13,732	$82,391

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301-----	Prior E & D (FY87 - FY95)						$17,000,000
30------	Subtotal: Engineering & Design				$49,545,579		
30------	Contingencies					$6,509,116	
30------	Contingency - round off						45,305
30------	TOTAL: ENGINEERING & DESIGN						$56,100,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$526,913	$526,913	$105,383	$632,296
	Contract Modifications	LUMPSUM	LS	$2,371,906	$2,371,906	$474,381	$2,846,287
	Progress & Completion Reports	LUMPSUM	LS	$424,679	$424,679	$84,936	$509,615
	All Other	LUMPSUM	LS	$3,646,163	$3,646,163	$729,233	$4,375,396
3102——	Review of Shop Drawings	LUMPSUM	LS	$590,415	$590,415	$118,083	$708,498
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$428,468	$428,468	$85,694	$514,162
	Compliance Sampling and Testing	LUMPSUM	LS	$705,749	$705,749	$141,150	$846,899
	Quality Surveys	LUMPSUM	LS	$999,736	$999,736	$199,947	$1,199,683
	Title II Servicse	LUMPSUM	LS	$543,197	$543,197	$108,639	$651,836
	All Other	LUMPSUM	LS	$6,253,462	$6,253,462	$1,250,692	$7,504,154
31——	Subtotal: Construction Management				$16,490,688		
31——	Contingencies					$3,298,138	
31——	Contingency - round off						11,174
31——	TOTAL: CONSTRUCTION MANAGEMENT						$19,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,721	$8,623,279	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$57,141,366	$15,358,635	$72,500,000
05——	LOCKS	LUMPSUM	LS		$211,071,205	$42,228,795	$253,300,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$18,354,250	$3,645,750	$22,000,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,418,694	$1,381,307	$10,800,000
25——	MITIGATION	LUMPSUM	LS		$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$49,545,579	$6,554,421	$56,100,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$16,490,688	$3,309,312	$19,800,000
	TOTAL						$510,700,000

COST ESTIMATE
900 X 110 X 22
NED

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Apprisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,001	$17,001	$4,250	$21,251
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,721		
01------	Contingencies					$8,644,180	
01------	Contingency - round off						($20,901)
01------	TOTAL: REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02---	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LIN	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP ST	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAI	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAI	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAI	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAI	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAI	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,027,906		
02---	Contingencies					$15,352,881	
02---	Contingency - round off						$19,213
02---	TOTAL: RELOCATIONS						$72,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05——	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27.5(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS-27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Cell (4X)	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 27 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures:						
05001002	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	38,000	CY	$1.40	$53,200	$10,640	$63,840
05001003	Lock Site-Backfill						
	Granular Backfill	460,000	CY	$13.75	$6,325,000	$1,265,000	$7,590,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	38,400	SF	$14.00	$537,600	$107,520	$645,120
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	44,600	LF	$180.00	$8,028,000	$1,605,600	$9,633,600
	Tension Anchors	LUMPSUM	LS	$470,000.00	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	133,900	LF	$170.00	$22,763,000	$4,552,600	$27,315,600
	3' Crushed Stone Base	28,700	CY	$30.00	$861,000	$172,200	$1,033,200
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	50,600	SF	$15.00	$759,000	$151,800	$910,800
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,142,000	LBS	$2.00	$4,284,000	$856,800	$5,140,800
	Emer. Bulkheads	1,040,000	LBS	$1.80	$1,872,000	$374,400	$2,246,400
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	37,800	CY	$270.00	$10,206,000	$2,041,200	$12,247,200
	Reinf. Conc. Slab (Fc = 6000 psi)	45,200	CY	$160.00	$7,232,000	$1,446,400	$8,678,400
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	727,500	LF	$6.00	$4,365,000	$873,000	$5,238,000
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	8,400	CY	$260.00	$2,184,000	$436,800	$2,620,800
	Rein. Conc. Slab (Fc = 4000 psi)	31,400	CY	$150.00	$4,710,000	$942,000	$5,652,000
	Ballast Concrete	72,000	CY	$70.00	$5,040,000	$1,008,000	$6,048,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500.00	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000.00	$645,000	$129,000	$774,000
050065--							
05006515	Piping Systems:						
	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work & Equipment	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Doplphin Demolition and Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
	Site Work						
0500993-	Permanent Mooring Facil.						
	Cells						
	PS 27.5 Cell Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5 Wall Sheet Piling	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$167,146,500		
05----	Contingencies					$33,429,300	
05----	Contingency - round off						$24,200
05----	TOTAL: LOCKS						$200,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	48	MO	$120,000.00	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	210,000	CY	$1.75	$367,500	$73,500	$441,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09------	Subtotal: Channels and Canals				$13,827,800		
09------	Contingencies:					$2,765,560	
09------	Contingency - round off						$6,640
09------	TOTAL: CHANNELS AND CANALS						$16,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101——	LEVEES						
110101--	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199--	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	68,000	SF	$10.95	$744,600	$111,690	$856,290
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,230,025		
11——	Contingencies:					$1,384,504	
11——	Contingency - round off						($14,529)
11——	TOTAL: LEVEES AND FLOODWALLS						$10,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25----	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lightin	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claud Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593——	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
25——	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
25——	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
25——	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
25——	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
	Subtotal: Mitigation				$26,956,400		
	Contingencies					$6,051,600	
	Contingency - round off						($8,000)
	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,439,755	$2,439,755	$487,951	$2,927,706
	Cost Estimates	LUMPSUM	LS	$34,087	$34,087	$6,817	$40,904
	Report Preparation	LUMPSUM	LS	$15,564	$15,564	$3,113	$18,677
	VE Investigations	LUMPSUM	LS	$22,326	$22,326	$4,465	$26,791
	AE Contracts	LUMPSUM	LS	$956,623	$956,623	$191,325	$1,147,948
	Programs & Project Management	LUMPSUM	LS	$104,267	$104,267	$20,853	$125,120
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$133,163	$133,163	$26,633	$159,796
	Cost Estimates	LUMPSUM	LS	$2,365	$2,365	$473	$2,838
	Report Preparation	LUMPSUM	LS	$6,904	$6,904	$1,381	$8,285
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$24,993	$24,993	$4,999	$29,992
300205-	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$591,556	$591,556	$118,311	$709,867
	Cost Estimates	LUMPSUM	LS	$9,419	$9,419	$1,884	$11,303
	Report Preparation	LUMPSUM	LS	$10,365	$10,365	$2,073	$12,438
	VE Investigations	LUMPSUM	LS	$19,373	$19,373	$3,875	$23,248
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$45,987	$45,987	$9,197	$55,184
300206-	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003----	O & M Manual						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004----	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005----	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$269,479	$269,479	$53,896	$323,375
	Cost Estimates	LUMPSUM	LS	$24,233	$24,233	$4,847	$29,080
	Engineering During Construct.	LUMPSUM	LS	$114,219	$114,219	$22,844	$137,063
	Construction Project Mgmt	LUMPSUM	LS	$120,613	$120,613	$24,123	$144,736
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,435,885	$5,435,885	$1,087,177	$6,523,062
	Cost Estimates	LUMPSUM	LS	$66,559	$66,559	$13,312	$79,871
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,225,921	$1,225,921	$245,184	$1,471,105
	Construction Project Mgmt	LUMPSUM	LS	$348,722	$348,722	$69,744	$418,466

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY95)						$17,000,000
30----	Subtotal: Engineering & Design				$44,782,972		
30----	Contingencies					$5,556,594	
30----	Contingency - round off						($39,566)
30----	TOTAL: ENGINEERING & DESIGN						$50,300,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31------	CONSTRUCTION MANAGEMENT						
3101----	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$435,994	$435,994	$87,199	$523,193
	Contract Modifications	LUMPSUM	LS	$1,962,651	$1,962,651	$392,530	$2,355,181
	Progress & Completion Reports	LUMPSUM	LS	$351,406	$351,406	$70,281	$421,687
	All Other	LUMPSUM	LS	$3,017,034	$3,017,034	$603,407	$3,620,441
3102----	Review of Shop Drawings	LUMPSUM	LS	$488,544	$488,544	$97,709	$586,253
3103----	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$354,541	$354,541	$70,908	$425,449
	Compliance Sampling and Testing	LUMPSUM	LS	$583,981	$583,981	$116,796	$700,777
	Quality Surveys	LUMPSUM	LS	$827,236	$827,236	$165,447	$992,683
	Title II Servicse	LUMPSUM	LS	$449,470	$449,470	$89,894	$539,364
	All Other	LUMPSUM	LS	$5,174,459	$5,174,459	$1,034,892	$6,209,351
31------	Subtotal: Construction Management				$13,645,316		
31------	Contingencies					$2,729,063	
31------	Contingency - round off						$25,621
31------	TOTAL: CONSTRUCTION MANAGEMENT						$16,400,000

Account Number	Account Number Description	Quantity	Unit	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS	$34,576,721	$8,623,279	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS	$57,027,906	$15,372,094	$72,400,000
05——	LOCKS	LUMPSUM	LS	$167,146,500	$33,453,500	$200,600,000
09——	CHANNELS & CANALS	LUMPSUM	LS	$13,827,800	$2,772,200	$16,600,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS	$9,230,025	$1,369,975	$10,600,000
25——	MITIGATION	LUMPSUM	LS	$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS	$44,782,972	$5,517,028	$50,300,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS	$13,645,316	$2,754,684	$16,400,000
	TOTAL					$443,100,000

COST ESTIMATE
900 X 110 X 36

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Apprisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,000	$17,000	$4,250	$21,250
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,720		
01------	Contingencies					$8,644,181	
01------	Contingency - round off						($20,901)
01------	TOTAL REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02—	RELOCATIONS						
021—	ROADS, CONSTRUCTION ACTIVITIES						
	D-1 DETOUR ROUTES						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	0	0	0	0
022—	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	0	0	0	0
	R-2 MAIN LINE	LUMPSUM	LS	0	0	0	0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	0	0	0	0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	0	0	0	0
023—	Cemeteries, Utilities, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	0	0	0	0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$423,340	$423,340	$105,835	$529,175
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$888,160	$888,160	$222,040	$1,110,200
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$854,000	$854,000	$213,500	$1,067,500

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$367,220	$367,220	$91,805	$459,025
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$827,160	$827,160	$206,790	$1,033,950
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$713,700	$713,700	$178,425	$892,125
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$538,020	$538,020	$134,505	$672,525
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$577,060	$577,060	$144,265	$721,325
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINES	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,577,460	$1,577,460	$394,365	$1,971,825
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,515,240	$1,515,240	$378,810	$1,894,050
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,257,820	$1,257,820	$314,455	$1,572,275
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$46,360	$46,360	$11,590	$57,950
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,469,280	$2,469,280	$617,320	$3,086,600
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,431,060	$1,431,060	$357,765	$1,788,825
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$467,260	$467,260	$116,815	$584,075
	E-10 2-15KV 25HZ FEEDER	LUMPS§M	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	0	0	0	0
	Claiborne Bridge	LUMPSUM	LS	0	0	0	0
	St. Claude Bridge	LUMPSUM	LS	0	0	0	0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	0	0	0	0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	0	0	0	0
02---	Subtotal: Relocations				$57,141,366		
02---	Contingencies					$15,381,246	
02---	Contingency - round off						($22,612)
02---	TOTAL: RELOCATIONS						$72,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05——	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000.00	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee / I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS 27.5 Piling	205,800	SF	$14.40	$2,963,520	$592,704	$3,556,224
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	32,200	SF	$11.00	$354,200	$70,840	$425,040
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Dolphins 4X	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,200	CY	$16.00	$99,200	$19,840	$119,040
	Landscaping - 29 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures						
05001002	Site Work						
	Excavation (To El. -61)						
	Dressing Exacavated Slopes	51,000	CY	$1.40	$71,400	$14,280	$85,680
05001003	Lock Site-Backfill						
	Granular Backfill	640,000	CY	$13.75	$8,800,000	$1,760,000	$10,560,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	60,000	TN	$23.50	$1,410,000	$282,000	$1,692,000
	12" Gravel Bedding	12,000	CY	$18.00	$216,000	$43,200	$259,200
	Filter Fabric	36,000	SY	$3.00	$108,000	$21,600	$129,600
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	26,100	SF	$14.00	$365,400	$73,080	$438,480
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	16,640	LF	$190.00	$3,161,600	$632,320	$3,793,920
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	50,880	LF	$180.00	$9,158,400	$1,831,680	$10,990,080
	Tension Anchors	LUMPSUM	LS	$470,000.00	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	152,960	LF	$170.00	$26,003,200	$5,200,640	$31,203,840
	3' Crushed Stone Base	28,600	CY	$30.00	$858,000	$171,600	$1,029,600
	Furnishing/Handling of Underwater Screeding Frame	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	60,700	SF	$15.00	$910,500	$182,100	$1,092,600
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,964,800	LBS	$2.00	$5,929,600	$1,185,920	$7,115,520
	Emer. Bulkheads	1,600,000	LBS	$1.80	$2,880,000	$576,000	$3,456,000
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	15,400	SF	$13.80	$212,520	$42,504	$255,024
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,300	CY	$370.00	$481,000	$96,200	$577,200
	Concrete, In-Place	1,400	CY	$200.00	$280,000	$56,000	$336,000
	Sand Fill	800	CY	$11.50	$9,200	$1,840	$11,040
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	38,600	LF	$36.00	$1,389,600	$277,920	$1,667,520
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	73,000	SF	$13.75	$1,003,750	$200,750	$1,204,500
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	26,000	CY	$11.50	$299,000	$59,800	$358,800
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	43,800	CY	$270.00	$11,826,000	$2,365,200	$14,191,200
	Reinf. Conc. Slab (Fc = 6000 psi)	45,300	CY	$160.00	$7,248,000	$1,449,600	$8,697,600
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	712,700	LF	$6.00	$4,276,200	$855,240	$5,131,440
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	15,800	CY	$260.00	$4,108,000	$821,600	$4,929,600
	Rein. Conc. Slab (Fc = 4000 psi)	35,500	CY	$150.00	$5,325,000	$1,065,000	$6,390,000
	Ballast Concrete	114,000	CY	$70.00	$7,980,000	$1,596,000	$9,576,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,688,000	LBS	$1.80	$4,838,400	$967,680	$5,806,080
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$223,500.00	$223,500	$44,700	$268,200
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000.00	$645,000	$129,000	$774,000
050065--	Piping Systems:						
05006515	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$235,000.00	$235,000	$47,000	$282,000
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Lock Slab Demolition	LUMPSUM	LS	$3,679,000.00	$3,679,000	$735,800	$4,414,800
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Dolphin Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
0500993-	Site Work						
	Permanent Mooring Facil. Cells						
	PSA 23 Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$189,041,090		
05----	Contingencies					$37,808,218	
05----	Contingency - round off						($49,308)
05----	TOTAL: LOCKS						$226,800,000

Account Number	Account Number Description	Estimated Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	873,000	CY	$1.85	$1,615,050	$323,010	$1,938,060
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
					$0	$0	$0
	Assistance Tugs	48	MO	$120,000.00	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	883,000	CY	$1.75	$1,545,250	$309,050	$1,854,300
	Dredge, Main Chann. North of New Lock	56,000	CY	$3.00	$168,000	$33,600	$201,600
	Dredge, Main Chann. South of New Lock	110,000	CY	$1.45	$159,500	$31,900	$191,400
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	338,000	CY	$2.65	$895,700	$179,140	$1,074,840
	Dredge, River to St. Claude	227,000	CY	$1.85	$419,950	$83,990	$503,940
	Dredge, 3 Utility Crossings	200,000	CY	$2.50	$500,000	$100,000	$600,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36" Riprap	36,000	TN	$23.50	$846,000	$169,200	$1,015,200
	12" Gravel Bedding	7,500	CY	$18.00	$135,000	$27,000	$162,000
	Filter Fabric	22,000	SY	$3.00	$66,000	$13,200	$79,200
09------	Subtotal: Channels and Canals				$16,351,700		
09------	Contingencies:					$3,270,340	
09------	Contingency - round off						($22,040)
09------	TOTAL: CHANNELS AND CANALS						$19,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101——	LEVEES						
110101	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199–	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	85,230	SF	$10.95	$933,268	$139,990	$1,073,259
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,418,694		
11——	Contingencies:					$1,412,804	
11——	Contingency - round off						($31,498)
11——	TOTAL: LEVEES AND FLOODWALLS						$10,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25------	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593---	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25---	Subtotal: Mitigation				$26,956,400		
25---	Contingencies					$6,051,600	
25---	Contingency - round off						($8,000)
25---	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels	LUMPSUM					
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials	LUMPSUM					
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,748,542	$2,748,542	$598,010	$3,346,552
	Cost Estimates	LUMPSUM	LS	$38,399	$38,399	$7,680	$46,079
	Report Preparation	LUMPSUM	LS	$17,536	$17,536	$3,507	$21,043
	VE Investigations	LUMPSUM	LS	$25,149	$25,149	$5,030	$30,179
	AE Contracts	LUMPSUM	LS	$1,077,696	$1,077,696	$598,010	$1,675,706
	Programs & Project Management	LUMPSUM	LS	$117,459	$117,459	$23,492	$140,951
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$150,015	$150,015	$30,003	$180,018
	Cost Estimates	LUMPSUM	LS	$2,662	$2,662	$532	$3,194
	Report Preparation	LUMPSUM	LS	$7,779	$7,779	$1,556	$9,335
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$28,164	$28,164	$5,633	$33,797
300205-	DM Mechanical & Electrical	LUMPSUM					
	Engineering Analysis & Design	LUMPSUM	LS	$666,427	$666,427	$133,285	$799,712
	Cost Estimates	LUMPSUM	LS	$10,610	$10,610	$2,122	$12,732
	Report Preparation	LUMPSUM	LS	$11,674	$11,674	$2,335	$14,009
	VE Investigations	LUMPSUM	LS	$21,822	$21,822	$4,364	$26,186
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$51,813	$51,813	$10,363	$62,176
300206-	DM Site Preparation & Demolition	LUMPSUM					
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock	LUMPSUM					
	Engineering Analysis & Design	LUMPSUM	LS	$200,481	$200,481	$40,096	$240,577
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	Report Preparation	LUMPSUM	LS	$15,000	$15,000	$3,000	$18,000
	AE Contracts	LUMPSUM	LS	$60,000	$60,000	$12,000	$72,000
	Programs & Project Management	LUMPSUM	LS	$155,728	$155,728	$31,146	$186,874
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$158,401	$158,401	$31,680	$190,081
	Programs & Project Management	LUMPSUM	LS	$31,110	$31,110	$6,222	$37,332
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$68,225	$68,225	$13,645	$81,870
	Programs & Project Management	LUMPSUM	LS	$46,862	$46,862	$9,372	$56,234

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005---	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$303,703	$303,703	$60,741	$364,444
	Cost Estimates	LUMPSUM	LS	$27,311	$27,311	$5,462	$32,773
	Engineering During Construct.	LUMPSUM	LS	$128,726	$128,726	$25,745	$154,471
	Construction Project Mgmt	LUMPSUM	LS	$135,931	$135,931	$27,186	$163,117
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$848,241	$848,241	$169,648	$1,017,889
	Cost Estimates	LUMPSUM	LS	$94,617	$94,617	$18,923	$113,540
	Value Engineering	LUMPSUM	LS	$1,749	$1,749	$350	$2,099
	Engineering During Construct.	LUMPSUM	LS	$299,958	$299,958	$59,992	$359,950
	Construction Project Mgmt	LUMPSUM	LS	$79,431	$79,431	$15,886	$95,317
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$187,420	$187,420	$37,484	$224,904
	Cost Estimates	LUMPSUM	LS	$41,460	$41,460	$8,292	$49,752
	Value Engineering	LUMPSUM	LS	$2,180	$2,180	$436	$2,616
	Engineering During Construct.	LUMPSUM	LS	$28,710	$28,710	$5,742	$34,452
	Construction Project Mgmt	LUMPSUM	LS	$99,110	$99,110	$19,822	$118,932
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$170,310	$170,310	$34,062	$204,372
	Cost Estimates	LUMPSUM	LS	$17,690	$17,690	$3,538	$21,228
	Engineering During Construct.	LUMPSUM	LS	$100,490	$100,490	$20,098	$120,588
	Construction Project Mgmt	LUMPSUM	LS	$10,340	$10,340	$2,068	$12,408
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$302,351	$302,351	$60,470	$362,821
	Cost Estimates	LUMPSUM	LS	$18,960	$18,960	$3,792	$22,752
	Engineering During Construct.	LUMPSUM	LS	$233,690	$233,690	$46,738	$280,428
	Construction Project Mgmt	LUMPSUM	LS	$45,560	$45,560	$9,112	$54,672
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$183,810	$183,810	$36,762	$220,572
	Cost Estimates	LUMPSUM	LS	$10,680	$10,680	$2,136	$12,816
	Engineering During Construct.	LUMPSUM	LS	$91,280	$91,280	$18,256	$109,536
	Construction Project Mgmt	LUMPSUM	LS	$10,370	$10,370	$2,074	$12,444
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$6,126,243	$6,126,243	$1,380,000	$7,506,243
	Cost Estimates	LUMPSUM	LS	$75,009	$75,009	$15,002	$90,011
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,381,615	$1,995,750	$399,150	$2,394,900
	Construction Project Mgmt	LUMPSUM	LS	$393,021	$393,021	$78,604	$471,625

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$181,122	$181,122	$36,224	$217,346
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$5,662	$5,662	$1,132	$6,794
	Construction Project Mgmt	LUMPSUM	LS	$23,955	$23,955	$4,791	$28,746
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$316,644	$316,644	$63,329	$379,973
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Engineering During Construct.	LUMPSUM	LS	$197,408	$197,408	$39,482	$236,890
	Construction Project Mgmt	LUMPSUM	LS	$545,251	$545,251	$109,050	$654,301
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$197,465	$197,465	$39,493	$236,958
	Cost Estimates	LUMPSUM	LS	$12,019	$12,019	$2,404	$14,423
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$56,714	$56,714	$11,343	$68,057
	Construction Project Mgmt	LUMPSUM	LS	$68,659	$68,659	$13,732	$82,391

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY97)						$17,000,000
30----	Subtotal: Engineering & Design				$47,852,030		
30----	Contingencies					$6,755,930	
30----	Contingency - round off						(7,960)
30----	TOTAL: ENGINEERING & DESIGN						$54,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$471,154	$471,154	$94,231	$565,385
	Contract Modifications	LUMPSUM	LS	$2,120,926	$2,120,926	$424,185	$2,545,111
	Progress & Completion Reports	LUMPSUM	LS	$379,745	$379,745	$75,949	$455,694
	All Other	LUMPSUM	LS	$3,670,501	$3,670,501	$734,100	$4,404,601
3102——	Review of Shop Drawings	LUMPSUM	LS	$527,940	$527,940	$105,588	$633,528
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$383,130	$383,130	$76,626	$459,756
	Compliance Sampling and Testing	LUMPSUM	LS	$631,073	$631,073	$126,215	$757,288
	Quality Surveys	LUMPSUM	LS	$893,952	$893,952	$178,790	$1,072,742
	Title II Servicse	LUMPSUM	LS	$485,722	$485,722	$97,144	$582,866
	All Other	LUMPSUM	LS	$6,001,913	$6,001,913	$1,310,000	$7,311,913
31——	Subtotal: Construction Management				$15,566,056		
31——	Contingencies					$3,222,829	
31——	Contingency - round off						11,115
31——	TOTAL: CONSTRUCTION MANAGEMENT						$18,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,720	$8,623,280	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$57,141,366	$15,358,634	$72,500,000
05——	LOCKS	LUMPSUM	LS		$189,041,090	$37,808,218	$226,800,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$16,351,700	$3,248,300	$19,600,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,418,694	$1,381,307	$10,800,000
25——	MITIGATION	LUMPSUM	LS		$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$47,852,030	$6,747,970	$54,600,000
31——	CONSTRUCTION MGMT.	LUMPSUM	LS		$15,566,056	$3,233,944	$18,800,000
	TOTAL						$479,300,000

COST ESTIMATE
1200 X 110 X 22

MRGO LOCK AND CONNECTING CHANNELS
File: 12B11022.WQ1

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN BARGE LOCK
1200 X 110 X 22 PILE FOUNDED LOCK

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Apprisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,000	$17,000	$4,250	$21,250
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,720		
01------	Contingencies					$8,644,181	
01------	Contingency - round off						($20,901)
01------	TOTAL REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02—	RELOCATIONS						
021–	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						$0
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
							$0
	B-1 St. Claude Bridge						$0
	(Low-Level Double Bascule)						$0
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022–	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023–	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINE	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450
	NEW ORLEANS SEWAGE AND WATER BOARD ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,027,906		
02---	Contingencies					$15,352,881	
02---	Contingency - round off						$19,213
02---	TOTAL: RELOCATIONS						$72,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05------	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000.00	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	270,500	CY	$3.00	$811,500	$162,300	$973,800
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee / I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS 27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,860	LF	$3,315.00	$6,165,900	$1,233,180	$7,399,080
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$11.00	$336,600	$67,320	$403,920
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Dolphins 4X	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	5,000	SY	$18.00	$90,000	$18,000	$108,000
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,200	CY	$16.00	$99,200	$19,840	$119,040
	Landscaping - 29 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures						
05001002	Site Work						
	Excavation (To El. -61)						
	Dressing Exacavated Slopes	45,000	CY	$1.40	$63,000	$12,600	$75,600
05001003	Lock Site-Backfill						
	Granular Backfill	525,000	CY	$13.75	$7,218,750	$1,443,750	$8,662,500
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	100,500	CY	$20.85	$2,095,425	$419,085	$2,514,510
05001004	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	37,000	SF	$14.00	$518,000	$103,600	$621,600
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	16,800	LF	$190.00	$3,192,000	$638,400	$3,830,400
	Precast Pad & Flat Jacks	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	52,920	LF	$180.00	$9,525,600	$1,905,120	$11,430,720
	Tension Anchors	LUMPSUM	LS	$558,000.00	$558,000	$111,600	$669,600
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	159,600	LF	$170.00	$27,132,000	$5,426,400	$32,558,400
	3' Crushed Stone Base	34,500	CY	$30.00	$1,035,000	$207,000	$1,242,000
	Furnishing/Handling of Underwater Screeding Frame	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	46,000	CY	$70.00	$3,220,000	$644,000	$3,864,000
	Piping for Grout	LUMPSUM	LS	$1,100,000.00	$1,100,000	$220,000	$1,320,000
	Containment Sheet Piling PZ-22	69,000	SF	$15.00	$1,035,000	$207,000	$1,242,000
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,142,000	LBS	$2.00	$4,284,000	$856,800	$5,140,800
	Emer. Bulkheads	1,040,000	LBS	$1.80	$1,872,000	$374,400	$2,246,400
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	28,800	SF	$13.80	$397,440	$79,488	$476,928
	Wale System (5 Tiers)	430,000	LB	$1.15	$494,500	$98,900	$593,400
	Guidewall						
	Piling, HP 14X73	10,200	LF	$28.25	$288,150	$57,630	$345,780
	Precast Concrete Pontoons	2,500	CY	$370.00	$925,000	$185,000	$1,110,000
	Concrete, In-Place	1,850	CY	$200.00	$370,000	$74,000	$444,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	7,800	LF	$35.00	$273,000	$54,600	$327,600
	Miscellaneous Metals	135,000	LB	$1.90	$256,500	$51,300	$307,800

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	41,300	LF	$36.00	$1,486,800	$297,360	$1,784,160
	12"X12"Treated Timber Fenders	6,800	LF	$30.50	$207,400	$41,480	$248,880
	3"X12" Treated Timber Planks	16,300	LF	$16.50	$268,950	$53,790	$322,740
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	50,100	CY	$270.00	$13,527,000	$2,705,400	$16,232,400
	Reinf. Conc. Slab (Fc = 6000 psi)	54,500	CY	$160.00	$8,720,000	$1,744,000	$10,464,000
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	855,100	LF	$6.00	$5,130,600	$1,026,120	$6,156,720
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	10,000	CY	$260.00	$2,600,000	$520,000	$3,120,000
	Rein. Conc. Slab (Fc = 4000 psi)	37,000	CY	$150.00	$5,550,000	$1,110,000	$6,660,000
	Ballast Concrete	88,000	CY	$70.00	$6,160,000	$1,232,000	$7,392,000
	Piping for Ballast Concrete	LUMPSUM	LS	$1,100,000.00	$1,100,000	$220,000	$1,320,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	624,000	LBS	$3.00	$1,872,000	$374,400	$2,246,400
	Floating Mooring Bits	175,000	LBS	$2.50	$437,500	$87,500	$525,000
	Miscellaneous Metals	1,090,000	LBS	$1.90	$2,071,000	$414,200	$2,485,200
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$223,500.00	$223,500	$44,700	$268,200
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	195,900	LBS	$1.90	$372,210	$74,442	$446,652
	Culvert Bulkhead	213,500	LBS	$2.00	$427,000	$85,400	$512,400
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$860,000.00	$860,000	$172,000	$1,032,000
050065--	Piping Systems:						
05006515	Mechanical						
	Hydraulic System	LUMPSUM	LS	$959,000.00	$959,000	$191,800	$1,150,800
	Compressed Air System	LUMPSUM	LS	$210,000.00	$210,000	$42,000	$252,000
	Washdown System	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$322,000.00	$322,000	$64,400	$386,400
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$526,000.00	$526,000	$105,200	$631,200
	Raceway System	LUMPSUM	LS	$724,000.00	$724,000	$144,800	$868,800
	Wire and Cable	LUMPSUM	LS	$744,500.00	$744,500	$148,900	$893,400
	Lighting Systems	LUMPSUM	LS	$361,500.00	$361,500	$72,300	$433,800
	Signal & Comm. Systems	LUMPSUM	LS	$115,500.00	$115,500	$23,100	$138,600
	Lighting Protection and Ground System	LUMPSUM	LS	$135,000.00	$135,000	$27,000	$162,000
	Elec. Testing	LUMPSUM	LS	$179,000.00	$179,000	$35,800	$214,800
	Generator	LUMPSUM	LS	$143,000.00	$143,000	$28,600	$171,600
	Other Electrical Work	LUMPSUM	LS	$182,000.00	$182,000	$36,400	$218,400
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Dolphin Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
0500993-	Site Work						
	Permanent Mooring Facil.						
	Cells						
	PSA 23 Sheet Piling	144,600	SF	$13.80	$1,995,480	$399,096	$2,394,576
	PS 27.5	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	27,000	CY	$11.75	$317,250	$63,450	$380,700
	Concrete Cap	1,850	CY	$121.50	$224,775	$44,955	$269,730
	Timber Fenders						
	18" Dia. Treated Piles	48,000	LF	$36.00	$1,728,000	$345,600	$2,073,600
	12"X12"Treated Tim. Fenders	22,000	LF	$72.50	$1,595,000	$319,000	$1,914,000
	3"X12" Treated Tim. Bracing	28,000	LF	$63.00	$1,764,000	$352,800	$2,116,800
05----	Subtotal: Locks				$187,911,380		
05----	Contingencies					$37,582,276	
05----	Contingency - round off						$6,344
05----	TOTAL: LOCKS						$225,500,000

Account Number	Account Number Description	Estimated Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	54	MO	$120,000.00	$6,480,000	$1,296,000	$7,776,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	310,000	CY	$1.75	$542,500	$108,500	$651,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0		$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09------	Subtotal: Channels and Canals				$14,722,800		
09------	Contingencies:					$2,944,560	
09------	Contingency - round off						$32,640
09------	TOTAL: CHANNELS AND CANALS						$17,700,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11------	LEVEES AND FLOODWALLS						
1101----	LEVEES						
110101--	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199--	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	68,000	SF	$10.95	$744,600	$111,690	$856,290
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11------	Subtotal: Levees and Floodwalls				$9,230,025		
11------	Contingencies:					$1,384,504	
11------	Contingency - round off						($14,529)
11------	TOTAL: LEVEES AND FLOODWALLS						$10,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25------	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593---	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25----	Subtotal: Mitigation				$26,956,400		
25----	Contingencies					$6,051,600	
25----	Contingency - round off						($8,000)
25----	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101-	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$596,419	$596,419	$119,284	$715,703
	Cost Estimates	LUMPSUM	LS	$21,353	$21,353	$4,271	$25,624
	VE Investigations	LUMPSUM	LS	$27,520	$27,520	$5,504	$33,024
	AE Contracts	LUMPSUM	LS	$280,722	$280,722	$56,144	$336,866
	Programs & Project Management	LUMPSUM	LS	$104,005	$104,005	$20,801	$124,806
300102-	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$634,248	$634,248	$126,850	$761,098
	Cost Estimates	LUMPSUM	LS	$21,353	$21,353	$4,271	$25,624
	VE Investigations	LUMPSUM	LS	$27,520	$27,520	$5,504	$33,024
	AE Contracts	LUMPSUM	LS	$285,324	$285,324	$57,065	$342,389
	Programs & Project Management	LUMPSUM	LS	$122,045	$122,045	$24,409	$146,454
300103-	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$539,078	$539,078	$107,816	$646,894
	Cost Estimates	LUMPSUM	LS	$31,938	$31,938	$6,388	$38,326
	Programs & Project Management	LUMPSUM	LS	$149,841	$149,841	$29,968	$179,809
300104-	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$198,254	$198,254	$39,651	$237,905
	Cost Estimates	LUMPSUM	LS	$12,517	$12,517	$2,503	$15,020
	AE Contracts	LUMPSUM	LS	$275,200	$275,200	$55,040	$330,240
	Programs & Project Management	LUMPSUM	LS	$138,888	$138,888	$27,778	$166,666
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$587,399	$587,399	$117,480	$704,879
	Cost Estimates	LUMPSUM	LS	$16,567	$16,567	$3,313	$19,880
	Report Preparation	LUMPSUM	LS	$9,204	$9,204	$1,841	$11,045
	VE Investigations	LUMPSUM	LS	$27,520	$27,520	$5,504	$33,024
	AE Contracts	LUMPSUM	LS	$587,399	$587,399	$117,480	$704,879
	Programs & Project Management	LUMPSUM	LS	$107,779	$107,779	$21,556	$129,335
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203--	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,838,942	$2,838,942	$567,788	$3,406,730
	Cost Estimates	LUMPSUM	LS	$39,661	$39,661	$7,932	$47,593
	Report Preparation	LUMPSUM	LS	$18,111	$18,111	$3,622	$21,733
	VE Investigations	LUMPSUM	LS	$25,977	$25,977	$5,195	$31,172
	AE Contracts	LUMPSUM	LS	$1,113,142	$1,113,142	$222,628	$1,335,770
	Programs & Project Management	LUMPSUM	LS	$121,325	$121,325	$24,265	$145,590
300204--	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$154,949	$154,949	$30,990	$185,939
	Cost Estimates	LUMPSUM	LS	$2,749	$2,749	$550	$3,299
	Report Preparation	LUMPSUM	LS	$8,034	$8,034	$1,607	$9,641
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$29,081	$29,081	$5,816	$34,897
300205--	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$688,343	$688,343	$137,669	$826,012
	Cost Estimates	LUMPSUM	LS	$10,964	$10,964	$2,193	$13,157
	Report Preparation	LUMPSUM	LS	$12,056	$12,056	$2,411	$14,467
	VE Investigations	LUMPSUM	LS	$22,540	$22,540	$4,508	$27,048
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$53,509	$53,509	$10,702	$64,211
300206--	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207--	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005----	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$313,570	$313,570	$62,714	$376,284
	Cost Estimates	LUMPSUM	LS	$28,197	$28,197	$5,639	$33,836
	Engineering During Construct.	LUMPSUM	LS	$132,908	$132,908	$26,582	$159,490
	Construction Project Mgmt	LUMPSUM	LS	$140,341	$140,341	$28,068	$168,409
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$6,757,552	$7,816,720	$1,563,344	$9,380,064
	Cost Estimates	LUMPSUM	LS	$77,451	$77,451	$15,490	$92,941
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,426,502	$1,426,502	$285,300	$1,711,802
	Construction Project Mgmt	LUMPSUM	LS	$405,784	$405,784	$81,157	$486,941

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508-	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509-	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510-	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511-	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512-	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513-	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514-	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301-----	Prior E & D (FY87 - FY97)						$17,000,000
30------	Subtotal: Engineering & Design				$48,621,383		
30------	Contingencies					$6,324,277	
30------	Contingency - round off						($45,660)
30------	TOTAL: ENGINEERING & DESIGN						$54,900,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$480,950	$480,950	$96,190	$577,140
	Contract Modifications	LUMPSUM	LS	$2,165,025	$2,165,025	$433,005	$2,598,030
	Progress & Completion Reports	LUMPSUM	LS	$387,644	$387,644	$77,529	$465,173
	All Other	LUMPSUM	LS	$3,328,124	$3,328,124	$665,625	$3,993,749
3102——	Review of Shop Drawings	LUMPSUM	LS	$538,922	$538,922	$107,784	$646,706
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$391,099	$391,099	$78,220	$469,319
	Compliance Sampling and Testing	LUMPSUM	LS	$644,196	$644,196	$128,839	$773,035
	Quality Surveys	LUMPSUM	LS	$912,529	$912,529	$182,506	$1,095,035
	Title II Servicse	LUMPSUM	LS	$495,813	$495,813	$99,163	$594,976
	All Other	LUMPSUM	LS	$5,707,942	$5,707,942	$1,141,588	$6,849,530
31——	Subtotal: Construction Management				$15,052,244		
31——	Contingencies					$3,010,449	
31——	Contingency - round off						$37,307
31——	TOTAL: CONSTRUCTION MANAGEMENT						$18,100,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Project Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,720	$8,623,280	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$57,027,906	$15,372,094	$72,400,000
05——	LOCKS	LUMPSUM	LS		$187,911,380	$37,582,276	$225,500,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$14,722,800	$2,977,200	$17,700,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,230,025	$1,369,975	$10,600,000
25——	MITIGATION	LUMPSUM	LS		$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$48,621,383	$6,278,617	$54,900,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$15,052,244	$3,047,756	$18,100,000
	TOTAL						$475,400,000

COST ESTIMATE
900 X 110 X 25/22

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Appraisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	A/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,000	$17,000	$4,250	$21,250
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LERRD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,720		
01------	Contingencies					$8,644,181	
01------	Contingency - round off						($20,901)
01------	TOTAL: REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02--	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINE	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC. COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, & Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,027,906		
02---	Contingencies					$15,352,881	
02---	Contingency - round off						$19,213
02---	TOTAL: RELOCATIONS						$72,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05——	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27.5(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS-27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Cell (4X)	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 27 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures:						
05001002	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	38,000	CY	$1.40	$53,200	$10,640	$63,840
05001003	Lock Site-Backfill						
	Granular Backfill	497,000	CY	$13.75	$6,833,750	$1,366,750	$8,200,500
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	34,700	SF	$14.00	$485,800	$97,160	$582,960
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	44,600	LF	$180.00	$8,028,000	$1,605,600	$9,633,600
	Tension Anchors	LUMPSUM	LS	$470,000.00	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	133,900	LF	$170.00	$22,763,000	$4,552,600	$27,315,600
	3' Crushed Stone Base	28,700	CY	$30.00	$861,000	$172,200	$1,033,200
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	52,100	SF	$15.00	$781,500	$156,300	$937,800
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,142,000	LBS	$2.00	$4,284,000	$856,800	$5,140,800
	Emer. Bulkheads	1,110,000	LBS	$1.80	$1,998,000	$399,600	$2,397,600
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	41,500	CY	$270.00	$11,205,000	$2,241,000	$13,446,000
	Reinf. Conc. Slab (Fc = 6000 psi)	45,300	CY	$160.00	$7,248,000	$1,449,600	$8,697,600
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	727,500	LF	$6.00	$4,365,000	$873,000	$5,238,000
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	10,800	CY	$260.00	$2,808,000	$561,600	$3,369,600
	Rein. Conc. Slab (Fc = 4000 psi)	31,400	CY	$150.00	$4,710,000	$942,000	$5,652,000
	Ballast Concrete	72,000	CY	$70.00	$5,040,000	$1,008,000	$6,048,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500.00	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000.00	$645,000	$129,000	$774,000
050065--							
05006515	Piping Systems:						
	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work & Equipment	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Doplphin Demolition and Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
	Site Work						
0500993-	Permanent Mooring Facil.						
	Cells						
	PS 27.5 Cell Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5 Wall Sheet Piling	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$169,390,950		
05----	Contingencies					$33,878,190	
05----	Contingency - round off						$30,860
05----	TOTAL: LOCKS						$203,300,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09-----	CHANNELS AND CANALS						
0901---	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	48	MO	$120,000.00	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	260,000	CY	$1.75	$455,000	$91,000	$546,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09-----	Subtotal: Channels and Canals				$13,915,300		
09-----	Contingencies:					$2,783,060	
09-----	Contingency - round off						$1,640
09-----	TOTAL: CHANNELS AND CANALS						$16,700,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11------	LEVEES AND FLOODWALLS						
1101---	LEVEES						
110101--	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199--	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	69,000	SF	$10.95	$755,550	$113,333	$868,883
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11------	Subtotal: Levees and Floodwalls				$9,240,975		
11------	Contingencies:					$1,386,146	
11------	Contingency - round off						($27,121)
11------	TOTAL: LEVEES AND FLOODWALLS						$10,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25------	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593---	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25------	Subtotal: Mitigation				$26,956,400		
25------	Contingencies					$6,051,600	
25------	Contingency - round off						($8,000)
25------	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30——	ENGINEERING AND DESIGN						
3001——	Feature Design Memoranda:						
300101-	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102-	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103-	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104-	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002——	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203--	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,464,152	$2,464,152	$492,830	$2,956,982
	Cost Estimates	LUMPSUM	LS	$34,428	$34,428	$6,886	$41,314
	Report Preparation	LUMPSUM	LS	$15,720	$15,720	$3,144	$18,864
	VE Investigations	LUMPSUM	LS	$22,549	$22,549	$4,510	$27,059
	AE Contracts	LUMPSUM	LS	$966,187	$966,187	$193,237	$1,159,424
	Programs & Project Management	LUMPSUM	LS	$105,310	$105,310	$21,062	$126,372
300204--	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$133,163	$133,163	$26,633	$159,796
	Cost Estimates	LUMPSUM	LS	$2,365	$2,365	$473	$2,838
	Report Preparation	LUMPSUM	LS	$6,904	$6,904	$1,381	$8,285
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$24,993	$24,993	$4,999	$29,992
300205--	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$591,556	$591,556	$118,311	$709,867
	Cost Estimates	LUMPSUM	LS	$9,519	$9,519	$1,904	$11,423
	Report Preparation	LUMPSUM	LS	$10,365	$10,365	$2,073	$12,438
	VE Investigations	LUMPSUM	LS	$19,373	$19,373	$3,875	$23,248
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$45,987	$45,987	$9,197	$55,184
300206--	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207--	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005----	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$272,174	$272,174	$54,435	$326,609
	Cost Estimates	LUMPSUM	LS	$24,475	$24,475	$4,895	$29,370
	Engineering During Construct.	LUMPSUM	LS	$115,361	$115,361	$23,072	$138,433
	Construction Project Mgmt	LUMPSUM	LS	$121,820	$121,820	$24,364	$146,184
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$841,584	$841,584	$168,317	$1,009,901
	Cost Estimates	LUMPSUM	LS	$81,226	$81,226	$16,245	$97,471
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$62,518	$62,518	$12,504	$75,022
	Construction Project Mgmt	LUMPSUM	LS	$112,320	$112,320	$22,464	$134,784
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,490,244	$5,490,244	$1,098,049	$6,588,293
	Cost Estimates	LUMPSUM	LS	$67,225	$67,225	$13,445	$80,670
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,238,180	$1,238,180	$247,636	$1,485,816
	Construction Project Mgmt	LUMPSUM	LS	$352,210	$352,210	$70,442	$422,652

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508-	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509-	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510-	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511-	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512-	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513-	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514-	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY97)						$17,000,000
30----	Subtotal: Engineering & Design				$44,905,721		
30----	Contingencies					$5,581,144	
30----	Contingency - round off						$13,135
30----	TOTAL: ENGINEERING & DESIGN						$50,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$435,994	$435,994	$87,199	$523,193
	Contract Modifications	LUMPSUM	LS	$1,982,278	$1,982,278	$396,456	$2,378,734
	Progress & Completion Reports	LUMPSUM	LS	$351,406	$351,406	$70,281	$421,687
	All Other	LUMPSUM	LS	$3,047,204	$3,047,204	$609,441	$3,656,645
3102——	Review of Shop Drawings	LUMPSUM	LS	$488,544	$488,544	$97,709	$586,253
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$354,541	$354,541	$70,908	$425,449
	Compliance Sampling and Testing	LUMPSUM	LS	$583,981	$583,981	$116,796	$700,777
	Quality Surveys	LUMPSUM	LS	$827,236	$827,236	$165,447	$992,683
	Title II Servicse	LUMPSUM	LS	$449,470	$449,470	$89,894	$539,364
	All Other	LUMPSUM	LS	$5,226,202	$5,226,202	$1,045,240	$6,271,442
31——	Subtotal: Construction Management				$13,746,856		
31——	Contingencies					$2,749,371	
31——	Contingency - round off						$3,773
31——	TOTAL: CONSTRUCTION MANAGEMENT						$16,500,000

CODE OF ACCOUNTS

MRGO LOCK AND CONNECTING CHANNELS
File: 9E110X25.WQ1

LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN BARGE LOCK
900 X 110 X 25 (SILL AT -22) PILE FOUNDED LOCK

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,720	$8,623,280	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$57,027,906	$15,372,094	$72,400,000
05——	LOCKS	LUMPSUM	LS		$169,390,950	$33,878,190	$203,300,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$13,915,300	$2,783,060	$16,700,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,240,975	$1,359,025	$10,600,000
25——	MITIGATION	LUMPSUM	LS		$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$44,905,721	$5,594,279	$50,500,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$13,746,856	$2,753,144	$16,500,000
	TOTAL						$446,200,000

COST ESTIMATE
900 X 110 X 18

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Apprisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,001	$17,001	$4,250	$21,251
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LEERD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,721		
01------	Contingencies					$8,644,180	
01------	Contingency - round off						($20,901)
01------	TOTAL: REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02--	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINE	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,027,906		
02---	Contingencies					$15,352,881	
02---	Contingency - round off						$19,213
02---	TOTAL: RELOCATIONS						$72,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05------	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27.5(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$70.00	$70,000	$14,000	$84,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS-27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Cell (4X)	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 27 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures:						
05001002	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	32,000	CY	$1.40	$44,800	$8,960	$53,760
05001003	Lock Site-Backfill						
	Granular Backfill	407,000	CY	$13.75	$5,596,250	$1,119,250	$6,715,500
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	39,300	SF	$14.00	$550,200	$110,040	$660,240
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	44,600	LF	$180.00	$8,028,000	$1,605,600	$9,633,600
	Tension Anchors	LUMPSUM	LS	$470,000.00	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	133,900	LF	$170.00	$22,763,000	$4,552,600	$27,315,600
	3' Crushed Stone Base	28,700	CY	$30.00	$861,000	$172,200	$1,033,200
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4"Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	48,200	SF	$15.00	$723,000	$144,600	$867,600
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	1,949,000	LBS	$2.00	$3,898,000	$779,600	$4,677,600
	Emer. Bulkheads	946,300	LBS	$1.80	$1,703,340	$340,668	$2,044,008
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	39,910	CY	$270.00	$10,775,700	$2,155,140	$12,930,840
	Reinf. Conc. Slab (Fc = 6000 psi)	43,610	CY	$160.00	$6,977,600	$1,395,520	$8,373,120
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	727,500	LF	$6.00	$4,365,000	$873,000	$5,238,000
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	7,000	CY	$260.00	$1,820,000	$364,000	$2,184,000
	Rein. Conc. Slab (Fc = 4000 psi)	31,400	CY	$150.00	$4,710,000	$942,000	$5,652,000
	Ballast Concrete	72,000	CY	$70.00	$5,040,000	$1,008,000	$6,048,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500.00	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000.00	$645,000	$129,000	$774,000
050065--							
05006515	Piping Systems:						
	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work & Equipment	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Doplphin Demolition and Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
	Site Work						
0500993-	Permanent Mooring Facil.						
	Cells						
	PS 27.5 Cell Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5 Wall Sheet Piling	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$165,782,590		
05----	Contingencies					$33,156,518	
05----	Contingency - round off						($39,108)
05----	TOTAL: LOCKS						$198,900,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	48	MO	$120,000.00	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	160,000	CY	$1.75	$280,000	$56,000	$336,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09------	Subtotal: Channels and Canals				$13,740,300		
09------	Contingencies:					$2,748,060	
09------	Contingency - round off						$11,640
09------	TOTAL: CHANNELS AND CANALS						$16,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101—	LEVEES						
110101–	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199–	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	67,000	SF	$10.95	$733,650	$110,048	$843,698
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,219,075		
11——	Contingencies:					$1,382,861	
11——	Contingency - round off						($1,936)
11——	TOTAL: LEVEES AND FLOODWALLS						$10,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25----	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593——	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
25——	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
25——	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
25——	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
25——	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
	Subtotal: Mitigation				$26,956,400		
	Contingencies					$6,051,600	
	Contingency - round off						($8,000)
	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101--	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102--	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103--	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104--	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203-	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,401,008	$2,401,008	$480,202	$2,881,210
	Cost Estimates	LUMPSUM	LS	$33,546	$33,546	$6,709	$40,255
	Report Preparation	LUMPSUM	LS	$15,320	$15,320	$3,064	$18,384
	VE Investigations	LUMPSUM	LS	$21,969	$21,969	$4,394	$26,363
	AE Contracts	LUMPSUM	LS	$941,430	$941,430	$188,286	$1,129,716
	Programs & Project Management	LUMPSUM	LS	$102,617	$102,617	$20,523	$123,140
300204-	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$131,051	$131,051	$26,210	$157,261
	Cost Estimates	LUMPSUM	LS	$2,328	$2,328	$466	$2,794
	Report Preparation	LUMPSUM	LS	$6,796	$6,796	$1,359	$8,155
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$24,595	$24,595	$4,919	$29,514
300205-	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$582,166	$582,166	$116,433	$698,599
	Cost Estimates	LUMPSUM	LS	$9,270	$9,270	$1,854	$11,124
	Report Preparation	LUMPSUM	LS	$10,202	$10,202	$2,040	$12,242
	VE Investigations	LUMPSUM	LS	$19,063	$19,063	$3,813	$22,876
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$45,262	$45,262	$9,052	$54,314
300206-	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207-	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manual						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005---	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$265,203	$265,203	$53,041	$318,244
	Cost Estimates	LUMPSUM	LS	$23,850	$23,850	$4,770	$28,620
	Engineering During Construct.	LUMPSUM	LS	$112,407	$112,407	$22,481	$134,888
	Construction Project Mgmt	LUMPSUM	LS	$118,696	$118,696	$23,739	$142,435
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,349,558	$5,349,558	$1,069,912	$6,419,470
	Cost Estimates	LUMPSUM	LS	$65,500	$65,500	$13,100	$78,600
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,206,454	$1,206,454	$241,291	$1,447,745
	Construction Project Mgmt	LUMPSUM	LS	$343,189	$343,189	$68,638	$411,827

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508--	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509--	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510--	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511--	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512--	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513--	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514--	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301-----	Prior E & D (FY87 - FY97)						$17,000,000
30------	Subtotal: Engineering & Design				$44,592,074		
30------	Contingencies					$5,518,413	
30------	Contingency - round off						($10,487)
30------	TOTAL: ENGINEERING & DESIGN						$50,100,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$431,853	$431,853	$86,371	$518,224
	Contract Modifications	LUMPSUM	LS	$1,943,989	$1,943,989	$388,798	$2,332,787
	Progress & Completion Reports	LUMPSUM	LS	$348,067	$348,067	$69,613	$417,680
	All Other	LUMPSUM	LS	$2,988,353	$2,988,353	$597,671	$3,586,024
3102——	Review of Shop Drawings	LUMPSUM	LS	$483,896	$483,896	$96,779	$580,675
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$351,168	$351,168	$70,234	$421,402
	Compliance Sampling and Testing	LUMPSUM	LS	$578,424	$578,424	$115,685	$694,109
	Quality Surveys	LUMPSUM	LS	$819,368	$819,368	$163,874	$983,242
	Title II Servicse	LUMPSUM	LS	$445,201	$445,201	$89,040	$534,241
	All Other	LUMPSUM	LS	$5,125,260	$5,125,260	$1,025,052	$6,150,312
31——	Subtotal: Construction Management				$13,515,579		
31——	Contingencies					$2,703,117	
31——	Contingency - round off						($18,696)
31——	TOTAL: CONSTRUCTION MANAGEMENT						$16,200,000

Account Number	Account Number Description	Quantity	Unit	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS	$34,576,721	$8,623,279	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS	$57,027,906	$15,372,094	$72,400,000
05——	LOCKS	LUMPSUM	LS	$165,782,590	$33,117,410	$198,900,000
09——	CHANNELS & CANALS	LUMPSUM	LS	$13,740,300	$2,759,700	$16,500,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS	$9,219,075	$1,380,925	$10,600,000
25——	MITIGATION	LUMPSUM	LS	$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS	$44,592,074	$5,507,926	$50,100,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS	$13,515,579	$2,684,421	$16,200,000
	TOTAL					$440,900,000

COST ESTIMATE
900 X 90 X 22

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Appraisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	A/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,000	$17,000	$4,250	$21,250
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LERRD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01-----	Subtotal: Lands and Damages				$34,576,720		
01-----	Contingencies					$8,644,181	
01-----	Contingency - round off						($20,901)
01-----	TOTAL: REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02---	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$6,044	$6,044	$1,511	$7,555
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,658,500	$1,658,500	$414,625	$2,073,125
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Low-Level Double Bascule)						
	Mob and Demob	LUMPSUM	LS	$204,000	$204,000	$51,000	$255,000
	Demolition(Ramps only)	LUMPSUM	LS	$430,440	$430,440	$107,610	$538,050
	Main span foundation	LUMPSUM	LS	$7,450,386	$7,450,386	$1,862,597	$9,312,983
	Main span superstructure	LUMPSUM	LS	$10,238,250	$10,238,250	$2,559,563	$12,797,813
	Approach ramps foundation	LUMPSUM	LS	$541,620	$541,620	$135,405	$677,025
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$3,589,482	$3,589,482	$897,371	$4,486,853
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINE	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC. COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, & Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$57,027,906		
02---	Contingencies					$15,352,881	
02---	Contingency - round off						$19,213
02---	TOTAL: RELOCATIONS						$72,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05------	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	239,000	CY	$3.00	$717,000	$143,400	$860,400
	Levee Construction	89,200	CY	$3.50	$312,200	$62,440	$374,640
	Levee I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	74,000	CY	$20.00	$1,480,000	$296,000	$1,776,000
	Place & Remove (4X)	LUMPSUM	LS	$640,000.00	$640,000	$128,000	$768,000
	I-Wall Closure						
	Sheet Piling PZ-27 (Materials)	14,500	SF	$11.00	$159,500	$31,900	$191,400
	Install & Remove (4X)	LUMPSUM	LS	$221,000.00	$221,000	$44,200	$265,200
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	157,500	LF	$18.00	$2,835,000	$567,000	$3,402,000
	Reinf. Conc. Grade Beams	2,870	CY	$200.00	$574,000	$114,800	$688,800
	Stab. Slab	900	CY	$20.00	$18,000	$3,600	$21,600
	Sand Layer	1,900	CY	$20.00	$38,000	$7,600	$45,600
	3' Gravel Road	8,000	CY	$16.00	$128,000	$25,600	$153,600
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS-27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Cell (4X)	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 27 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures:						
05001002	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	38,000	CY	$1.40	$53,200	$10,640	$63,840
05001003	Lock Site-Backfill						
	Granular Backfill	460,000	CY	$13.75	$6,325,000	$1,265,000	$7,590,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	68,300	TN	$23.50	$1,605,050	$321,010	$1,926,060
	12" Gravel Bedding	13,000	CY	$18.00	$234,000	$46,800	$280,800
	Filter Fabric	43,000	SY	$3.00	$129,000	$25,800	$154,800
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	35,500	SF	$14.00	$497,000	$99,400	$596,400
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	157,400	LF	$170.00	$26,758,000	$5,351,600	$32,109,600
	3' Crushed Stone Base	25,300	CY	$30.00	$759,000	$151,800	$910,800
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	33,700	CY	$70.00	$2,359,000	$471,800	$2,830,800
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	50,600	SF	$15.00	$759,000	$151,800	$910,800
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	1,665,000	LBS	$2.00	$3,330,000	$666,000	$3,996,000
	Emer. Bulkheads	808,500	LBS	$1.80	$1,455,300	$291,060	$1,746,360
05005706	Timber Fenders 8"X 12"	2,400	LF	$35.00	$84,000	$16,800	$100,800
05005715	Gate Machinery	LUMPSUM	LS	$1,163,000.00	$1,163,000	$232,600	$1,395,600
	Emergency Bulkhead Crane	LUMPSUM	LS	$945,000.00	$945,000	$189,000	$1,134,000
	Conc. Storage Rack	LUMPSUM	LS	$101,000.00	$101,000	$20,200	$121,200
	Lowering Carriage Machinery	LUMPSUM	LS	$560,000.00	$560,000	$112,000	$672,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	35,400	CY	$270.00	$9,558,000	$1,911,600	$11,469,600
	Reinf. Conc. Slab (Fc = 6000 psi)	40,700	CY	$160.00	$6,512,000	$1,302,400	$7,814,400
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	719,500	LF	$6.00	$4,317,000	$863,400	$5,180,400
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	9,600	CY	$260.00	$2,496,000	$499,200	$2,995,200
	Rein. Conc. Slab (Fc = 4000 psi)	31,100	CY	$150.00	$4,665,000	$933,000	$5,598,000
	Ballast Concrete	70,000	CY	$70.00	$4,900,000	$980,000	$5,880,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	1,681,400	LBS	$1.80	$3,026,520	$605,304	$3,631,824
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500.00	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	120,300	LBS	$1.90	$228,570	$45,714	$274,284
	Culvert Bulkhead	142,200	LBS	$2.00	$284,400	$56,880	$341,280
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$561,000.00	$561,000	$112,200	$673,200
050065--							
05006515	Piping Systems:						
	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work & Equipment	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Doplphin Demolition and Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
	Site Work						
0500993-	Permanent Mooring Facil.						
	Cells						
	PS 27.5 Cell Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5 Wall Sheet Piling	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$156,629,195		
05----	Contingencies					$31,325,839	
05----	Contingency - round off						$44,966
05----	TOTAL: LOCKS						$188,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	45	MO	$120,000.00	$5,400,000	$1,080,000	$6,480,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	184,000	CY	$1.75	$322,000	$64,400	$386,400
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09------	Subtotal: Channels and Canals				$13,422,300		
09------	Contingencies:					$2,684,460	
09------	Contingency - round off						($6,760)
09------	TOTAL: CHANNELS AND CANALS						$16,100,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101—	LEVEES						
110101–	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199–	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,300	CY	$330.00	$429,000	$64,350	$493,350
	Piling, Steel Sheet PZ-22	70,900	SF	$10.95	$776,355	$116,453	$892,808
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,274,980		
11——	Contingencies:					$1,391,247	
11——	Contingency - round off						$33,773
11——	TOTAL: LEVEES AND FLOODWALLS						$10,700,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25----	MITIGATION						
2591----	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592----	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,800	$1,108,800	$277,200	$1,386,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,200	$63,200	$15,800	$79,000
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$236,000	$236,000	$59,000	$295,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,760,000	$1,760,000	$440,000	$2,200,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$32,800	$32,800	$8,200	$41,000
	Traffic Control Officers	LUMPSUM	LS	$228,800	$228,800	$57,200	$286,000
	Pedestrian Shuttle Service	LUMPSUM	LS	$411,200	$411,200	$102,800	$514,000
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$600,000	$600,000	$150,000	$750,000
	Compensation Fund - RTA	LUMPSUM	LS	$579,200	$579,200	$144,800	$724,000
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$296,000	$296,000	$74,000	$370,000
	Debris Removal By Barge	LUMPSUM	LS	$1,900,000	$1,900,000	$475,000	$2,375,000
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$124,800	$124,800	$31,200	$156,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$12,800	$12,800	$3,200	$16,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$56,000	$56,000	$14,000	$70,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,400	$98,400	$24,600	$123,000
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$944,000	$944,000	$236,000	$1,180,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$12,282,400	$2,820,600	$15,103,000
2593----	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25------	Subtotal: Mitigation				$26,956,400		
25------	Contingencies					$6,051,600	
25------	Contingency - round off						($8,000)
25------	TOTAL: MITIGATION						$33,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101-	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$359,061	$359,061	$71,812	$430,873
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102-	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103-	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104-	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203--	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,255,472	$2,255,472	$451,094	$2,706,566
	Cost Estimates	LUMPSUM	LS	$31,527	$31,527	$6,305	$37,832
	Report Preparation	LUMPSUM	LS	$14,374	$14,374	$2,875	$17,249
	VE Investigations	LUMPSUM	LS	$20,687	$20,687	$4,137	$24,824
	AE Contracts	LUMPSUM	LS	$884,365	$884,365	$176,873	$1,061,238
	Programs & Project Management	LUMPSUM	LS	$96,395	$96,395	$19,279	$115,674
300204--	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$123,107	$123,107	$24,621	$147,728
	Cost Estimates	LUMPSUM	LS	$2,186	$2,186	$437	$2,623
	Report Preparation	LUMPSUM	LS	$6,376	$6,376	$1,275	$7,651
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$23,118	$23,118	$4,624	$27,742
300205--	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$546,915	$546,915	$109,383	$656,298
	Cost Estimates	LUMPSUM	LS	$8,729	$8,729	$1,746	$10,475
	Report Preparation	LUMPSUM	LS	$9,535	$9,535	$1,907	$11,442
	VE Investigations	LUMPSUM	LS	$17,951	$17,951	$3,590	$21,541
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$42,514	$42,514	$8,503	$51,017
300206--	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207--	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005----	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$247,435	$247,435	$49,487	$296,922
	Cost Estimates	LUMPSUM	LS	$22,250	$22,250	$4,450	$26,700
	Engineering During Construct.	LUMPSUM	LS	$104,875	$104,875	$20,975	$125,850
	Construction Project Mgmt	LUMPSUM	LS	$110,744	$110,744	$22,149	$132,893
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,025,164	$5,025,164	$1,005,033	$6,030,197
	Cost Estimates	LUMPSUM	LS	$61,541	$61,541	$12,308	$73,849
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,133,260	$1,133,260	$226,652	$1,359,912
	Construction Project Mgmt	LUMPSUM	LS	$322,391	$322,391	$64,478	$386,869

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508-	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509-	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510-	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511-	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512-	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513-	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,470,483	$1,470,483	$294,097	$1,764,580
	Cost Estimates	LUMPSUM	LS	$28,143	$28,143	$5,629	$33,772
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$241,497	$241,497	$48,299	$289,796
	Construction Project Mgmt	LUMPSUM	LS	$333,751	$333,751	$66,750	$400,501
300514-	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY97)						$17,000,000
30----	Subtotal: Engineering & Design				$43,871,505		
30----	Contingencies					$5,374,298	
30----	Contingency - round off						($45,803)
30----	TOTAL: ENGINEERING & DESIGN						$49,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$416,312	$416,312	$83,262	$499,574
	Contract Modifications	LUMPSUM	LS	$1,873,863	$1,873,863	$374,773	$2,248,636
	Progress & Completion Reports	LUMPSUM	LS	$335,508	$335,508	$67,102	$402,610
	All Other	LUMPSUM	LS	$2,880,560	$2,880,560	$576,112	$3,456,672
3102——	Review of Shop Drawings	LUMPSUM	LS	$466,493	$466,493	$93,299	$559,792
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$338,517	$338,517	$67,703	$406,220
	Compliance Sampling and Testing	LUMPSUM	LS	$557,590	$557,590	$111,518	$669,108
	Quality Surveys	LUMPSUM	LS	$789,782	$789,782	$157,956	$947,738
	Title II Servicse	LUMPSUM	LS	$429,156	$429,156	$85,831	$514,987
	All Other	LUMPSUM	LS	$4,940,415	$4,940,415	$988,083	$5,928,498
31——	Subtotal: Construction Management				$13,028,196		
31——	Contingencies					$2,605,639	
31——	Contingency - round off						($33,835)
31——	TOTAL: CONSTRUCTION MANAGEMENT						$15,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,720	$8,623,280	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$57,027,906	$15,372,094	$72,400,000
05——	LOCKS	LUMPSUM	LS		$156,629,195	$31,325,839	$188,000,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$13,422,300	$2,684,460	$16,100,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,274,980	$1,425,020	$10,700,000
25——	MITIGATION	LUMPSUM	LS		$26,956,400	$6,043,600	$33,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$43,871,505	$5,374,298	$49,200,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$13,028,196	$2,605,639	$15,600,000
	TOTAL						$428,200,000

COST ESTIMATE
BRIDGE ONLY
MID-LEVEL DOUBLE BASCULE

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02—	RELOCATIONS						
021–	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$4,480	$4,480	$1,120	$5,600
	Signalization	LUMPSUM	LS	$249,900	$249,900	$62,475	$312,375
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$1,293,500	$1,293,500	$323,375	$1,616,875
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (Mid-Level Double Bascule)						
	Real Estate	LUMPSUM	LS	$80,000.00	$80,000	$20,000	$100,000
	Mob and Demob	LUMPSUM	LS	$250,000	$250,000	$62,500	$312,500
	Demolition(Ramps only)	LUMPSUM	LS	$944,100	$944,100	$236,025	$1,180,125
	Main span foundation	LUMPSUM	LS	$7,440,600	$7,440,600	$1,860,150	$9,300,750
	Main span superstructure	LUMPSUM	LS	$10,037,213	$10,037,213	$2,509,303	$12,546,516
	Approach ramps foundation	LUMPSUM	LS	$2,149,525	$2,149,525	$537,381	$2,686,906
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$4,429,410	$4,429,410	$1,107,353	$5,536,763
	Pedestrian Access	LUMPSUM	LS	$332,580	$332,580	$83,145	$415,725
	Levee Tie-In	LUMPSUM	LS	$351,525	$351,525	$87,881	$439,406
	Subtotal: Relocations				$28,139,133		
	Contingencies					$7,034,783	
	Contingency - round off						$26,084
	TOTAL: RELOCATIONS						$35,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25——	MITIGATION						
2591——	IMPACT AVOIDANCE						
	Comprehensive Pile Testing Program	LUMPSUM	LS	$30,000	$30,000	$7,500	$37,500
	Florida Avenue Access Road Permanent Detour Route	LUMPSUM	LS	$5,000,000	$5,000,000	$1,250,000	$6,250,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,000	$194,000	$48,500	$242,500
	Asthetic Mitigtion						
	Textured Finishes						
	Floodwalls	LUMPSUM	LS	$168,000	$168,000	$42,000	$210,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Claude Bridge Piers	LUMPSUM	LS	$345,600	$345,600	$86,400	$432,000
	Exposed Lock Walls	LUMPSUM	LS	$168,000	$168,000	$42,000	$210,000
	Landscaping (Levees,Fldwls, Detour Routes, and 4 Bridge Approaches)	LUMPSUM	LS	$8,000	$8,000	$2,000	$10,000
	Histroical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$6,513,600	$1,628,400	$8,142,000
2592——	DIRECT MITIGATION						
	Soundproof Residential Sturctures	LUMPSUM	LS	$1,108,000	$1,108,000	$277,000	$1,385,000
	Synchronized Traffic Signals	LUMPSUM	LS	$63,000	$63,000	$15,750	$78,750
	Computerized Hwy Message Boards	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Incident Management Plan	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Emergency Ambulance Service	LUMPSUM	LS	$1,600,000	$1,600,000	$400,000	$2,000,000
	Police Substation (Staffing & Equipment for 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$25,000	$25,000	$6,250	$31,250
	Traffic Control Officers	LUMPSUM	LS	$225,000	$225,000	$56,250	$281,250
	Predestrain Shuttle Service	LUMPSUM	LS	$410,000	$410,000	$102,500	$512,500
	Operatioal Subsidy for Increased Bus Service	LUMPSUM	LS	$500,000	$500,000	$125,000	$625,000
	Compensation Fund - RTA	LUMPSUM	LS	$575,000	$575,000	$143,750	$718,750
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$295,000	$295,000	$73,750	$368,750
	Salvaging & Curation of Bridge/Lock Component	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$10,000	$10,000	$2,500	$12,500
	Culural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$55,000	$55,000	$13,750	$68,750
	Compensation Fund to Local Merchants	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$350,000	$350,000	$87,500	$437,500
	Lighting Under St. Claude Ave. Bridge Approaches	LUMPSUM	LS	$8,500	$8,500	$2,125	$10,625
	Community Facilities Under St. Claude Bridge Approaches	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Secured Parking for Construction Workers	LUMPSUM	LS	$470,000	$470,000	$117,500	$587,500
	Training Assistance	LUMPSUM	LS	$300,000	$300,000	$75,000	$375,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$8,524,500	$1,943,625	$10,468,125

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
2593——	GENERAL MITIGATION						
	Community Facilities (General)	LUMPSUM	LS	$500,000	$500,000	$125,000	$625,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$500,000	$500,000	$0	$500,000
	Subtotal: General Mitigation				$1,990,000	$185,000	$2,175,000
25——	Subtotal: Mitigations				$17,028,100		
25——	Contingencies					$3,757,025	
25——	Contingency - round off						$14,875
25——	TOTAL: MITIGATION						$20,800,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30——	ENGINEERING AND DESIGN						
3001——	Feature Design Memoranda:						
300101-	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$668,000	$668,000	$133,600	$801,600
	Cost Estimates	LUMPSUM	LS	$23,900	$23,900	$4,780	$28,680
	VE Investigations	LUMPSUM	LS	$30,820	$30,820	$6,164	$36,984
	AE Contracts	LUMPSUM	LS	$314,400	$314,400	$62,880	$377,280
	Programs & Project Management	LUMPSUM	LS	$116,480	$116,480	$23,296	$139,776
300104-	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$128,860	$128,860	$25,772	$154,632
	Cost Estimates	LUMPSUM	LS	$8,140	$8,140	$1,628	$9,768
	AE Contracts	LUMPSUM	LS	$178,900	$178,900	$35,780	$214,680
	Programs & Project Management	LUMPSUM	LS	$90,300	$90,300	$18,060	$108,360
3005——	Construction Contract Planning, Engineering & Design:						
300508-	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$261,860	$261,860	$52,372	$314,232
	Cost Estimates	LUMPSUM	LS	$24,650	$24,650	$4,930	$29,580
	Engineering During Construct.	LUMPSUM	LS	$49,780	$49,780	$9,956	$59,736
	Construction Project Mgmt	LUMPSUM	LS	$147,890	$147,890	$29,578	$177,468
300513-	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,340,400	$1,340,400	$268,080	$1,608,480
	Cost Estimates	LUMPSUM	LS	$37,210	$37,210	$7,442	$44,652
	Value Engineering	LUMPSUM	LS	$1,960	$1,960	$392	$2,352
	Engineering During Construct.	LUMPSUM	LS	$333,170	$333,170	$66,634	$399,804
	Construction Project Mgmt	LUMPSUM	LS	$266,990	$266,990	$53,398	$320,388
301——	Prior E & D (FY87 - FY95)						$12,400,000
30——	Subtotal: Engineering & Design				$16,423,710		
30——	Contingencies					$804,742	
30——	Contingency - round off						($28,452)
30——	TOTAL: ENGINEERING & DESIGN						$17,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$76,295	$76,295	$15,259	$91,554
	Contract Modifications	LUMPSUM	LS	$343,450	$343,450	$68,690	$412,140
	Progress & Completion Reports	LUMPSUM	LS	$61,500	$61,500	$12,300	$73,800
	All Other	LUMPSUM	LS	$594,380	$594,380	$118,876	$713,256
3102——	Review of Shop Drawings	LUMPSUM	LS	$85,490	$85,490	$17,098	$102,588
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$62,040	$62,040	$12,408	$74,448
	Compliance Sampling and Testing	LUMPSUM	LS	$102,200	$102,200	$20,440	$122,640
	Quality Surveys	LUMPSUM	LS	$144,760	$144,760	$28,952	$173,712
	Title II Servicse	LUMPSUM	LS	$78,650	$78,650	$15,730	$94,380
	All Other	LUMPSUM	LS	$971,910	$971,910	$194,382	$1,166,292
31——	Subtotal: Construction Management				$2,520,675		
31——	Contingencies					$504,135	
31——	Contingency - round off						($24,810)
31——	TOTAL: CONSTRUCTION MANAGEMENT						$3,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS AND DAMAGES	LUMPSUM	LS		$0	$0	$0
02——	RELOCATIONS	LUMPSUM	LS		$28,139,133	$7,060,867	$35,200,000
05——	LOCKS	LUMPSUM	LS		$0	$0	$0
09——	CHANNELS & CANALS	LUMPSUM	LS		$0	$0	$0
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$0	$0	$0
25——	MITIGATION	LUMPSUM	LS		$17,028,100	$3,771,900	$20,800,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$16,423,710	$776,290	$17,200,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$2,520,675	$479,325	$3,000,000
	TOTAL						$76,200,000

COST ESTIMATE
PHASED ALTERNATIVE
MID-LEVEL VERTICAL LIFT
900 X 110 X 22

MRGO LOCK AND CONNECTING CHANNELS
File: FPHASED.CAL

CODE OF ACCOUNTS
LOCK NORTH OF CLAIBORNE AVE. PREFAB FLOAT-IN BARGE LOCK
900 X 110 X 22 PILE FOUNDED LOCK PHASED CONSTRUCTION

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
01---	LANDS AND DAMAGES						
01A--	Project Planning	LUMPSUM	LS	$9,880	$9,880	$2,470	$12,350
01B--	Aquisitions	LUMPSUM	LS	$43,850	$43,850	$10,963	$54,813
01C--	Condemnations	LUMPSUM	LS	$26,760	$26,760	$6,690	$33,450
01D--	Inleasing	LUMPSUM	LS	$0	$0	$0	$0
01E--	Appraisals						
01E1-	In-House	LUMPSUM	LS	$2,880	$2,880	$720	$3,600
01E2-	C/E Contracted	LUMPSUM	LS	$40,000	$40,000	$10,000	$50,000
01F--	PL 91-646 Assistance	LUMPSUM	LS	$2,240	$2,240	$560	$2,800
01G--	Temporary Permits	LUMPSUM	LS	$7,170	$7,170	$1,793	$8,963
01H--	Audits	LUMPSUM	LS	$0	$0	$0	$0
01J--	Encroachments & Trespass	LUMPSUM	LS	$0	$0	$0	$0
01K--	Disposals	LUMPSUM	LS	$0	$0	$0	$0
01L--	Real Property Accountibility	LUMPSUM	LS	$0	$0	$0	$0
01R--	Real Estate Payments						
01R1-	Land Payments	LUMPSUM	LS	$34,424,000	$34,424,000	$8,606,000	$43,030,000
01R2-	PL 91-646 Assist. Paymts.	LUMPSUM	LS	$17,001	$17,001	$4,250	$21,251
01R3-	Other Payments	LUMPSUM	LS	$200	$200	$50	$250
01S--	Real Estate Receipts	LUMPSUM	LS	$0	$0	$0	$0
01T--	LERRD Credits	LUMPSUM	LS	$2,740	$2,740	$685	$3,425
01------	Subtotal: Lands and Damages				$34,576,721		
01------	Contingencies					$8,644,180	
01------	Contingency - round off						($20,901)
01------	TOTAL: REAL ESTATE						$43,200,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
02---	RELOCATIONS						
021--	Roads, Construction Activities						
	D-1 Detour Routes						
	Site Work						
	Signage	LUMPSUM	LS	$8,300	$8,300	$2,075	$10,375
	Signalization	LUMPSUM	LS	$433,500	$433,500	$108,375	$541,875
	Detour Routes						
	Roadway surfacing	LUMPSUM	LS	$2,587,000	$2,587,000	$646,750	$3,233,750
	Maintain Detour Roads	LUMPSUM	LS	$576,300	$576,300	$144,075	$720,375
	B-1 St. Claude Bridge (300' Vert.- Lift Bridge)						
	Mob and Demob	LUMPSUM	LS	$250,000	$250,000	$62,500	$312,500
	Demolition(Ramps only)	LUMPSUM	LS	$944,100	$944,100	$236,025	$1,180,125
	Main span foundation	LUMPSUM	LS	$7,790,400	$7,790,400	$1,947,600	$9,738,000
	Main span superstructure	LUMPSUM	LS	$5,146,300	$5,146,300	$1,286,575	$6,432,875
	Approach ramps foundation	LUMPSUM	LS	$1,941,200	$1,941,200	$485,300	$2,426,500
	App'ch ramps superstru & rdwy	LUMPSUM	LS	$4,070,900	$4,070,900	$1,017,725	$5,088,625
	Mechanical System	LUMPSUM	LS	$2,330,000	$2,330,000	$582,500	$2,912,500
	Electrical System	LUMPSUM	LS	$1,387,000	$1,387,000	$346,750	$1,733,750
	Pedestrian Access	LUMPSUM	LS	$332,580	$332,580	$83,145	$415,725
	Levee Tie-In	LUMPSUM	LS	$351,500	$351,500	$87,875	$439,375
	B-2 Claiborne Bridge						
	Mob and Demob	LUMPSUM	LS	$153,000	$153,000	$50,490	$203,490
	Demolition(exist. superstr)	LUMPSUM	LS	$510,000	$510,000	$168,300	$678,300
	Main span foundation	LUMPSUM	LS	$3,994,320	$3,994,320	$1,318,126	$5,312,446
	Main span superstructure	LUMPSUM	LS	$5,249,940	$5,249,940	$1,732,480	$6,982,420
	Mechanical System	LUMPSUM	LS	$2,376,804	$2,376,804	$784,345	$3,161,149
	Electrical System	LUMPSUM	LS	$1,414,740	$1,414,740	$466,864	$1,881,604
	B-3 Florida Ave. Bridge (vehicular)	LUMPSUM	LS	$0	$0	$0	$0
022--	Railroads, Construction Activities						
	NEW ORLEANS PUBLIC BELT						
	R-1 FLA AVE BRIDGE(RAILROAD)	LUMPSUM	LS	$0	$0	$0	$0
	R-2 MAIN LINE	LUMPSUM	LS	$0	$0	$0	$0
	R-3 GALVEZ MARGINAL TRACK	LUMPSUM	LS	$172,020	$172,020	$43,005	$215,025
	R-4 GALVEZ NO. 3 TRACK	LUMPSUM	LS	$76,860	$76,860	$19,215	$96,075
	R-5 RAILROAD MARSHALLING YD.	LUMPSUM	LS	$0	$0	$0	$0
	FOC-1 FIBER OPTIC LINE	LUMPSUM	LS	$0	$0	$0	$0
023--	Cemeteries, Utilites, and Structures Construction Activities						
	SOUTH CENTRAL BELL						
	T-5 SPARE CONDUITS IN LOCK	LUMPSUM	LS	$0	$0	$0	$0
	T-1 SUBMARINE CABLES	LUMPSUM	LS	$420,900	$420,900	$105,225	$526,125
	T-4 SUBMARINE CABLES	LUMPSUM	LS	$29,280	$29,280	$7,320	$36,600
	T-6 SUBMARINE CABLES	LUMPSUM	LS	$56,120	$56,120	$14,030	$70,150
	T-7 SUBMARINE CABLES	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	T-8 SUBMARINE CABLES	LUMPSUM	LS	$885,720	$885,720	$221,430	$1,107,150
	T-9 SUBMARINE CABLES	LUMPSUM	LS	$852,780	$852,780	$213,195	$1,065,975

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	COX CABLE TV						
	T-2 CABLE TV	LUMPSUM	LS	$362,340	$362,340	$90,585	$452,925
	T-3 CABLE TV 4-3/4" COAXIAL	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	NEW ORLEANS PUBLIC SERVICE, INC GAS FACILITIES						
	G-1 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-2 16" DIA GAS MAIN	LUMPSUM	LS	$37,820	$37,820	$9,455	$47,275
	G-3 16" DIA GAS MAIN	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	G-4 16" DIA GAS MAIN	LUMPSUM	LS	$79,300	$79,300	$19,825	$99,125
	G-5 16" DIA GAS MAIN	LUMPSUM	LS	$833,260	$833,260	$208,315	$1,041,575
	G-6 16" DIA GAS MAIN	LUMPSUM	LS	$721,020	$721,020	$180,255	$901,275
	NEW ORLEANS PUBLIC SERVICE, INC ELECTICAL FACILITIES						
	E-1 2-24KV FEEDERS	LUMPSUM	LS	$533,140	$533,140	$133,285	$666,425
	E-2 4-24KV FEEDERS	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	E-4 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-5 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$608,780	$608,780	$152,195	$760,975
	E-9 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$573,400	$573,400	$143,350	$716,750
	E-13 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$68,320	$68,320	$17,080	$85,400
	E-14 2-24KV PRIM IN 6"CASE	LUMPSUM	LS	$62,220	$62,220	$15,555	$77,775
	E-15 AERIAL TRANSMISSION LINE	LUMPSUM	LS	$0	$0	$0	$0
	NEW ORLEANS PUBLIC SERVICE, INC COMMUNICATIONS FACILITIES						
	T-10 COMMUNICATION CABLES	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	NEW ORLEANS SEWAGE AND WATER BOARD SEWER FACILITIES						
	S-1 8.8 MGD SEWAGE PUMP STA.	LUMPSUM	LS	$0	$0	$0	$0
	S-2 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-3 30" DIA GRAVITY SEWER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	S-4 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,543,300	$1,543,300	$385,825	$1,929,125
	S-7 66" DIA FORCED SEWER MAIN	LUMPSUM	LS	$158,600	$158,600	$39,650	$198,250
	S-5 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$1,489,620	$1,489,620	$372,405	$1,862,025
	S-8 54" DIA FORCED SEWER MAIN	LUMPSUM	LS	$132,980	$132,980	$33,245	$166,225
	S-6 SEWER PUMP STA. & 20"P/L	LUMPSUM	LS	$1,110,200	$1,110,200	$277,550	$1,387,750
	S-9 FLA. AVE 45' WIDE SIPHON	LUMPSUM	LS	$0	$0	$0	$0
	S-10 JORDAN AVE STORM DRAIN	LUMPSUM	LS	$0	$0	$0	$0
	S-11 SEWER LIFT STA/LINES	LUMPSUM	LS	$113,460	$113,460	$28,365	$141,825
	M-1 MISC. WORK IN STR.	LUMPSUM	LS	$48,800	$48,800	$12,200	$61,000
	NEW ORLEANS SEWAGE AND WATER BOARD WATER FACILITIES						
	W-1 1-20" DIA WATER MAIN	LUMPSUM	LS	$1,229,760	$1,229,760	$307,440	$1,537,200
	W-2 1-20" DIA WATER MAIN	LUMPSUM	LS	$41,480	$41,480	$10,370	$51,850
	W-3 1-20" DIA WATER MAIN	LUMPSUM	LS	$35,380	$35,380	$8,845	$44,225
	W-4 1-20" DIA WATER MAIN	LUMPSUM	LS	$2,486,360	$2,486,360	$621,590	$3,107,950
	W-5 48" DIA WATER MAIN	LUMPSUM	LS	$1,403,000	$1,403,000	$350,750	$1,753,750
	W-6 48" DIA WATER MAIN	LUMPSUM	LS	$119,560	$119,560	$29,890	$149,450

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	NEW ORLEANS SEWAGE AND WATER BOARD						
	ELECTRICAL FACILITIES						
	E-3 POWER CABLE	LUMPSUM	LS	$53,680	$53,680	$13,420	$67,100
	E-6 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-7 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-8 2-15KV 25HZ FEEDER	LUMPSUM	LS	$466,040	$466,040	$116,510	$582,550
	E-10 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-11 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
	E-12 2-15KV 25HZ FEEDER	LUMPSUM	LS	$74,420	$74,420	$18,605	$93,025
02A--	Roads, Real Estate Activities						
	Detour Routes	LUMPSUM	LS	$0	$0	$0	$0
	Claiborne Bridge	LUMPSUM	LS	$0	$0	$0	$0
	St. Claude Bridge	LUMPSUM	LS	$0	$0	$0	$0
02B--	Railroads, Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02C--	Cemeteries, Utilites, and Structures Real Estate Activities	LUMPSUM	LS	$0	$0	$0	$0
02---	Subtotal: Relocations				$60,232,064		
02---	Contingencies					$16,153,920	
02---	Contingency - round off						$14,016
02---	TOTAL: RELOCATIONS						$76,400,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
05------	LOCKS						
050001--	Mobilization & Demobilization:	LUMPSUM	LS	$2,500,000	$2,500,000	$500,000	$3,000,000
050002--	Graving Site						
	Excavation	260,000	CY	$3.00	$780,000	$156,000	$936,000
	Levee Construction	90,200	CY	$3.50	$315,700	$63,140	$378,840
	Levee I-Wall						
	Sheet Piling PZ 27	29,800	SF	$15.00	$447,000	$89,400	$536,400
	Cofferdam Cells						
	Sheet Piling PS 27.5	18,000	SF	$14.40	$259,200	$51,840	$311,040
	Cell Fill -Light Wt. Aggregate	2,400	CY	$18.00	$43,200	$8,640	$51,840
	Stone Closure						
	Materials	80,000	CY	$20.00	$1,600,000	$320,000	$1,920,000
	Place & Remove (4X)	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	I-Wall Closure						
	Sheet Piling PZ-27.5(Materials)	16,000	SF	$11.00	$176,000	$35,200	$211,200
	Install & Remove (4X)	LUMPSUM	LS	$240,000.00	$240,000	$48,000	$288,000
	Dewatering System (5 yr.)	LUMPSUM	LS	$900,000.00	$900,000	$180,000	$1,080,000
	Work Slab						
	12" X 12" PPC Piles	174,500	LF	$18.00	$3,141,000	$628,200	$3,769,200
	Reinf. Conc. Grade Beams	3,200	CY	$200.00	$640,000	$128,000	$768,000
	Stab. Slab	1,000	CY	$20.00	$20,000	$4,000	$24,000
	Sand Layer	2,100	CY	$20.00	$42,000	$8,400	$50,400
	3' Gravel Road	8,200	CY	$16.00	$131,200	$26,240	$157,440
050003--	Care and Diversion of Water:						
05000302	Sitework						
	Protection Cells PS-27.5 Piling	196,000	SF	$14.40	$2,822,400	$564,480	$3,386,880
	Cellular Sand Fill	76,500	CY	$13.00	$994,500	$198,900	$1,193,400
	Concrete Cap	2,900	CY	$150.00	$435,000	$87,000	$522,000
	Temporary Timber Guidewall	1,600	LF	$3,315.00	$5,304,000	$1,060,800	$6,364,800
	Lakeside Protective End Cell						
	PS 27.5 Piling	30,600	SF	$14.40	$440,640	$88,128	$528,768
	Cellular Sand Fill	12,000	CY	$13.00	$156,000	$31,200	$187,200
	12" Stone Cap	2,300	TN	$23.50	$54,050	$10,810	$64,860
	Install & Remove Cell (4X)	LUMPSUM	LS	$350,000.00	$350,000	$70,000	$420,000
050004--	Permanent Access Road and Parking and Landscaping:						
05000402	Site Work						
	Roadway and Parking, Asphaltic	4,400	SY	$18.00	$79,200	$15,840	$95,040
	Metal Guardrails	900	LF	$23.00	$20,700	$4,140	$24,840
	Levee Crown Surface	500	CY	$26.00	$13,000	$2,600	$15,600
	Precast Concrete Ramps	3,650	SF	$55.00	$200,750	$40,150	$240,900
	Semi-Compacted Fill	6,000	CY	$16.00	$96,000	$19,200	$115,200
	Landscaping - 27 Acres	LUMPSUM	LS	$391,500.00	$391,500	$78,300	$469,800
050009--	Buildings, Project Operations:						
05000904	Equipment Bldg.(Mason)	LUMPSUM	LS	$300,000.00	$300,000	$60,000	$360,000
05000904	Control Houses (4)(Mason)	LUMPSUM	LS	$400,000.00	$400,000	$80,000	$480,000
05000905	Admin.&Maint.Bldg.(Prefab)	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
05000915	HVAC Systems	LUMPSUM	LS	$25,000.00	$25,000	$5,000	$30,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050010	Earthwork for Structures:						
05001002	Site Work						
	Excavation (To El. -43)		Cost Included in Account 09				
	Dressing Exacavated Slopes	38,000	CY	$1.40	$53,200	$10,640	$63,840
05001003	Lock Site-Backfill						
	Granular Backfill	460,000	CY	$13.75	$6,325,000	$1,265,000	$7,590,000
	Random Fill (Dredge Material)		Cost Included in Account 09				
	3' Clay Blanket	80,000	CY	$20.85	$1,668,000	$333,600	$2,001,600
05001004	Foundation Protection						
	36" Riprap	69,000	TN	$23.50	$1,621,500	$324,300	$1,945,800
	12" Gravel Bedding	14,000	CY	$18.00	$252,000	$50,400	$302,400
	Filter Fabric	44,000	SY	$3.00	$132,000	$26,400	$158,400
050011--	Foundation Work:						
	Piling, Steel Sheet (PZ-22)	38,400	SF	$14.00	$537,600	$107,520	$645,120
	Setting Piles and Pad						
	48" Dia. 5/8" Wall Pipe Pile	14,600	LF	$190.00	$2,774,000	$554,800	$3,328,800
	Precast Pad & Flat Jacks	LUMPSUM	LS	$695,000.00	$695,000	$139,000	$834,000
	Tension Piles						
	48" Dia, 5/8" Wall Pipe Piles w/Hd	44,600	LF	$180.00	$8,028,000	$1,605,600	$9,633,600
	Tension Anchors	LUMPSUM	LS	$470,000.00	$470,000	$94,000	$564,000
	48" Dia. 5/8" Wall Pipe Piles (Compression Only)	133,900	LF	$170.00	$22,763,000	$4,552,600	$27,315,600
	3' Crushed Stone Base	28,700	CY	$30.00	$861,000	$172,200	$1,033,200
	Furnishing/Handling of Underwater	LUMPSUM	LS	$500,000.00	$500,000	$100,000	$600,000
	Screeding Frame						
	Leveling Lock Modules	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Foundation Grout (4'Thick)	38,300	CY	$70.00	$2,681,000	$536,200	$3,217,200
	Piping for Grout	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Containment Sheet Piling PZ-22	50,600	SF	$15.00	$759,000	$151,800	$910,800
050020--	Diving Services, 1.5 yrs.	LUMPSUM	LS	$1,500,000.00	$1,500,000	$300,000	$1,800,000
050057--	Lock Gates & Operating Mach.:						
05005705	Metals						
	Miter Gates (4 sets)	2,142,000	LBS	$2.00	$4,284,000	$856,800	$5,140,800
	Emer. Bulkheads	1,040,000	LBS	$1.80	$1,872,000	$374,400	$2,246,400
05005706	Timber Fenders 8"X 12"	3,000	LF	$35.00	$105,000	$21,000	$126,000
05005715	Gate Machinery	LUMPSUM	LS	$1,800,000.00	$1,800,000	$360,000	$2,160,000
	Emergency Bulkhead Crane	LUMPSUM	LS	$1,350,000.00	$1,350,000	$270,000	$1,620,000
	Conc. Storage Rack	LUMPSUM	LS	$112,125.00	$112,125	$22,425	$134,550
	Lowering Carriage Machinery	LUMPSUM	LS	$800,000.00	$800,000	$160,000	$960,000
050061--	Guide and Guard Walls:						
05006103	Conc. Floating Guidewalls						
	Cofferdam						
	(Reuse materials, both cells shall be reused 3 times)						
	Piling, Steel Sheet PZ-27	14,400	SF	$13.65	$196,560	$39,312	$235,872
	Wale System (5 Tiers)	215,000	LB	$1.15	$247,250	$49,450	$296,700
	Guidewall						
	Piling, HP 14X73	7,000	LF	$28.25	$197,750	$39,550	$237,300
	Precast Concrete Pontoons	1,330	CY	$370.00	$492,100	$98,420	$590,520
	Concrete, In-Place	1,300	CY	$200.00	$260,000	$52,000	$312,000
	Sand Fill	700	CY	$11.50	$8,050	$1,610	$9,660
	Pontoon Timbers(12X12)	4,200	LF	$35.00	$147,000	$29,400	$176,400
	Miscellaneous Metals	67,500	LB	$1.90	$128,250	$25,650	$153,900

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
0500610	Timber Guidewalls						
	Guidewalls						
	Treated Timber Piles	34,400	LF	$35.75	$1,229,800	$245,960	$1,475,760
	12"X12"Treated Timber Fenders	5,800	LF	$30.50	$176,900	$35,380	$212,280
	3"X12" Treated Timber Planks	13,700	LF	$16.50	$226,050	$45,210	$271,260
	End Cells						
	Piling, Steel Sheet PS-27.5	66,000	SF	$13.75	$907,500	$181,500	$1,089,000
	Concrete Cap	4,000	CY	$121.50	$486,000	$97,200	$583,200
	Cellular Sand Fill	23,000	CY	$11.50	$264,500	$52,900	$317,400
050063--	Lock Structure:						
0500630	Concrete						
	Post-tensioned Concrete Base(Graving Site)						
	Reinf. Conc. Wall (Fc = 6000 psi)	37,800	CY	$270.00	$10,206,000	$2,041,200	$12,247,200
	Reinf. Conc. Slab (Fc = 6000 psi)	45,200	CY	$160.00	$7,232,000	$1,446,400	$8,678,400
	Post-Tensioning						
	1 3/8" Threaded Bar-Fully Bonded	727,500	LF	$6.00	$4,365,000	$873,000	$5,238,000
	Reinf. Conc. Upper Wall (Galvez St Wharf Site)						
	Reinf. Conc Wall (Fc = 4000 psi)	8,400	CY	$260.00	$2,184,000	$436,800	$2,620,800
	Rein. Conc. Slab (Fc = 4000 psi)	31,400	CY	$150.00	$4,710,000	$942,000	$5,652,000
	Ballast Concrete	72,000	CY	$70.00	$5,040,000	$1,008,000	$6,048,000
	Piping for Ballast Concrete	LUMPSUM	LS	$920,000.00	$920,000	$184,000	$1,104,000
	Module Joints						
	Exterior Seal	LUMPSUM	LS	$175,000.00	$175,000	$35,000	$210,000
	Interior & Culvert Seals	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Tugboat Services (3 Tugs, 6 months)	LUMPSUM	LS	$3,000,000.00	$3,000,000	$600,000	$3,600,000
05006305	Metals						
	Wall Armor	518,000	LBS	$3.00	$1,554,000	$310,800	$1,864,800
	Floating Mooring Bits	145,000	LBS	$2.50	$362,500	$72,500	$435,000
	Miscellaneous Metals	904,000	LBS	$1.90	$1,717,600	$343,520	$2,061,120
	Module Transport End Dams(2 Sets)						
	End Dam Bulkheads	2,055,000	LBS	$1.80	$3,699,000	$739,800	$4,438,800
	Installation (2X)	LUMPSUM	LS	$100,000.00	$100,000	$20,000	$120,000
05006313	Construction Guides & Instrumentation	LUMPSUM	LS	$186,500.00	$186,500	$37,300	$223,800
050064--	Culvert Valves & Oper. Mach.:						
05006405	Metals						
	Tainter Valves	138,800	LBS	$1.90	$263,720	$52,744	$316,464
	Culvert Bulkhead	164,000	LBS	$2.00	$328,000	$65,600	$393,600
05006415	Mechanical						
	Culvert Valve Machinery	LUMPSUM	LS	$645,000.00	$645,000	$129,000	$774,000
050065--							
05006515	Piping Systems:						
	Mechanical						
	Hydraulic System	LUMPSUM	LS	$949,000.00	$949,000	$189,800	$1,138,800
	Compressed Air System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Washdown System	LUMPSUM	LS	$206,250.00	$206,250	$41,250	$247,500
	Sump Pump System	LUMPSUM	LS	$45,000.00	$45,000	$9,000	$54,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
050066--	Power and Lighting Systems:						
05006616	Electrical						
	Motor Control Center, Dist. Panelboards, And Other Dist. Equipment	LUMPSUM	LS	$201,500.00	$201,500	$40,300	$241,800
	Control Sys. Equip and Associated Equipment	LUMPSUM	LS	$329,000.00	$329,000	$65,800	$394,800
	Raceway System	LUMPSUM	LS	$603,500.00	$603,500	$120,700	$724,200
	Wire and Cable	LUMPSUM	LS	$620,500.00	$620,500	$124,100	$744,600
	Lighting Systems	LUMPSUM	LS	$278,000.00	$278,000	$55,600	$333,600
	Signal & Comm. Systems	LUMPSUM	LS	$89,000.00	$89,000	$17,800	$106,800
	Lighting Protection and Ground System	LUMPSUM	LS	$104,000.00	$104,000	$20,800	$124,800
	Elec. Testing	LUMPSUM	LS	$137,750.00	$137,750	$27,550	$165,300
	Generator	LUMPSUM	LS	$84,000.00	$84,000	$16,800	$100,800
	Other Electrical Work & Equipment	LUMPSUM	LS	$140,000.00	$140,000	$28,000	$168,000
050099--	Associated General Items:						
0500991-	Demolition of Existing Lock (In-The-Wet Plan)						
	Lock Wall Demolition	LUMPSUM	LS	$2,453,000.00	$2,453,000	$490,600	$2,943,600
	Debris Removal	LUMPSUM	LS	$2,836,000.00	$2,836,000	$567,200	$3,403,200
	Bridge Demo. & Removal	LUMPSUM	LS	$690,000.00	$690,000	$138,000	$828,000
	Guidewall & Doplphin Demolition and Removal	LUMPSUM	LS	$481,100.00	$481,100	$96,220	$577,320
0500992-	Demolition of Existing Facilities						
	Galvez St. Wharf	LUMPSUM	LS	$3,469,000.00	$3,469,000	$693,800	$4,162,800
	Coast Guard Facility	LUMPSUM	LS	$696,000.00	$696,000	$139,200	$835,200
	Private Facilities	LUMPSUM	LS	$3,470,000.00	$3,470,000	$694,000	$4,164,000
	Tree Removal	LUMPSUM	LS	$132,000.00	$132,000	$26,400	$158,400
	HTRW Treatment for Abandoned Above Ground Facilities	LUMPSUM	LS	$1,031,000.00	$1,031,000	$206,200	$1,237,200
	Site Work						
0500993-	Permanent Mooring Facil. Cells						
	PS 27.5 Cell Sheet Piling	168,100	SF	$13.80	$2,319,780	$463,956	$2,783,736
	PS 27.5 Wall Sheet Piling	23,700	SF	$13.75	$325,875	$65,175	$391,050
	Sand Fill	30,000	CY	$11.75	$352,500	$70,500	$423,000
	Concrete Cap	2,000	CY	$121.50	$243,000	$48,600	$291,600
	Timber Fenders						
	18" Dia. Treated Piles	53,000	LF	$36.00	$1,908,000	$381,600	$2,289,600
	12"X12"Treated Tim. Fenders	24,000	LF	$72.50	$1,740,000	$348,000	$2,088,000
	3"X12" Treated Tim. Bracing	31,000	LF	$63.00	$1,953,000	$390,600	$2,343,600
05----	Subtotal: Locks				$167,096,500		
05----	Contingencies					$33,419,300	
05----	Contingency - round off						($15,800)
05----	TOTAL: LOCKS						$200,500,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
09------	CHANNELS AND CANALS						
0901----	Channels						
090101--	Mobilization, Demobilization:						
	Initial Dredging	LUMPSUM	LS	$150,000.00	$150,000	$30,000	$180,000
	Existing Lock	LUMPSUM	LS	$125,000.00	$125,000	$25,000	$150,000
	Discharge Pipeline	LUMPSUM	LS	$200,000.00	$200,000	$40,000	$240,000
090113--	Traffic Control:						
09011302	Site Work						
	Dredge North Bypass Channel	690,000	CY	$1.85	$1,276,500	$255,300	$1,531,800
	Disposal of Contaminated Dredge Material	26,070	CY	$125.00	$3,258,750	$651,750	$3,910,500
	Dredge South Bypass Channel (Use Material as Random Fill)	145,000	CY	$3.50	$507,500	$101,500	$609,000
	Assistance Tugs	48	MO	$120,000.00	$5,760,000	$1,152,000	$6,912,000
090116--	Pipeline Dredging:						
	Dredge, New Lock Excavation	210,000	CY	$1.75	$367,500	$73,500	$441,000
	Dredge, Main Chann. North of New Lock	0	CY	$0.00	$0	$0	$0
	Dredge, Main Chann. South of New Lock (Use Material as Random Fill)	213,000	CY	$2.65	$564,450	$112,890	$677,340
	Dredge, River to St. Claude (Use Material as Random Fill)	150,000	CY	$3.45	$517,500	$103,500	$621,000
	Dredge, 3 Utility Crossings	125,000	CY	$2.50	$312,500	$62,500	$375,000
090130--	Bank Stabilization:						
09013002	Site Work-North Bypass						
	36"Riprap	27,000	TN	$23.50	$634,500	$126,900	$761,400
	12" Gravel Bedding	5,700	CY	$18.00	$102,600	$20,520	$123,120
	Filter Fabric	17,000	SY	$3.00	$51,000	$10,200	$61,200
09------	Subtotal: Channels and Canals				$13,827,800		
09------	Contingencies:					$2,765,560	
09------	Contingency - round off						$6,640
09------	TOTAL: CHANNELS AND CANALS						$16,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
11——	LEVEES AND FLOODWALLS						
1101——	LEVEES						
110101--	Mobilization, Demobilization and Preparatory Work:	LUMPSUM	LS	$100,000.00	$100,000	$15,000	$115,000
110199--	Associated General Items:						
1101991-	River Protection Floodwalls						
	I-Wall	3,700	CY	$330.00	$1,221,000	$183,150	$1,404,150
	T-Wall	3,650	CY	$250.00	$912,500	$136,875	$1,049,375
	14"X 14" Precast Prestressed Concrete Piles	56,000	LF	$17.25	$966,000	$144,900	$1,110,900
	Piling, Steel Sheet PZ-22	112,000	SF	$11.60	$1,299,200	$194,880	$1,494,080
	Pile Tests	4	EA	$31,250.00	$125,000	$18,750	$143,750
	Levee Setback Reshaping	16,600	CY	$16.00	$265,600	$39,840	$305,440
	Semi Compacted Embankment						
	On-Site Degraded Material	115,100	CY	$6.00	$690,600	$103,590	$794,190
	Off-Site Borrow	64,000	CY	$16.00	$1,024,000	$153,600	$1,177,600
	Levee Crown Surfacing	2,500	CY	$26.00	$65,000	$9,750	$74,750
1101992-	Tie-In Levee/I-Wall						
	I-Wall	1,260	CY	$330.00	$415,800	$62,370	$478,170
	Piling, Steel Sheet PZ-22	69,000	SF	$10.95	$755,550	$113,333	$868,883
	Semi Compacted Fill	14,500	CY	$16.00	$232,000	$34,800	$266,800
	Levee Crown Surface	500	CY	$26.00	$13,000	$1,950	$14,950
1101993-	Demolition of Exist. Floodwall						
	Demol. Conc. Floodwall	5,400	CY	$110.00	$594,000	$89,100	$683,100
	Extract Steel Sheet Piling	26,500	SF	$1.75	$46,375	$6,956	$53,331
	Extract 12" Conc. Piles	2,700	LF	$2.50	$6,750	$1,013	$7,763
	Backfill	3,200	CY	$18.00	$57,600	$8,640	$66,240
1101994-	Utility Crossings & Sleeves						
	Permanent Floodwall Sleeves						
	Trench "A"	LUMPSUM	LS	$80,000.00	$80,000	$12,000	$92,000
	Trench "C"	LUMPSUM	LS	$201,000.00	$201,000	$30,150	$231,150
	Trench "E"	LUMPSUM	LS	$170,000.00	$170,000	$25,500	$195,500
11——	Subtotal: Levees and Floodwalls				$9,240,975		
11——	Contingencies:					$1,386,146	
11——	Contingency - round off						($27,121)
11——	TOTAL: LEVEES AND FLOODWALLS						$10,600,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
25——	MITIGATION						
2591——	IMPACT AVOIDANCE						
	Compresive Pile Testing Program	LUMPSUM	LS	$30,400	$30,400	$7,600	$38,000
	Florida Avenue Access Road (Permanent Detour Route)	LUMPSUM	LS	$6,499,200	$6,499,200	$1,624,800	$8,124,000
	Florida Avenue Access Road Lighting	LUMPSUM	LS	$194,400	$194,400	$48,600	$243,000
	Aesthetic Mitigation						
	Textured Finished						
	Floodwall	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	St. Claude Bridge Approaches	LUMPSUM	LS	$120,000	$120,000	$30,000	$150,000
	St. Cld and Claib Bridge Piers	LUMPSUM	LS	$720,000	$720,000	$180,000	$900,000
	Exposed Lock Walls	LUMPSUM	LS	$168,800	$168,800	$42,200	$211,000
	Landscaping Levees, Fldwls, Detour Routes and (4) Bridge Approaches	LUMPSUM	LS	$248,000	$248,000	$62,000	$310,000
	Landscaping: Backfill Area Between Lockwalls & Floodwalls	LUMPSUM	LS	$773,600	$773,600	$193,400	$967,000
	Historical Recordation Program	LUMPSUM	LS	$480,000	$480,000	$120,000	$600,000
	Subtotal: Impact Avoidance				$9,403,200	$2,350,800	$11,754,000
2592——	DIRECT MITIGATION						
	Soundproof Residential Structures	LUMPSUM	LS	$1,108,750	$1,108,750	$277,188	$1,385,938
	Synchronized Traffic Signals	LUMPSUM	LS	$78,750	$78,750	$19,688	$98,438
	Computerized Hwy Message Boards	LUMPSUM	LS	$375,000	$375,000	$93,750	$468,750
	Incident Management Plan	LUMPSUM	LS	$294,800	$294,800	$73,700	$368,500
	Emergency Ambulance Service	LUMPSUM	LS	$1,936,000	$1,936,000	$484,000	$2,420,000
	Police Substation (Staff & Equipment 4 yrs)	LUMPSUM	LS	$1,064,000	$1,064,000	$266,000	$1,330,000
	School Crossing Guards	LUMPSUM	LS	$40,219	$40,219	$10,055	$50,274
	Traffic Control Officers	LUMPSUM	LS	$286,000	$286,000	$71,500	$357,500
	Pedestrian Shuttle Service	LUMPSUM	LS	$514,200	$514,200	$128,550	$642,750
	Operational Subsidy for Increased Bus Service	LUMPSUM	LS	$750,000	$750,000	$187,500	$937,500
	Compensation Fund - RTA	LUMPSUM	LS	$579,667	$579,667	$144,917	$724,584
	Street Resurfacing for Construction Traffic (Seven Miles)	LUMPSUM	LS	$370,000	$370,000	$92,500	$462,500
	Debris Removal By Barge	LUMPSUM	LS	$2,375,000	$2,375,000	$593,750	$2,968,750
	Cult Res: Brochure Publication	LUMPSUM	LS	$60,000	$60,000	$15,000	$75,000
	Salvaging and Curation of Bridge/Lock Component	LUMPSUM	LS	$125,000	$125,000	$31,250	$156,250
	Historical Markers (Includes Street Signs)	LUMPSUM	LS	$13,200	$13,200	$3,300	$16,500

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
	Cultural Display (Old Lock)	LUMPSUM	LS	$16,000	$16,000	$4,000	$20,000
	Temporary Relocation of Residents (St. Claude Ave. Bridge)	LUMPSUM	LS	$112,000	$112,000	$28,000	$140,000
	Compensation to Local Merchants	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Monetary Compensation to Holy Cross School	LUMPSUM	LS	$500,000	$500,000	$125,000	$625,000
	Transplant of Oak Trees from Existing Lock	LUMPSUM	LS	$240,000	$240,000	$60,000	$300,000
	Walk/Jog/Bike Path Along Fldwl	LUMPSUM	LS	$200,000	$200,000	$50,000	$250,000
	Observation Decks (3), Displays (3), Drinking Ftns (3) and Restrooms (3)	LUMPSUM	LS	$98,100	$98,100	$24,525	$122,625
	Lighting Under St. Cld Br Apprches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities Under St Claude Ave. Bridge Approaches	LUMPSUM	LS	$61,400	$61,400	$15,350	$76,750
	Secured Parking for Construction Workers	LUMPSUM	LS	$1,180,000	$1,180,000	$295,000	$1,475,000
	Training Assistance	LUMPSUM	LS	$400,000	$400,000	$100,000	$500,000
	Rail Line on St. Claude Bridge	LUMPSUM	LS	$80,000	$80,000	$20,000	$100,000
	Subtotal: Direct Mitigation				$13,866,886	$3,216,722	$17,083,608
2593——	GENERAL MITIGATION						
	Lighting Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$8,800	$8,800	$2,200	$11,000
	Community Facilities (General)	LUMPSUM	LS	$1,087,200	$1,087,200	$271,800	$1,359,000
	Community Facilities Under Claiborne Ave. Bridge Approaches	LUMPSUM	LS	$61,600	$61,600	$15,400	$77,000
	Street Resurfacing, Lighting and Landscaping	LUMPSUM	LS	$767,200	$767,200	$191,800	$959,000
	Business Incubator	LUMPSUM	LS	$750,000	$750,000	$0	$750,000
	Neighborhood Revitalization Program	LUMPSUM	LS	$1,000,000	$1,000,000	$0	$1,000,000
	Additional Police/Safety (6 Yrs)	LUMPSUM	LS	$1,596,000	$1,596,000	$399,000	$1,995,000
	Subtotal: General Mitigation				$5,270,800	$880,200	$6,151,000
25——	Subtotal: Mitigation				$28,540,886		
25——	Contingencies					$6,447,722	
25——	Contingency - round off						$11,392
25——	TOTAL: MITIGATION						$35,000,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
30------	ENGINEERING AND DESIGN						
3001----	Feature Design Memoranda:						
300101-	RDM ST. Claude Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$559,736	$559,736	$111,947	$671,683
	Cost Estimates	LUMPSUM	LS	$22,671	$22,671	$4,534	$27,205
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$295,000	$295,000	$59,000	$354,000
	Programs & Project Management	LUMPSUM	LS	$145,613	$145,613	$29,123	$174,736
300102-	RDM Claiborne Bridge						
	Engineering Analysis & Design	LUMPSUM	LS	$362,755	$362,755	$72,551	$435,306
	Cost Estimates	LUMPSUM	LS	$23,794	$23,794	$4,759	$28,553
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$300,000	$300,000	$60,000	$360,000
	Programs & Project Management	LUMPSUM	LS	$170,870	$170,870	$34,174	$205,044
300103-	RDM Utility Relocations						
	Engineering Analysis & Design	LUMPSUM	LS	$652,864	$652,864	$130,573	$783,437
	Cost Estimates	LUMPSUM	LS	$36,302	$36,302	$7,260	$43,562
	Programs & Project Management	LUMPSUM	LS	$209,786	$209,786	$41,957	$251,743
300104-	RDM Detour Routes						
	Engineering Analysis & Design	LUMPSUM	LS	$209,161	$209,161	$41,832	$250,993
	Cost Estimates	LUMPSUM	LS	$13,632	$13,632	$2,726	$16,358
	AE Contracts	LUMPSUM	LS	$289,000	$289,000	$57,800	$346,800
	Programs & Project Management	LUMPSUM	LS	$194,451	$194,451	$38,890	$233,341
3002----	Design Memoranda						
300201-	DM Levees, Floodwall & Channels						
	Engineering Analysis & Design	LUMPSUM	LS	$872,431	$872,431	$174,486	$1,046,917
	Cost Estimates	LUMPSUM	LS	$17,785	$17,785	$3,557	$21,342
	Report Preparation	LUMPSUM	LS	$10,000	$10,000	$2,000	$12,000
	VE Investigations	LUMPSUM	LS	$28,696	$28,696	$5,739	$34,435
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$150,896	$150,896	$30,179	$181,075
300202-	DM Materials						
	Engineering Analysis & Design	LUMPSUM	LS	$81,951	$81,951	$16,390	$98,341
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$59,082	$59,082	$11,816	$70,898

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300203--	DDM Lock & Appurtenant Structures						
	Engineering Analysis & Design	LUMPSUM	LS	$2,439,755	$2,439,755	$487,951	$2,927,706
	Cost Estimates	LUMPSUM	LS	$34,087	$34,087	$6,817	$40,904
	Report Preparation	LUMPSUM	LS	$15,564	$15,564	$3,113	$18,677
	VE Investigations	LUMPSUM	LS	$22,326	$22,326	$4,465	$26,791
	AE Contracts	LUMPSUM	LS	$956,623	$956,623	$191,325	$1,147,948
	Programs & Project Management	LUMPSUM	LS	$104,267	$104,267	$20,853	$125,120
300204--	DM Instrumentation						
	Engineering Analysis & Design	LUMPSUM	LS	$133,163	$133,163	$26,633	$159,796
	Cost Estimates	LUMPSUM	LS	$2,365	$2,365	$473	$2,838
	Report Preparation	LUMPSUM	LS	$6,904	$6,904	$1,381	$8,285
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Engineering Technical Management	LUMPSUM	LS	$24,993	$24,993	$4,999	$29,992
300205--	DM Mechanical & Electrical						
	Engineering Analysis & Design	LUMPSUM	LS	$591,556	$591,556	$118,311	$709,867
	Cost Estimates	LUMPSUM	LS	$9,419	$9,419	$1,884	$11,303
	Report Preparation	LUMPSUM	LS	$10,365	$10,365	$2,073	$12,438
	VE Investigations	LUMPSUM	LS	$19,373	$19,373	$3,875	$23,248
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$45,987	$45,987	$9,197	$55,184
300206--	DM Site Preparation & Demolition						
	Engineering Analysis & Design	LUMPSUM	LS	$298,823	$298,823	$59,765	$358,588
	Cost Estimates	LUMPSUM	LS	$12,506	$12,506	$2,501	$15,007
	Report Preparation	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009
	AE Contracts	LUMPSUM	LS	$0	$0	$0	$0
	Programs & Project Management	LUMPSUM	LS	$48,468	$48,468	$9,694	$58,162
300207--	DM Demolition of Exist. Lock						
	Engineering Analysis & Design	LUMPSUM	LS	$127,735	$127,735	$25,547	$153,282
	Cost Estimates	LUMPSUM	LS	$14,446	$14,446	$2,889	$17,335
	Report Preparation	LUMPSUM	LS	$9,557	$9,557	$1,911	$11,468
	AE Contracts	LUMPSUM	LS	$38,229	$38,229	$7,646	$45,875
	Programs & Project Management	LUMPSUM	LS	$99,223	$99,223	$19,845	$119,068
300208-	DM Social Mitigation						
	Engineering Analysis & Design	LUMPSUM	LS	$1,316,905	$1,316,905	$263,381	$1,580,286
	Programs & Project Management	LUMPSUM	LS	$71,518	$71,518	$14,304	$85,822
3003---	O & M Manuel						
	Engineering Analysis & Design	LUMPSUM	LS	$162,694	$162,694	$32,539	$195,233
	Programs & Project Management	LUMPSUM	LS	$33,556	$33,556	$6,711	$40,267
3004---	Post Construction Foundation Report						
	Engineering Analysis & Design	LUMPSUM	LS	$70,346	$70,346	$14,069	$84,415
	Programs & Project Management	LUMPSUM	LS	$9,174	$9,174	$1,835	$11,009

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
3005----	Construction Contract Planning, Engineering & Design:						
300501--	Site Preparation						
	Plans and Specifications	LUMPSUM	LS	$269,479	$269,479	$53,896	$323,375
	Cost Estimates	LUMPSUM	LS	$24,233	$24,233	$4,847	$29,080
	Engineering During Construct.	LUMPSUM	LS	$114,219	$114,219	$22,844	$137,063
	Construction Project Mgmt	LUMPSUM	LS	$120,613	$120,613	$24,123	$144,736
300502--	Flood Protection Construction & Utility Relocations						
	Plans and Specifications	LUMPSUM	LS	$833,252	$833,252	$166,650	$999,902
	Cost Estimates	LUMPSUM	LS	$80,422	$80,422	$16,084	$96,506
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$61,899	$61,899	$12,380	$74,279
	Construction Project Mgmt	LUMPSUM	LS	$111,208	$111,208	$22,242	$133,450
300503--	Channel Dredging - Phase I Claiborne to Florida Avenues						
	Plans and Specifications	LUMPSUM	LS	$137,162	$137,162	$27,432	$164,594
	Cost Estimates	LUMPSUM	LS	$22,554	$22,554	$4,511	$27,065
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$128,312	$128,312	$25,662	$153,974
	Construction Project Mgmt	LUMPSUM	LS	$111,207	$111,207	$22,241	$133,448
300504--	North Bypass Channel Appurtenances						
	Plans and Specifications	LUMPSUM	LS	$113,185	$113,185	$22,637	$135,822
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Engineering During Construct.	LUMPSUM	LS	$36,340	$36,340	$7,268	$43,608
	Construction Project Mgmt	LUMPSUM	LS	$11,598	$11,598	$2,320	$13,918
300505--	Utility Connections						
	Plans and Specifications	LUMPSUM	LS	$557,058	$557,058	$111,412	$668,470
	Cost Estimates	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$196,402	$196,402	$39,280	$235,682
	Construction Project Mgmt	LUMPSUM	LS	$63,786	$63,786	$12,757	$76,543
300506--	Tug Assistance Contract						
	Plans and Specifications	LUMPSUM	LS	$154,385	$154,385	$30,877	$185,262
	Cost Estimates	LUMPSUM	LS	$7,026	$7,026	$1,405	$8,431
	Engineering During Construct.	LUMPSUM	LS	$0	$0	$0	$0
	Construction Project Mgmt	LUMPSUM	LS	$12,591	$12,591	$2,518	$15,109
300507--	Lock & Appurtenant Structures						
	Plans and Specifications	LUMPSUM	LS	$5,435,885	$5,435,885	$1,087,177	$6,523,062
	Cost Estimates	LUMPSUM	LS	$66,559	$66,559	$13,312	$79,871
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$1,225,921	$1,225,921	$245,184	$1,471,105
	Construction Project Mgmt	LUMPSUM	LS	$348,772	$348,772	$69,754	$418,526

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300508-	Vehicular Detour Routes Claiborne Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$288,476	$288,476	$57,695	$346,171
	Cost Estimates	LUMPSUM	LS	$21,791	$21,791	$4,358	$26,149
	Engineering During Construct.	LUMPSUM	LS	$293,415	$293,415	$58,683	$352,098
	Construction Project Mgmt	LUMPSUM	LS	$160,819	$160,819	$32,164	$192,983
300509-	Claiborne Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$480,364	$480,364	$96,073	$576,437
	Cost Estimates	LUMPSUM	LS	$64,397	$64,397	$12,879	$77,276
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$902,125	$902,125	$180,425	$1,082,550
	Construction Project Mgmt	LUMPSUM	LS	$156,953	$156,953	$31,391	$188,344
300510-	Vehicular Detour Routes St. Claude Ave. Closure						
	Plans and Specifications	LUMPSUM	LS	$139,688	$139,688	$27,938	$167,626
	Cost Estimates	LUMPSUM	LS	$9,870	$9,870	$1,974	$11,844
	Engineering During Construct.	LUMPSUM	LS	$39,810	$39,810	$7,962	$47,772
	Construction Project Mgmt	LUMPSUM	LS	$157,600	$157,600	$31,520	$189,120
300511-	Dredge South Bypass Channel						
	Plans and Specifications	LUMPSUM	LS	$145,155	$145,155	$29,031	$174,186
	Cost Estimates	LUMPSUM	LS	$12,803	$12,803	$2,561	$15,364
	Engineering During Construct.	LUMPSUM	LS	$4,537	$4,537	$907	$5,444
	Construction Project Mgmt	LUMPSUM	LS	$19,200	$19,200	$3,840	$23,040
300512-	Existing Lock Demolition						
	Plans and Specifications	LUMPSUM	LS	$201,750	$201,750	$40,350	$242,100
	Cost Estimates	LUMPSUM	LS	$17,931	$17,931	$3,586	$21,517
	Engineering During Construct.	LUMPSUM	LS	$125,780	$125,780	$25,156	$150,936
	Construction Project Mgmt	LUMPSUM	LS	$347,409	$347,409	$69,482	$416,891
300513-	St. Claude Ave. Bridge Replacement						
	Plans and Specifications	LUMPSUM	LS	$1,924,900	$1,924,900	$384,980	$2,309,880
	Cost Estimates	LUMPSUM	LS	$36,810	$36,810	$7,362	$44,172
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$316,080	$316,080	$63,216	$379,296
	Construction Project Mgmt	LUMPSUM	LS	$436,918	$436,918	$87,384	$524,302
300514-	Final Dredging Contract						
	Plans and Specifications	LUMPSUM	LS	$158,259	$158,259	$31,652	$189,911
	Cost Estimates	LUMPSUM	LS	$9,630	$9,630	$1,926	$11,556
	Value Engineering	LUMPSUM	LS	$0	$0	$0	$0
	Engineering During Construct.	LUMPSUM	LS	$45,454	$45,454	$9,091	$54,545
	Construction Project Mgmt	LUMPSUM	LS	$55,024	$55,024	$11,005	$66,029

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
300515--	Permanent Mooring Facilities						
	Plans and Specifications	LUMPSUM	LS	$172,184	$172,184	$34,437	$206,621
	Cost Estimates	LUMPSUM	LS	$15,977	$15,977	$3,195	$19,172
	Engineering During Construct.	LUMPSUM	LS	$58,947	$58,947	$11,789	$70,736
	Construction Project Mgmt	LUMPSUM	LS	$47,808	$47,808	$9,562	$57,370
301----	Prior E & D (FY87 - FY97)						$17,000,000
30----	Subtotal: Engineering & Design				$45,624,531		
30----	Contingencies					$5,724,906	
30----	Contingency - round off						($49,437)
30----	TOTAL: ENGINEERING & DESIGN						$51,300,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Account No. Cost Quantity X UC	Contingency	Project Cost
31——	CONSTRUCTION MANAGEMENT						
3101——	Contract Administration						
	Review & Approval of Contract Payments	LUMPSUM	LS	$486,506	$486,506	$97,301	$583,807
	Contract Modifications	LUMPSUM	LS	$2,190,031	$2,190,031	$438,006	$2,628,037
	Progress & Completion Reports	LUMPSUM	LS	$392,117	$392,117	$78,423	$470,540
	All Other	LUMPSUM	LS	$3,366,569	$3,366,569	$673,314	$4,039,883
3102——	Review of Shop Drawings	LUMPSUM	LS	$545,144	$545,144	$109,029	$654,173
3103——	Inspection & Quality Assurance						
	Schedule Compliance	LUMPSUM	LS	$395,616	$395,616	$79,123	$474,739
	Compliance Sampling and Testing	LUMPSUM	LS	$651,637	$651,637	$130,327	$781,964
	Quality Surveys	LUMPSUM	LS	$923,074	$923,074	$184,615	$1,107,689
	Title II Servicse	LUMPSUM	LS	$501,543	$501,543	$100,309	$601,852
	All Other	LUMPSUM	LS	$5,773,939	$5,773,939	$1,154,788	$6,928,727
31——	Subtotal: Construction Management				$15,226,176		
31——	Contingencies					$3,045,235	
31——	Contingency - round off						$28,589
31——	TOTAL: CONSTRUCTION MANAGEMENT						$18,300,000

Account Number	Account Number Description	Quantity	Unit	Unit Cost	Cost	Contingency	Total Cost
01——	LANDS & DAMAGES	LUMPSUM	LS		$34,576,721	$8,623,279	$43,200,000
02——	RELOCATIONS	LUMPSUM	LS		$60,232,064	$16,167,936	$76,400,000
05——	LOCKS	LUMPSUM	LS		$167,096,500	$33,403,500	$200,500,000
09——	CHANNELS & CANALS	LUMPSUM	LS		$13,827,800	$2,772,200	$16,600,000
11——	LEVEES & FLOODWALLS	LUMPSUM	LS		$9,240,975	$1,359,025	$10,600,000
25——	MITIGATION	LUMPSUM	LS		$28,540,886	$6,459,114	$35,000,000
30——	ENGINEERING & DESIGN	LUMPSUM	LS		$45,624,531	$5,675,469	$51,300,000
31——	CONSTRUCTION MGMT	LUMPSUM	LS		$15,226,176	$3,073,824	$18,300,000
	TOTAL						$451,900,000

ANNEX 1
MODEL STUDY TIME & COST

CEWES-HR-N (CELMN-ED-HD/23 Jul 93) (1110-2-1150a) 1st End Mr. Wilson/
Mr. Hewlett/lm/601 634-2813/4164
SUBJECT: Model Study Cost Estimates - IHNC New Ship Lock/Barge Lock

DA, Waterways Experiment Station, Corps of Engineers, 3909 Halls Ferry Road,
Vicksburg, MS 39180-6199 9 SEP 1993

FOR Commander, U.S. Army Engineer District, New Orleans, ATTN: CELMN-ED-HD,
P.O. Box 60267, New Orleans, LA 70160-0267

1. Enclosed is a memorandum for record (encl 2) covering the information requested. The following table presents the cost estimates and elapsed time for the proposed studies.

a.	Navigation physical model studies (assuming two entrance plans):		
	(1) Tows	$205,000	8 months *
	(2) Tows and ships	$240,000	10 months
b.	Navigation computer simulation study (assuming one approach plan):		
	(1) Tows	$190,000	6 months
	(2) Tows and ships	$235,000	7 months
c.	Field data collection (performed concurrently with the simulator study)	$60,000	2 months
d.	Lock filling and emptying model:		
	(1) 110-ft by 900-ft non-standard barge lock	$700,000	14 months
	(2) 110-ft by 1,200-ft non-standard barge lock	$730,000	15 months
	(3) 110-ft by 900-ft ship lock	$820,000	16 months
	(4) 110-ft by 1200-ft ship lock	$850,000	17 months

* The times given above include the time to completion of tests and availability of model test results. Draft reports would be available three months following completion of testing.

2. When seeking approval for this study, please comply with paragraph 8.b of ER 110-2-1403, dated 21 January 1985, that defines the procedure for approval of hydraulic and hydrology studies and provide us a copy of the appropriate approval memorandum with your funding document or authority to proceed.

3. We understand that these studies are under consideration for the U.S. Army Engineer Waterways Experiment Station (WES) to perform beginning in about FY 96. In order for us to perform the studies, we must be authorized the necessary FTE. To assist us in obtaining necessary FTE allocation, it is

CEWES-HR-N
SUBJECT: Model Study Cost Estimates - IHNC New Ship Lock/Barge Lock

requested that you take action to have this work entered into the Headquarters, U.S. Army Corps of Engineers FORCON manpower accounting system when updates for future FY'S are requested. For this study to be considered by the Programs Division of Civil Works Directorate as justification for the necessary FTE authorization, it must be substantiated and validated by a submission from your office.

4. If you have any questions, please contact Mr. Chris Hewlett or Mr. Don Wilson at (601) 634-4164 or -2813, respectively.

2 Encls
wd encl 1
Added 1 encl
2. as

ROBERT W. WHALIN, PhD, PE
Director

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
3909 HALLS FERRY ROAD
VICKSBURG, MISSISSIPPI 39180-6199

REPLY TO
ATTENTION OF

CEWES-HR-N (1110-2-1150a) 31 August 1993

MEMORANDUM FOR RECORD

SUBJECT: Model Study Cost Estimates - IHNC New Ship Lock/Barge Lock

1. References.

a. CELMN-ED-HD memorandum of 23 July 1993, subject as above.

b. Telephone conversation between Mr. Charles Shadie, U.S. Army Engineer District, New Orleans (LMN) and Dr. Larry Daggett, U.S. Army Engineer Waterways Experiment Station (WES) on 10 August 1993, subject as above.

c. CELMN-ED-HD memorandum for record dated 8 July 1993, subject: IHNC Model Studies - Future Needs.

d. Telephone conversation between Mr. Charles Shadie, LMN, and Mr. Chris Hewlett, WES, on 18 August 1993, subject as above.

e. CEWES-HR-N 1st end dated 6 March 1990, subject: Model Study Cost.

f. Design drawing, General Plan, Lock and Channel, Industrial Canal Lock Replacement, Plate 1, LMN.

2. The following time and cost estimates were requested in reference 1a. We understand the estimates will be incorporated into the Inner Harbor Navigation Canal (IHNC) Lock Replacement Study - Feasibility Report and the model studies will be initiated about three years in the future. Additional time was required to obtain plan drawings from LMN and additional information on the project, therefore, a request to extend the response date to 31 August 1993 was made and granted (reference 1b). References 1c and 1d indicate that at the present time the proposed design configuration of the IHNC lock has not been specified. Design ship and tow configurations are therefore not certain. This proposal is predicated on the assumption that economic evaluation by the New Orleans District will result in a recommended lock for the National Economic Development (NED) Feasibility Study plan.

3. We recommend taking advantage of the physical model (located at WES) of the river entrance to the canal to test and design the entrance and approach conditions to the river side of the lock. In our earlier investigation (reference 1e), we learned that complex current patterns exist at the intersection of the Mississippi River Gulf-Outlet (MRGO) and the IHNC. Since this lock design moves the lock even nearer the intersection than the previous design, it is recommended that the approach on the lake side of the lock be analyzed using a maneuvering simulation model. Since physical space restrictions limit testing the construction sequences in the physical

model, these sequences will be tested with the simulation model. The estimates for the physical model navigation study and the navigation computer simulation study are based on studying the design tow in the lock recommended by the Feasibility Study. If a ship lock is recommended as the locally preferred plan, incremental time and costs are included for study of a design ship as well as a tow. In other words, it is assumed that only one size lock will be studied, but it could require investigation of two designs (one for a tow and one for a ship).

4. Navigation Physical Model Study. An undistorted, 1:120-scale, fixed-bed navigation model, which reproduces 4.1 miles of the Mississippi River and the entrance to the IHNC is available to conduct tests on the Mississippi River side of the proposed lock. The model can be used to conduct tow and ship navigation tests to aid in the design of the river entrance to the lock canal. Preparation of the model for operation and revision of the model to include the IHNC up to the southern lock approach of the proposed lock will require four months and cost $100,000. The revision of the model requires an extension of the IHNC portion of the model which will cross an existing model currently maintained in an inactive status for the Vicksburg District (LMK). Therefore, this portion of the estimate is contingent on permission to cross the LMK model. The lock and dam that the LMK model represents is currently under construction and may be completed by the time the IHNC model is required. Collection of current direction, velocity, and tow track data and an evaluation of navigation conditions with the proposed design and three river flows will require about two months and cost $35,000. Collection of ship track data and an evaluation of navigation conditions for ships with the proposed design and three river flows will require about one month and cost $15,000. If the design ship is not one of our existing models, construction of a scale ship model will cost approximately $5,000 and the work will be performed concurrently with revision of the navigation physical model. Testing additional canal entrance plans for a tow lock will require about two months and cost $35,000 each. Additional testing for a ship lock will require about one month and cost $15,000 per entrance plan. If we assume two entrance plans would be tested with only tows, the total time required would be 8 months and the study would cost $170,000 (one design tow). If ships are included in the test program the study will expand to 10 months and cost a total of $205,000 (including the construction of one design ship). Preparation of a draft report will require $20,000 and three months; publication of a final report will cost $15,000 and require three months following receipt of review comments.

5. Navigation Computer Simulation Study. In conjunction with the navigation physical model, a computer simulation study is recommended. This simulation study will concentrate on the MRGO side of the lock while the navigation physical model will focus only on the Mississippi River side. The WES has reviewed the design as it stands and has identified five traffic scenarios which we recommend be tested in a numerical computer simulation study. These scenarios span both the construction and completed phases of the project:

a. During construction of the new lock facility, northbound traffic leaving the existing lock structure must detour to the bypass channel through the protection cells in front of the lock. Southbound traffic passing under the Florida Avenue Bridge must also immediately divert to the bypass lanes (reference 1f). These maneuvers and the possible resultant meeting/passing situation in the bypass lanes need to be tested on a ship simulator because there is a question as to the allowable tow size and required maneuvering room. Visibility may be restricted also. This scenario would be restricted to existing traffic because the existing lock would still be in place. This test could yield valuable information concerning tow size and operational restrictions that may be needed during the construction phase of the project.

b. Vessel approaches to the new lock from the Mississippi River side (south) should be simulated. This would probably involve simulations of both the design tow and ship (both presently undetermined). The horizontal clearance through the St. Claude Avenue and N. Claiborne Avenue Bridges in their final conditions are still unknown and could affect navigation safety during the lock approach (reference 1f). If ships are tested for this scenario, tug operations could be critical. This scenario would be the one area of overlap with the navigation physical model; however, the ship simulation tests would terminate before the vessels enter the lock chamber. These tests would allow comparison with the physical model test results using licensed local pilots in a real-time environment.

c. Vessel approaches to the new lock from the Mississippi River Gulf-Outlet (MRGO) side (north) should be simulated. These tests are recommended because (1) currents are complex in the area, (2) the design ship and tow will be larger than vessels now using the IHNC, and (3) the Florida Avenue Bridge is being moved closer to the proposed position of the new lock and guard wall. At present, there is no information as to the prospective horizontal clearance through the bridge piers. As in the preceding scenario, tugs could be required for simulations of single-screw ships, particularly when strong wind conditions are present. The tests will be to determine approach conditions and will stop before the vessels enter the lock chamber.

d. After completion of the new lock, the design of the required bypass channel during demolition of the old lock is unspecified. This may be critical only for a short time but could result in partial traffic restriction. It is recommended that simulation tests be conducted for this scenario.

e. After completion of the new lock structure, it is evident that ships moving into the basin on the western side of the channel (encl 1) between the new lock and the Florida Avenue Bridge will have a constricted entrance between the new lock guard wall and the new bridge piers and fenders. There is an indication that containerships (Ro-Ro) and general cargo vessels utilize this area as well as tows. Depending on the ship size, this may be a navigation concern and it is recommended that the maneuver to enter and exit this basin be tested on a simulator.

6. Development of simulation data bases (visual scene, currents, vessel, numerical models, etc.) will require 4 months to complete and cost $100,000. At least six professional tow pilots are required to test the five scenarios listed in paragraph 5. Assuming that two pilots visit the simulator per week during each of three weeks over a four-week period, the basic testing with tows will take one month and cost $33,000. If simulation tests with a design ship are needed, the testing will require an additional month and another $33,000. After testing (either alternative), one month will be required to produce a preliminary results letter report with a cost of $25,000. Development of ship numerical models (tow or ship) will cost approximately $6,000 each. At this point without knowing the design vessels, the study cost estimate must include one existing condition design tow, one proposed condition design tow, one design ship for the proposed lock and one design ship for the entrance into the western basin (scenario 4e). Final publication of a WES technical report will cost an additional $20,000. If only tow testing is required the computer simulation study will take six months for preliminary results and cost $190,000 (including two vessel numerical models). With the addition of ship tests, the study will take seven months and cost $235,000 (including four vessel numerical models).

7. Field Current Data Collection. Channel current data for the proposed computer simulation study will be obtained from a proposed field data collection effort and from the physical model. Because of the expected change in design vessels, it is considered important that the effect of currents on navigation in the area be investigated. Within the canal it is anticipated that currents will be negligible. However, currents will affect vessels outside the canal in the approaches including the approaches in the MRGO. The currents on the MRGO side of the lock are not expected to change because of project construction; therefore, field data from the existing condition are considered adequate for simulations of the proposed lock configurations. The field data will be gathered from the MRGO side of the lock only; currents on the Mississippi River side of the lock can be measured from the physical model. If the physical navigation model is not used, currents for the river entrance would have to be obtained with a numerical model; cost estimates are not included for this model.

8. Tide gages will be deployed at four locations within the study area on the MRGO side of the lock. One will be near the proposed location of the new lock, one at the Lake Pontchartrain entrance to Inner Harbor, one at the entrance to the Gulf Intracoastal Waterway northeast of the study area, and another farther down the MRGO toward the Gulf of Mexico. Current speed and direction measurements will be obtained for seven different transects ranging from the south side of the Florida Avenue Bridge to about a mile down the MRGO. One boat, with three persons on board, will operate along the proposed transects. Current speed and direction data will be collected using Acoustic Doppler Current Profile systems. Data are to be collected over a 25-hour period in conjunction with a spring tide interval and with each transect being traversed at least once per hour. The field data will be obtained concurrently with ship simulation data base development and cost $60,000.

9. Lock Filling and Emptying Study. If the recommended plan for the filling and emptying system for the lock involves a non-standard design barge lock or a ship lock and barge, a physical model study of the filling and emptying system will be required (as stated in paragraph 4 of reference 1a). This model will be used to investigate the hydraulic characteristics of the filling and emptying system. Testing will consist of evaluating the performance of the lock intakes, optimizing conditions in the lock chamber during filling and emptying, recording filling and emptying times, measuring instantaneous and average pressures in the filling and emptying system, and evaluating flow conditions at the discharge outlets. The cost and time estimates are based on requiring approximately ten revisions to the basic filling and emptying system design. The four possible plans that will require filling and emptying studies are:

a. 110-ft by 900-ft non-standard barge lock
b. 110-ft by 1200-ft non-standard barge lock
c. 110-ft by 900-ft ship lock
d. 110-ft by 1200-ft ship lock.

The filling and emptying study will test only the one configuration chosen as the design lock. If the recommended plan is a ship lock, then the filling and emptying system must be designed to provide satisfactory hydraulic characteristics for both ships and barges. Thus, longer testing times will be required to arrive at a satisfactory design. Obviously, the larger locks will require additional time and cost for construction. A 1:25-scale model will be used for the study. Approximately 600 ft of approach and exit topography and the lock configuration with the filling and emptying system constructed in detail will be reproduced. No tow or ship entry or exit tests will be performed due to the limited approaches that can be constructed in the existing facilities. Estimates of time and cost to study each of the different plans are shown in the following table. Design and construction of two non-propulsive ship models are included in plans c and d.

Plan	Design and Construction		Testing		Report	Total	
	Time (months)	Cost ($1000)	Time (months)	Cost ($1000)	Cost ($1000)	Time (months)	Cost ($1000)
a.	6	350	8	320	30	14	700
b.	7	380	8	320	30	15	730
c.	6	390	10	400	30	16	820
d.	7	420	10	400	30	17	850

CEWES-HR-N
SUBJECT: Model Study Cost Estimates - IHNC New Ship Lock/Barge Lock

A draft of the report will be furnished for your review and comments about three months after completion of all tests. The report will be published about three months after your comments are received.

Encl

CHRIS HEWLETT
Research Hydraulic Engineer
Navigation Branch

DONALD C. WILSON
Research Hydraulic Engineer
Navigation Branch



NEW ORLEANS

Encl 1 to Encl 2

ANNEX 2
DESIGN CRITERIA & RESULTS OF GOVERNING LOADING CONDITIONS

1200 X 110 X 36 SHIP LOCK

SAMPLE CALCULATIONS

INDEX

1. DESIGN CRITERIA

2. DRAFT REQUIREMENTS

3. PILE FOUNDATION (INCLUDING FLOTATION & SLIDING)

4. TENSION PILE DESIGN

5. SETTING PILE DESIGN

6. BASE ANALYSIS - TRANSVERSE - CHAMBER

7. BASE DESIGN - TRANSVERSE - CHAMBER

8. WAVE ANALYSIS - CHAMBER

9. BASE DESIGN - LONGITUDINAL - CHAMBER

DESIGN CRITERIA

SAMPLE CALCULATIONS PERTAIN TO THE 1200 X 110 X 36 SHIP LOCK. TYPICAL CALCULATIONS ARE FOR THE CHAMBER MODULE. THE GATEBAY CALCULATIONS ARE INCLUDED ONLY WHEN THAT MODULE CONTROLS THE DESIGN.

STRUCTURAL DESIGN CRITERIA

3 OCTOBER 96

1. Scope. The analysis and design concepts for the structural components are presented in the following text. A general layout of the structure is presented on Plates B-19 and B-20 for the 1200' Ship Lock and B-29 and B-30 for the Barge Lock.

2. References. The structural components shall be designed according to the applicable portions of the Corps of Engineers (COE) manuals for engineering and design and other reference material.

a. COE Publications:

(1) EM 1110-2-2000, Standard Practice for Concrete (Sep 85).

(2) EM 1110-2-2102, Waterstops and Other Joint Materials (May 93).

(3) EM 1110-2-2104, Strength Design for Reinforced - Concrete Hydraulic Structures (June 92).

(4) EM 1110-2-2105, Design of Hydraulic Steel Structures (May 93).

(5) EM 1110-2-2502, Retaining and Floodwalls (Sep 89).

(6) EM 1110-2-2602, Planning and Design of Navigation Lock (Sep 95).

(7) EM 1110-2-2703, Lock Gates and Operating Equipment (Jun 84).

(8) EM 1110-2-2906, Design of Pile Foundations (Jan 91).

(9) EM 1110-2-8152, Planning and Design of Temporary Cofferdams and Braced Excavations (Aug 94).

(10) ER 1110-2-1806, Earthquake Design and Evaluation for Civil Works Projects (Jul 95).

(11) ETL 1110-2-256, Sliding Stability for Concrete

Structures (Jun 81).

(12) ETL 1110-2-307, Flotation Stability Criteria for Concrete Hydraulic Structures (Aug 97).

(13) ETL 1110-2-338, Barge Impact Analysis (April 93).

(14) ETL 1110-2-355, Structural Analysis and Design of U-Frame Lock Monoliths (Dec 93).

(15) SL-80-4, Strength Report of Reinforced Concrete Hydraulic Structures, Report 3 - T-Wall Design, (Jan 82)

b. Technical Publications.

(1) American Concrete Institute, Building Code Requirements for Reinforced Concrete, (ACI 318-89).

(2) American Concrete Institute, Guide for the Design and Construction of Fixed Offshore Structures, (ACI 357R-84).

(3) American Concrete Institute, State of the Art Report on barge-Like Concrete Structures, (ACI 357.2R-88)

(4) American Institute of Steel Construction (AISC), Manual of Steel Construction 9th Edition, 1989.

(5) American Welding Society, Structural Welding Code, Steel, (AWS-D 1.1-88).

(6) Concrete Reinforcing Steel Institute, CRSI Handbook, (1984).

(7) Precast/Prestressed Concrete Institute, PCI Design Handbook, 4th Edition (1992)

(8) Post-Tensioning Institute, Post Tensioning Manual, 5th Edition, (1990).

(9) American Association of State Highway and Transportation Oficials, Standard Specifications for Highway Bridges, 14 Edition (1992)

c. Computer Programs.

(1) "Pile Group Analysis (CPGA)," WES Program No. X0080.

(2) "Pile Group Graphics Display (CPGG)," WES Program No. X0081.

(3) "Two Dimensional Analysis of U-Frame and W-Frame Structures (CWFRAM)," WES Program No. X0091.

(4) "C-Frame," WES Program No. X0030.

(5) "CWALSHT," WES Program No. X0031.

(6) " GT STRUDL", Georgia Institute of Technology.

(7) "CGSI", WES Program No. X0061.

(8) "CGFAG", WES Program No. X8008.

2. Design Criteria.

a. General. Design criteria shall be according to the referenced EM's, ETL's, and technical publications.

b. Material weights.

Item	PCF	
Water	63.0	
Select Sand	120.0	Ko = 0.50
Semi-Compacted Fill	110.0	Ko = 0.80
Silt	117.0	
Stone	132.0	
Concrete	150.0	
Steel	490.0	

c. Design Stresses.

(1) Concrete. The Strength Design Method is used in the design of conventionally reinforced concrete in accordance with the requirements of the ACI 318R-89R Building Code. Values

contained in the Code shall be modified as required in EM 1110-2-2104. The appropriate Load Factors are stated in para. (8). The transportation and setting load cases shall be analyzed by both the Strength Design Method and Working Strength Design(WSD)as directed in Section 4.4 of ACI 357. The WSD allowables for reinforcing steel are specified in ACI 357. The concrete compressive stress for the temporary loading shall not exceed 0.45 f'c. Crack width is controlled by limiting the stress in the tension reinforcement. In the transverse direction, the tensile stresses do not exceed the values specified in Table 4.1 of ACI 357. Table 4.1 was developed as a method for controlling cracks. The crack widths were calculated in accordance with formulas in ACI para. 10.6.4 Commentary. The Beta Factor for the I-Beam is 1.16. Crack widths were limited to 0.008 inch for normal operation and 0.0012 inch for temporary and extreme load conditions. In that the structure is precast, the dead load of the structure was include in the calculation of flexural stresses at service load. The base section is prestressed in the longitudinal direction; tension is not permitted in the concrete, therefore, concerns for cracks are eliminated. In the lock upper wall the flexural stresses are low, cracking will not be a problem. Although the reinfocement was increased to reduce stress, an upper limit was maintained to assure a ductile failure. The maximum steel ratio does not exceed 0.25pbal. (for members with compression steel pmax = 0.25pbal. + p'X(fs/fy)). Service load deflections and the effects of deformation loads (i.e. temperature) shall be investigated during the FDM. The base concrete shall have a minimum design strength (fc') of 6,000 psi at 28 days, the upper walls shall be constructed of concrete with a minimum 28-day strength of 4000 psi, and the ballast concrete shall have a design strength of 3,000 psi.

(2) Reinforcement. The design strength of conventional reinforcement shall be based on the use of ASTM Grade 60 steel, having a yield strength of 60,000 psi. Development length shall be based on the full yield strength of 60,000 psi.

(3) Prestressed Concrete. Criteria is based on the procedures presented in Section 9 of AASHTO Standard Specifications, the Post-Tensioning Manual and Chapter 18 of ACI 318. Prestressed members and composite members shall be designed to satisfy both strength (Ultimate Strength Design-USD) and serviceability requirements (Working Strength

Design-WSD). Allowable stresses are listed below. The Load Factors required in USD are specified in para. (8) below. The tendon system shall be fully bonded. This Feasibility Design will only consider the threaded bar post-tensioning system. The concrete compressive strength fc' is 6000 psi at 28 days, the concrete compressive strength at the time of transfer fci' is 4500 psi. The ultimate tensile strength fpu of the post-tensioning bar is 160ksi.

Allowable Stresses, Prestressed Concrete.

PRESTRESSING STEEL (Post-Tensioned Members)

Maximum Jacking	0.75 fpu
Maximum at Transfer	0.66 fpu
Effective (After Losses)	0.60 fpu**

** It is recognized that losses due to shrinkage, elastic shortening and creep of concrete as well as steel relaxation and friction should be considered. However, for this level of design an approximate value shall be used in the absence of a detailed analysis.

CONCRETE

AT TRANSFER (Before Losses)

Compression	0.55 f'ci
Tension	0

AT SERVICE LOADS (After Losses)

Compression	0.40 f'c
Tension	0

BEARING (Anchorage)

Compression	3000 psi

4) Structural Steel. For this Feasibility Report all members shall be designed using Allowable Stress Design (ASD). Permissible stresses for structural steel members are specified in Chapter 4 of EM 1110-2-2105. The main steel components are classified by type, in para. 7 below. For Feasibility analysis, the miter gate was analyzed using ASD. The miter gate shall be reanalyzed using LRFD as required in EM 1110-2-2105 during FDM design.

(5) Welds. Allowable stresses for the design of welds shall be according to the latest AWS Welding Code as modified by EM 1110-2-2105.

(6) Steel Pipe Piles. Allowable compressive stresses are given for both the lower and upper regions of the pile.

Axial Compression - Lower Region

$$Fa = 1/3 \times Fy \times 5/6$$

Combined Bending and Axial Compression - Upper Region:

$$\frac{fa}{Fa} \pm \frac{fbx}{Fb} \pm \frac{fby}{Fb} \leq 1.0$$

where:

fa = computed axial unit stress
Fa = 5/6 X 3/5 X Fy
fbx and fby = computed bending unit stress
Fb = 5/6 X 2/3 X Fy

(7) Hydraulic Steel Component Classification. As described in paras. 4.4 and 4.8 of EM 1110-2-2105, the main componemts are classified by Type as follows:

	Steel Component	Type
1.	Miter Gate	B
2.	Culvert Tainter Valves	A
3.	Culvert Valve Bulkheads	C
4.	Emergency Bulkheads	B
5.	Temporary Module Closure Dam	C

(8) Ultimate Strength Design. Load factors for the ultimate strength design of the concrete structure are in accordance with EM 1110-2-2104 for hydraulic structure load conditions. For setting and transportation, the load factors were developed in accordance with ACI 357R-84.

Loading Condition	Load Factor
1. Normal Operating	Uh = (1.3) X 1.7(D + L)
2. Maximum Operating	Uh = (1.3) X 1.7(D + L)
3. Maintenance Dewatering (Unusual)	Uh = 1.7(D + L)
4. Hurricane (Unusual)	Uh = 1.7(D + L)
5. Setting	**U = 1.2D + 1.6L + 1.3W** **U = 0.9(D + L) + 1.3W**
6. Transportation	**U = 1.2D + 1.6L + 1.3W** **U = 0.9(D + L) + 1.3W**
	D = dead load L = live load W = wind plus wave load (where wind = 50 psf)

4. Loading Conditions.

(1) General. Six load cases shall be investigated. Two uplift conditions shall be applied to the Normal Operation and Maximum Operation, the conditions are described below. Only Uplift A is applied to the Maintenance Dewatering and Hurricane load cases.

(2) Uplift Conditions.

A. Uplift Condition A assumes the headwater sheet pile is fully effective. The uplift pressure is constant and equal to the tailwater pressure head.

B. Uplift Condition B assumes the headwater sheet pile cutoff is ineffective. Uplift pressure varies uniformly between the headwater pressure and the tailwater pressure.

(3) Loadings.

Load Case 1	Normal Operation	
	Riverside Headwater	El. 10.0
	Lakeside Tailwater	El. 1.0
	Chamber	El. 10.0
Load Case 2A	Maximum Operation	
	Riverside Headwater	El. 17.6
	Lakeside Tailwater	El. -2.0
	Chamber	El. 17.6
Load Case 2B	Maximum Operation	
	Riverside Headwater	El. 17.6
	Lakeside Tailwater	El. -2.0
	Chamber	El. -2.0
Load Case 3	Maintenance Dewatering	
	Riverside Headwater	El. 10.0
	Lakeside Tailwater	El. 1.0
	Chamber	El. DRY
Load Case 4	Hurricane	
	Lakeside Headwater	El. 13.0
	Riverside Tailwater	El. 0.0
	Chamber	El. 0.0
Load Case 5	Setting (Construction)	
	Static Head at	El. 3.0
	Chamber	El. DRY
	No Backfill	
	Voids Grouted	
	Flotation F.S. = 1.05	
Load Case 6	Transportation Case	
	Still Water	El. 1.0
	Wave Height	6.0 FT
	Wave Period	400 FT
	Voids Empty w/ short U-Frame	

Additional Factors.

- Sand backfill is assumed throughout the wall height, except for a negligible clay blanket, for all load cases except

Load Case 5.

- The effects of siltation are considered negligible.
- Drag on the outer walls was added when the effects were conservative.

Drag Force = At Rest Lateral earth pressure X 0.5 X (Tangent of the internal angle of friction)

5. PILE FOUNDATION. The pile foundation shall be designed in accordance with EM 1110-2-2906. The minimum factors of safety, based on the results of pile tests, for the loading conditions are as follows:

Loading Condition	Category	Soil Case	Pile Capacity Factor of Safety Compression	Tension
Normal Operation	Usual	S	2.0	2.0
Maximum Operation	Usual	Q	2.0	2.0
Maintenance Dewatering	Unusual	Q	1.5	1.5
Hurricane	Unusual	Q	1.5	1.5
Setting (Constr.)	Unusual	Q	1.5	1.5

6. FLOTATION. Flotation shall be evaluated in accordance with ETL 1110-2-307. For the Maintenance Dewatering Case, the dead weight of the structure alone shall exceed bouyancy by a Factor of Safety equal to 1.05. Tension connections to an adequate number of piles shall be utilized to develop the minimum required Factor of Safety. Drag force is neglected. The minimum factor of safety for load conditions shall be as follows:

Load Condition	Minimum Factor of Safety
Normal Operation	1.5
Maximum Operation	1.5
Maintenance Dewatering	1.05 w/o Tension Piles
	1.30 w/ Tension Piles

Hurricane	1.3
Setting	N/A

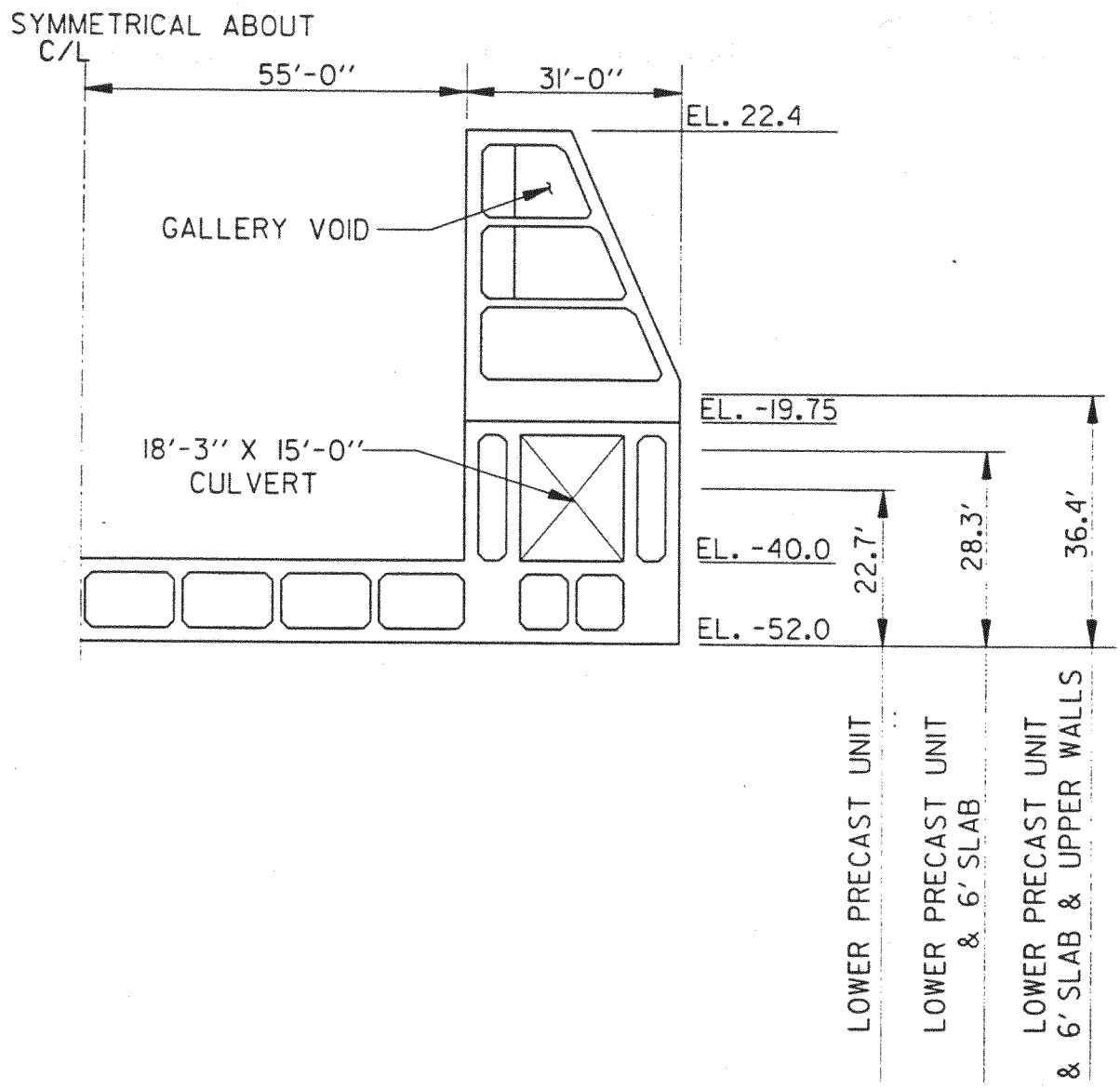
7. SLIDING. Since this foundation is grouted to the base a check for sliding is performed. The analysis will conservatively assume no embedment of the piles into the U-Frame base. The shear strength of the pile tension connections is also neglected. The sliding resistance considered is developed by the friction between the concrete base and the tremied 4' pile cap. The factor of safety shall be calculated in accordance with ETL 1110-2-256. A friction factor of 0.60 is used. A minimum factor of safety equal to 2.0 is required for all load conditions.

DRAFT REQUIREMENTS

DRAFT REQUIREMENTS

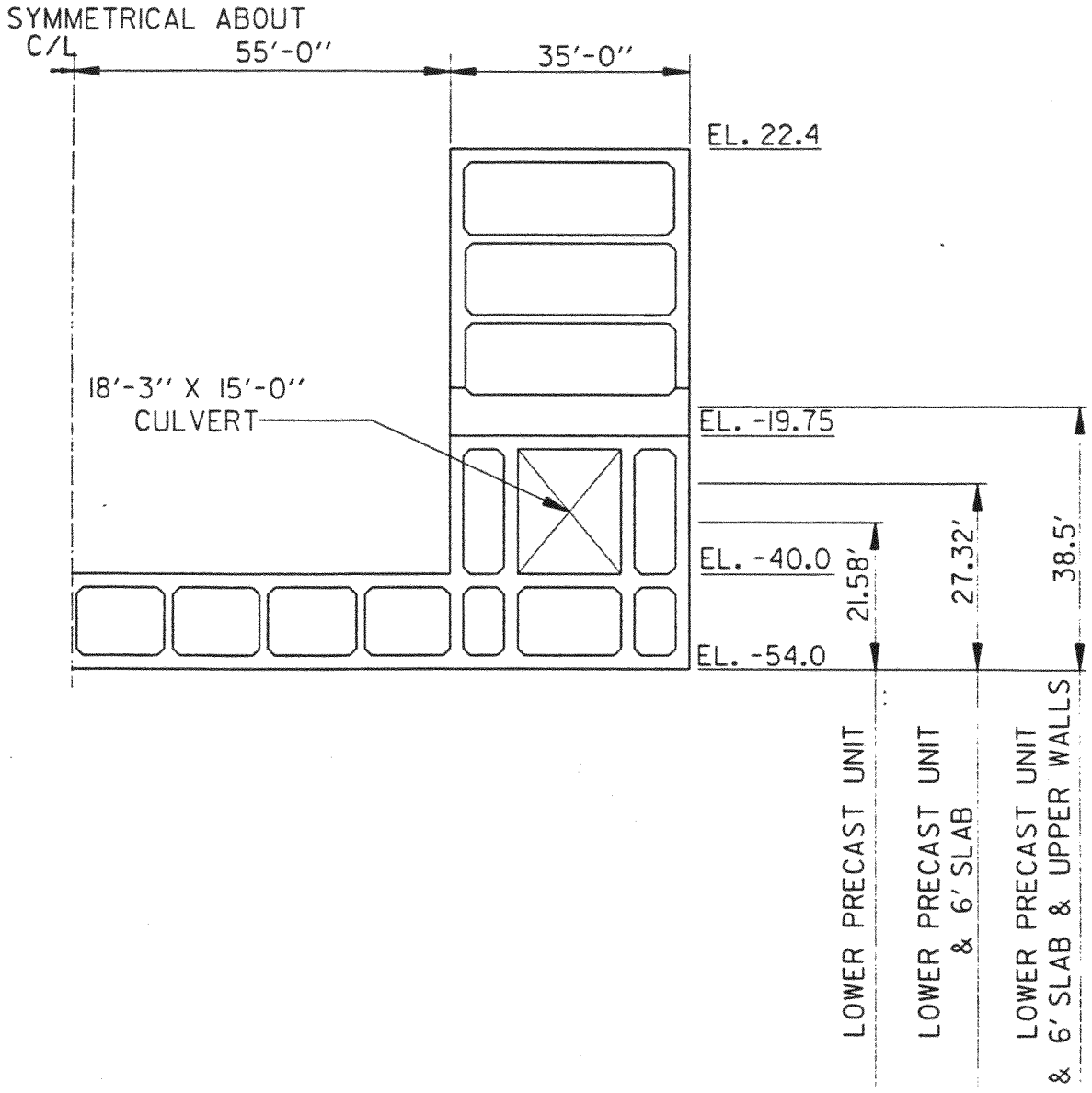
The governing draft is the depth of the MRGO channel. Presently the channel has a minimum draft to EL. -30, the mean low water is El. 0.0.

It was decided that the graving site would be built to the culvert roof plus a sufficient roof thickness that would support the construction of the upper walls. The chamber and gatebay bases require drafts of 22.7' and 21.6' respectively. An additional 3' of safety factor was added to the graving site platform to assure lift off. The 3' was concurred upon by Drs. Moustafa and Berner . Therefore, the total draft at the platform is approx. 26'.



TYPICAL SHIP LOCK CHAMBER SECTION

SCALE: N.T.S.



TYPICAL SHIP LOCK GATEBAY SECTION

SCALE: N.T.S.

PILE FOUNDATION

PILE FOUNDATION

The piles shall be 48" diameter, 5/8" wall steel pipes conforming to ASTM A53 Gr B and API 5L Gr B (Fy = 35 ksi, Fu = 60 ksi). The 5/8" wall thickness satisfies the AISC Specification Chapter B requirements for local buckling.

The pile lengths are based on a Factor of Safety equal to 2.0. Pile tests shall be performed. No group reduction factor is needed as long as a minimum spacing of 12' is maintained. Both the chamber module and gate bay module pile loads were checked considering five load cases. The maximum compressive load was dictated by the ship lock gatebay module experiencing the maximum operation condition with minimal uplift. The uniform pile reaction(transverse direction) was increased 125% beneath the lock walls, developing a maximum reaction of 840 kips. The 160' pile has a soil capacity of approx. 880 kip. The lighter barge lock required a 140' pile length. The shiplock gatebay was also analyzed as a rigid base acted upon by the eccentric gravity loads and lateral loads. The Program CPGA was used to determine the axial loads and combined stress created by axial compression and bending. The maximum reaction increased slightly to 851 kips and the maximum combined stress ratio is 0.49; both well within the permissible limit. The maximum required length pile was conservatively used throughout the foundation. The CPGA rigid base analysis was also used for the maintenance dewatering case to determine if any portion of the pile foundation went into tension. The results are no net tension. The same pile lengths were also adequate for the setting pads and tension piles. Tension piles were used solely to achieve the required Factor of Safety against flotation for the maintenance dewatering case.

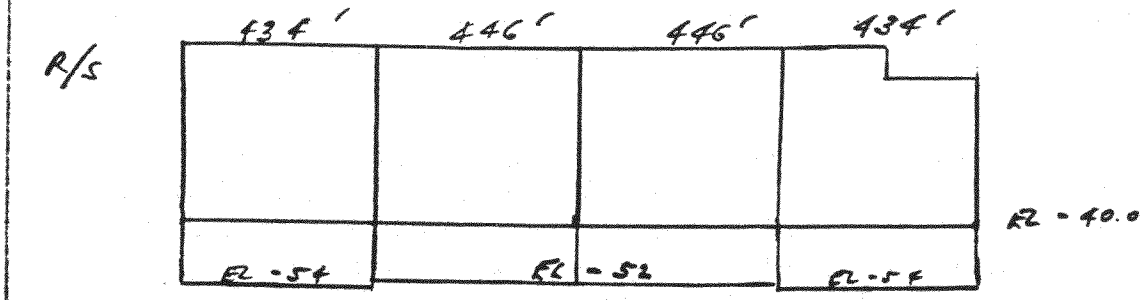
The included sample calculations are for the 1200 X 110 Ship Lock. Included are:

- Uplift Pressures
- Sliding Calculations
- Pile reactions for both the chamber and gatebay modules based on a simple P/A distribution with a 125% increase beneath the lock walls
- CPGA runs for the gatebay module incurring a moment created by eccentric gravity loads and lateral loads.
- Ultimate Pile Capacity curve

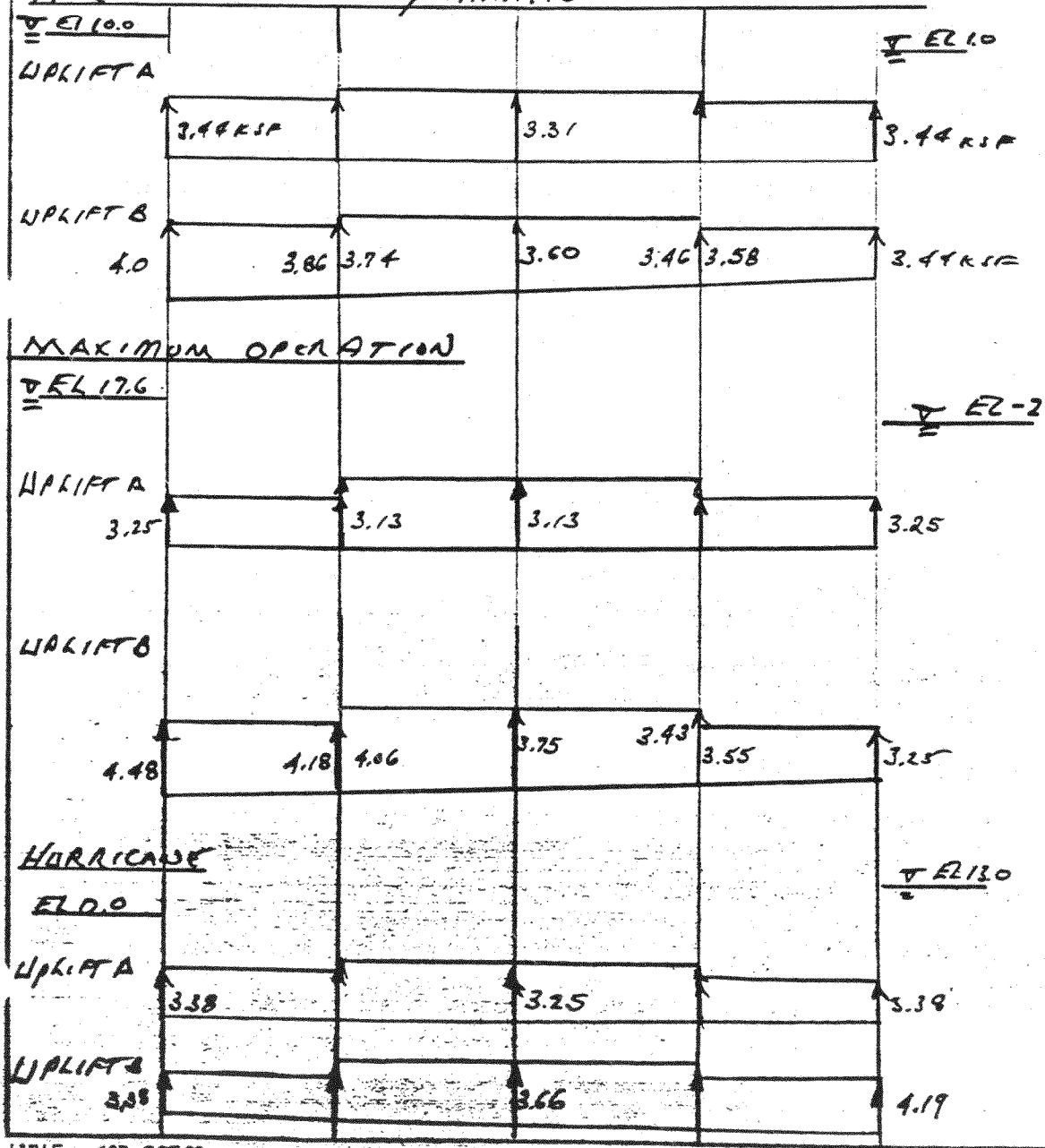
COMPUTATION SHEET

PROJECT 1200K 110K3G FOUNDATION	PAGE 1 OF 20	COMPUTED BY MJG	DATE 6/96
SUBJECT UPLIFT PRESSURE ON BASE *		CHECKED BY	DATE

* Add 4' OF HEAD FOR PRESSURE @ BASE OF GROUT CH



NORMAL OPERATION / MAINTENANCE DEWATERING



MAXIMUM OPERATION

HURRICANE

SHIPLOCK GATEBAY 2 20 MKG 9/95
SLIDING

ALTHOUGH PILE FOUNDED, THE MAJORITY OF PILES WILL MAKE CONTACT W/ THE BASE THROUGH A TREMIED CONCRETE PAD. CONSERVATIVELY ASSUME SLIDING PLANE BETWEEN BASE AND 4' TREMIED PILE CAP. RESISTANCE TO SLIDING IS DEVELOPED FROM FRICTION, NEGLECT TENSION PILE CONNECTIONS. NEGLECT DRAG.

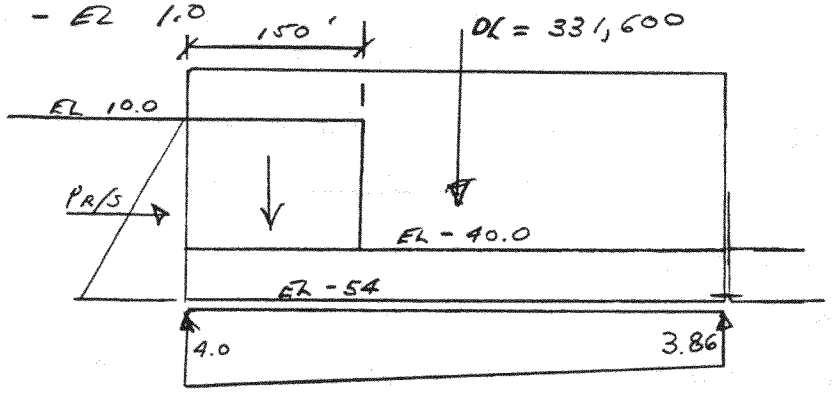
$\Sigma F_{RESIST} = \mu \cdot \Sigma$ GRAVITY LOADS where μ = concrete to concrete friction coefficient = 0.65 *

Σ Dead Load = 360,500 (STRUCTURE (FROM CPGA INPUT PG 19)) $_K$ − 1600 (BULK HEAD) − 27,300 (4' GROUT) = 331,600 K

MAINTENANCE DEWATERING UPLIFT B

R/S STAGE – EL 10.0

H/S STAGE – EL 1.0



ΣP_Z = DL + CHAMBER H_2O − UPLIFT

= 331,600 + (150 × 110 × 50 × 0.0625) − $\left(\frac{4.0+3.86}{2} \times 180 \times 434\right)$

= 384.000 − 307,000

= 77,000 K

$\Sigma P_Y = P_{R/S} - P_{L/S}$ Assume Construction outer watertight is still intact ∴ $P_{L/S}$ is negligible

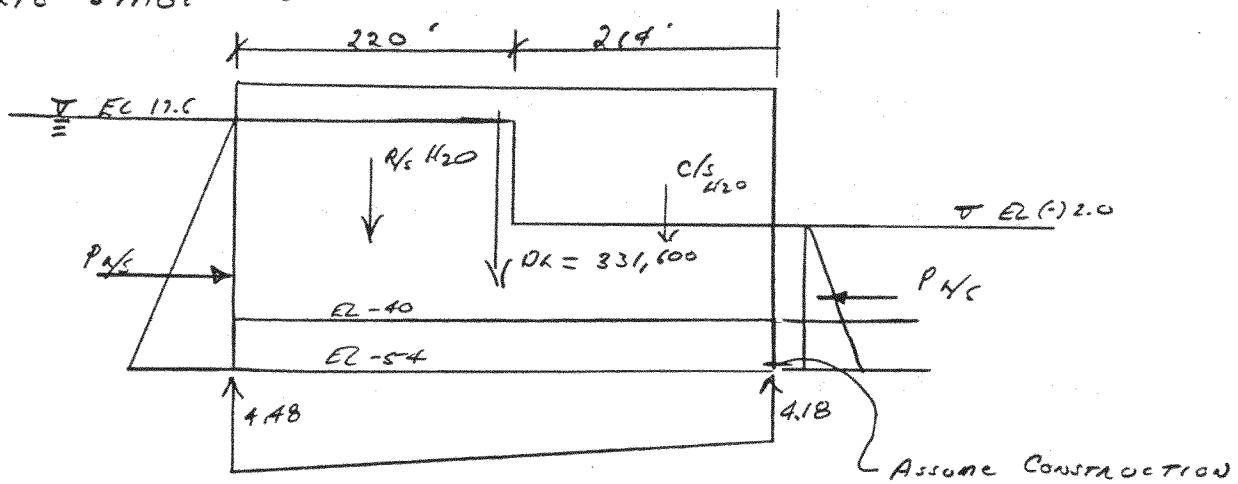
$= \frac{64^2}{2} \times 0.0625 \times 180 =$

$F.S. = \frac{(77,000 \times 0.65)}{23,040} = 2.17$

* PG 12, SMALL CONCRETE DAMS, PCA

MAXIMUM OPERATION — UPLIFT B

R/S STAGE - EL 17.6
L/S STAGE - EL (-) 2.0



ΣP_Z = ΣDL + CHAMBER H_2O @ EL 17.6 + CHAMBER H_2O @ EL -2.0 + H_2O Column - Uplift

= 331,600 + (110 × 220 × 57.6 × 0.0625) + (110 × 214 × 38 × 0.0625) + (2 × 18.25 × 0.0625 × 15 × 39

$$- \left(\frac{4.48 + 4.18}{2} \times 180 \times 424\right)$$

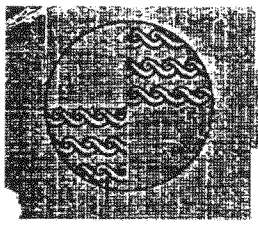
= 487,970 - 338,260

= 149,700 K

$$\Sigma P_Y = \left(\frac{71.6^2}{2} \times 0.0625 \times 180\right) - \left(\frac{52^2}{2} \times 0.0625 \times 180\right)$$

= 13,630 K

$$FS = \frac{149,700 \times 0.65}{13,630} = 7.1$$



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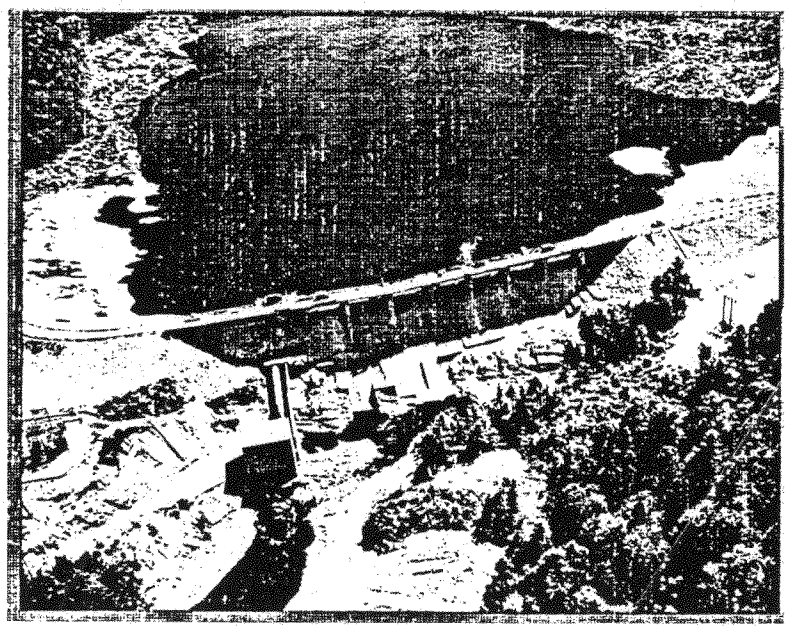
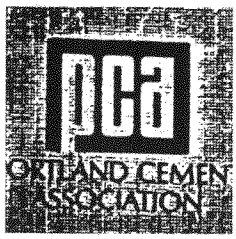
Small Concrete Dams





Safety Factors

Safety factors should be considered in the light of economic conditions. Large safety factors result in a more costly structure; however, low safety factors may result in failure, which could also lead to high cost. Proper safety factors result only from an adequate determination of sliding, overturning, and overstressing forces within and acting on the dam.

Overturning

Ordinarily, the safety factor against overturning is between 2 and 3. In smaller dams it is often larger. If the computed safety factor falls below 2, the section of the dam should be modified to increase the safety margin. A gravity dam rarely fails from overturning since any tendency to overturn provides greater opportunity for a sliding force to create the failure. The safety factor against overturning is the ratio of the righting moment to the overturning moment about the toe of the dam. This can be expressed as:

$$FSo = \frac{W_c \times l_1 + W_w \times l_2}{P \times l_3 + U \times l_4} \qquad (1)$$

in which W_c = force due to weight of concrete
W_w = force due to weight of water on inclined surfaces
P = force of water acting to displace dam downstream
U = uplift force
l = length of moment arm for respective forces

All forces (except the resultant foundation force) should be considered in computing this safety factor. Other forces may be wave, ice, earthquake, and silt pressure.

Another method of evaluating the safety factor against overturning relates to internal stresses. If the vertical stress at the upstream edge of any horizontal section computed without uplift exceeds the uplift pressure at that point, the section above that point is considered safe against overturning. This computation can be used for small dams, but is not recommended for dams of great height.

Also, if the uplift pressure at the upstream face exceeds the vertical stress at any horizontal section without uplift, the uplift forces greatly increase the tendency for overturning about the downstream toe at that assumed horizontal plane. The dam may still be considered safe if the tension stresses developed are less than the allowable stresses in the concrete and in the foundation material. This assumption is based on good workmanship and development of a tensile strength within the structure on all horizontal planes. A dam is usually designed so that there will be no tension (or a limited tensile force) in the upstream face under severe loading conditions.

Sliding

Three approaches are used by engineers in evaluating the safety of a dam from being displaced downstream. Each has merit and generally involves the same relationship of forces. Although the computed values are safe, they are considerably different. The three approaches are: (1) a safe sliding factor, (2) a safety factor, and (3) a shear-friction safety factor. Clear distinction must be made among these three approaches. The primary purpose of each is to obtain a safe coefficient that when exceeded would put the dam in jeopardy of being pushed downstream.

The sliding factor is the coefficient of friction required to prevent sliding of any horizontal plane in the dam or upon its foundation under loading conditions. For small dams the sliding factor normally determines safety against sliding. This approach does not employ shear forces; however, shear forces are assumed as added safety in design. Also, this approach penalizes

Table 1. ALLOWABLE SLIDING FACTORS FOR VARIOUS FOUNDATION CONDITIONS

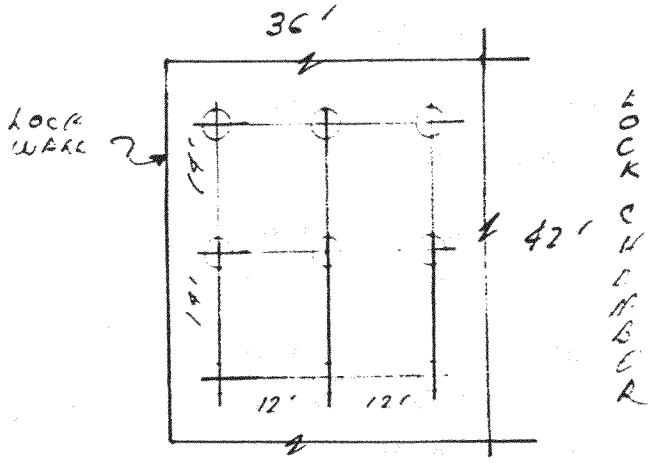
Material	Safe sliding factor, *f*	Suggested minimum factor of safety, *fs*	Shear sliding factor, *SSF*
Concrete on concrete	0.65-0.8	1-1.5	4
Concrete on sound rock, clean and irregular surface	0.8	1-1.5	4
Concrete on rock, some laminations	0.7	1-1.5	4
Concrete on gravel and coarse sands	0.4	2.5	—
Concrete on sand	0.3	2.5	—
Concrete on shale	0.3	2.5	—
Concrete on silt and clay		2.5*	—

*Tests required to determine safety.

SHIP LOCK PILE FOUNDATION 4 20 PJS 6/96
48"ϕ PILE GROUP EFFICIENCY FACTOR

Ref. EM 1110-2-2906

Consider Denser pile group beneath Gate Bay Monolith Wall



$$\eta = \frac{Q_{group}}{N\,Q_{ULT}}$$

N = # Piles = 9

$B_g = 36'$

$L_g = 42'$

$D = 160'$

Q_{ULT} = 850 TONS x 2 = 1700 KIPS From PILE CAPACITY CURVES DATED Nov 96

$$Q_{group} = 2(B_g + L_g)D\bar{c} + \left[5\left(1+\frac{D}{5B_g}\right)\left(1+\frac{B_g}{5L_g}\right)\right] c_6 L_g \cdot B_g$$

Σ END BEARING = 0

$$C_{ave} = \frac{(800 \times 46') + (1200 \times 20) + (1500 \times 94)}{160} = 1260 \text{ psf} \quad \text{use } 1200$$

$\bar{c} = \alpha\, C_{ave}$ $\alpha = 0.65$ ($C_{ave} = 0.6$ ksf) (Fig 4-5a EM 2905

$\bar{c} = 0.65\ (1.20)$

$= 0.80$ KSF

$Q_{group} = 2(B_g + L_g)\,D\cdot\bar{c} + 0$

$= 2(36 + 42)\,160 \cdot 0.80$

$= 19,968$ K

$$\eta = \frac{19,968}{8 \times 1,700} = 1.47 > 1.0 \quad \therefore \quad \underline{1.0}$$

IHNC Lock Replacement

Designed by: P.J.S.
Checked by:

Pile Determination - Normal Operations, Load Case 1
Chamber: EL. 10.00
Tailwater: EL. 1.00

Concrete Weight:										
Float-in segment:	1386.00	sf	x	14.00	'strip	x	0.15	=	2910.60 x 2 (other half) =	5821 kips
	(CADD)									
Grout:	4.00	ft	x	14.00	'strip	x	172.00 ft x	0.1500	= =	1445 kips
Walls:	786.12	sf	x	14.00	'strip	x	0.15	=	1650.85 x 2 (other half) =	3302 kips
	(CADD)									
Water:										
Chamber @ EL. 10.0:	50.00	ft	x	14.00	'strip	x	110.00 ft x	0.0625	= =	4813 kips
Water in culvert:	273.75	sf	x	14.00	'strip	x	0.0625	=	239.53 x 2 (other half) =	479 kips
Soil:										
Soil with water:	124.83	sf	x	14.00	'strip	x	0.12	=	209.71 x 2 (other half) =	419 kips
	(CADD)									
Drag:	295.43	kips	(from C. Balint)						x 2 (other half) =	591 kips
Uplift:										
Tailwater @ El. 1.0:	57.00	ft	x	14.00	'strip	x	172.00 ft x	-0.0625	= =	-8579 kips
									Total weight:	8291 kips

Distribute 8291 kips over 172.0 ft: 8291 / 172 = 48.20 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 48.20 kips/ft x 1.25 = 60.25 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 60.25 = 5302.42 kips

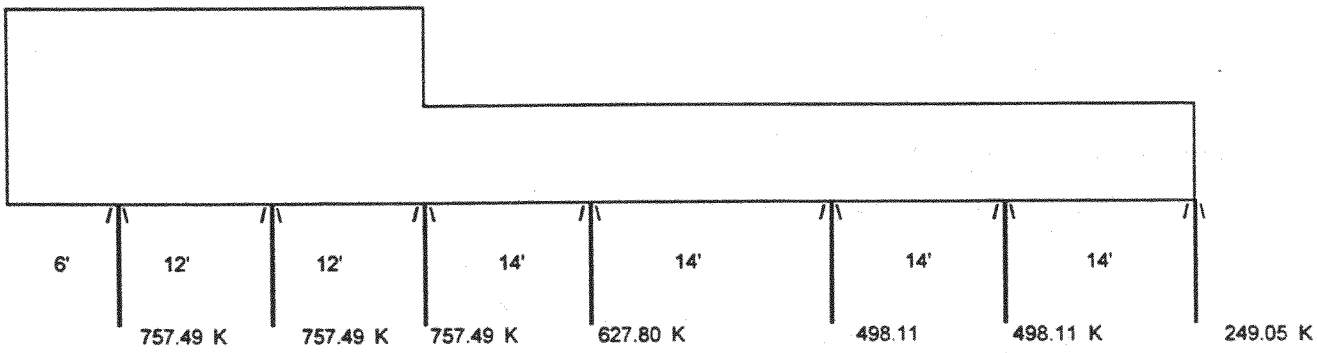
therefore, remaining 84' of monolith will have load of:[(48.20 x 172.00) 5302.42] / 84 = 35.58 kips/ft

For 44.00 ft on each end: 88.00 ft x 60.25 / 7.0 piles = 757.49 kips/pile

Using a factor of safety = 2.0, this equates to **757.49 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 35.58 / 6.0 piles = 498.11 kips/pile

Using a factor of safety = 2.0, this equates to **498.11 tons/pile**



1200 x 110 x 36 CHAMBER

IHNC Lock Replacement — Designed by: P.J.S. Checked by:

Pile Determination - Maximum Operations, Load Case 2A * Governing Case *****
Chamber: EL. 17.60
Tailwater: EL. -2.00

Concrete Weight:								
Float-in segment:	1386.00 sf (CADD)	x	14.00 ' strip	x	0.15 =	2910.60	x 2 (other half) =	5821 kips
Grout:	4.00 ft	x	14.00 ' strip	x	172.00 ft x 0.1500 =		=	1445 kips
Walls:	786.12 sf (CADD)	x	14.00 ' strip	x	0.15 =	1650.85	x 2 (other half) =	3302 kips
Water:								
Chamber @ EL. 17.6:	57.60 ft	x	14.00 ' strip	x	110.00 ft x 0.0625 =		=	5544 kips
Water in culvert:	273.75 sf	x	14.00 ' strip	x	0.0625 =	239.53	x 2 (other half) =	479 kips
Soil:								
Soil with water:	124.83 sf (CADD)	x	14.00 ' strip	x	0.12 =	209.71	x 2 (other half) =	419 kips
Drag:	295.43 kips (from C. Balint)						x 2 (other half) =	591 kips
Uplift:								
Tailwater @ EL.-2.0:	54.00 ft	x	14.00 ' strip	x	172.00 ft x -0.0625 =		=	-8127 kips
							Total weight:	9474 kips

Distribute 9474 kips over 172.0 ft: 9474 / 172 = 55.08 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 55.08 kips/ft x 1.25 = 68.85 kips/ft

so, for 88' of monolith, load is: 84.00 ft x 68.85 = 5783.58 kips

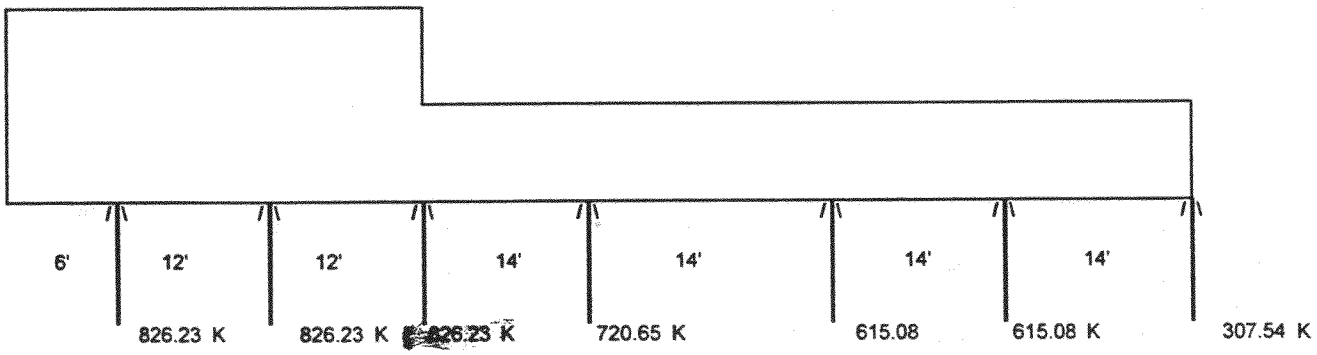
therefore, remaining 84' of monolith will have load of:[(55.08 x 172.00) 5783.58] / 88 = 41.94 kips/ft

For 42.00 ft on each end: 84.00 ft x 68.85 / 7.0 piles = 826.23 kips/pile

Using a factor of safety = 2.0, this equates to **826.23 tons/pile**

For 88.00 ft in the middle: 88.00 ft x 41.94 / 6.0 piles = 615.08 kips/pile

Using a factor of safety = 2.0, this equates to **615.08 tons/pile**



1200 x 110 x 36 CHAMBER

IHNC Lock Replacement

Designed by: P.J.S.
Checked by:

Pile Determination - Maximum Operations, Load Case 2B
Chamber: EL. -2.00
Tailwater: EL. -2.00

Concrete Weight:										
Float-in segment:	1386.00	sf	x	14.00	'strip	x	0.15	=	2910.60 x 2 (other half) =	5821 kips
	(CADD)									
Grout:	4.00	ft	x	14.00	'strip	x	172.00 ft x	0.1500	= =	1445 kips
Walls:	786.12	sf	x	14.00	'strip	x	0.15	=	1650.85 x 2 (other half) =	3302 kips
	(CADD)									
Water:										
Chamber @ EL.-2.0:	38.00	ft	x	14.00	'strip	x	110.00 ft x	0.0625	= =	3658 kips
Water in culvert:	273.75	sf	x	14.00	'strip	x	0.0625	=	239.53 x 2 (other half) =	479 kips
Soil:										
Soil with water:	124.83	sf	x	14.00	'strip	x	0.12	=	209.71 x 2 (other half) =	419 kips
	(CADD)									
Drag:	295.43	kips	(from C. Balint)						x 2 (other half) =	591 kips
Uplift:										
Tailwater @ EL.-2.0:	54.00	ft	x	14.00	'strip	x	172.00 ft x	-0.0625	= =	-8127 kips
									Total weight:	7588 kips

Distribute 7588 kips over 172.0 ft: 7588 / 172 = 44.11 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 44.11 kips/ft x 1.25 = 55.14 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 55.14 = 4852.51 kips

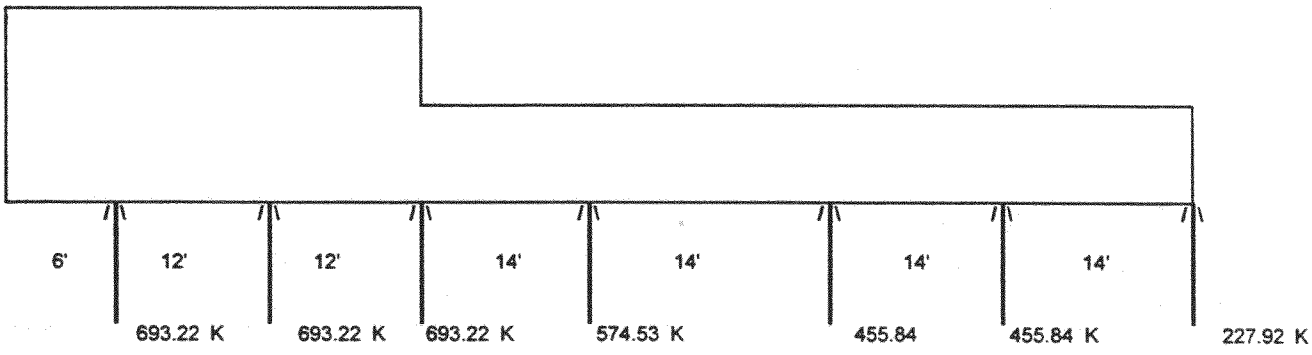
therefore, remaining 84' of monolith will have load of:[(44.11 x 172.00) 4852.51] / 84 = 32.56 kips/ft

For 44.00 ft on each end: 88.00 ft x 55.14 / 7.0 piles = 693.22 kips/pile

Using a factor of safety = 2.0, this equates to **693.22 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 32.56 / 6.0 piles = 455.84 kips/pile

Using a factor of safety = 2.0, this equates to **455.84 tons/pile**



IHNC Lock Replacement Designed by: P.J.S.
Checked by:

Pile Determination - Maintenance Dewatering, Load Case 3
Chamber: No Water
Tailwater: EL. 1.00

Concrete Weight:								
Float-in segment:	1386.00 sf (CADD)	x	14.00 ' strip	x	0.15 =	2910.60 x 2 (other half) =	5821	kips
Grout:	4.00 ft	x	14.00 ' strip	x	172.00 ft x 0.1500 =	=	1445	kips
Walls:	786.12 sf (CADD)	x	14.00 ' strip	x	0.15 =	1650.85 x 2 (other half) =	3302	kips
Water:								
	0.00 ft	x	14.00 ' strip	x	110.00 ft x 0.0625 =	=	0	kips
	0.00 sf	x	14.00 ' strip	x	0.0625 =	0.00 x 2 (other half) =	0	kips
Soil:								
Soil with water:	124.83 sf (CADD)	x	14.00 ' strip	x	0.12 =	209.71 x 2 (other half) =	419	kips
Uplift:								
Tailwater @ El. 1.0:	3.92 ks	x	14.00 ' strip	x	172.00 ft =	=	-9427	kips
Headwater @ EL. 10.0	(.5(3.84+3.99))					Total weight:	1560	kips

Distribute 1560 kips over 172.0 ft: 1560 / 172 = 9.07 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 9.07 kips/ft x 1.25 = 11.34 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 11.34 = 997.55 kips

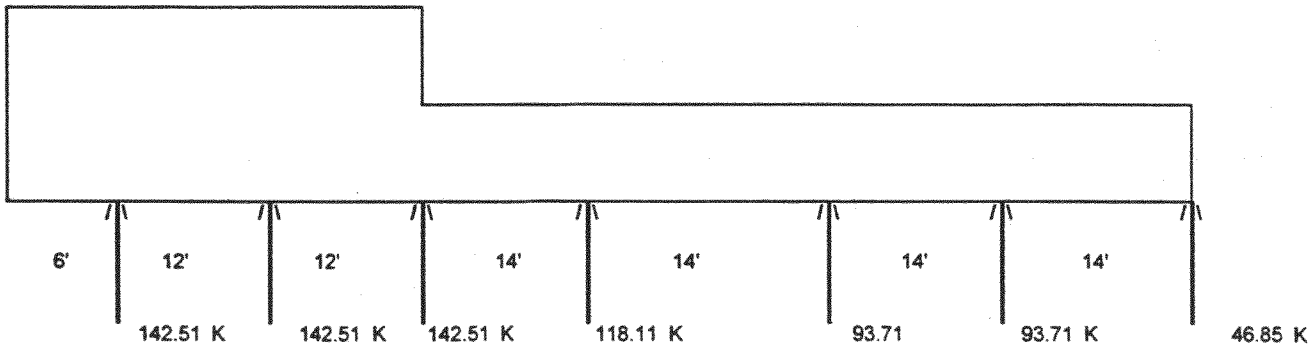
therefore, remaining 84' of monolith will have load of:[(9.07 x 172.00) 997.55] / 84 = 6.69 kips/ft

For 44.00 ft on each end: 88.00 ft x 11.34 / 7.0 piles = 142.51 kips/pile

Using a factor of safety = 2.0, this equates to **142.51 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 6.69 / 6.0 piles = 93.71 kips/pile

Using a factor of safety = 2.0, this equates to **93.71 tons/pile**



1200 x 110 x 36 CHAMBER

IHNC Lock Replacement

Designed by: P.J.S.
Checked by:

Pile Determination - Hurricane, Load Case 4B
Chamber: EL. 0.00
Tailwater: EL. 13.00

Concrete Weight:										
Float-in segment:	1386.00 sf (CADD)	x	14.00 ' strip	x	0.15	=	2910.60	x 2 (other half) =	5821	kips
Grout:	4.00 ft	x	14.00 ' strip	x	172.00 ft	x	0.1500	= =	1445	kips
Walls:	786.12 sf (CADD)	x	14.00 ' strip	x	0.15	=	1650.85	x 2 (other half) =	3302	kips
Water:										
Chamber @ EL. 0.0:	40.00 ft	x	14.00 ' strip	x	110.00 ft	x	0.0625	= =	3850	kips
Water in culvert:	273.75 sf	x	14.00 ' strip	x	0.0625	=	239.53	x 2 (other half) =	479	kips
Soil:										
Soil with water:	124.83 sf (CADD)	x	14.00 ' strip	x	0.12	=	209.71	x 2 (other half) =	419	kips
Drag:	295.43 kips (from C. Balint)							x 2 (other half) =	591	kips
Uplift:										
Tailwater @ EL. 13.0:	69.00 ft	x	14.00 ' strip	x	172.00 ft	x	-0.0625	= =	-10385	kips
								Total weight:	5523	kips

Distribute 5523 kips over 172.0 ft: 5523 / 172 = 32.11 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 32.11 kips/ft x 1.25 = 40.13 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 40.13 = 3531.87 kips

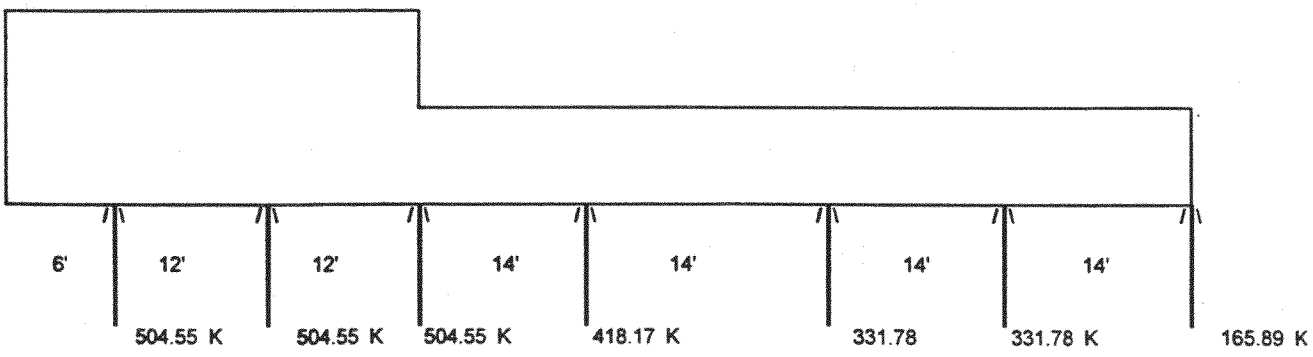
therefore, remaining 84' of monolith will have load of:[(32.11 x 172.00) 3531.87] / 84 = 23.70 kips/ft

For 44.00 ft on each end: 88.00 ft x 40.13 / 7.0 piles = 504.55 kips/pile

Using a factor of safety = 2.0, this equates to: **504.55 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 23.70 / 6.0 piles = 331.78 kips/pile

Using a factor of safety = 2.0, this equates to: **331.78 tons/pile**



IHNC Lock Replacement — Gate Bay

Designed by: P.J.S.
Checked by:

Pile Determination - Normal Operations, Load Case 1
Chamber: EL. 10.00
Tailwater: EL. 1.00

Concrete Weight:											
Float-in segment:	1695.00	sf	x	14.00	' strip	x	0.15	=	3559.50 x 2 (other half) =	7119	kips
	(CADD)										
Grout:	4.00	ft	x	14.00	' strip	x	180.00 ft x	0.1500	= =	1512	kips
Walls:	860.31	sf	x	14.00	' strip	x	0.15	=	1806.65 x 2 (other half) =	3613	kips
	(CADD)										
Water:											
Chamber @ EL. 10.0:	50.00	ft	x	14.00	' strip	x	110.00 ft x	0.0625	= =	4813	kips
Water in culvert:	273.75	sf	x	14.00	' strip	x	0.0625	=	239.53 x 2 (other half) =	479	kips
Drag:	295.43	kips	(from C. Balint)						x 2 (other half) =	591	kips
Uplift:											
Tailwater @ El. 1.0:	59.00	ft	x	14.00	' strip	x	180.00 ft x	-0.0625	= =	-9293	kips
Additional Weight:											
(from gates & water elevatio	3.22	k/ft	(from P. Schaefer)	x	14.00	' strip		=	=	45	kips
differentials on each side of gates)											
									Total weight:	8879	kips

Distribute 8879 kips over 180.0 ft: 8879 / 180 = 49.33 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 49.33 kips/ft x 1.25 = 61.66 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 61.66 = 5179.59 kips

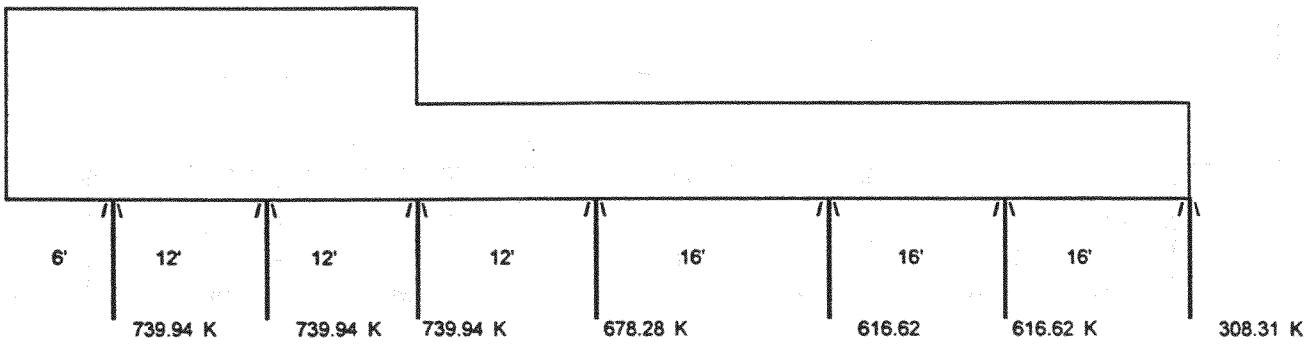
therefore, remaining 96' of monolith will have load of:[(49.33 x 180.00) - 5179.59] / 96 = 38.54 kips/ft

For 42.00 ft on each end: 84.00 ft x 61.66 / 7.0 piles = 739.94 kips/pile

Using a factor of safety = 2.0, this equates to: **739.94 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 38.54 / 6.0 piles = 616.62 kips/pile

Using a factor of safety = 2.0, this equates to: **616.62 tons/pile**



IHNC Lock Replacement **"Gate Bay"** Designed by: P.J.S.
Checked by:

Pile Determination - Maximum Operations, Load Case 2A ** Governing Case ******
Chamber: EL. 17.60
Tailwater: EL. -2.00

Concrete Weight:											
Float-in segment:	1695.00	sf	x	14.00	'strip	x	0.15	=	3559.50	x 2 (other half) =	7119 kips
	(CADD)										
Grout:	4.00	ft	x	14.00	'strip	x	180.00 ft x	0.1500	=	=	1512 kips
Walls:	860.31	sf	x	14.00	'strip	x	0.15	=	1806.65	x 2 (other half) =	3613 kips
	(CADD)										
Water:											
Chamber @ EL. 17.6:	57.60	ft	x	14.00	'strip	x	110.00 ft x	0.0625	=	=	5544 kips
Water in culvert:	273.75	sf	x	14.00	'strip	x	0.0625	=	239.53	x 2 (other half) =	479 kips
Drag:	295.43	kips	(from C. Balint)							x 2 (other half) =	591 kips
Uplift:											
Tailwater @ EL.-2.0:	56.00	ft	x	14.00	'strip	x	180.00 ft x	-0.0625	=	=	-8820 kips
Additional Weight:											
(from gates & water elevation differentials on each side of gates)	3.81	k/ft	(from P. Schaefer)	x	14.00	'strip		=		=	53 kips
										Total weight:	10092 kips

Distribute 10092 kips over 180.0 ft: 10092 / 180 = 56.06 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 56.06 kips/ft x 1.25 = 70.08 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 70.08 = 5886.75 kips

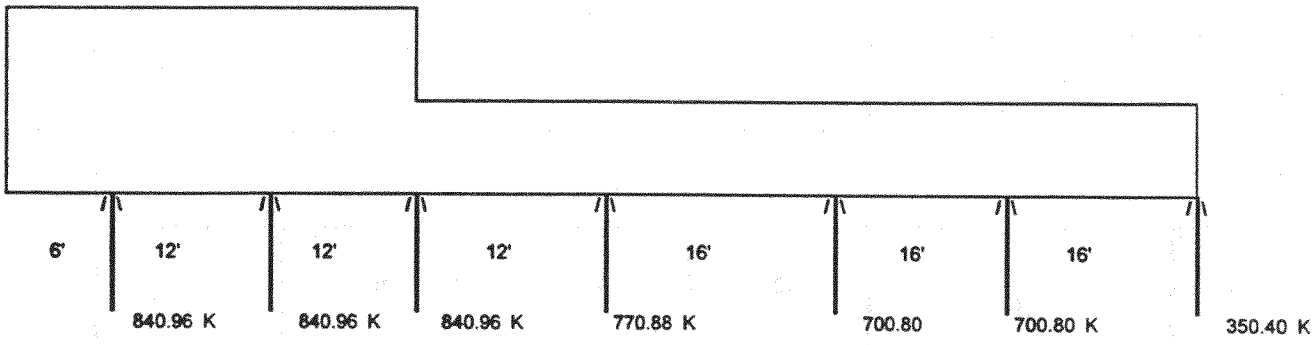
therefore, remaining 96' of monolith will have load of:[(56.06 x 180.00) 5886.75] / 96 = 43.80 kips/ft

For 42.00 ft on each end: 84.00 ft x 70.08 / 7.0 piles = 840.96 kips/pile

Using a factor of safety = 2.0, this equates to: **840.96 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 43.80 / 6.0 piles = 700.80 kips/pile

Using a factor of safety = 2.0, this equates to: **700.80 tons/pile**



12 00 x 110 x 36

IHNC Lock Replacement **Gate Bay** Designed by: P.J.S.
Checked by:

Pile Determination - Maximum Operations, Load Case 2B
Chamber: EL. -2.00
Tailwater: EL. -2.00

Concrete Weight:											
Float-in segment:	1695.00 sf (CADD)	x	14.00 ' strip	x	0.15 =		3559.50	x 2 (other half) =		7119	kips
Grout:	4.00 ft	x	14.00 ' strip	x	180.00 ft	x	0.1500 =		=	1512	kips
Walls:	860.31 sf (CADD)	x	14.00 ' strip	x	0.15 =		1806.65	x 2 (other half) =		3613	kips
Water:											
Chamber @ EL.-2.0:	38.00 ft	x	14.00 ' strip	x	110.00 ft	x	0.0625 =		=	3658	kips
Water in culvert:	273.75 sf	x	14.00 ' strip	x	0.0625 =		239.53	x 2 (other half) =		479	kips
Drag:	295.43 kips (from C. Balint)							x 2 (other half) =		591	kips
Uplift:											
Tailwater @ EL.-2.0:	56.00 ft	x	14.00 ' strip	x	180.00 ft	x	-0.0625 =		=	-8820	kips
Additional Weight: (from gates & water elevatio differentials on each side of gates)	3.08 k/ft (from P. Schaefer)	x	14.00 ' strip				=		=	43	kips
								Total weight:		8195	kips

Distribute 8195 kips over 180.0 ft: 8195 / 180 = 45.53 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 45.53 kips/ft x 1.25 = 56.91 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 56.91 = 4780.33 kips

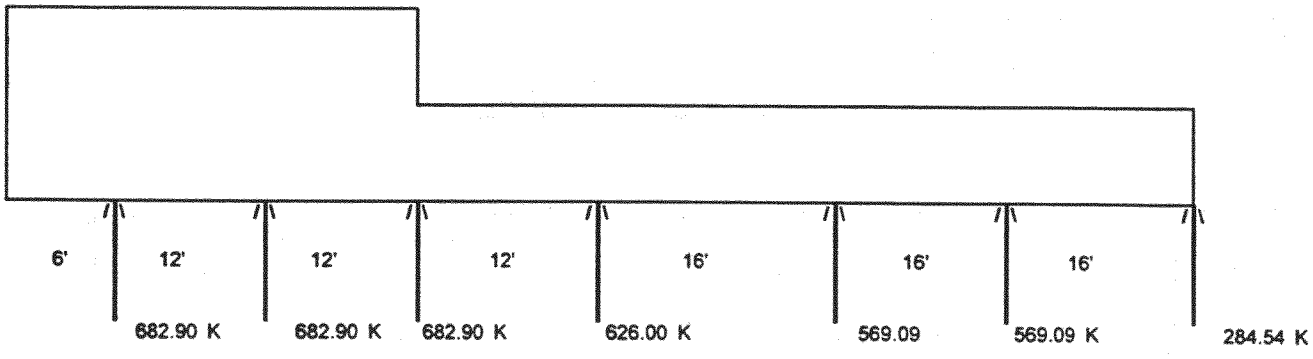
therefore, remaining 96' of monolith will have load of:[(45.53 x 180.00) 4780.33] / 96 = 35.57 kips/ft

For 42.00 ft on each end: 84.00 ft x 56.91 / 7.0 piles = 682.90 kips/pile

Using a factor of safety = 2.0, this equates to: **682.90 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 35.57 / 6.0 piles = 569.09 kips/pile

Using a factor of safety = 2.0, this equates to: **569.09 tons/pile**



IHNC Lock Replacement "Gate Bay" Designed by: P.J.S.
Checked by:

Pile Determination - Maintenance Dewatering, Load Case 3
Chamber: No Water
Tailwater: EL. 1.00

Concrete Weight:											
Float-in segment:	1695.00	sf	x	14.00	' strip	x	0.15	=	3559.50 x 2 (other half) =	7119	kips
	(CADD)										
Grout:	4.00	ft	x	14.00	' strip	x	180.00 ft x	0.1500	= =	1512	kips
Walls:	860.31	sf	x	14.00	' strip	x	0.15	=	1806.65 x 2 (other half) =	3613	kips
	(CADD)										
Water:											
	0.00	ft	x	14.00	' strip	x	110.00 ft x	0.0625	= =	0	kips
	0.00	sf	x	14.00	' strip	x	0.0625	=	0.00 x 2 (other half) =	0	kips
Uplift:											
Tailwater @ El. 1.0:	4.18	ks	x	14.00	' strip	x	180.00 ft	=	=	-10534	kips
Headwater @ EL. 10.0	(.5(4.11+4.25))										
Additional Weight:											
(from gates & water elevatio	4.07	k/ft	(from P. Schaefer)	x	14.00	' strip		=	=	57	kips
differentials on each side of gates)											
									Total weight:	1768	kips

Distribute 1768 kips over 180.0 ft: 1768 / 180 = 9.82 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 9.82 kips/ft x 1.25 = 12.28 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 12.28 = 1031.15 kips

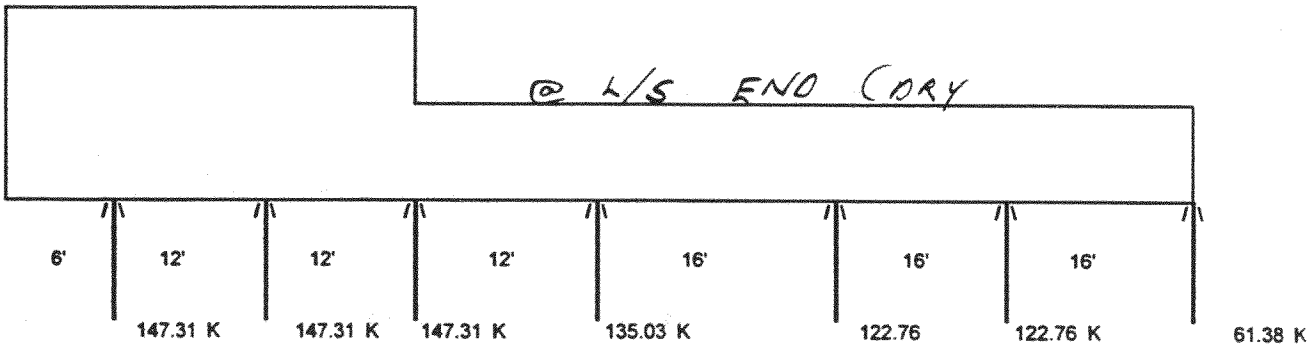
therefore, remaining 96' of monolith will have load of:[(9.82 x 180.00) 1031.15] / 96 = 7.67 kips/ft

For 42.00 ft on each end: 84.00 ft x 12.28 / 7.0 piles = 147.31 kips/pile

Using a factor of safety = 2.0, this equates to: **147.31 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 7.67 / 6.0 piles = 122.76 kips/pile

Using a factor of safety = 2.0, this equates to: **122.76 tons/pile**



IHNC Lock Replacement **Gate Bay** Designed by: P.J.S.
Checked by:

Pile Determination - Maintenance Dewatering, Load Case 3
Chamber: R/S OF BULKHEAD AT EL. 10.0
Tailwater: EL. 1.00

Concrete Weight:											
Float-in segment:	1695.00	sf (CADD)	x	14.00	' strip	x	0.15 =	3559.50	x 2 (other half) =	7119	kips
Walls:	860.31	sf (CADD)	x	14.00	' strip	x	0.15 =	1806.65	x 2 (other half) =	3613	kips
Water:											
	50.00	ft	x	14.00	' strip	x	110.00 ft x 0.0625 =		=	4813	kips
	0.00	sf	x	14.00	' strip	x	0.0625 =	0.00	x 2 (other half) =	0	kips
Uplift:											
Tailwater @ El. 1.0: Headwater @ EL. 10.0	4.18	ksf (.5(4.11+4.25))	x	14.00	' strip	x	180.00 ft =		=	-10534	kips
Additional Weight: (from gates & water elevatio differentials on each side of gates)	4.07	k/ft (from P. Schaefer)	x	14.00	' strip		=		=	57	kips
									Total weight:	5068	kips

Distribute 5068 kips over 180.0 ft: 5068 / 180 = 28.16 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 28.16 kips/ft x 1.25 = 35.20 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 35.20 = 2956.44 kips

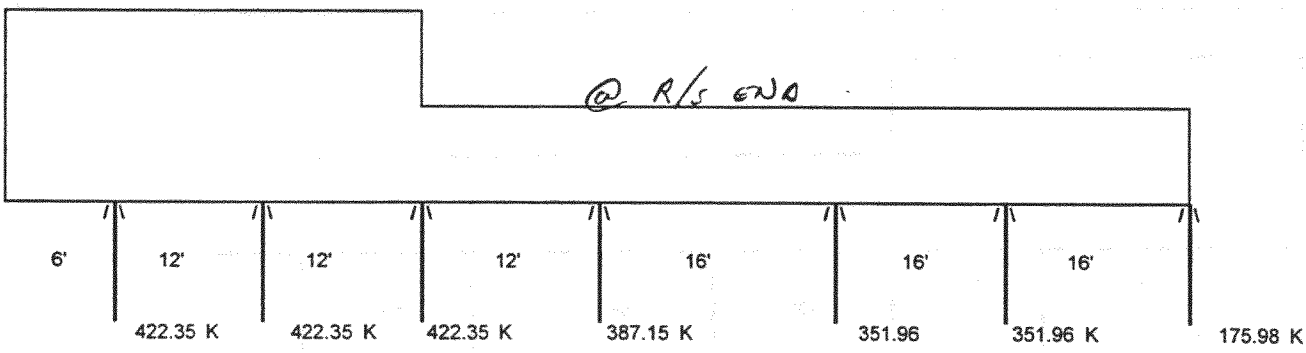
therefore, remaining 96' of monolith will have load of:[(28.16 x 180.00) 2956.44] / 96 = 22.00 kips/ft

For 42.00 ft on each end: 84.00 ft x 35.20 / 7.0 piles = 422.35 kips/pile

Using a factor of safety = 2.0, this equates to **422.35 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 22.00 / 6.0 piles = 351.96 kips/pile

Using a factor of safety = 2.0, this equates to **351.96 tons/pile**



IHNC Lock Replacement "Gate Bay" Designed by: P.J.S.
Checked by:

Pile Determination - Hurricane, Load Case 4B
Chamber: EL. 0.00
Tailwater: EL. 13.00

Concrete Weight:									
Float-in segment:	1695.00 sf (CADD)	x	14.00 ' strip	x	0.15 =	3559.50	x 2 (other half) =	7119	kips
Grout:	4.00 ft	x	14.00 ' strip	x	180.00 ft x 0.1500 =		=	1512	kips
Walls:	860.31 sf (CADD)	x	14.00 ' strip	x	0.15 =	1806.65	x 2 (other half) =	3613	kips
Water:									
Chamber @ EL. 0.0:	40.00 ft	x	14.00 ' strip	x	110.00 ft x 0.0625 =		=	3850	kips
Water in culvert:	273.75 sf	x	14.00 ' strip	x	0.0625 =	239.53	x 2 (other half) =	479	kips
Drag:	295.43 kips (from C. Balint)						x 2 (other half) =	591	kips
Uplift:									
Tailwater @ EL. 13.0:	71.00 ft	x	14.00 ' strip	x	180.00 ft x -0.0625 =		=	-11183	kips
Additional Weight:									
(from gates & water elevatio differentials on each side of gates)	3.40 k/ft (from P. Schaefer)	x	14.00 ' strip		=		=	48	kips
							Total weight:	6029	kips

Distribute 6029 kips over 180.0 ft: 6029 / 180 = 33.50 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

42.00 ft on each end, load is: 33.50 kips/ft x 1.25 = 41.87 kips/ft

so, for 84' of monolith, load is: 84.00 ft x 41.87 = 3517.11 kips

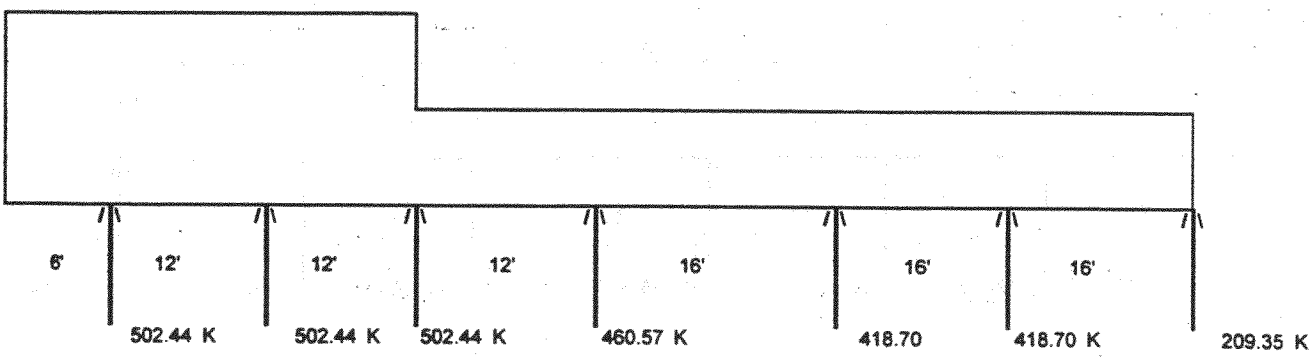
therefore, remaining 96' of monolith will have load of:[(33.50 x 180.00) 3517.11] / 96 = 26.17 kips/ft

For 42.00 ft on each end: 84.00 ft x 41.87 / 7.0 piles = 502.44 kips/pile

Using a factor of safety = 2.0, this equates to: **502.44 tons/pile**

For 96.00 ft in the middle: 96.00 ft x 26.17 / 6.0 piles = 418.70 kips/pile

Using a factor of safety = 2.0, this equates to: **418.70 tons/pile**



COMPUTATION SHEET

PROJECT	PAGE 16 OF 20	COMPUTED BY MBL	DATE 9/96
SUBJECT		CHECKED BY	DATE

The following CPGA run checks reactions and stresses in the Gate Bay Module pile foundation for load cases with significant lateral loads. Since the piles are "grouted to" and not "embedded in" the same cases were analyzed with the overturning loads resisted axially. ($\sigma = \frac{P}{A} \pm \frac{Mc}{I}$).

The load cases considered were the Maintenance Dewatering and Maximum Operations; Of the two the Maximum Operations governed.

Summary

$P_{COMP\ max}$ = 851 K

$P_{TEN\ max}$ = N/A

48" of Pile Len = 160' w/ Tip @ EL -215

$P_{NAT\ COMP}$ = 860 TONS

$P_{NAT\ TENSION}$ = 720 TONS

Wall THICKNESS - COMPLY WITH AISC TABLE B5.1 REQUIREMENTS FOR LOCAL BUCKLING

$D/t_w < 3300/F_y$

USE ASTM A53 Gr B
API 5L Gr B Pipe

$t_{w\ min} = \frac{48 \times 35}{3300} = 0.51"$

F_y = 35 KSI

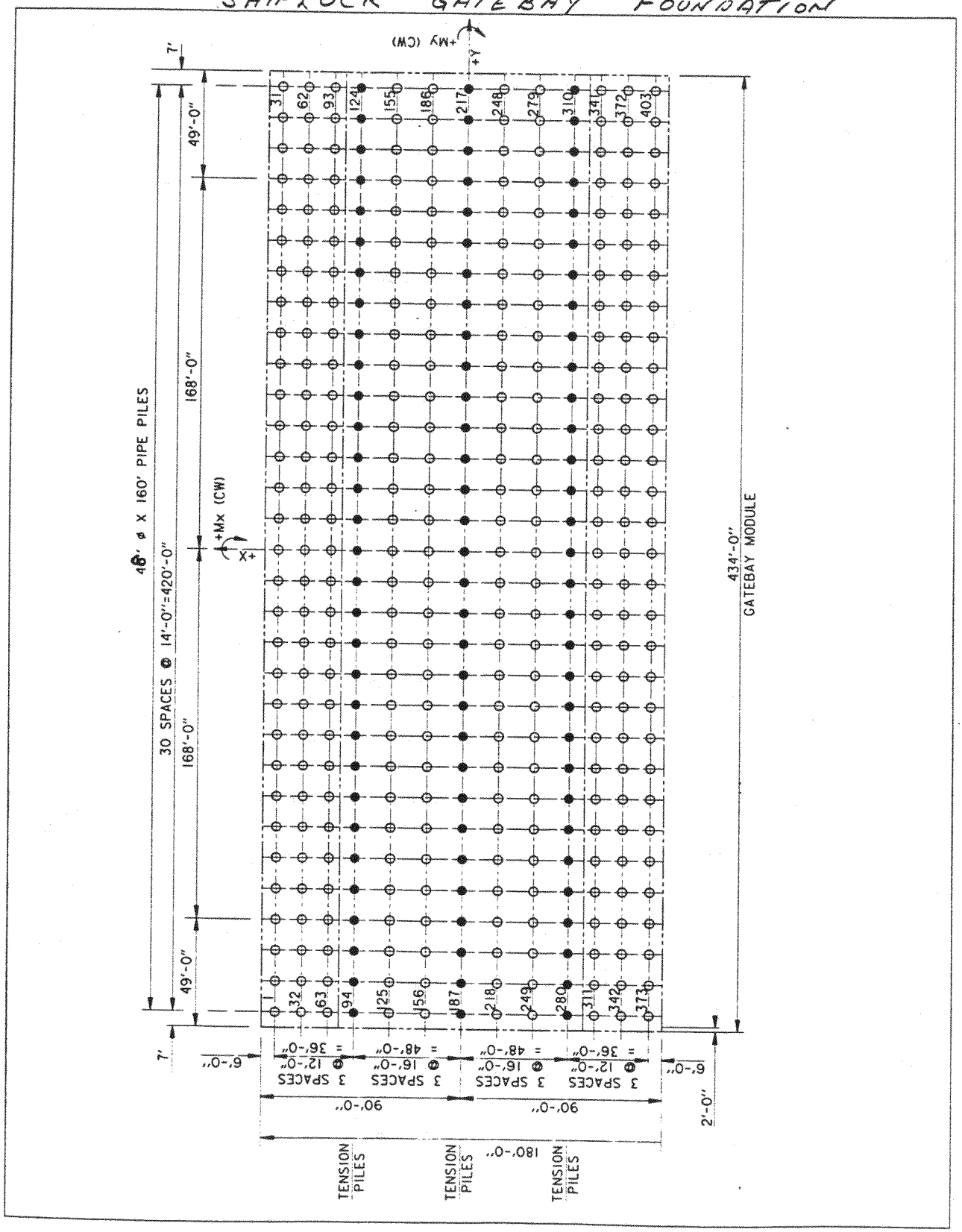
USE 5/8" WALL PIPE

$A = 93\ in^2$

$f_a = \frac{851\ K}{93} = 9.15$ KSI

$F_a = 35 \times 5/6 \times 1/3 = 10.$ KSI $> f_a$

SHIPLOCK GATEBAY FOUNDATION



COMPUTATION SHEET

PROJECT	PAGE 17 OF 20	COMPUTED BY C.O.B	DATE 9/96
SUBJECT		CHECKED BY	DATE

PROPERTIES OF PILE 48"Ø, 5/8" WALL, 35 KSI

$E = 29{,}000$ KSI

$I_1 = I_2 = 0.049087\,(48^4 - 46.75^4)$

$= 26{,}100\ in^4$

$S_1 = S_2 = 26{,}100\ in^4 / (48"/2)$

$= 1087.5\ in^3$

$A = 0.785398\,(48^2 - 46.75^2)$

$\cong 93.02\ in^2$

$C_{33} = 2.0$ (FULL SKIN FRICTION)

$B_{66} = 0$ (NO TORSIONAL EFFECTS CONSIDERED)

ALLOWABLES

$A_C = 880$ K, $A_T = 760$ K — PILE CAPACITY CURVES ← CONTROLS

$A_{CL} = A_{TT} = (F_A)(A)$

$F_A = 5/6 \times 3/5 \times F_y$

$= 0.50\,(35\text{ KSI})$

$= 17.5$ KSI

$A_{CL} = (17.5)(96.02\ in^2)$

$= 1679$ K

$\frac{D}{t} = \frac{48}{0.625} = 76.8 < \frac{3300}{F_y} = 94$

∴ COMPACT

$A_{m1} = A_{m2} = F_b S$

$F_b = 0.55 F_y$ FOR COMPACT PIPE

$= 19$ KSI

$A_m = (19.0\text{ KSI})(1087.5\ in^3)$

$= 20{,}940$

SOIL

$ES < 0.355$ KSI FROM PILE CURVES

LENGTH = 160'

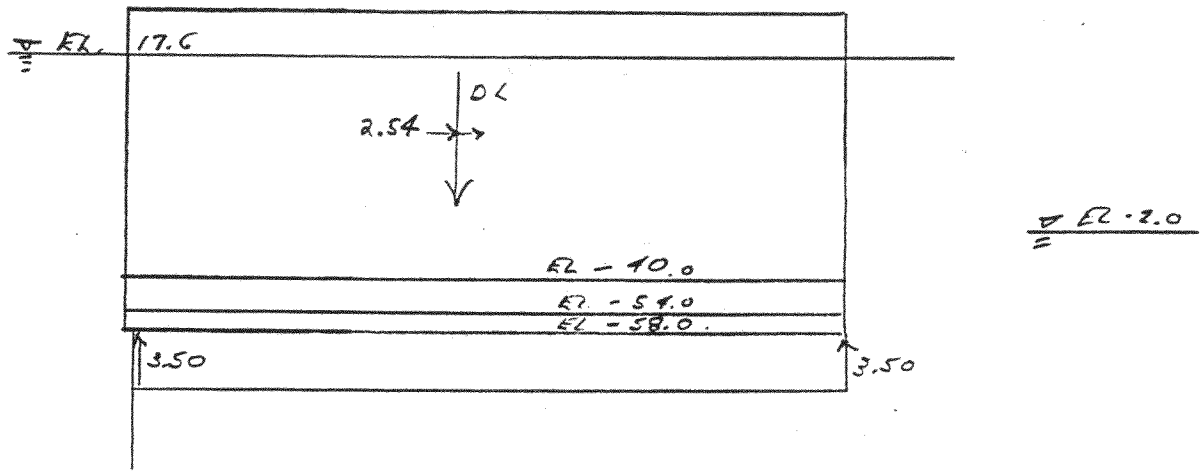
LV = 0

COMPUTATION SHEET

PROJECT SHIPLOCK FOUNDATION	PAGE 18 OF 20	COMPUTED BY [illegible]	DATE 9/96
SUBJECT RIGID BASE ANALYSIS		CHECKED BY	DATE

MAX. OPERATION UPLIFT A

CHAMBER FULL



$\Sigma P_x = 0 \qquad \Sigma P_y = 0$

$\Sigma P_z = \text{Gate DL} + \text{Chamber}_{H_2O} + \text{Culvert } H_2O + \text{Grout} - \text{Uplift}$

$= 331{,}600 + (110 \times 434 \times 57.6 \times 0.0625) + (2 \times 15 \times 18.25 \times 0.0625 \times 393')$
$+ (4' \times 180 \times 434 \times 0.15) - (3.50 \times 180 \times 434)$

$= 331{,}600 + 171{,}860 + 13{,}450 + 46{,}870 - 273{,}420$
$= 290{,}360\ K$

INCLUDE DRAG FORCE = 18,230 K

$\Sigma P_z = 308{,}600\ K$

$\Sigma M_x = (331{,}600 \times -2.54) + (0) + (13{,}450 \times 20.5) + 0 - 0 + 0_{DRAG}$
$= -567{,}600'\ K$

```
010 IHNC LOCK R/S GATEBAY-MAXIMUM OPERATION 2A/FULL CHAMBER-
015 DRAG FORCE INCLUDED//FILE:GATE2A17
020 PROP 29000 26100 26100 93.0 2.0 0 ALL
030 SOIL ES 0.355 LEN 160.0 0 ALL
040 TENSION 0.8 ALL
050 ALLOW R 880.0 760.0 1627.0 1627.0 20940.0 20940.0 ALL
060 PILE 1 84 -210 0
080 ROW Y 31 1 30 AT 14
090 REPEAT 13 3 AT -12 6 AT -16 3 AT -12
100 LOAD 1 0 0 308600 -567600 0 0
120 FOUT 2 4 5 6
130 PFO ALL
```

R/S GATEBAY

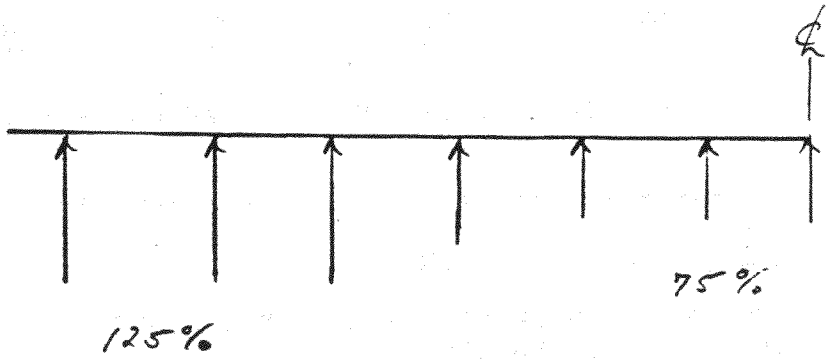
UPLIFT A

CHAMBER @ EL 17.6 W/DRAG

MAX. OPERATING

P_{max} = 785K < 880 capacity

CBF_{max} = 0.49



$W_{125\%}$ = 785 x 13 piles / 180' = 56.7 K/LF for 14' pile spacing

42' x 56.7 x 1.25 / 3.5 piles = 851 kips < 880 capacity

```
**********************************
* CORPS PROGRAM  #  X0080      *  CPGA - CASE PILE GROUP ANALYSIS PROGRAM
* VERSION NUMBER # 86/09/02-A *  RUN DATE 09-20-96    RUN TIME 19:33:56
**********************************


THNC LOCK R/S GATEBAY-MAXIMUM OPERATION 2A/FULL CHAMBER
DRAG FORCE INCLUDED//FILE:GATE2A17


THERE ARE 403 PILES AND
          1 LOAD CASES IN THIS RUN.

ALL PILE COORDINATES ARE CONTAINED WITHIN A BOX
                                    X          Y          Z
                                  -----      -----      -----
WITH DIAGONAL COORDINATES = (    -84.00 ,  -210.00 ,     .00 )
                           (     84.00 ,   210.00 ,     .00 )

*******************************************************************************

                        APPLIED LOADS

LOAD      PX         PY         PZ          MX          MY          MZ
CASE       K          K          K         FT-K        FT-K        FT-K

  1        .0         .0   308600.0   -567600.0          .0          .0

LOAD CASE    1.  NUMBER OF FAILURES =    0.  NUMBER OF PILES IN TENSION =    0.

*******************************************************************************

        PILE CAP DISPLACEMENTS

LOAD
CASE       DX          DY          DZ          RX          RY          RZ
           IN          IN          IN         RAD         RAD         RAD

   1   .0000E+00   .0000E+00   .2726E+00  -.2664E-05  -.8971E-11   .0000E+00

*******************************************************************************

        PILE FORCES IN LOCAL GEOMETRY

            M1 & M2 NOT AT PILE HEAD FOR PINNED PILES
            * INDICATES PILE FAILURE
            # INDICATES CBF BASED ON MOMENTS DUE TO
                       (F3*EMIN) FOR CONCRETE PILES
            B INDICATES BUCKLING CONTROLS


LOAD CASE -    1

PILE     F1         F2         F3         M1         M2         M3    ALF   CBF
          K          K          K         IN-K       IN-K       IN-K
```

1	.0	.0	784.6	.0	.0	.0	.89	.48
2	.0	.0	783.4	.0	.0	.0	.89	.48
3	.0	.0	782.1	.0	.0	.0	.89	.48
4	.0	.0	780.8	.0	.0	.0	.89	.48
5	.0	.0	779.6	.0	.0	.0	.89	.48
6	.0	.0	778.3	.0	.0	.0	.88	.48
7	.0	.0	777.1	.0	.0	.0	.88	.48
8	.0	.0	775.8	.0	.0	.0	.88	.48
9	.0	.0	774.6	.0	.0	.0	.88	.48
10	.0	.0	773.3	.0	.0	.0	.88	.48
11	.0	.0	772.0	.0	.0	.0	.88	.47
12	.0	.0	770.8	.0	.0	.0	.88	.47
13	.0	.0	769.5	.0	.0	.0	.87	.47
14	.0	.0	768.3	.0	.0	.0	.87	.47
15	.0	.0	767.0	.0	.0	.0	.87	.47
16	.0	.0	765.8	.0	.0	.0	.87	.47
17	.0	.0	764.5	.0	.0	.0	.87	.47
18	.0	.0	763.2	.0	.0	.0	.87	.47
19	.0	.0	762.0	.0	.0	.0	.87	.47
20	.0	.0	760.7	.0	.0	.0	.86	.47
21	.0	.0	759.5	.0	.0	.0	.86	.47
22	.0	.0	758.2	.0	.0	.0	.86	.47
23	.0	.0	757.0	.0	.0	.0	.86	.47
24	.0	.0	755.7	.0	.0	.0	.86	.46
25	.0	.0	754.4	.0	.0	.0	.86	.46
26	.0	.0	753.2	.0	.0	.0	.86	.46
27	.0	.0	751.9	.0	.0	.0	.85	.46
28	.0	.0	750.7	.0	.0	.0	.85	.46
29	.0	.0	749.4	.0	.0	.0	.85	.46
30	.0	.0	748.2	.0	.0	.0	.85	.46
31	.0	.0	746.9	.0	.0	.0	.85	.46
32	.0	.0	784.6	.0	.0	.0	.89	.48
33	.0	.0	783.4	.0	.0	.0	.89	.48
34	.0	.0	782.1	.0	.0	.0	.89	.48
35	.0	.0	780.8	.0	.0	.0	.89	.48
36	.0	.0	779.6	.0	.0	.0	.89	.48
37	.0	.0	778.3	.0	.0	.0	.88	.48
38	.0	.0	777.1	.0	.0	.0	.88	.48
39	.0	.0	775.8	.0	.0	.0	.88	.48
40	.0	.0	774.6	.0	.0	.0	.88	.48
41	.0	.0	773.3	.0	.0	.0	.88	.48
42	.0	.0	772.0	.0	.0	.0	.88	.47
43	.0	.0	770.8	.0	.0	.0	.88	.47
44	.0	.0	769.5	.0	.0	.0	.87	.47
45	.0	.0	768.3	.0	.0	.0	.87	.47
46	.0	.0	767.0	.0	.0	.0	.87	.47
47	.0	.0	765.8	.0	.0	.0	.87	.47
48	.0	.0	764.5	.0	.0	.0	.87	.47
49	.0	.0	763.2	.0	.0	.0	.87	.47
50	.0	.0	762.0	.0	.0	.0	.87	.47
51	.0	.0	760.7	.0	.0	.0	.86	.47
52	.0	.0	759.5	.0	.0	.0	.86	.47
53	.0	.0	758.2	.0	.0	.0	.86	.47
54	.0	.0	757.0	.0	.0	.0	.86	.47
55	.0	.0	755.7	.0	.0	.0	.86	.46
56	.0	.0	754.4	.0	.0	.0	.86	.46
57	.0	.0	753.2	.0	.0	.0	.86	.46
58	.0	.0	751.9	.0	.0	.0	.85	.46
59	.0	.0	750.7	.0	.0	.0	.85	.46
60	.0	.0	749.4	.0	.0	.0	.85	.46

61	.0	.0	748.2	.0	.0	.0	.85	.46
62	.0	.0	746.9	.0	.0	.0	.85	.46
63	.0	.0	784.6	.0	.0	.0	.89	.48
64	.0	.0	783.4	.0	.0	.0	.89	.48
65	.0	.0	782.1	.0	.0	.0	.89	.48
66	.0	.0	780.8	.0	.0	.0	.89	.48
67	.0	.0	779.6	.0	.0	.0	.89	.48
68	.0	.0	778.3	.0	.0	.0	.88	.48
69	.0	.0	777.1	.0	.0	.0	.88	.48
70	.0	.0	775.8	.0	.0	.0	.88	.48
71	.0	.0	774.6	.0	.0	.0	.88	.48
72	.0	.0	773.3	.0	.0	.0	.88	.48
73	.0	.0	772.0	.0	.0	.0	.88	.47
74	.0	.0	770.8	.0	.0	.0	.88	.47
75	.0	.0	769.5	.0	.0	.0	.87	.47
76	.0	.0	768.3	.0	.0	.0	.87	.47
77	.0	.0	767.0	.0	.0	.0	.87	.47
78	.0	.0	765.8	.0	.0	.0	.87	.47
79	.0	.0	764.5	.0	.0	.0	.87	.47
80	.0	.0	763.2	.0	.0	.0	.87	.47
81	.0	.0	762.0	.0	.0	.0	.87	.47
82	.0	.0	760.7	.0	.0	.0	.86	.47
83	.0	.0	759.5	.0	.0	.0	.86	.47
84	.0	.0	758.2	.0	.0	.0	.86	.47
85	.0	.0	757.0	.0	.0	.0	.86	.47
86	.0	.0	755.7	.0	.0	.0	.86	.46
87	.0	.0	754.4	.0	.0	.0	.86	.46
88	.0	.0	753.2	.0	.0	.0	.86	.46
89	.0	.0	751.9	.0	.0	.0	.85	.46
90	.0	.0	750.7	.0	.0	.0	.85	.46
91	.0	.0	749.4	.0	.0	.0	.85	.46
92	.0	.0	748.2	.0	.0	.0	.85	.46
93	.0	.0	746.9	.0	.0	.0	.85	.46
94	.0	.0	784.6	.0	.0	.0	.89	.48
95	.0	.0	783.4	.0	.0	.0	.89	.48
96	.0	.0	782.1	.0	.0	.0	.89	.48
97	.0	.0	780.8	.0	.0	.0	.89	.48
98	.0	.0	779.6	.0	.0	.0	.89	.48
99	.0	.0	778.3	.0	.0	.0	.88	.48
100	.0	.0	777.1	.0	.0	.0	.88	.48
101	.0	.0	775.8	.0	.0	.0	.88	.48
102	.0	.0	774.6	.0	.0	.0	.88	.48
103	.0	.0	773.3	.0	.0	.0	.88	.48
104	.0	.0	772.0	.0	.0	.0	.88	.47
105	.0	.0	770.8	.0	.0	.0	.88	.47
106	.0	.0	769.5	.0	.0	.0	.87	.47
107	.0	.0	768.3	.0	.0	.0	.87	.47
108	.0	.0	767.0	.0	.0	.0	.87	.47
109	.0	.0	765.8	.0	.0	.0	.87	.47
110	.0	.0	764.5	.0	.0	.0	.87	.47
111	.0	.0	763.2	.0	.0	.0	.87	.47
112	.0	.0	762.0	.0	.0	.0	.87	.47
113	.0	.0	760.7	.0	.0	.0	.86	.47
114	.0	.0	759.5	.0	.0	.0	.86	.47
115	.0	.0	758.2	.0	.0	.0	.86	.47
116	.0	.0	757.0	.0	.0	.0	.86	.47
117	.0	.0	755.7	.0	.0	.0	.86	.46
118	.0	.0	754.4	.0	.0	.0	.86	.46
19	.0	.0	753.2	.0	.0	.0	.86	.46
120	.0	.0	751.9	.0	.0	.0	.85	.46

121	.0	.0	750.7	.0	.0	.0	.85	.46
122	.0	.0	749.4	.0	.0	.0	.85	.46
123	.0	.0	748.2	.0	.0	.0	.85	.46
124	.0	.0	746.9	.0	.0	.0	.85	.46
125	.0	.0	784.6	.0	.0	.0	.89	.48
126	.0	.0	783.4	.0	.0	.0	.89	.48
127	.0	.0	782.1	.0	.0	.0	.89	.48
128	.0	.0	780.8	.0	.0	.0	.89	.48
129	.0	.0	779.6	.0	.0	.0	.89	.48
130	.0	.0	778.3	.0	.0	.0	.88	.48
131	.0	.0	777.1	.0	.0	.0	.88	.48
132	.0	.0	775.8	.0	.0	.0	.88	.48
133	.0	.0	774.6	.0	.0	.0	.88	.48
134	.0	.0	773.3	.0	.0	.0	.88	.48
135	.0	.0	772.0	.0	.0	.0	.88	.47
136	.0	.0	770.8	.0	.0	.0	.88	.47
137	.0	.0	769.5	.0	.0	.0	.87	.47
138	.0	.0	768.3	.0	.0	.0	.87	.47
139	.0	.0	767.0	.0	.0	.0	.87	.47
140	.0	.0	765.8	.0	.0	.0	.87	.47
141	.0	.0	764.5	.0	.0	.0	.87	.47
142	.0	.0	763.2	.0	.0	.0	.87	.47
143	.0	.0	762.0	.0	.0	.0	.87	.47
144	.0	.0	760.7	.0	.0	.0	.86	.47
145	.0	.0	759.5	.0	.0	.0	.86	.47
146	.0	.0	758.2	.0	.0	.0	.86	.47
147	.0	.0	757.0	.0	.0	.0	.86	.47
148	.0	.0	755.7	.0	.0	.0	.86	.46
149	.0	.0	754.4	.0	.0	.0	.86	.46
150	.0	.0	753.2	.0	.0	.0	.86	.46
151	.0	.0	751.9	.0	.0	.0	.85	.46
152	.0	.0	750.7	.0	.0	.0	.85	.46
153	.0	.0	749.4	.0	.0	.0	.85	.46
154	.0	.0	748.2	.0	.0	.0	.85	.46
155	.0	.0	746.9	.0	.0	.0	.85	.46
156	.0	.0	784.6	.0	.0	.0	.89	.48
157	.0	.0	783.4	.0	.0	.0	.89	.48
158	.0	.0	782.1	.0	.0	.0	.89	.48
159	.0	.0	780.8	.0	.0	.0	.89	.48
160	.0	.0	779.6	.0	.0	.0	.89	.48
161	.0	.0	778.3	.0	.0	.0	.88	.48
162	.0	.0	777.1	.0	.0	.0	.88	.48
163	.0	.0	775.8	.0	.0	.0	.88	.48
164	.0	.0	774.6	.0	.0	.0	.88	.48
165	.0	.0	773.3	.0	.0	.0	.88	.48
166	.0	.0	772.0	.0	.0	.0	.88	.47
167	.0	.0	770.8	.0	.0	.0	.88	.47
168	.0	.0	769.5	.0	.0	.0	.87	.47
169	.0	.0	768.3	.0	.0	.0	.87	.47
170	.0	.0	767.0	.0	.0	.0	.87	.47
171	.0	.0	765.8	.0	.0	.0	.87	.47
172	.0	.0	764.5	.0	.0	.0	.87	.47
173	.0	.0	763.2	.0	.0	.0	.87	.47
174	.0	.0	762.0	.0	.0	.0	.87	.47
175	.0	.0	760.7	.0	.0	.0	.86	.47
176	.0	.0	759.5	.0	.0	.0	.86	.47
177	.0	.0	758.2	.0	.0	.0	.86	.47
178	.0	.0	757.0	.0	.0	.0	.86	.47
79	.0	.0	755.7	.0	.0	.0	.86	.46
180	.0	.0	754.4	.0	.0	.0	.86	.46

181	.0	.0	753.2	.0	.0	.0	.86	.46
182	.0	.0	751.9	.0	.0	.0	.85	.46
183	.0	.0	750.7	.0	.0	.0	.85	.46
184	.0	.0	749.4	.0	.0	.0	.85	.46
185	.0	.0	748.2	.0	.0	.0	.85	.46
186	.0	.0	746.9	.0	.0	.0	.85	.46
187	.0	.0	784.6	.0	.0	.0	.89	.48
188	.0	.0	783.4	.0	.0	.0	.89	.48
189	.0	.0	782.1	.0	.0	.0	.89	.48
190	.0	.0	780.8	.0	.0	.0	.89	.48
191	.0	.0	779.6	.0	.0	.0	.89	.48
192	.0	.0	778.3	.0	.0	.0	.88	.48
193	.0	.0	777.1	.0	.0	.0	.88	.48
194	.0	.0	775.8	.0	.0	.0	.88	.48
195	.0	.0	774.6	.0	.0	.0	.88	.48
196	.0	.0	773.3	.0	.0	.0	.88	.48
197	.0	.0	772.0	.0	.0	.0	.88	.47
198	.0	.0	770.8	.0	.0	.0	.88	.47
199	.0	.0	769.5	.0	.0	.0	.87	.47
200	.0	.0	768.3	.0	.0	.0	.87	.47
201	.0	.0	767.0	.0	.0	.0	.87	.47
202	.0	.0	765.8	.0	.0	.0	.87	.47
203	.0	.0	764.5	.0	.0	.0	.87	.47
204	.0	.0	763.2	.0	.0	.0	.87	.47
205	.0	.0	762.0	.0	.0	.0	.87	.47
206	.0	.0	760.7	.0	.0	.0	.86	.47
207	.0	.0	759.5	.0	.0	.0	.86	.47
208	.0	.0	758.2	.0	.0	.0	.86	.47
209	.0	.0	757.0	.0	.0	.0	.86	.47
210	.0	.0	755.7	.0	.0	.0	.86	.46
211	.0	.0	754.4	.0	.0	.0	.86	.46
212	.0	.0	753.2	.0	.0	.0	.86	.46
213	.0	.0	751.9	.0	.0	.0	.85	.46
214	.0	.0	750.7	.0	.0	.0	.85	.46
215	.0	.0	749.4	.0	.0	.0	.85	.46
216	.0	.0	748.2	.0	.0	.0	.85	.46
217	.0	.0	746.9	.0	.0	.0	.85	.46
218	.0	.0	784.6	.0	.0	.0	.89	.48
219	.0	.0	783.4	.0	.0	.0	.89	.48
220	.0	.0	782.1	.0	.0	.0	.89	.48
221	.0	.0	780.8	.0	.0	.0	.89	.48
222	.0	.0	779.6	.0	.0	.0	.89	.48
223	.0	.0	778.3	.0	.0	.0	.88	.48
224	.0	.0	777.1	.0	.0	.0	.88	.48
225	.0	.0	775.8	.0	.0	.0	.88	.48
226	.0	.0	774.6	.0	.0	.0	.88	.48
227	.0	.0	773.3	.0	.0	.0	.88	.48
228	.0	.0	772.0	.0	.0	.0	.88	.47
229	.0	.0	770.8	.0	.0	.0	.88	.47
230	.0	.0	769.5	.0	.0	.0	.87	.47
231	.0	.0	768.3	.0	.0	.0	.87	.47
232	.0	.0	767.0	.0	.0	.0	.87	.47
233	.0	.0	765.8	.0	.0	.0	.87	.47
234	.0	.0	764.5	.0	.0	.0	.87	.47
235	.0	.0	763.2	.0	.0	.0	.87	.47
236	.0	.0	762.0	.0	.0	.0	.87	.47
237	.0	.0	760.7	.0	.0	.0	.86	.47
238	.0	.0	759.5	.0	.0	.0	.86	.47
239	.0	.0	758.2	.0	.0	.0	.86	.47
240	.0	.0	757.0	.0	.0	.0	.86	.47

241	.0	.0	755.7	.0	.0	.0	.86	.46
242	.0	.0	754.4	.0	.0	.0	.86	.46
243	.0	.0	753.2	.0	.0	.0	.86	.46
244	.0	.0	751.9	.0	.0	.0	.85	.46
245	.0	.0	750.7	.0	.0	.0	.85	.46
246	.0	.0	749.4	.0	.0	.0	.85	.46
247	.0	.0	748.2	.0	.0	.0	.85	.46
248	.0	.0	746.9	.0	.0	.0	.85	.46
249	.0	.0	784.6	.0	.0	.0	.89	.48
250	.0	.0	783.4	.0	.0	.0	.89	.48
251	.0	.0	782.1	.0	.0	.0	.89	.48
252	.0	.0	780.8	.0	.0	.0	.89	.48
253	.0	.0	779.6	.0	.0	.0	.89	.48
254	.0	.0	778.3	.0	.0	.0	.88	.48
255	.0	.0	777.1	.0	.0	.0	.88	.48
256	.0	.0	775.8	.0	.0	.0	.88	.48
257	.0	.0	774.6	.0	.0	.0	.88	.48
258	.0	.0	773.3	.0	.0	.0	.88	.48
259	.0	.0	772.0	.0	.0	.0	.88	.47
260	.0	.0	770.8	.0	.0	.0	.88	.47
261	.0	.0	769.5	.0	.0	.0	.87	.47
262	.0	.0	768.3	.0	.0	.0	.87	.47
263	.0	.0	767.0	.0	.0	.0	.87	.47
264	.0	.0	765.8	.0	.0	.0	.87	.47
265	.0	.0	764.5	.0	.0	.0	.87	.47
266	.0	.0	763.2	.0	.0	.0	.87	.47
267	.0	.0	762.0	.0	.0	.0	.87	.47
268	.0	.0	760.7	.0	.0	.0	.86	.47
269	.0	.0	759.5	.0	.0	.0	.86	.47
270	.0	.0	758.2	.0	.0	.0	.86	.47
271	.0	.0	757.0	.0	.0	.0	.86	.47
272	.0	.0	755.7	.0	.0	.0	.86	.46
273	.0	.0	754.4	.0	.0	.0	.86	.46
274	.0	.0	753.2	.0	.0	.0	.86	.46
275	.0	.0	751.9	.0	.0	.0	.85	.46
276	.0	.0	750.7	.0	.0	.0	.85	.46
277	.0	.0	749.4	.0	.0	.0	.85	.46
278	.0	.0	748.2	.0	.0	.0	.85	.46
279	.0	.0	746.9	.0	.0	.0	.85	.46
280	.0	.0	784.6	.0	.0	.0	.89	.48
281	.0	.0	783.4	.0	.0	.0	.89	.48
282	.0	.0	782.1	.0	.0	.0	.89	.48
283	.0	.0	780.8	.0	.0	.0	.89	.48
284	.0	.0	779.6	.0	.0	.0	.89	.48
285	.0	.0	778.3	.0	.0	.0	.88	.48
286	.0	.0	777.1	.0	.0	.0	.88	.48
287	.0	.0	775.8	.0	.0	.0	.88	.48
288	.0	.0	774.6	.0	.0	.0	.88	.48
289	.0	.0	773.3	.0	.0	.0	.88	.48
290	.0	.0	772.0	.0	.0	.0	.88	.47
291	.0	.0	770.8	.0	.0	.0	.88	.47
292	.0	.0	769.5	.0	.0	.0	.87	.47
293	.0	.0	768.3	.0	.0	.0	.87	.47
294	.0	.0	767.0	.0	.0	.0	.87	.47
295	.0	.0	765.8	.0	.0	.0	.87	.47
296	.0	.0	764.5	.0	.0	.0	.87	.47
297	.0	.0	763.2	.0	.0	.0	.87	.47
298	.0	.0	762.0	.0	.0	.0	.87	.47
99	.0	.0	760.7	.0	.0	.0	.86	.47
300	.0	.0	759.5	.0	.0	.0	.86	.47

301	.0	.0	758.2	.0	.0	.0	.86	.47
302	.0	.0	757.0	.0	.0	.0	.86	.47
303	.0	.0	755.7	.0	.0	.0	.86	.46
304	.0	.0	754.4	.0	.0	.0	.86	.46
305	.0	.0	753.2	.0	.0	.0	.86	.46
306	.0	.0	751.9	.0	.0	.0	.85	.46
307	.0	.0	750.7	.0	.0	.0	.85	.46
308	.0	.0	749.4	.0	.0	.0	.85	.46
309	.0	.0	748.2	.0	.0	.0	.85	.46
310	.0	.0	746.9	.0	.0	.0	.85	.46
311	.0	.0	784.6	.0	.0	.0	.89	.48
312	.0	.0	783.4	.0	.0	.0	.89	.48
313	.0	.0	782.1	.0	.0	.0	.89	.48
314	.0	.0	780.8	.0	.0	.0	.89	.48
315	.0	.0	779.6	.0	.0	.0	.89	.48
316	.0	.0	778.3	.0	.0	.0	.88	.48
317	.0	.0	777.1	.0	.0	.0	.88	.48
318	.0	.0	775.8	.0	.0	.0	.88	.48
319	.0	.0	774.6	.0	.0	.0	.88	.48
320	.0	.0	773.3	.0	.0	.0	.88	.48
321	.0	.0	772.0	.0	.0	.0	.88	.47
322	.0	.0	770.8	.0	.0	.0	.88	.47
323	.0	.0	769.5	.0	.0	.0	.87	.47
324	.0	.0	768.3	.0	.0	.0	.87	.47
325	.0	.0	767.0	.0	.0	.0	.87	.47
326	.0	.0	765.8	.0	.0	.0	.87	.47
327	.0	.0	764.5	.0	.0	.0	.87	.47
328	.0	.0	763.2	.0	.0	.0	.87	.47
329	.0	.0	762.0	.0	.0	.0	.87	.47
330	.0	.0	760.7	.0	.0	.0	.86	.47
331	.0	.0	759.5	.0	.0	.0	.86	.47
332	.0	.0	758.2	.0	.0	.0	.86	.47
333	.0	.0	757.0	.0	.0	.0	.86	.47
334	.0	.0	755.7	.0	.0	.0	.86	.46
335	.0	.0	754.4	.0	.0	.0	.86	.46
336	.0	.0	753.2	.0	.0	.0	.86	.46
337	.0	.0	751.9	.0	.0	.0	.85	.46
338	.0	.0	750.7	.0	.0	.0	.85	.46
339	.0	.0	749.4	.0	.0	.0	.85	.46
340	.0	.0	748.2	.0	.0	.0	.85	.46
341	.0	.0	746.9	.0	.0	.0	.85	.46
342	.0	.0	784.6	.0	.0	.0	.89	.48
343	.0	.0	783.4	.0	.0	.0	.89	.48
344	.0	.0	782.1	.0	.0	.0	.89	.48
345	.0	.0	780.8	.0	.0	.0	.89	.48
346	.0	.0	779.6	.0	.0	.0	.89	.48
347	.0	.0	778.3	.0	.0	.0	.88	.48
348	.0	.0	777.1	.0	.0	.0	.88	.48
349	.0	.0	775.8	.0	.0	.0	.88	.48
350	.0	.0	774.6	.0	.0	.0	.88	.48
351	.0	.0	773.3	.0	.0	.0	.88	.48
352	.0	.0	772.0	.0	.0	.0	.88	.47
353	.0	.0	770.8	.0	.0	.0	.88	.47
354	.0	.0	769.5	.0	.0	.0	.87	.47
355	.0	.0	768.3	.0	.0	.0	.87	.47
356	.0	.0	767.0	.0	.0	.0	.87	.47
357	.0	.0	765.8	.0	.0	.0	.87	.47
358	.0	.0	764.5	.0	.0	.0	.87	.47
59	.0	.0	763.2	.0	.0	.0	.87	.47
360	.0	.0	762.0	.0	.0	.0	.87	.47

361	.0	.0	760.7	.0	.0	.0	.86	.47
362	.0	.0	759.5	.0	.0	.0	.86	.47
363	.0	.0	758.2	.0	.0	.0	.86	.47
364	.0	.0	757.0	.0	.0	.0	.86	.47
365	.0	.0	755.7	.0	.0	.0	.86	.46
366	.0	.0	754.4	.0	.0	.0	.86	.46
367	.0	.0	753.2	.0	.0	.0	.86	.46
368	.0	.0	751.9	.0	.0	.0	.85	.46
369	.0	.0	750.7	.0	.0	.0	.85	.46
370	.0	.0	749.4	.0	.0	.0	.85	.46
371	.0	.0	748.2	.0	.0	.0	.85	.46
372	.0	.0	746.9	.0	.0	.0	.85	.46
373	.0	.0	784.6	.0	.0	.0	.89	.48
374	.0	.0	783.4	.0	.0	.0	.89	.48
375	.0	.0	782.1	.0	.0	.0	.89	.48
376	.0	.0	780.8	.0	.0	.0	.89	.48
377	.0	.0	779.6	.0	.0	.0	.89	.48
378	.0	.0	778.3	.0	.0	.0	.88	.48
379	.0	.0	777.1	.0	.0	.0	.88	.48
380	.0	.0	775.8	.0	.0	.0	.88	.48
381	.0	.0	774.6	.0	.0	.0	.88	.48
382	.0	.0	773.3	.0	.0	.0	.88	.48
383	.0	.0	772.0	.0	.0	.0	.88	.47
384	.0	.0	770.8	.0	.0	.0	.88	.47
385	.0	.0	769.5	.0	.0	.0	.87	.47
386	.0	.0	768.3	.0	.0	.0	.87	.47
387	.0	.0	767.0	.0	.0	.0	.87	.47
388	.0	.0	765.8	.0	.0	.0	.87	.47
389	.0	.0	764.5	.0	.0	.0	.87	.47
390	.0	.0	763.2	.0	.0	.0	.87	.47
391	.0	.0	762.0	.0	.0	.0	.87	.47
392	.0	.0	760.7	.0	.0	.0	.86	.47
393	.0	.0	759.5	.0	.0	.0	.86	.47
394	.0	.0	758.2	.0	.0	.0	.86	.47
395	.0	.0	757.0	.0	.0	.0	.86	.47
396	.0	.0	755.7	.0	.0	.0	.86	.46
397	.0	.0	754.4	.0	.0	.0	.86	.46
398	.0	.0	753.2	.0	.0	.0	.86	.46
399	.0	.0	751.9	.0	.0	.0	.85	.46
400	.0	.0	750.7	.0	.0	.0	.85	.46
401	.0	.0	749.4	.0	.0	.0	.85	.46
402	.0	.0	748.2	.0	.0	.0	.85	.46
403	.0	.0	746.9	.0	.0	.0	.85	.46

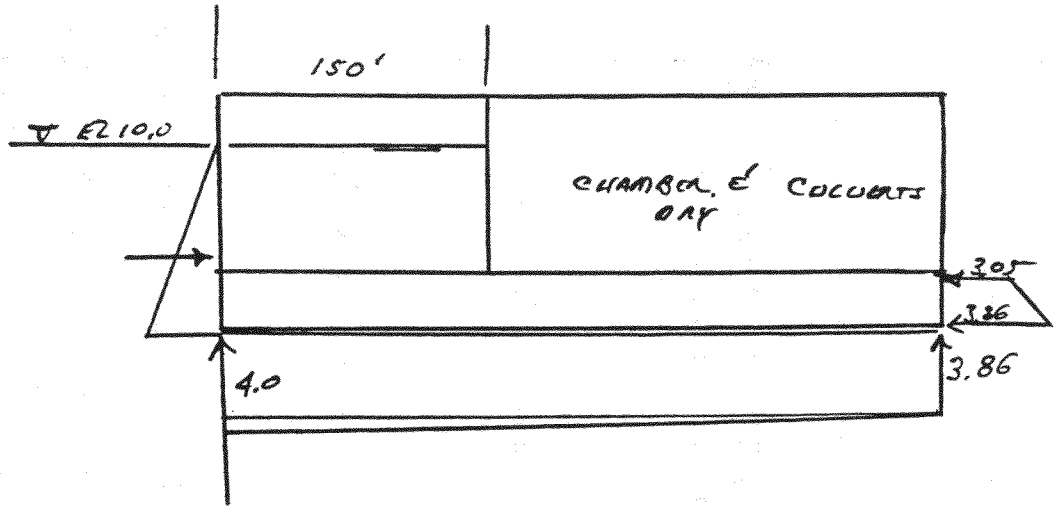
COMPUTATION SHEET

PROJECT	PAGE 19 OF 20	COMPUTED BY NJL	DATE 9/96
SUBJECT		CHECKED BY	DATE

MAINTENANCE DEWATERN

Check FOR TENSION LOADS @ R/S

ASSUMPTIONS: - EMERGENCY BULKHEAD IN
- No DRAG
- UPLIFT B



P_Z = DL + CHAMBER H_2O + GROUT$_{OF}$ - UPLIFT

$= (331,580 + 1600) + (50 \times 0.0625 \times 150 \times 10) + (4' [0.15 - 0.0625] \times 180 \times 424)$

$- (3.86 \times 180 \times 424) - (\frac{0.14}{2} \times 180 \times 434)$

$= 333,180 + 51,560 + 27,340 - 301,540 - 5470$

$= +105,070\ K$

$P_Y = (\frac{64^2}{2} \times 0.0625)\ 180 - (\frac{3.05 + 3.86}{2} \times 13' \times 180) =$

$23,040_K - 8080_K = +14,960\ K$

$M_Z = -840,238_{DL} - 232,000_{BULKHEAD} - (51,560 \times 142) + 0 + (5470 \times 72.33)$

$+ (23,040 \times 21.33) - (8080 \times 6.25')$

$= -1,072,240 - 7,321,520 + 395,545 + 491,440 - 50,500$

$= -7,557,175^{K}$

```
010 IHNC LOCK R/S GATEBAY-MAINTEN. DEWATER 3B/FILE:GATE3B
020 PROP 29000 26100 26100 93.0 2.0 0 ALL
030 SOIL ES 0.355 LEN 160.0 0 ALL
040 TENSION 0.8 ALL
050 ALLOW R 880.0 760.0 1627.0 1627.0 20940.0 20940.0 ALL
060 PILE 1 84 -210 0
 80 ROW Y 31 1 30 AT 14
090 REPEAT 13 3 AT -12 6 AT -16 3 AT -12
100 LOAD 1 0 14960 105100 -7557200 0 0
120 FOUT 2 4 5 6
130 PFO ALL
```

R/S GATEBAY

MAINT. DEWATER

UPLIFT B

Governs Min. Compression → Min Compressive Force = 10 K (No Tension Piles)

```
*******************************
* CORPS PROGRAM  #  X0080     *  CPGA - CASE PILE GROUP ANALYSIS PROGRAM
* VERSION NUMBER # 86/09/02-A *  RUN DATE 09-21-96    RUN TIME 17:26:44
*******************************


IHNC LOCK R/S GATEBAY-MAINTEN. DEWATER 3B/FILE:GATE3B


THERE ARE 403 PILES AND
            1 LOAD CASES IN THIS RUN.

ALL PILE COORDINATES ARE CONTAINED WITHIN A BOX
                                      X          Y          Z
                                    -----      -----      -----
WITH DIAGONAL COORDINATES = (     -84.00 ,  -210.00 ,      .00 )
                            (      84.00 ,   210.00 ,      .00 )


*******************************************************************************

                         APPLIED LOADS

LOAD      PX         PY         PZ          MX          MY          MZ
CASE       K          K          K         FT-K        FT-K        FT-K

  1        .0    14960.0   105100.0   -7557200.0          .0          .0

LOAD CASE    1.  NUMBER OF FAILURES =    0.  NUMBER OF PILES IN TENSION =    0.


*******************************************************************************

         PILE CAP DISPLACEMENTS

LOAD
CASE        DX          DY          DZ          RX          RY          RZ
            IN          IN          IN         RAD         RAD         RAD

   1   -.1686E-15   .6882E+00   .9283E-01  -.3547E-04  -.3310E-11   .2300E-11


*******************************************************************************

         PILE FORCES IN LOCAL GEOMETRY

             M1 & M2 NOT AT PILE HEAD FOR PINNED PILES
             * INDICATES PILE FAILURE
             # INDICATES CBF BASED ON MOMENTS DUE TO
                         (F3*EMIN) FOR CONCRETE PILES
             B INDICATES BUCKLING CONTROLS


LOAD CASE -    1

PILE     F1       F2       F3        M1        M2        M3   ALF  CBF
          K        K        K       IN-K      IN-K      IN-K

  1       .0     37.1    511.9    3632.4        .0        .0  .58  .49
```

2	.0	37.1	495.2	3632.4	.0	.0	.56	.48
3	.0	37.1	478.5	3632.4	.0	.0	.54	.47
4	.0	37.1	461.7	3632.4	.0	.0	.52	.46
5	.0	37.1	445.0	3632.4	.0	.0	.51	.45
6	.0	37.1	428.2	3632.4	.0	.0	.49	.44
7	.0	37.1	411.5	3632.4	.0	.0	.47	.43
8	.0	37.1	394.7	3632.4	.0	.0	.45	.42
9	.0	37.1	378.0	3632.4	.0	.0	.43	.41
10	.0	37.1	361.3	3632.4	.0	.0	.41	.40
11	.0	37.1	344.5	3632.4	.0	.0	.39	.39
12	.0	37.1	327.8	3632.4	.0	.0	.37	.37
13	.0	37.1	311.0	3632.4	.0	.0	.35	.36
14	.0	37.1	294.3	3632.4	.0	.0	.33	.35
15	.0	37.1	277.5	3632.4	.0	.0	.32	.34
16	.0	37.1	260.8	3632.4	.0	.0	.30	.33
17	.0	37.1	244.1	3632.4	.0	.0	.28	.32
18	.0	37.1	227.3	3632.4	.0	.0	.26	.31
19	.0	37.1	210.6	3632.4	.0	.0	.24	.30
20	.0	37.1	193.8	3632.4	.0	.0	.22	.29
21	.0	37.1	177.1	3632.4	.0	.0	.20	.28
22	.0	37.1	160.3	3632.4	.0	.0	.18	.27
23	.0	37.1	143.6	3632.4	.0	.0	.16	.26
24	.0	37.1	126.8	3632.4	.0	.0	.14	.25
25	.0	37.1	110.1	3632.4	.0	.0	.13	.24
26	.0	37.1	93.4	3632.4	.0	.0	.11	.23
27	.0	37.1	76.6	3632.4	.0	.0	.09	.22
28	.0	37.1	59.9	3632.4	.0	.0	.07	.21
29	.0	37.1	43.1	3632.4	.0	.0	.05	.20
30	.0	37.1	26.4	3632.4	.0	.0	.03	.19
31	.0	37.1	9.6	3632.4	.0	.0	.01	.18
32	.0	37.1	511.9	3632.4	.0	.0	.58	.49
33	.0	37.1	495.2	3632.4	.0	.0	.56	.48
34	.0	37.1	478.5	3632.4	.0	.0	.54	.47
35	.0	37.1	461.7	3632.4	.0	.0	.52	.46
36	.0	37.1	445.0	3632.4	.0	.0	.51	.45
37	.0	37.1	428.2	3632.4	.0	.0	.49	.44
38	.0	37.1	411.5	3632.4	.0	.0	.47	.43
39	.0	37.1	394.7	3632.4	.0	.0	.45	.42
40	.0	37.1	378.0	3632.4	.0	.0	.43	.41
41	.0	37.1	361.3	3632.4	.0	.0	.41	.40
42	.0	37.1	344.5	3632.4	.0	.0	.39	.39
43	.0	37.1	327.8	3632.4	.0	.0	.37	.37
44	.0	37.1	311.0	3632.4	.0	.0	.35	.36
45	.0	37.1	294.3	3632.4	.0	.0	.33	.35
46	.0	37.1	277.5	3632.4	.0	.0	.32	.34
47	.0	37.1	260.8	3632.4	.0	.0	.30	.33
48	.0	37.1	244.1	3632.4	.0	.0	.28	.32
49	.0	37.1	227.3	3632.4	.0	.0	.26	.31
50	.0	37.1	210.6	3632.4	.0	.0	.24	.30
51	.0	37.1	193.8	3632.4	.0	.0	.22	.29
52	.0	37.1	177.1	3632.4	.0	.0	.20	.28
53	.0	37.1	160.3	3632.4	.0	.0	.18	.27
54	.0	37.1	143.6	3632.4	.0	.0	.16	.26
55	.0	37.1	126.8	3632.4	.0	.0	.14	.25
56	.0	37.1	110.1	3632.4	.0	.0	.13	.24
57	.0	37.1	93.4	3632.4	.0	.0	.11	.23
58	.0	37.1	76.6	3632.4	.0	.0	.09	.22
59	.0	37.1	59.9	3632.4	.0	.0	.07	.21
60	.0	37.1	43.1	3632.4	.0	.0	.05	.20
61	.0	37.1	26.4	3632.4	.0	.0	.03	.19

62	.0	37.1	9.6	3632.4	.0	.0	.01	.18
63	.0	37.1	511.9	3632.4	.0	.0	.58	.49
64	.0	37.1	495.2	3632.4	.0	.0	.56	.48
65	.0	37.1	478.5	3632.4	.0	.0	.54	.47
66	.0	37.1	461.7	3632.4	.0	.0	.52	.46
67	.0	37.1	445.0	3632.4	.0	.0	.51	.45
68	.0	37.1	428.2	3632.4	.0	.0	.49	.44
69	.0	37.1	411.5	3632.4	.0	.0	.47	.43
70	.0	37.1	394.7	3632.4	.0	.0	.45	.42
71	.0	37.1	378.0	3632.4	.0	.0	.43	.41
72	.0	37.1	361.3	3632.4	.0	.0	.41	.40
73	.0	37.1	344.5	3632.4	.0	.0	.39	.39
74	.0	37.1	327.8	3632.4	.0	.0	.37	.37
75	.0	37.1	311.0	3632.4	.0	.0	.35	.36
76	.0	37.1	294.3	3632.4	.0	.0	.33	.35
77	.0	37.1	277.5	3632.4	.0	.0	.32	.34
78	.0	37.1	260.8	3632.4	.0	.0	.30	.33
79	.0	37.1	244.1	3632.4	.0	.0	.28	.32
80	.0	37.1	227.3	3632.4	.0	.0	.26	.31
81	.0	37.1	210.6	3632.4	.0	.0	.24	.30
82	.0	37.1	193.8	3632.4	.0	.0	.22	.29
83	.0	37.1	177.1	3632.4	.0	.0	.20	.28
84	.0	37.1	160.3	3632.4	.0	.0	.18	.27
85	.0	37.1	143.6	3632.4	.0	.0	.16	.26
86	.0	37.1	126.8	3632.4	.0	.0	.14	.25
87	.0	37.1	110.1	3632.4	.0	.0	.13	.24
88	.0	37.1	93.4	3632.4	.0	.0	.11	.23
89	.0	37.1	76.6	3632.4	.0	.0	.09	.22
90	.0	37.1	59.9	3632.4	.0	.0	.07	.21
91	.0	37.1	43.1	3632.4	.0	.0	.05	.20
92	.0	37.1	26.4	3632.4	.0	.0	.03	.19
93	.0	37.1	9.6	3632.4	.0	.0	.01	.18
94	.0	37.1	511.9	3632.4	.0	.0	.58	.49
95	.0	37.1	495.2	3632.4	.0	.0	.56	.48
96	.0	37.1	478.5	3632.4	.0	.0	.54	.47
97	.0	37.1	461.7	3632.4	.0	.0	.52	.46
98	.0	37.1	445.0	3632.4	.0	.0	.51	.45
99	.0	37.1	428.2	3632.4	.0	.0	.49	.44
100	.0	37.1	411.5	3632.4	.0	.0	.47	.43
101	.0	37.1	394.7	3632.4	.0	.0	.45	.42
102	.0	37.1	378.0	3632.4	.0	.0	.43	.41
103	.0	37.1	361.3	3632.4	.0	.0	.41	.40
104	.0	37.1	344.5	3632.4	.0	.0	.39	.39
105	.0	37.1	327.8	3632.4	.0	.0	.37	.37
106	.0	37.1	311.0	3632.4	.0	.0	.35	.36
107	.0	37.1	294.3	3632.4	.0	.0	.33	.35
108	.0	37.1	277.5	3632.4	.0	.0	.32	.34
109	.0	37.1	260.8	3632.4	.0	.0	.30	.33
110	.0	37.1	244.1	3632.4	.0	.0	.28	.32
111	.0	37.1	227.3	3632.4	.0	.0	.26	.31
112	.0	37.1	210.6	3632.4	.0	.0	.24	.30
113	.0	37.1	193.8	3632.4	.0	.0	.22	.29
114	.0	37.1	177.1	3632.4	.0	.0	.20	.28
115	.0	37.1	160.3	3632.4	.0	.0	.18	.27
116	.0	37.1	143.6	3632.4	.0	.0	.16	.26
117	.0	37.1	126.8	3632.4	.0	.0	.14	.25
118	.0	37.1	110.1	3632.4	.0	.0	.13	.24
119	.0	37.1	93.4	3632.4	.0	.0	.11	.23
120	.0	37.1	76.6	3632.4	.0	.0	.09	.22
121	.0	37.1	59.9	3632.4	.0	.0	.07	.21

122	.0	37.1	43.1	3632.4	.0	.0	.05	.20
123	.0	37.1	26.4	3632.4	.0	.0	.03	.19
124	.0	37.1	9.6	3632.4	.0	.0	.01	.18
125	.0	37.1	511.9	3632.4	.0	.0	.58	.49
126	.0	37.1	495.2	3632.4	.0	.0	.56	.48
127	.0	37.1	478.5	3632.4	.0	.0	.54	.47
128	.0	37.1	461.7	3632.4	.0	.0	.52	.46
129	.0	37.1	445.0	3632.4	.0	.0	.51	.45
130	.0	37.1	428.2	3632.4	.0	.0	.49	.44
131	.0	37.1	411.5	3632.4	.0	.0	.47	.43
132	.0	37.1	394.7	3632.4	.0	.0	.45	.42
133	.0	37.1	378.0	3632.4	.0	.0	.43	.41
134	.0	37.1	361.3	3632.4	.0	.0	.41	.40
135	.0	37.1	344.5	3632.4	.0	.0	.39	.39
136	.0	37.1	327.8	3632.4	.0	.0	.37	.37
137	.0	37.1	311.0	3632.4	.0	.0	.35	.36
138	.0	37.1	294.3	3632.4	.0	.0	.33	.35
139	.0	37.1	277.5	3632.4	.0	.0	.32	.34
140	.0	37.1	260.8	3632.4	.0	.0	.30	.33
141	.0	37.1	244.1	3632.4	.0	.0	.28	.32
142	.0	37.1	227.3	3632.4	.0	.0	.26	.31
143	.0	37.1	210.6	3632.4	.0	.0	.24	.30
144	.0	37.1	193.8	3632.4	.0	.0	.22	.29
145	.0	37.1	177.1	3632.4	.0	.0	.20	.28
146	.0	37.1	160.3	3632.4	.0	.0	.18	.27
147	.0	37.1	143.6	3632.4	.0	.0	.16	.26
148	.0	37.1	126.8	3632.4	.0	.0	.14	.25
149	.0	37.1	110.1	3632.4	.0	.0	.13	.24
150	.0	37.1	93.4	3632.4	.0	.0	.11	.23
151	.0	37.1	76.6	3632.4	.0	.0	.09	.22
152	.0	37.1	59.9	3632.4	.0	.0	.07	.21
153	.0	37.1	43.1	3632.4	.0	.0	.05	.20
154	.0	37.1	26.4	3632.4	.0	.0	.03	.19
155	.0	37.1	9.6	3632.4	.0	.0	.01	.18
156	.0	37.1	511.9	3632.4	.0	.0	.58	.49
157	.0	37.1	495.2	3632.4	.0	.0	.56	.48
158	.0	37.1	478.5	3632.4	.0	.0	.54	.47
159	.0	37.1	461.7	3632.4	.0	.0	.52	.46
160	.0	37.1	445.0	3632.4	.0	.0	.51	.45
161	.0	37.1	428.2	3632.4	.0	.0	.49	.44
162	.0	37.1	411.5	3632.4	.0	.0	.47	.43
163	.0	37.1	394.7	3632.4	.0	.0	.45	.42
164	.0	37.1	378.0	3632.4	.0	.0	.43	.41
165	.0	37.1	361.3	3632.4	.0	.0	.41	.40
166	.0	37.1	344.5	3632.4	.0	.0	.39	.39
167	.0	37.1	327.8	3632.4	.0	.0	.37	.37
168	.0	37.1	311.0	3632.4	.0	.0	.35	.36
169	.0	37.1	294.3	3632.4	.0	.0	.33	.35
170	.0	37.1	277.5	3632.4	.0	.0	.32	.34
171	.0	37.1	260.8	3632.4	.0	.0	.30	.33
172	.0	37.1	244.1	3632.4	.0	.0	.28	.32
173	.0	37.1	227.3	3632.4	.0	.0	.26	.31
174	.0	37.1	210.6	3632.4	.0	.0	.24	.30
175	.0	37.1	193.8	3632.4	.0	.0	.22	.29
176	.0	37.1	177.1	3632.4	.0	.0	.20	.28
177	.0	37.1	160.3	3632.4	.0	.0	.18	.27
178	.0	37.1	143.6	3632.4	.0	.0	.16	.26
179	.0	37.1	126.8	3632.4	.0	.0	.14	.25
180	.0	37.1	110.1	3632.4	.0	.0	.13	.24
181	.0	37.1	93.4	3632.4	.0	.0	.11	.23

182	.0	37.1	76.6	3632.4	.0	.0	.09	.22
183	.0	37.1	59.9	3632.4	.0	.0	.07	.21
184	.0	37.1	43.1	3632.4	.0	.0	.05	.20
185	.0	37.1	26.4	3632.4	.0	.0	.03	.19
186	.0	37.1	9.6	3632.4	.0	.0	.01	.18
187	.0	37.1	511.9	3632.4	.0	.0	.58	.49
188	.0	37.1	495.2	3632.4	.0	.0	.56	.48
189	.0	37.1	478.5	3632.4	.0	.0	.54	.47
190	.0	37.1	461.7	3632.4	.0	.0	.52	.46
191	.0	37.1	445.0	3632.4	.0	.0	.51	.45
192	.0	37.1	428.2	3632.4	.0	.0	.49	.44
193	.0	37.1	411.5	3632.4	.0	.0	.47	.43
194	.0	37.1	394.7	3632.4	.0	.0	.45	.42
195	.0	37.1	378.0	3632.4	.0	.0	.43	.41
196	.0	37.1	361.3	3632.4	.0	.0	.41	.40
197	.0	37.1	344.5	3632.4	.0	.0	.39	.39
198	.0	37.1	327.8	3632.4	.0	.0	.37	.37
199	.0	37.1	311.0	3632.4	.0	.0	.35	.36
200	.0	37.1	294.3	3632.4	.0	.0	.33	.35
201	.0	37.1	277.5	3632.4	.0	.0	.32	.34
202	.0	37.1	260.8	3632.4	.0	.0	.30	.33
203	.0	37.1	244.1	3632.4	.0	.0	.28	.32
204	.0	37.1	227.3	3632.4	.0	.0	.26	.31
205	.0	37.1	210.6	3632.4	.0	.0	.24	.30
206	.0	37.1	193.8	3632.4	.0	.0	.22	.29
207	.0	37.1	177.1	3632.4	.0	.0	.20	.28
208	.0	37.1	160.3	3632.4	.0	.0	.18	.27
209	.0	37.1	143.6	3632.4	.0	.0	.16	.26
210	.0	37.1	126.8	3632.4	.0	.0	.14	.25
211	.0	37.1	110.1	3632.4	.0	.0	.13	.24
212	.0	37.1	93.4	3632.4	.0	.0	.11	.23
213	.0	37.1	76.6	3632.4	.0	.0	.09	.22
214	.0	37.1	59.9	3632.4	.0	.0	.07	.21
215	.0	37.1	43.1	3632.4	.0	.0	.05	.20
216	.0	37.1	26.4	3632.4	.0	.0	.03	.19
217	.0	37.1	9.6	3632.4	.0	.0	.01	.18
218	.0	37.1	511.9	3632.4	.0	.0	.58	.49
219	.0	37.1	495.2	3632.4	.0	.0	.56	.48
220	.0	37.1	478.5	3632.4	.0	.0	.54	.47
221	.0	37.1	461.7	3632.4	.0	.0	.52	.46
222	.0	37.1	445.0	3632.4	.0	.0	.51	.45
223	.0	37.1	428.2	3632.4	.0	.0	.49	.44
224	.0	37.1	411.5	3632.4	.0	.0	.47	.43
225	.0	37.1	394.7	3632.4	.0	.0	.45	.42
226	.0	37.1	378.0	3632.4	.0	.0	.43	.41
227	.0	37.1	361.3	3632.4	.0	.0	.41	.40
228	.0	37.1	344.5	3632.4	.0	.0	.39	.39
229	.0	37.1	327.8	3632.4	.0	.0	.37	.37
230	.0	37.1	311.0	3632.4	.0	.0	.35	.36
231	.0	37.1	294.3	3632.4	.0	.0	.33	.35
232	.0	37.1	277.5	3632.4	.0	.0	.32	.34
233	.0	37.1	260.8	3632.4	.0	.0	.30	.33
234	.0	37.1	244.1	3632.4	.0	.0	.28	.32
235	.0	37.1	227.3	3632.4	.0	.0	.26	.31
236	.0	37.1	210.6	3632.4	.0	.0	.24	.30
237	.0	37.1	193.8	3632.4	.0	.0	.22	.29
238	.0	37.1	177.1	3632.4	.0	.0	.20	.28
239	.0	37.1	160.3	3632.4	.0	.0	.18	.27
240	.0	37.1	143.6	3632.4	.0	.0	.16	.26
241	.0	37.1	126.8	3632.4	.0	.0	.14	.25

242	.0	37.1	110.1	3632.4	.0	.0	.13	.24
243	.0	37.1	93.4	3632.4	.0	.0	.11	.23
244	.0	37.1	76.6	3632.4	.0	.0	.09	.22
245	.0	37.1	59.9	3632.4	.0	.0	.07	.21
246	.0	37.1	43.1	3632.4	.0	.0	.05	.20
247	.0	37.1	26.4	3632.4	.0	.0	.03	.19
248	.0	37.1	9.6	3632.4	.0	.0	.01	.18
249	.0	37.1	511.9	3632.4	.0	.0	.58	.49
250	.0	37.1	495.2	3632.4	.0	.0	.56	.48
251	.0	37.1	478.5	3632.4	.0	.0	.54	.47
252	.0	37.1	461.7	3632.4	.0	.0	.52	.46
253	.0	37.1	445.0	3632.4	.0	.0	.51	.45
254	.0	37.1	428.2	3632.4	.0	.0	.49	.44
255	.0	37.1	411.5	3632.4	.0	.0	.47	.43
256	.0	37.1	394.7	3632.4	.0	.0	.45	.42
257	.0	37.1	378.0	3632.4	.0	.0	.43	.41
258	.0	37.1	361.3	3632.4	.0	.0	.41	.40
259	.0	37.1	344.5	3632.4	.0	.0	.39	.39
260	.0	37.1	327.8	3632.4	.0	.0	.37	.37
261	.0	37.1	311.0	3632.4	.0	.0	.35	.36
262	.0	37.1	294.3	3632.4	.0	.0	.33	.35
263	.0	37.1	277.5	3632.4	.0	.0	.32	.34
264	.0	37.1	260.8	3632.4	.0	.0	.30	.33
265	.0	37.1	244.1	3632.4	.0	.0	.28	.32
266	.0	37.1	227.3	3632.4	.0	.0	.26	.31
267	.0	37.1	210.6	3632.4	.0	.0	.24	.30
268	.0	37.1	193.8	3632.4	.0	.0	.22	.29
269	.0	37.1	177.1	3632.4	.0	.0	.20	.28
270	.0	37.1	160.3	3632.4	.0	.0	.18	.27
271	.0	37.1	143.6	3632.4	.0	.0	.16	.26
272	.0	37.1	126.8	3632.4	.0	.0	.14	.25
273	.0	37.1	110.1	3632.4	.0	.0	.13	.24
274	.0	37.1	93.4	3632.4	.0	.0	.11	.23
275	.0	37.1	76.6	3632.4	.0	.0	.09	.22
276	.0	37.1	59.9	3632.4	.0	.0	.07	.21
277	.0	37.1	43.1	3632.4	.0	.0	.05	.20
278	.0	37.1	26.4	3632.4	.0	.0	.03	.19
279	.0	37.1	9.6	3632.4	.0	.0	.01	.18
280	.0	37.1	511.9	3632.4	.0	.0	.58	.49
281	.0	37.1	495.2	3632.4	.0	.0	.56	.48
282	.0	37.1	478.5	3632.4	.0	.0	.54	.47
283	.0	37.1	461.7	3632.4	.0	.0	.52	.46
284	.0	37.1	445.0	3632.4	.0	.0	.51	.45
285	.0	37.1	428.2	3632.4	.0	.0	.49	.44
286	.0	37.1	411.5	3632.4	.0	.0	.47	.43
287	.0	37.1	394.7	3632.4	.0	.0	.45	.42
288	.0	37.1	378.0	3632.4	.0	.0	.43	.41
289	.0	37.1	361.3	3632.4	.0	.0	.41	.40
290	.0	37.1	344.5	3632.4	.0	.0	.39	.39
291	.0	37.1	327.8	3632.4	.0	.0	.37	.37
292	.0	37.1	311.0	3632.4	.0	.0	.35	.36
293	.0	37.1	294.3	3632.4	.0	.0	.33	.35
294	.0	37.1	277.5	3632.4	.0	.0	.32	.34
295	.0	37.1	260.8	3632.4	.0	.0	.30	.33
296	.0	37.1	244.1	3632.4	.0	.0	.28	.32
297	.0	37.1	227.3	3632.4	.0	.0	.26	.31
298	.0	37.1	210.6	3632.4	.0	.0	.24	.30
299	.0	37.1	193.8	3632.4	.0	.0	.22	.29
300	.0	37.1	177.1	3632.4	.0	.0	.20	.28
301	.0	37.1	160.3	3632.4	.0	.0	.18	.27

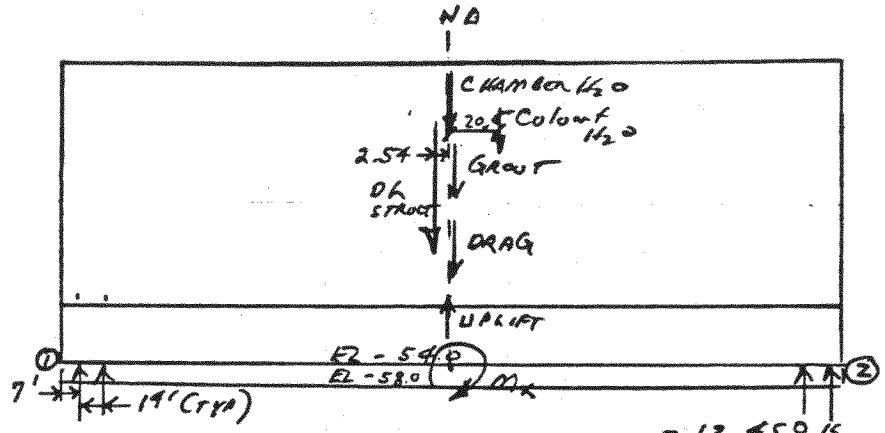
302	.0	37.1	143.6	3632.4	.0	.0	.16	.26
303	.0	37.1	126.8	3632.4	.0	.0	.14	.25
304	.0	37.1	110.1	3632.4	.0	.0	.13	.24
305	.0	37.1	93.4	3632.4	.0	.0	.11	.23
306	.0	37.1	76.6	3632.4	.0	.0	.09	.22
307	.0	37.1	59.9	3632.4	.0	.0	.07	.21
308	.0	37.1	43.1	3632.4	.0	.0	.05	.20
309	.0	37.1	26.4	3632.4	.0	.0	.03	.19
310	.0	37.1	9.6	3632.4	.0	.0	.01	.18
311	.0	37.1	511.9	3632.4	.0	.0	.58	.49
312	.0	37.1	495.2	3632.4	.0	.0	.56	.48
313	.0	37.1	478.5	3632.4	.0	.0	.54	.47
314	.0	37.1	461.7	3632.4	.0	.0	.52	.46
315	.0	37.1	445.0	3632.4	.0	.0	.51	.45
316	.0	37.1	428.2	3632.4	.0	.0	.49	.44
317	.0	37.1	411.5	3632.4	.0	.0	.47	.43
318	.0	37.1	394.7	3632.4	.0	.0	.45	.42
319	.0	37.1	378.0	3632.4	.0	.0	.43	.41
320	.0	37.1	361.3	3632.4	.0	.0	.41	.40
321	.0	37.1	344.5	3632.4	.0	.0	.39	.39
322	.0	37.1	327.8	3632.4	.0	.0	.37	.37
323	.0	37.1	311.0	3632.4	.0	.0	.35	.36
324	.0	37.1	294.3	3632.4	.0	.0	.33	.35
325	.0	37.1	277.5	3632.4	.0	.0	.32	.34
326	.0	37.1	260.8	3632.4	.0	.0	.30	.33
327	.0	37.1	244.1	3632.4	.0	.0	.28	.32
328	.0	37.1	227.3	3632.4	.0	.0	.26	.31
329	.0	37.1	210.6	3632.4	.0	.0	.24	.30
330	.0	37.1	193.8	3632.4	.0	.0	.22	.29
331	.0	37.1	177.1	3632.4	.0	.0	.20	.28
332	.0	37.1	160.3	3632.4	.0	.0	.18	.27
333	.0	37.1	143.6	3632.4	.0	.0	.16	.26
334	.0	37.1	126.8	3632.4	.0	.0	.14	.25
335	.0	37.1	110.1	3632.4	.0	.0	.13	.24
336	.0	37.1	93.4	3632.4	.0	.0	.11	.23
337	.0	37.1	76.6	3632.4	.0	.0	.09	.22
338	.0	37.1	59.9	3632.4	.0	.0	.07	.21
339	.0	37.1	43.1	3632.4	.0	.0	.05	.20
340	.0	37.1	26.4	3632.4	.0	.0	.03	.19
341	.0	37.1	9.6	3632.4	.0	.0	.01	.18
342	.0	37.1	511.9	3632.4	.0	.0	.58	.49
343	.0	37.1	495.2	3632.4	.0	.0	.56	.48
344	.0	37.1	478.5	3632.4	.0	.0	.54	.47
345	.0	37.1	461.7	3632.4	.0	.0	.52	.46
346	.0	37.1	445.0	3632.4	.0	.0	.51	.45
347	.0	37.1	428.2	3632.4	.0	.0	.49	.44
348	.0	37.1	411.5	3632.4	.0	.0	.47	.43
349	.0	37.1	394.7	3632.4	.0	.0	.45	.42
350	.0	37.1	378.0	3632.4	.0	.0	.43	.41
351	.0	37.1	361.3	3632.4	.0	.0	.41	.40
352	.0	37.1	344.5	3632.4	.0	.0	.39	.39
353	.0	37.1	327.8	3632.4	.0	.0	.37	.37
354	.0	37.1	311.0	3632.4	.0	.0	.35	.36
355	.0	37.1	294.3	3632.4	.0	.0	.33	.35
356	.0	37.1	277.5	3632.4	.0	.0	.32	.34
357	.0	37.1	260.8	3632.4	.0	.0	.30	.33
358	.0	37.1	244.1	3632.4	.0	.0	.28	.32
359	.0	37.1	227.3	3632.4	.0	.0	.26	.31
360	.0	37.1	210.6	3632.4	.0	.0	.24	.30
361	.0	37.1	193.8	3632.4	.0	.0	.22	.29

362	.0	37.1	177.1	3632.4	.0	.0	.20	.28
363	.0	37.1	160.3	3632.4	.0	.0	.18	.27
364	.0	37.1	143.6	3632.4	.0	.0	.16	.26
365	.0	37.1	126.8	3632.4	.0	.0	.14	.25
366	.0	37.1	110.1	3632.4	.0	.0	.13	.24
367	.0	37.1	93.4	3632.4	.0	.0	.11	.23
368	.0	37.1	76.6	3632.4	.0	.0	.09	.22
369	.0	37.1	59.9	3632.4	.0	.0	.07	.21
370	.0	37.1	43.1	3632.4	.0	.0	.05	.20
371	.0	37.1	26.4	3632.4	.0	.0	.03	.19
372	.0	37.1	9.6	3632.4	.0	.0	.01	.18
373	.0	37.1	511.9	3632.4	.0	.0	.58	.49
374	.0	37.1	495.2	3632.4	.0	.0	.56	.48
375	.0	37.1	478.5	3632.4	.0	.0	.54	.47
376	.0	37.1	461.7	3632.4	.0	.0	.52	.46
377	.0	37.1	445.0	3632.4	.0	.0	.51	.45
378	.0	37.1	428.2	3632.4	.0	.0	.49	.44
379	.0	37.1	411.5	3632.4	.0	.0	.47	.43
380	.0	37.1	394.7	3632.4	.0	.0	.45	.42
381	.0	37.1	378.0	3632.4	.0	.0	.43	.41
382	.0	37.1	361.3	3632.4	.0	.0	.41	.40
383	.0	37.1	344.5	3632.4	.0	.0	.39	.39
384	.0	37.1	327.8	3632.4	.0	.0	.37	.37
385	.0	37.1	311.0	3632.4	.0	.0	.35	.36
386	.0	37.1	294.3	3632.4	.0	.0	.33	.35
387	.0	37.1	277.5	3632.4	.0	.0	.32	.34
388	.0	37.1	260.8	3632.4	.0	.0	.30	.33
389	.0	37.1	244.1	3632.4	.0	.0	.28	.32
390	.0	37.1	227.3	3632.4	.0	.0	.26	.31
391	.0	37.1	210.6	3632.4	.0	.0	.24	.30
392	.0	37.1	193.8	3632.4	.0	.0	.22	.29
393	.0	37.1	177.1	3632.4	.0	.0	.20	.28
394	.0	37.1	160.3	3632.4	.0	.0	.18	.27
395	.0	37.1	143.6	3632.4	.0	.0	.16	.26
396	.0	37.1	126.8	3632.4	.0	.0	.14	.25
397	.0	37.1	110.1	3632.4	.0	.0	.13	.24
398	.0	37.1	93.4	3632.4	.0	.0	.11	.23
399	.0	37.1	76.6	3632.4	.0	.0	.09	.22
400	.0	37.1	59.9	3632.4	.0	.0	.07	.21
401	.0	37.1	43.1	3632.4	.0	.0	.05	.20
402	.0	37.1	26.4	3632.4	.0	.0	.03	.19
403	.0	37.1	9.6	3632.4	.0	.0	.01	.18

COMPUTATION SHEET

PROJECT	Pile Foundation	PAGE 20 OF 20	COMPUTED BY	DATE 9/95
SUBJECT	Gate Bay Module / Rigid Base / 2A		CHECKED BY	DATE

Load Case 2A - Rigid Base
Piles "Grouted to" Base



D.S. Structure = 331,600 K Culvert H_2O

ΣP_z = 308,600 K (see CPGA Input)

$\Sigma M_x = (331,600 \times -25.4) + (13,450 \times 20.5)$

$= -567,600$ 'K

$\sigma = \frac{P}{A} \pm \frac{Mc}{I}$ where $A = 180 \times 43' = 78,120$ ft²

$I = \frac{180 \times 43^3}{12} = 1,226 \times 10^6$

$c = 21.7'$

$\sigma_1 = \frac{308,600}{78,120} + \frac{567,600 \times 21.7}{1,226 \times 10^6}$

$= 3.95 + 0.10 = 4.05$ KSF

$\sigma_2 = 3.95 - 0.10 = 3.85$ KSF

Pile Reaction Map $= \frac{4.05 \times 14' \times 180}{13} = 785$ kips

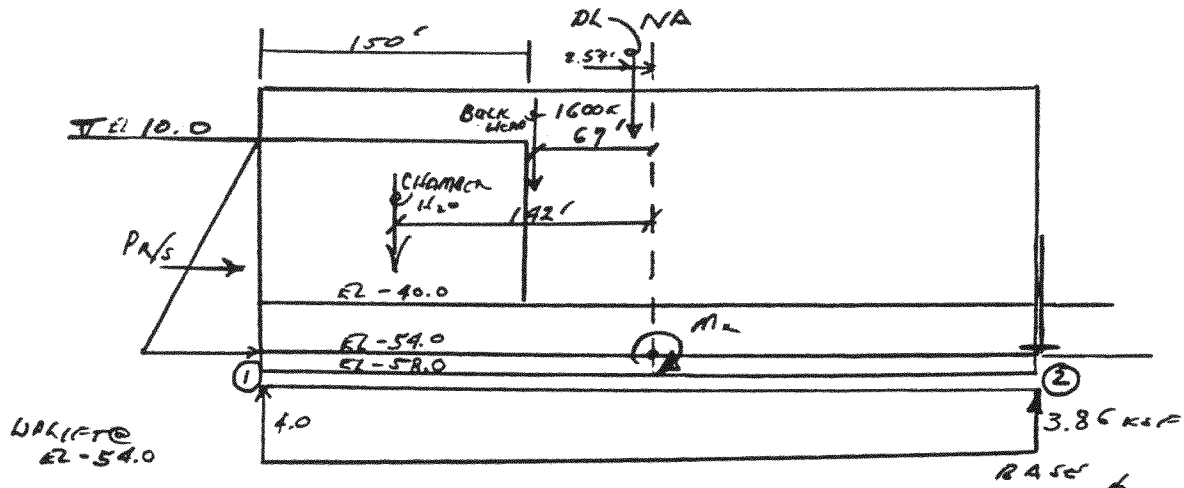
125% => $785 \times 1.3 / 180 = 56.7$ K/LF

42' End Wall $\times 56.7 \times 1.25 / 3.5$ piles $= 851$ kips < 880K capacity

COMPUTATION SHEET

PROJECT	Pile Foundation	PAGE 21 OF	COMPUTED BY MR	DATE 9/96
SUBJECT	Gatebay Module / Rigid Base / 3B		CHECKED BY	DATE

Load Case 3B Maintenance Dewater



$A = 78,120\ \text{in}^2$

$I_x = 1,226 \times 10^6$

$\Sigma DL = 331,600$

$\Sigma P_z = DL_{\text{struct}} + \text{Bulk Heads} + \text{Chamber } H_2O + \text{Grout} - \text{Uplift}$

$= 331,600 + 1600 + (50 \times 0.0625 \times 110 \times 150) + (4 \times (0.15 - 0.0625) 180 \times 434) - (3.86 \times 180 \times 434) - (0.1\tfrac{1}{2} \times 180 \times 434)$

$= 331,600 + 1600 + 51,560 + 27,340 - 30,540 - 5490$

$= 105,080\ k$

$\Sigma P_y = P_{w/s} = \frac{64^2}{2} \times 0.0625 \times 180 = 23,040\ k \rightarrow$

$\Sigma M_x = (331,600 \times (-) 2.54) + (1600 \times (-) 67) + (51,560 \times -142) + 0 + (5,490 \times 72.33) + (23,040 \times 21.33)$

$= -8,270,980 + 887,090 = -7,384,000$

$\sigma_1 = \frac{105,080}{78,120} + \frac{7,384,000 \times 21.7}{1,226 \times 10^6}$

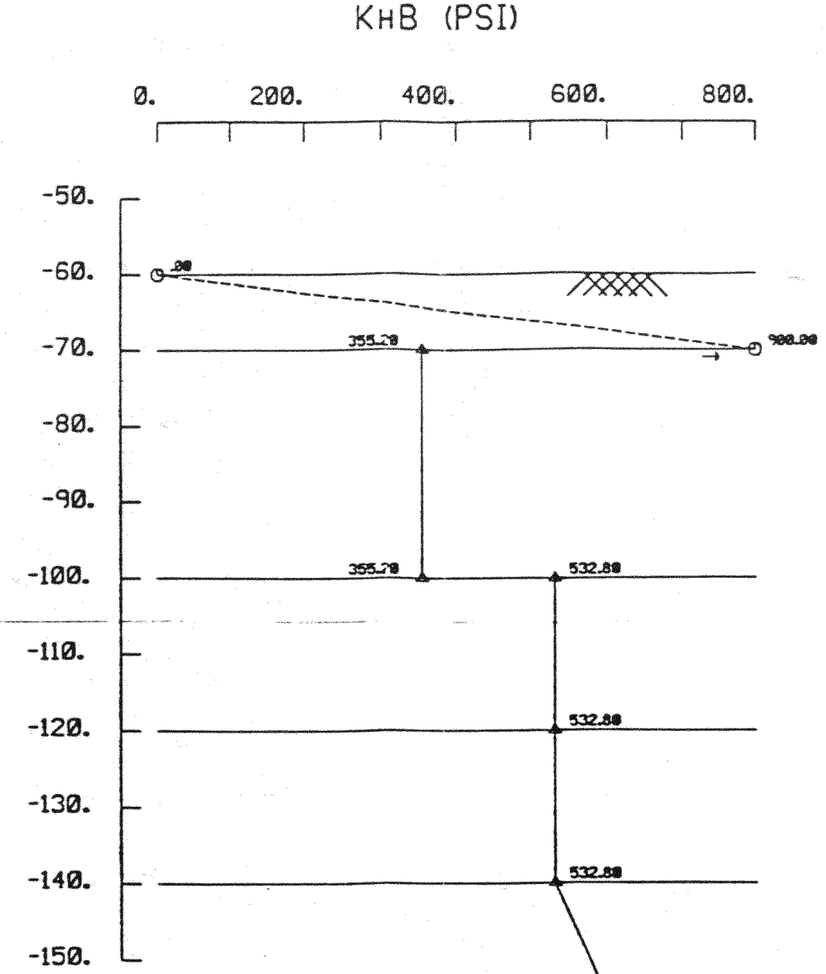
$= 1.35 + 1.30 = 2.65\ ksf$

$\sigma_2 = 1.35 - 1.30 = 0.05\ ksf$

Min. Compression $= 0.05 \times 14 \times \frac{180}{12} = 10\ \text{kips}$ comp

SF

00. 6000.



DIRECTION NG
NDITION
DING
ADING

NOTES: KH = $\alpha K1/B = (0.2222qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k1 = Modulue of subgrade reaction for test plate (pci)

B1 = Width or diameter of test plate (in)

K1 = k1B1 = 80qu(pcf) = 0.5556qu(psi)

qu = 2 c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

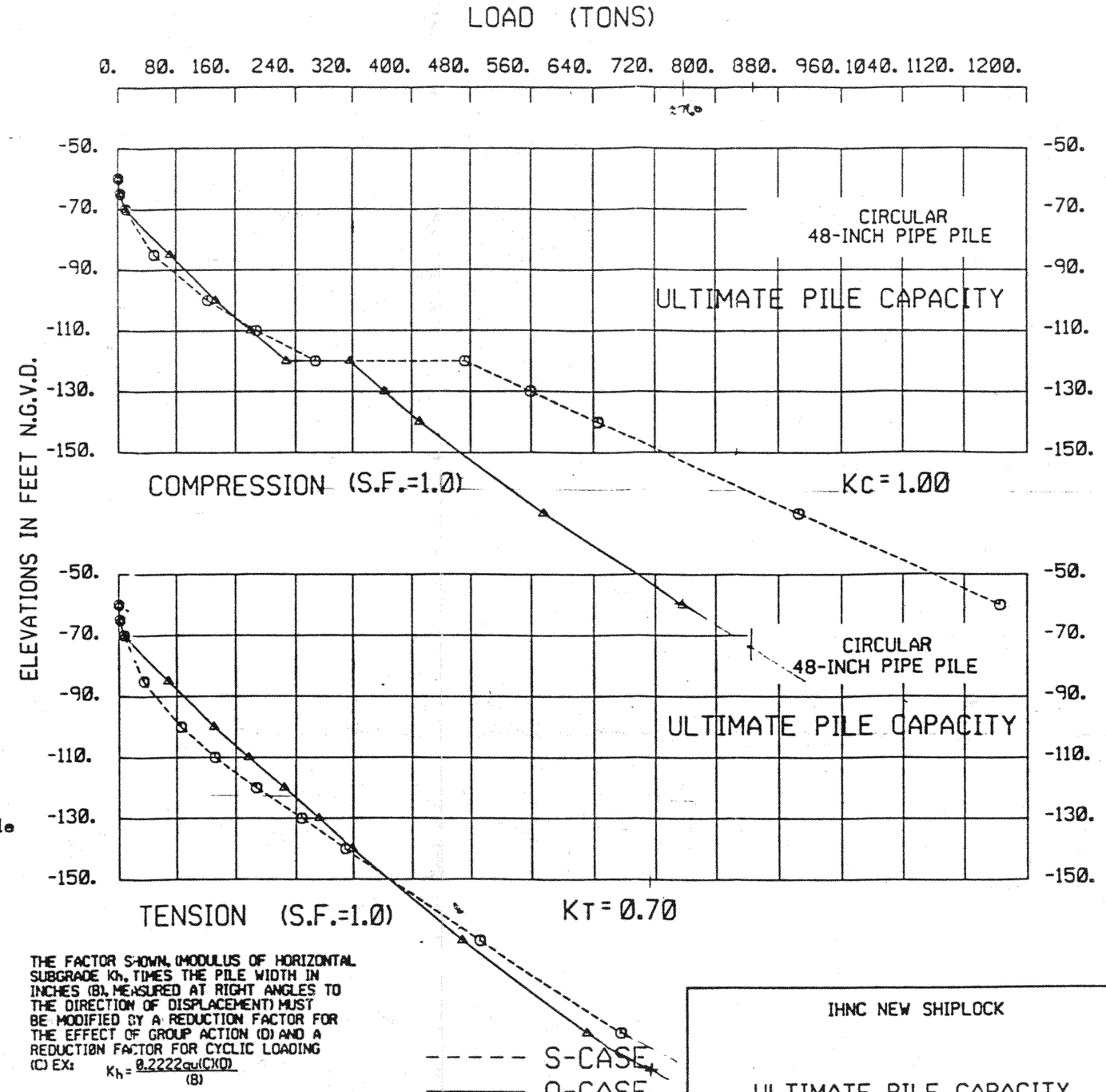
D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

KH = (nh)(Z/B)(C)(D) COHESIONLESS

nh = Coeficient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)



THE FACTOR SHOWN, (MODULUS OF HORIZONTAL SUBGRADE Kh, TIMES THE PILE WIDTH IN INCHES (B), MEASURED AT RIGHT ANGLES TO THE DIRECTION OF DISPLACEMENT) MUST BE MODIFIED BY A REDUCTION FACTOR FOR THE EFFECT OF GROUP ACTION (D) AND A REDUCTION FACTOR FOR CYCLIC LOADING (C) EX: $K_h = \frac{0.2222qu(C)(D)}{(B)}$

A F.S. = 3.0 is Recommended If No Pile Test Are Performed
With Pile Test Results, A F.S. = 2.0 is Recommended

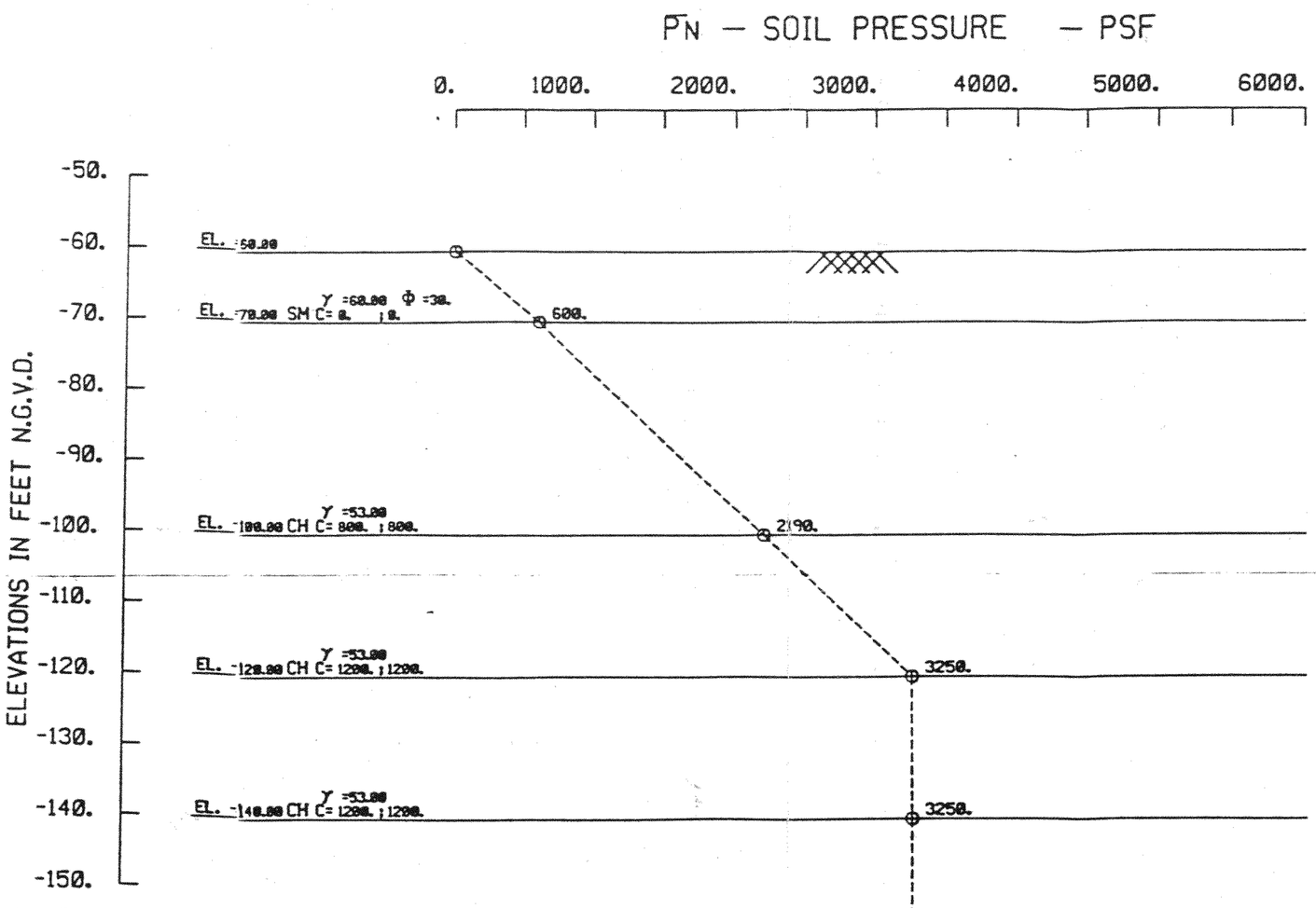
IHNC NEW SHIPLOCK

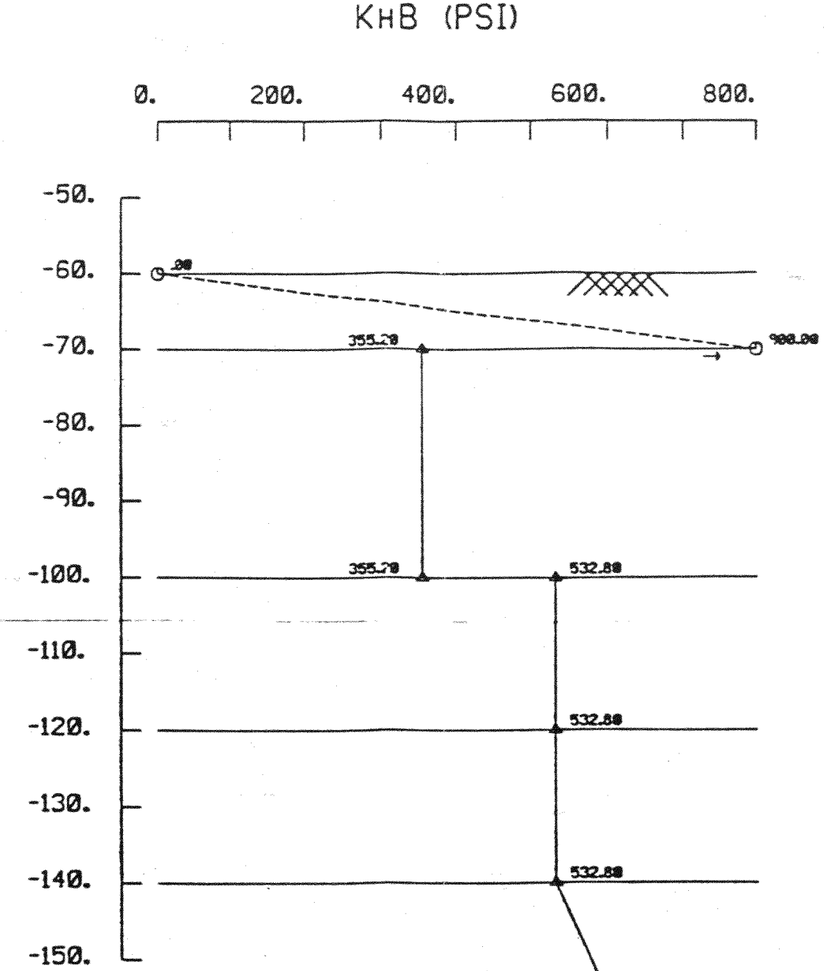
ULTIMATE PILE CAPACITY

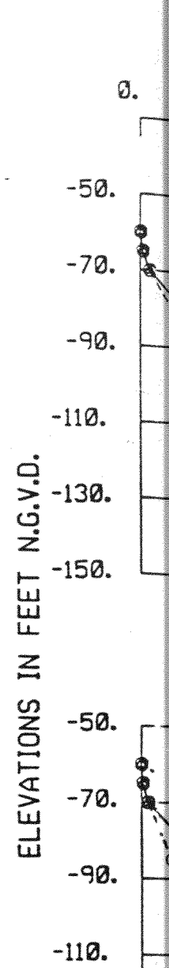
48-INCH PIPE PILE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS

NEW ORLEANS
MAY 96







S-CASE

CH,CL- Φ=23°

ML- Φ=28°

SM,SP- Φ=30°

CH

γ = 53.00

EL. -200 C= 1200 ; 1800

TYPICAL SOIL PROFILE

SOIL STRATIFICATION IS BASED ON GEOLOGIC PROFILE

SHEAR STRENGTH AND WET DENSITIES SEE PLATE

SECOND ORDER STATIONS

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
.85	7B
.70	6B
.55	5B
.40	4B
.25	3B

C	LOADING CONDITION
1.00	INITIAL LOADING
0.30	CYCLIC LOADING

NOTES: KH = $\alpha K1/B = (0.2222qu/B)(C)(D)$ COHESIVE

α = 0.4 = Factor of material properties of soil and pile

k1 = Modulus of subgrade reaction for test plate (pci)

B1 = Width or diameter of test plate (in)

K1 = k1B1 = 80qu(pcf) = 0.5556qu(psi)

qu = 2 c = Unconfined compressive strength (psf)

C = Reduction for cyclic loading-not applicable

D = Group effect reduction factor

B = Width of pile measured at right angles to the direction of displacement (in)

KH = (nh)(Z/B)(C)(D) COHESIONLESS

nh = Coefficient of horizontal subgrade reaction (pci)

Z = Depth below equivalent ground surface (in)

THE FACTOR S
SUBGRADE Kh, T
INCHES (B), MEA
THE DIRECTION
BE MODIFIED B
THE EFFECT OF
REDUCTION FA
(C) EX: Kh =

A F.S. = 3.0
With Pile Te

TENSION PILES

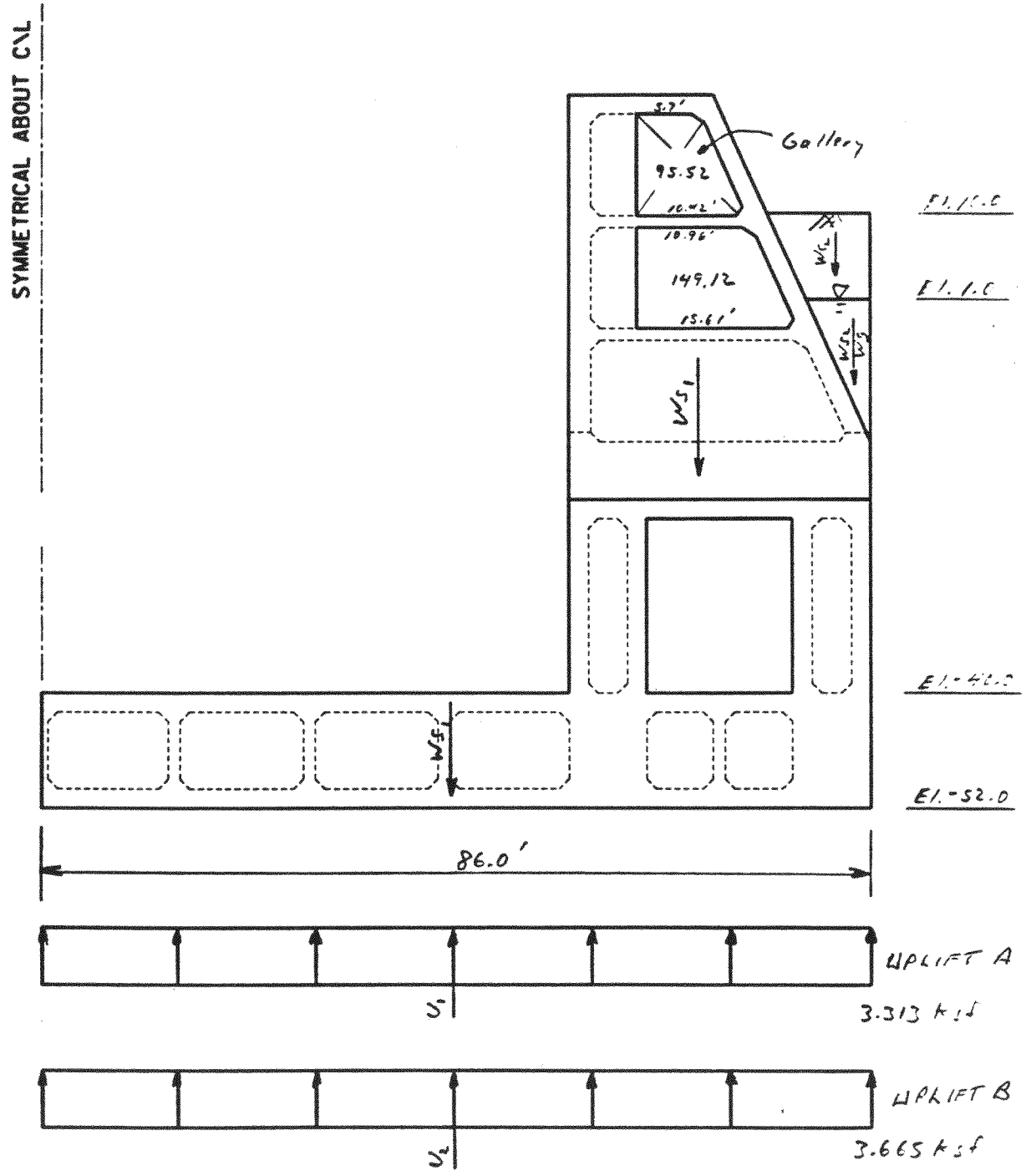
TENSION PILE

The U-Frame foundation does not experience a net tension. The tension piles are included to achieve the required factors of safety against flotation. The anchors are adequate to provide a pinned support for the chamber base when analyzed as fixed at the walls with the uplift acting on the 110 chamber span. The tension pile locations are shown on Plate B-24A, the connection details are shown on Plate B-24B.

Except for the maintenance dewatering, the factor of safety against flotation for all other load cases equals or exceeds the minimum specified.

LOAD CASE 3 (MAINTENANCE DEWATERING)
RS = 10.0, LS = 1.0
FLOTATION (UNGROUTED) *

* Grout pad assumed not bonded to precast unit.



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Total Dead Load of Chamber Module per 14' Section (DL_{CM})

(Taken fom pile design input)

$DL_{CM} = DL_{GRAV} + DL_{GALV} + DL_{SOIL}$

$= 5821 \text{ kips} + 3302 \text{ kips} + 420 \text{ kips}$

$= 9543 \text{ kips}$

CHAMBER UPLIFT LOADS

Uplift per 14' Section (UL_{GB})

Load Case

1. Riverside El. 10.0
   Lakeside El. 1.0 Uplift B

2. Riverside El. 10.0
   Lakeside El. 3.0 Uplift B (Extreme Condition)

The tension anchors are designed to provide a minimum Factor of Safety equal to 1.3 for the Maintenance Dewatering Case. The anchors and pile capacity shall also be adequate to provide a pinned support for the base chamber section at the module riverside end. Also, the Factor of Safety for the extreme load case is determined.

Load Case 1 Uplift

H_{avg} = El. 10 - [((El. 10 - El. 1)/1760') X (434'+(446'/2))]
= El. 6.64
Height = (El. 6.64 - El. -52)
= 58.64'
Uplift Pressure = 58.64' X 0.0625 kcf
= 3.66 ksf
Uplift Force = 3.66 ksf X 14' X 172'
= 8825 kips
Factored Uplift = 1.3 X 8825 kips
= 11,472 kips
Required Tension Force
= 11,472k - 9543k = 1930 kips/row

IHNC Lock Replacement

Designed by: P.J.S.
Checked by: MR

Pile Determination - Maintenance Dewatering, Load Case 3
Chamber: No Water
Tailwater: EL. 1.00

Concrete Weight:									
Float-in segment:	1386.00 sf (CADD)	x	14.00 ' strip	x	0.15 =	2910.60	x 2 (other half) =	5821	kips
Grout:	4.00 ft	x	14.00 ' strip	x	172.00 ft x 0.1500 =		=	1445	kips
Walls:	786.12 sf (CADD)	x	14.00 ' strip	x	0.15 =	1650.85	x 2 (other half) =	3302	kips
Water:									
	0.00 ft	x	14.00 ' strip	x	110.00 ft x 0.0625 =		=	0	kips
	0.00 sf	x	14.00 ' strip	x	0.0625 =	0.00	x 2 (other half) =	0	kips
Soil:									
Soil with water:	124.83 sf (CADD)	x	14.00 ' strip	x	0.12 =	209.71	x 2 (other half) =	419	kips
Uplift:									
Tailwater @ El. 1.0: Headwater @ EL. 10.0	3.92 ks (.5(3.84+3.99))	x	14.00 ' strip	x	172.00 ft		=	-9427	kips
							Total weight:	1560	kips

Distribute 1560 kips over 172.0 ft: 1560 / 172 = 9.07 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 9.07 kips/ft x 1.25 = 11.34 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 11.34 = 997.55 kips

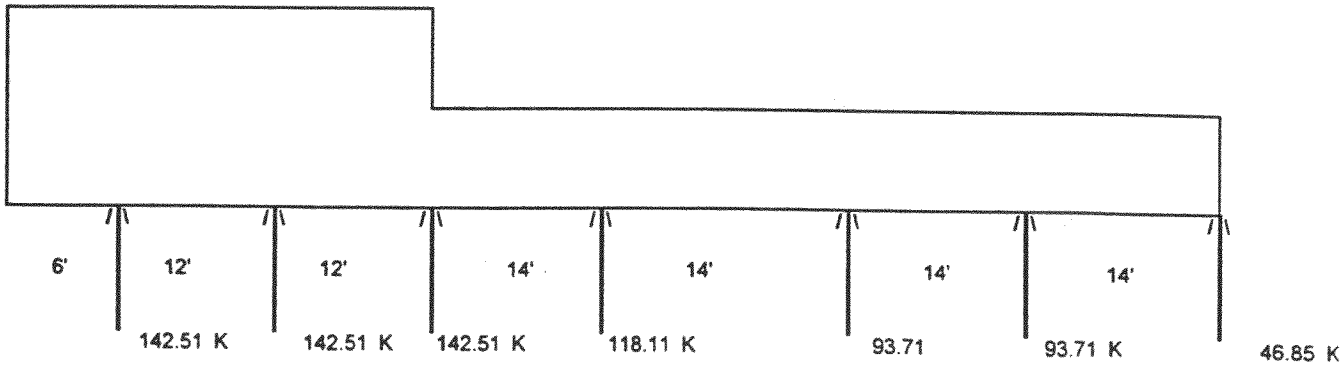
therefore, remaining 84' of monolith will have load of:[(9.07 x 172.00) 997.55] / 84 = 6.69 kips/ft

For 44.00 ft on each end: 88.00 ft x 11.34 / 7.0 piles = 142.51 kips/pile

Using a factor of safety = 2.0, this equates to **142.51 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 6.69 / 6.0 piles = 93.71 kips/pile

Using a factor of safety = 2.0, this equates to **93.71 tons/pile**



TENSION PILE DESIGN

- 3 tension piles per pile row

- 4 tension anchor bars per pile

- Anchor bars ASTM A 687 (fpu = 150 ksi, fy = 105 ksi)

- Allowable Tension Pile Capacity w/ F.S. = 1.5 = 940 kips per pile (See Pile Curve)

- Anchor Permissible Overstress = 1.33

Pile Tension Capacity = 1930 kips/row
= 1930/3 piles per row
= 645 kips/pile < 940 kips available pile capacity

Design connection to resist maximum uplift at the riverside end of the module. This assures that the connection is adequate to act as a pinned support for the base analysis. The Upstream tension connections have a load of 27.11 ksf X 28' = 760 kips.

760 kips/pile < 940 kips available pile capacity

Tension Anchor Design Load = 760 kips / 4 anchors
= 190.00 kips per

Allowable Tension of Anchor Bar (F_t)

F_t = 0.33 F_u (1.33) (per A.I.S.C. Table 1-A)
F_u = 150 ksi
F_t = 0.33 X 150 ksi X 1.33
= 65.84 ksi

Anchor Load = 190.00 kips

Required Area = 190.00 kips / 65.84 ksi
= 2.89 in^2

Anchor Diameter (D)

Area = Π $(D/2)^2$

2.89 in^2 = Π $(D/2)^2$

D = 1.92 in. Use 2 in. Bars

DEVELOPMENT LENGTH (l_d)

Assumptions

1. Coarse threads of threaded anchor rod approximate the grip of a deformed bar (to be test verified)

2. The 2 inch diameter bar ≈ #16 bar, therefore the development length of the #14 bar and #18 bar specified in ACI 318, para 12.2.2 will be averaged.

Development Length

$l_d = (0.085 + 0.125)/2 \; f_y / \sqrt{f'_c}$

f_y = 105,000 psi

f'_c = 4000 psi

$l_d = 0.105(105{,}000 \text{ psi}) / \sqrt{4000}$

= 14.53'

= 14'-6" ← **GOVERNS**

$l_{dmin} = 0.03 \; d_b \; f_y \; / \sqrt{f'_c}$ per ACI 318, 12.2.3.6

d_b = 2 in.

l_{dmin} = 0.03 (2 in.) (105,000 psi) / √4000

= 8'-4"

Check Extreme Loading - Load Case 2

H_{avg} = El. 10 - [((El. 10 - El. 3)/1760') X (434'+(446'/2))]

= El. 7.40

Height = (El. 7.4 - El. -52)

= 59.4'

Uplift Pressure = 59.4' X 0.0625 kcf

= 3.71 ksf

Uplift Force = 3.71 ksf X 14' X 172'

= 8934 kips

Available Capacity

Maximum Tension Pile Capacity

Bolt Capacity = $3.14in^2$ X 65.8 ksi = 206 Kips/Bolt

Pile Capacity = 206 X 4 = 824k > 760 Kips

= Dead Load + Pile Capacity

= 9543 + 3(760) = 11823 Kips

F.S. extreme = 11823/8934

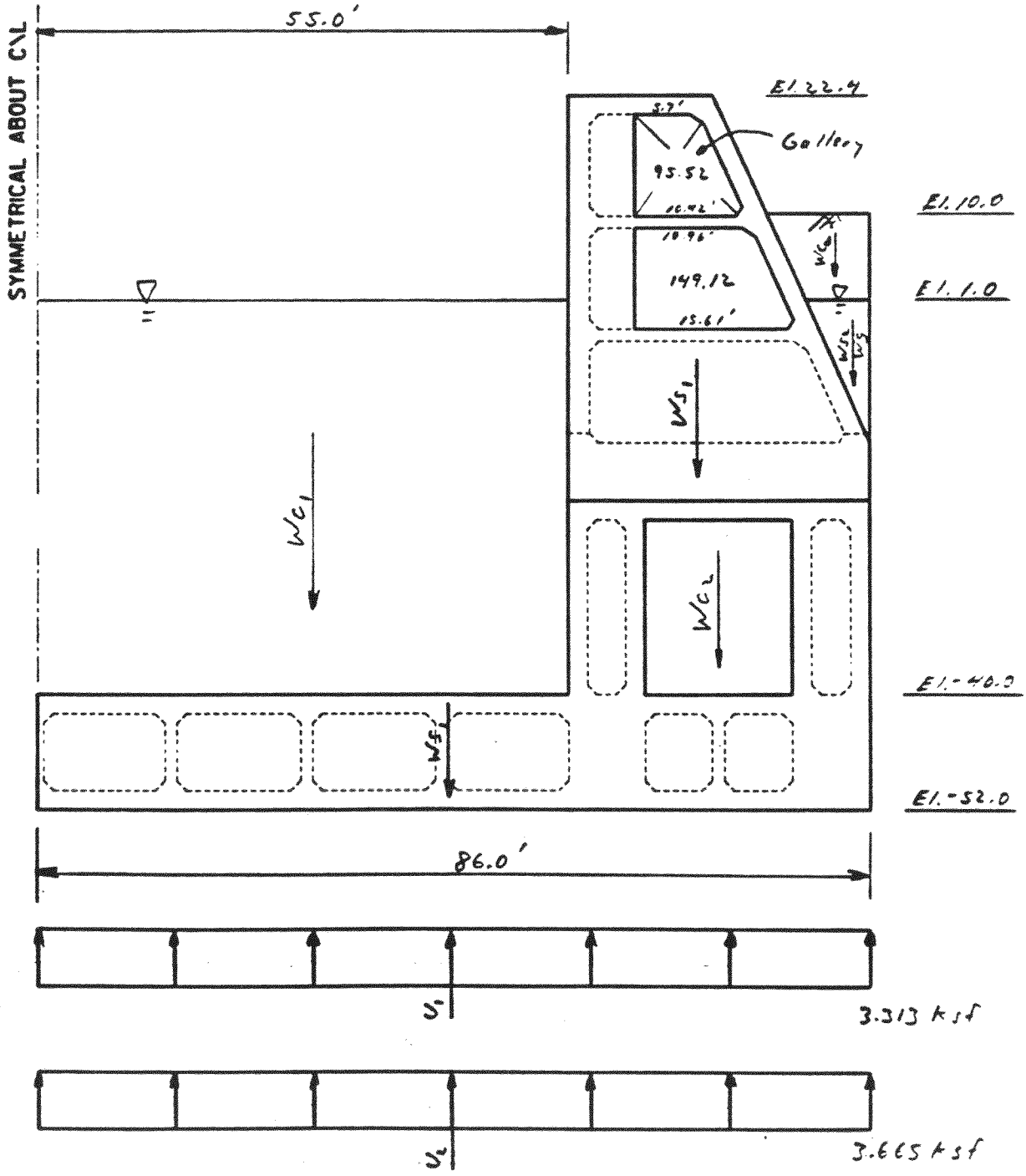
= 1.32

LOAD CASE 1 (NORMAL OPERATION)

RS = 10.0, LS = 1.0

FLOTATION (UNBONDED)*

* Grout pad assumed not bonded to precast unit.



PROJECT	PAGE 8 OF 15	COMPUTED BY OCB	DATE 6/96
SUBJECT		CHECKED BY	DATE

FLOTATION - CASE 1 (NORMAL OPERATION)

Concrete (WS_1)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0$ ft.^{2} (exact)

$W = 1386.0\,(14.0)\,(.15) = \underline{2,910.6}$ ↑

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81$ ft.^{2}

$W_v = 772.81\,(14.0)\,(.15) = \underline{1622.9}$ ↑

$A_o = 149.12$ ft.^{2}

$V_o = 149.12\,(1.25) = 186.4$ ft.^{3}

$V_L = .5\,(1.0)\,(1.0)\,(2)\,(6.2 + 10.72 + 11.46 + 16.11) = 44.69$ ft.^{3}

$W_{oc} = (186.4 + 44.69)\,.15 = \underline{34.7}$ ↑

TOTAL CONCRETE (WS_1) = $\underline{4568.2}$ ↑

Backfill (WS_2)

Saturated Soil (El. 10.0 to 1.0)

$A = 76.68$ ft.^{2}

$W = 76.68\,(14.0)\,(.120) = \underline{128.8}$ ↑

Submerged Soil (El. -13.75 to 1.0)

$A = 48.15$ ft.^{2}

$W = 48.15\,(14.0)\,(.0575) = \underline{38.8}$ ↑

TOTAL BACKFILL (WS_2) = $\underline{167.6}$ ↑

COMPUTATION SHEET

PROJECT	PAGE 9 OF 15	COMPUTED BY OCB	DATE 6/96
SUBJECT		CHECKED BY [illegible]	DATE

Water (W_c)

Operator Controled

$A = 41.0(55.0) + 18.25(15.0) = 2{,}528.75\ ft.^2$

$W = 2528.75(14.0)(.0625) = \underline{\underline{2{,}212.7^k}}$

Water (W_g)

Gravity Controled

$A = 48.15\ ft.^2$

$W = 48.15(14.0)(.0625) = \underline{\underline{42.1^k}}$

Uplift-1 (U_1)

$U_1 = 3.313(86.0)(14.0) = \underline{\underline{3988.9^k}}$

Uplift-2 (U_2)

$U_2 = .5(3.594 + 3.736)(86.0)(14.0) = \underline{\underline{4{,}412.7}}$

FACTORS OF SAFETY

CASE 1-1

$$FS = \frac{4568.2 + 167.6 + 2212.7}{3988.9 - 42.1}$$

$FS = \underline{1.76}$

CASE 1-2

$$FS = \frac{4568.2 + 167.6 + 2212.7}{4412.7 - 42.1}$$

$FS = \underline{1.59}$ *

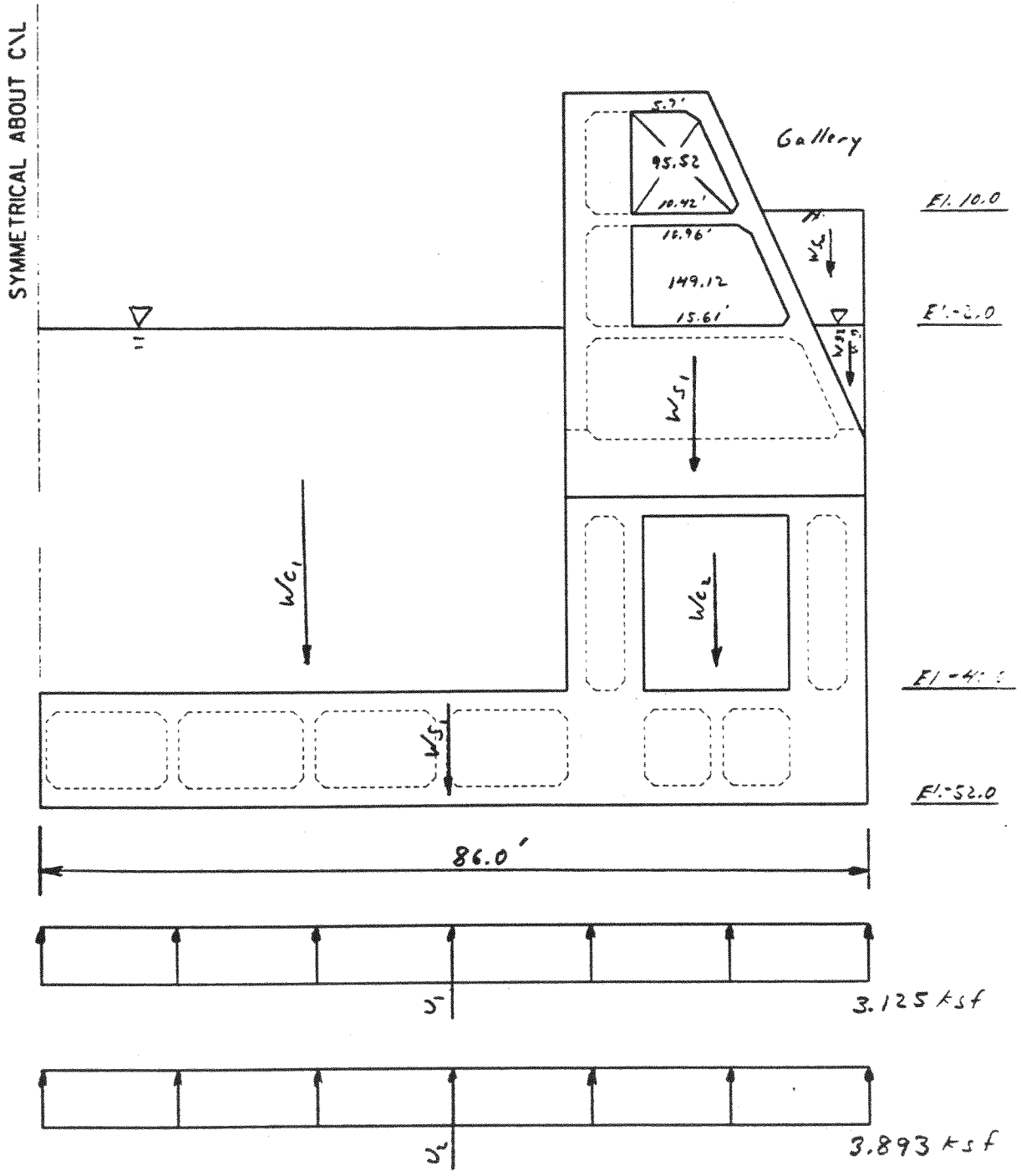
* Tension piles not required.
$FS > 1.5$

LOAD CASE 2A (MAXIMUM OPERATION)

RS = 17.6, LS = -2.0

FLOTATION (UNBONDED)*

* Grout pad assumed not bonded to precast unit.



FLOTATION - CASE 2A (MAXIMUM OPERATION)

Concrete (WS_1)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0$ ft.^{2} (CMAT)

$W = 1386.0 (14.0) (.15) = \underline{2,910.6}$ K

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81$ ft.^{2}

$W_v = 772.81 (14.0) (.15) = \underline{1622.9}$ K

$A_o = 149.12$ ft.^{2}

$V_o = 149.12 (1.25) = 186.4$ ft.^{3}

$V_c = .5 (1.0) (1.0) (2) (6.2 + 10.32 + 11.46 + 16.11) = 44.69$ ft.^{3}

$W_c = (186.4 + 44.69) .15 = \underline{34.7}$ K

TOTAL CONCRETE (WS_1) = $\underline{4568.2}$ K

Backfill (WS_2)

Saturated Soil (El. 10.0 to -2.0)

$A = 94.28$ ft.^{2}

$W = 94.28 (14.0) (.120) = \underline{158.4}$ K

Submerged Soil (El. -13.75 to -2.0)

$A = 30.55$ ft.^{2}

$W = 30.55 (14.0) (.0575) = \underline{24.6}$ K

TOTAL BACKFILL (WS_2) = $\underline{183.0}$ K

COMPUTATION SHEET

PROJECT	PAGE 12 OF 15	COMPUTED BY MCG	DATE 6/76
SUBJECT		CHECKED BY [illegible]	DATE

Water (W_c)

Operator Controlled

$A = 38.0\,(55.0) + 16.25\,(15.0) = 2,363.75$ ft.^{2}

$W = 2363.75\,(14.0)\,(.0625) = \underline{2,068.3}$ K

Water (W_g)

Gravity Controlled

$A = 30.55$ ft.^{2}

$W = 30.55\,(14.0)\,(.062\,4) = \underline{26.7}$ K

Uplift-1 (U_1)

$U_1 = 3.1.2\,(86.0)\,(14.0) = \underline{3762.5}$ K

Uplift-2 (U_2)

$U_2 = .3\,(7.073 + 3.358)\,(86.0)\,(14.0) = \underline{4687.2}$ K

FACTORS OF SAFETY

CASE 2A-1

$$FS = \frac{4568.2 + 183.0 + 2068.3}{3762.5 - 26.7}$$

$FS = \underline{1.83}$

CASE 2A-2

$$FS = \frac{4568.2 + 183.0 + 2068.3}{4687.2 - 26.7}$$

$FS = \underline{1.76}$ *

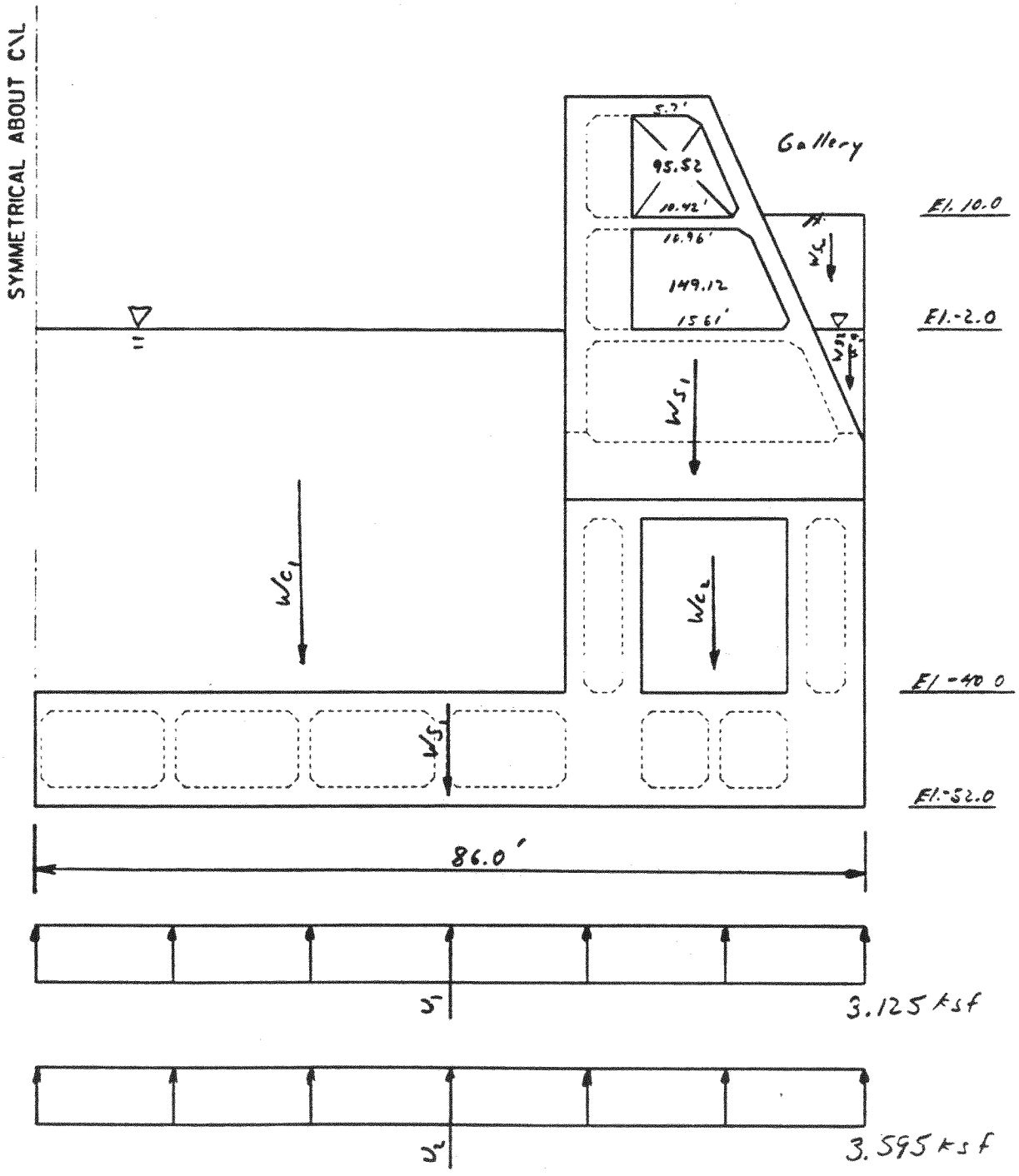
* Tension piles not required.
FS ≥ 1.5

LOAD CASE 2B (MAXIMUM OPERATION)

RS = 10.0, LS = -2.0

FLOTATION (UNGROUTED)*

* Grout pad assumed not bonded to precast unit.



PROJECT	PAGE 14 OF 15	COMPUTED BY OCB	DATE 6/96
SUBJECT		CHECKED BY	DATE

FLOTATION - CASE 2B (MAXIMUM OPERATION)

Concrete (WS$_1$)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0$ ft.^{2} (CMAR)

$W = 1386.0\,(14.0)\,(.15) = \underline{2,910.6}$ K

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81$ ft.^{2}

$W_v = 772.81\,(14.0)\,(.15) = \underline{1622.9}$ K

$A_o = 149.12$ ft.^{2}

$V_o = 149.12\,(1.25) = 186.4$ ft.^{3}

$V_L = .5\,(1.0)\,(1.0)\,(2)\,(6.2 + 10.92 + 11.46 + 16.11) = 44.69$ ft.^{3}

$W_{oc} = (186.4 + 44.69).15 = \underline{34.7}$ K

TOTAL CONCRETE (WS$_1$) = $\underline{4568.2}$ K

Backfill (WS$_2$)

Saturated Soil (El. 10.0 to -2.0)

$A = 94.28$ ft.^{2}

$W = 94.28\,(14.0)\,(.120) = \underline{158.4}$ K

Submerged Soil (El. -13.75 to -2.0)

$A = 30.55$ ft.^{2}

$W = 30.55\,(14.0)\,(.0575) = \underline{24.6}$ K

TOTAL BACKFILL (WS$_2$) = $\underline{183.0}$ K

Water (Wc)

Operator Controled

$A = 38.0\,(55.0) + 16.25\,(15.0) = 2,363.75$ ft.^{2}

$W = 2363.75\,(14.0)(.0625) = \underline{2,068.3}$ ↑

Water (Wg)

Gravity Controled

$A = 30.55$ ft.^{2}

$W = 30.55\,(14.0)(.0625) = \underline{26.7}$ ↑

Uplift-1 (U_1)

$U_1 = 3.125\,(86.0)(14.0) = \underline{3,762.5}$ ↑

Uplift-2 (U_2)

$U_2 = .5(3.690 + 3.500)(86.0)(14.0) = \underline{4,328.4}$ ↑

FACTORS OF SAFETY

CASE 2B-1

$$FS = \frac{4568.2 + 183.0 + 2068.3}{3762.5 - 26.7}$$

$FS = \underline{1.83}$

CASE 2B-2

$$FS = \frac{4568.2 + 183.0 + 2068.3}{4328.4 - 26.7}$$

$FS = \underline{1.59}$ *

* Tension piles not required.
$FS > 1.5$

SETTING PILES

SETTING PILES

CRITERIA

- Use 3 setting Pads as recommended by Board
- Add sufficient ballast to assure Dead loads exceed bouyancy by 5% with water stage @ EL 3.0
- Setting piles resist wt of partially ballasted structure with water @ EL 1.0.

GATE BAY MODULE

Partial Ballasting

Req,d D.L. = $1.05 \times (57 \times 0.0625 \times 180 \times 434) = 278{,}300$ K

WT. OF SHELL = 188,000 K

Ballast WT Req,d = 278,300 − 188,000 = 90,300 K < 146,100 K AVAIL BALLAST WT.

NOTE: FOR INITIAL SETTING, BALLAST D-frame to 95% needed ~~ballast~~ when water Stage @ EL 1.0 with concrete. The remaining setting ballast wt. shall be water in locker would voids. This will permit refloating in case of poor alignment.

Setting Load = 5% EXCESS of Bouyancy + 2' Head Drop

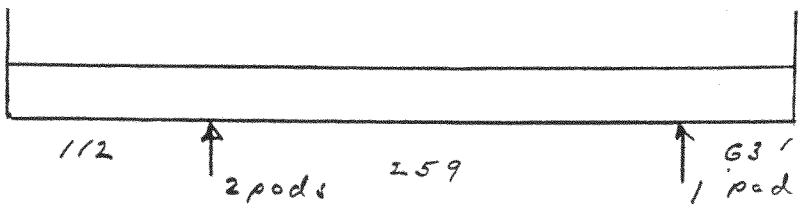
$= (57 \times 0.0625 \times 180 \times 434)\,0.05 + 2(0.0625 \times 180 \times 434)$

$= 13{,}900 + 9{,}765$

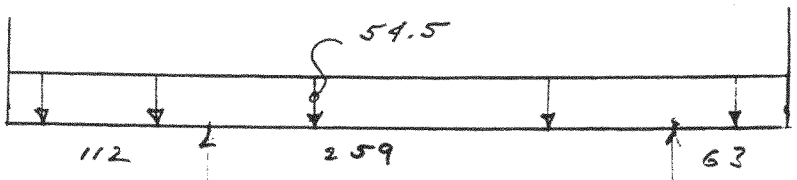
$= 23{,}670$ K

$\text{Load}/_{LF} = 23{,}670 / 434 = 54.5\ \text{K}/_{LF}$

Through iterative process, pad location with lowest moment and number of piles is shown below.



LONGITUDINAL AXIS



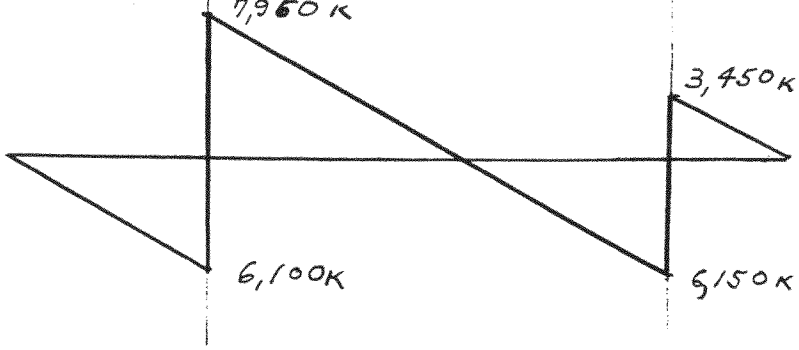
$R_L = \frac{434 \times 54.5 \times 154}{259}$

$= 14,060^K$

$R_R = 23,670 - 14,060$

$= 9610$

V



$M_{max} = 6100^K \times 112/2 = 341,600^{'K}$

U-FRAME $= 4,099,200^{''K}$

DETERMINE STRESS ON FULL U-FRAME (USE WSD FOR PRELIMINARY REPORT)

$\sigma_{TENSION\ MAX} = \frac{341,600}{26,280} = 13.0\ KSF$

$= 90\ psi$ Negligible $< 6\sqrt{f_c'}$

requires minimal reinforcement $= 6\sqrt{4,000}$

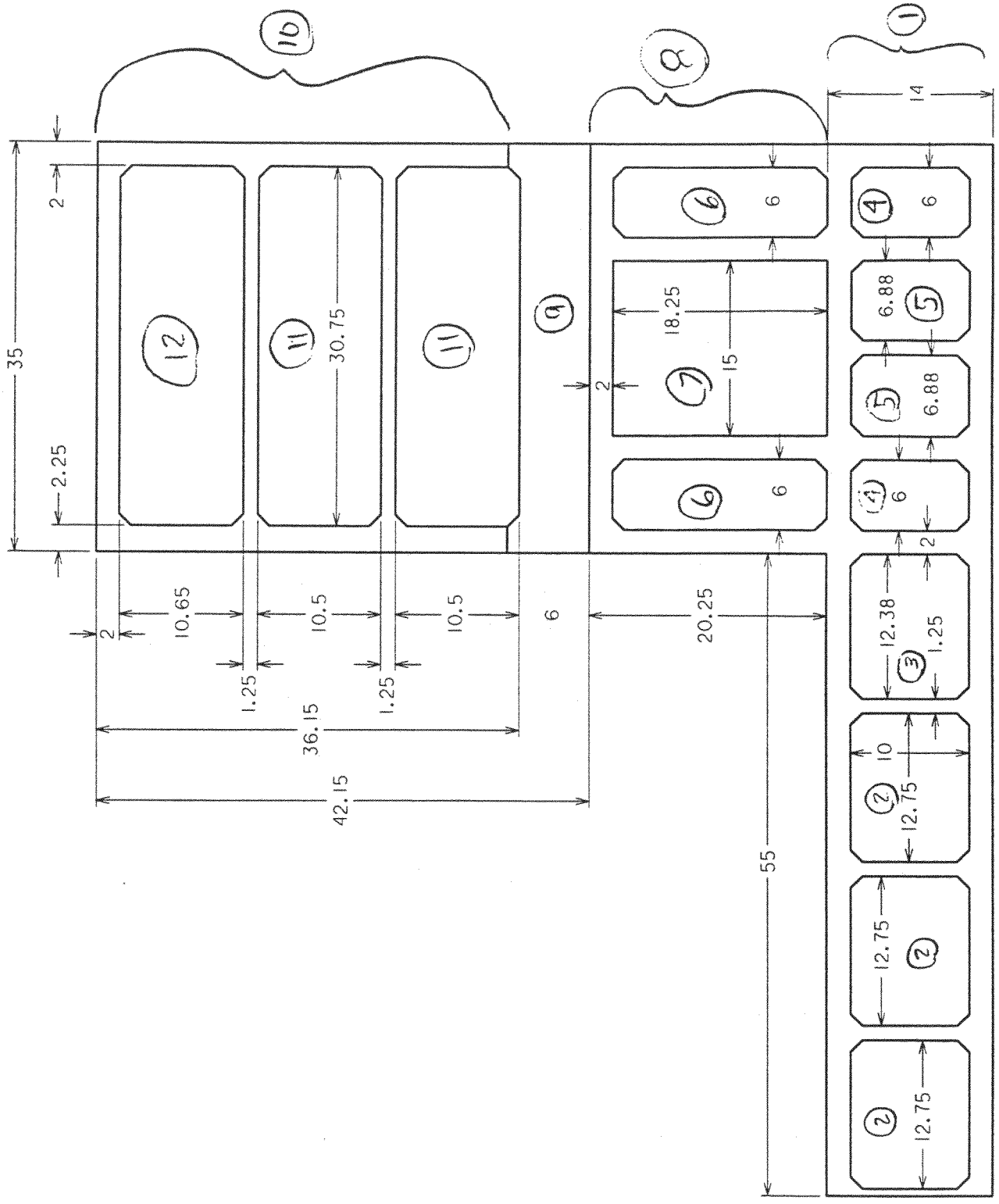
$= 380\ psi$

$\sigma_{compression\ max} = \frac{341,600}{43,360} = 7.9\ KSF$

$= 54.7 psi < 0.45 f_c' = 0.45 \times 6000$

$= 2700\ psi$

∴ U-FRAME Adequate in Long. Direction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30.75
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6
6
18.25
7
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6
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6.88
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6.88
5
4
6
2
12.38
3
1.25
10
12.75
2
12.75
2
12.75
2
2
10.65
10.5
10.5
6
20.25
1.25
1.25
36.15
42.15
55

IHNC Lock Replacement
Setting Conditions - determination of Neutral Axis & Moment of Inertia - Gate Bay Monolith (1/2 SECTION)

Determine Neutral Axis

Area No.	# of Areas	'b' (ft)	'h' (ft)	A (sf)	y (ft)	y*A (cf)
1	1	90	14	1260	7.000	8820.00
2	-3	12.75	10	-382.5	7.000	-2677.50
3	-1	12.38	10	-123.8	7.000	-866.60
4	-2	6	10	-120	7.000	-840.00
5	-2	6.88	10	-137.6	7.000	-963.20
6	-2	6	18.25	-219	23.125	-5064.38
7	-1	15	18.25	-273.75	23.125	-6330.47
8	1	35	20.25	708.75	24.125	17098.59
9	1	35	6	210	37.250	7822.50
10	1	35	36.15	1265.25	58.325	73795.71
11	-1	30.75	10.5	-322.875	45.500	-14690.81
12	-1	30.75	10.5	-322.875	57.250	-18484.59
13	-1	30.75	10.65	-327.488	69.075	-22621.20
		Sum (A) =		1214.113	Sum (y*A) =	34998.05

Centroid = 34998.05 / 1214.113 = 28.83 ft from bottom of slab

Determine Moment of Inertia
Ix=Sum(I+Ad^2) = Sum(bh^3/12+Ad^2) for a rectangular shape
= Sum(bh^3/36+Ad^2) for a triangular shape

Area No.	# of Areas	'b' (ft)	'B' (in)	'h' (ft)	'H' (in)	'd' (ft)	'D' (in)	'a' (sf)	'A' (sq. in)	I
1	1	90	1080	14	168	21.826	261.912	1260.00	181440.00	1.29E+10
2	-3	12.75	153	10	120	21.826	261.912	127.50	18360.00	-3.84E+09
3	-1	12.38	148.56	10	120	21.826	261.912	123.80	17827.20	-1.24E+09
4	-2	6	72	10	120	21.826	261.912	60.00	8640.00	-1.21E+09
5	-2	6.88	82.56	10	120	21.826	261.912	68.80	9907.20	-1.38E+09
6	-2	6	72	18.25	219	5.701	68.412	109.50	15768.00	-2.74E+08
7	-1	15	180	18.25	219	5.701	68.412	273.75	39420.00	-3.42E+08
8	1	35	420	20.25	243	4.701	56.412	708.75	102060.00	8.27E+08
9	1	35	420	6	72	8.424	101.088	210.00	30240.00	3.22E+08
10	1	35	420	36.15	433.8	29.499	353.988	1265.25	182196.00	2.57E+10
11	-1	30.75	369	10.5	126	16.674	200.088	322.88	46494.00	-1.92E+09
11	-1	30.75	369	10.5	126	28.424	341.088	322.88	46494.00	-5.47E+09
12	-1	30.75	369	10.65	127.8	40.249	482.988	327.49	47158.20	-1.11E+10
									Ix =	**1.30E+10** **in^4**
									=	**6.25E+05** **ft^4**

I_x Full Section $= 12.5E+05$ Ft^4

$$S_{x\,BOT} = \frac{I_x}{28.83} = 43,360 \text{ Ft}^3$$

$$S_{x\,TOP} = \frac{I_x}{(76.4 - 28.83)} = 26,280 \text{ Ft}^3$$

SETTING PILES

TRANSVERSE AXIS (See Diagram on PG 6)
(14' WIDTH)

$M_{max} = 4.24 \times \frac{(90-21)^2}{2} = 10{,}093$ '-K

COMPARE w/ USO DESIGN - REFER TO BASE DESIGN

$M_u = 1.7 \times 10{,}093 = 17{,}160$ '-K

$M_N = 93{,}000$ '-K $> M_u$ ∴ I-BEAM REINFORCEMENT IS ADEQUATE

$V_{max} = 4.24 \times (90-21) = 293$ K

$V_u = 293 \times 1.7 = 497$ K

$V_N = V_{N\ 18"\ WEB\ w/\ 2\#8\ @\ 12"} = 1353(0.85) = 1150_K > V_u$

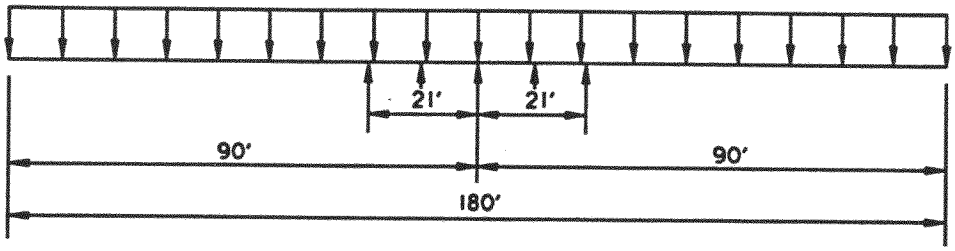
PILE REACTION @ PAD

Pile Capacity (F.S. = 1.5) $= \frac{860\ TN \times 2\ K/TN}{1.5} = 1{,}150$ Kips
USE 1,100 K

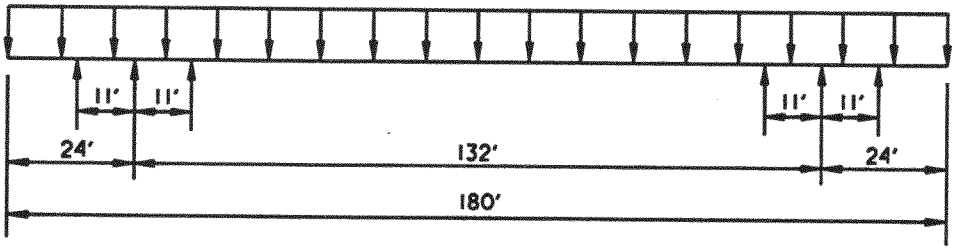
Piles @ Twin Pads $= \frac{14{,}100\ K}{1100K \times 2} = 6.4$ USE 8 Piles

Piles @ Single Pad $= \frac{9610\ K}{1100\ K} = 8.7$ USE 9 PILES

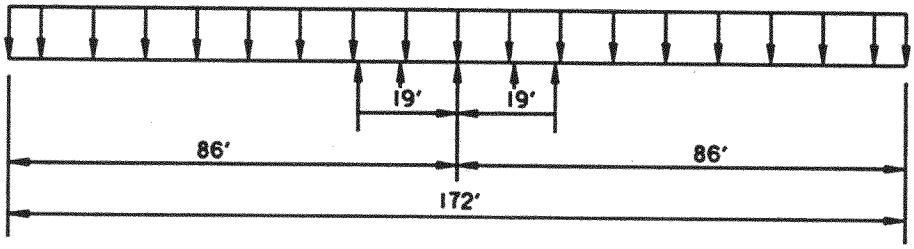
GATEBAY TRANSVERSE
4.24 K/LF FOR 14' WIDTH



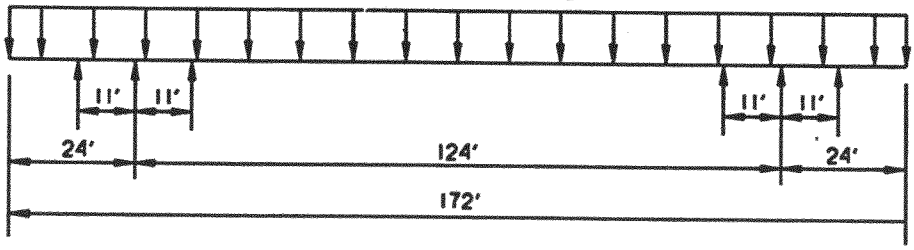
GATEBAY TRANSVERSE
4.24 K/LF FOR 14' WIDTH



CHAMBER TRANSVERSE
4.27 K/LF FOR 14' WIDTH



CHAMBER TRANSVERSE
4.24 K/LF FOR 14' WIDTH



7 10 9/12 9/8 C

SETTING PILES

CHAMBER MODULE

Req'd DL = $1.05 \times (57 \times 0.0625 \times 172 \times 446) = 286,950$

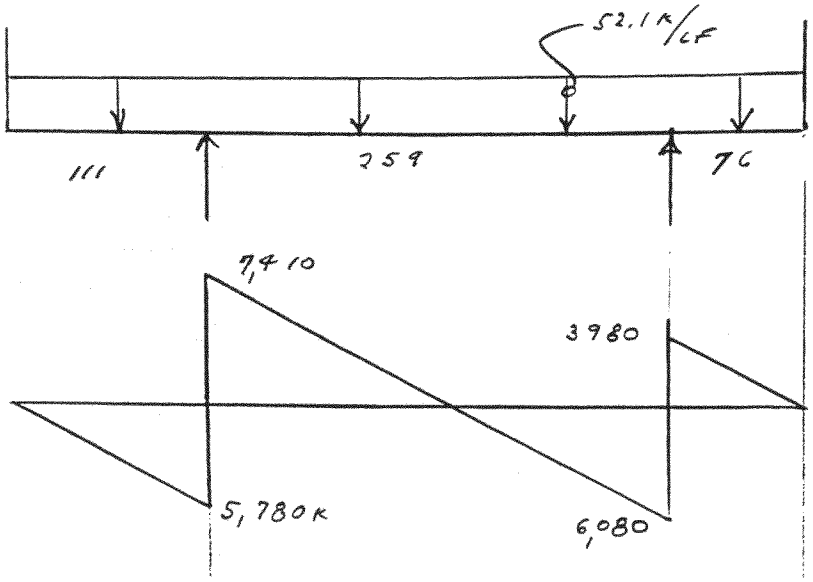
WT. OF SHELL + PLUS WATER WT ON OUTER WALL = $174,500 K + 2\left(0.0625 \times 18.75 \times \frac{6.5}{2} \times 996\right) = 177,200 K$

Ballast WT. REQ'D = $286,950 - 177,200 = 109,750 K$ < 116,130 K AVAIL BALLAST WT 6 K

SETTING LOAD = $(57 \times 0.0625 \times 172 \times 996) 0.05 + (2 \times 0.0625 \times 172 \times 996) = 23,253$

LOAD/LF = $23,250/446 = 52.1$ K/LF

PAD FINAL LOCATION



$R_L = \frac{446 \times 52.1 \times 147}{259} = 13,190 K$

$R_R = 23,250 - 13,190 = 10,060$

$M_{max} = 5780 \times \frac{111}{2} = 320,790$ '-K

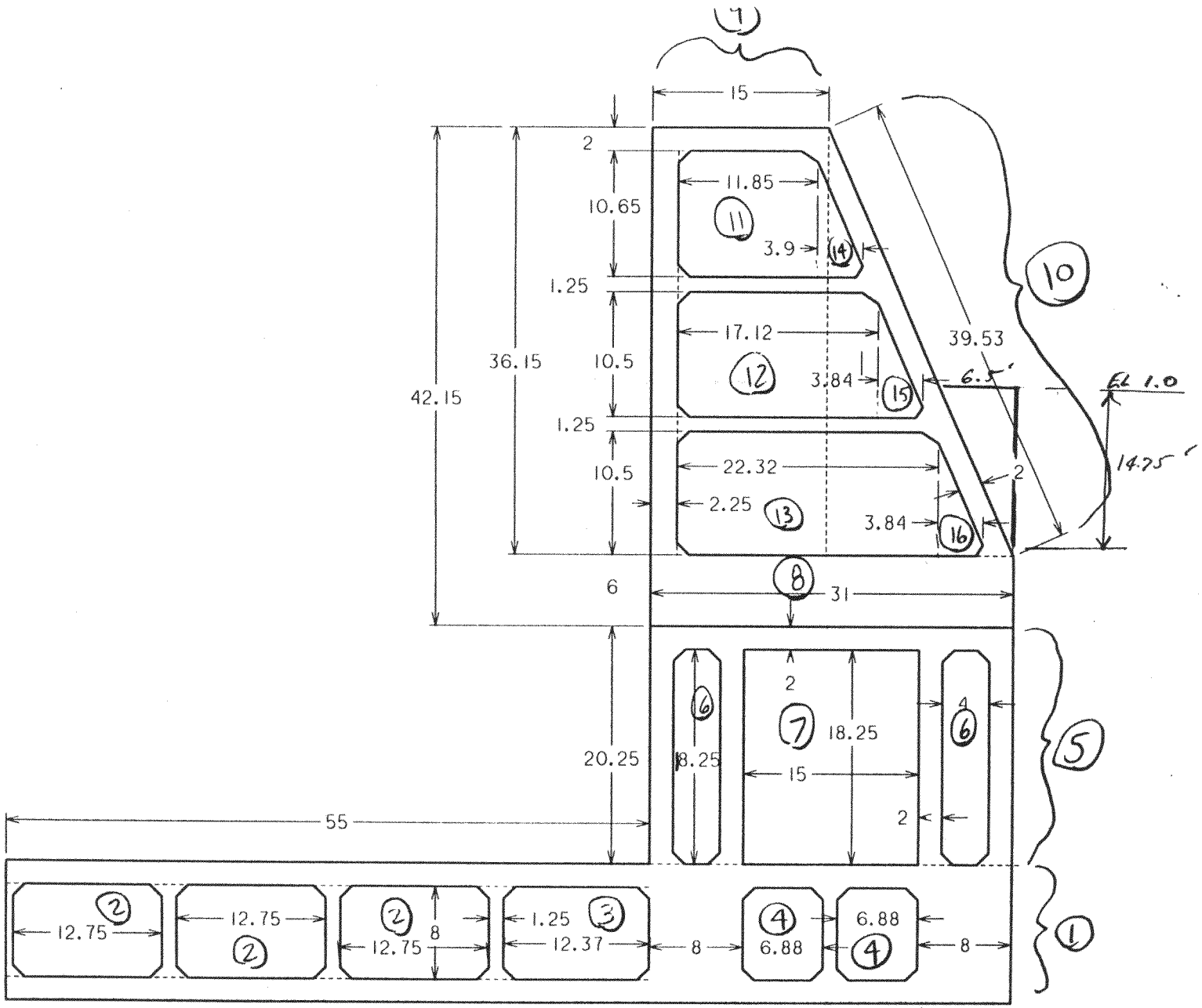
DETERMINE STRESS ON FULL U-FRAME

$\sigma_{Tension\ Max} = \frac{320,790}{19,140} = 16.25$ KSF

$= 113$ psi neg/g/c < $6\sqrt{4000} = 380$ psi

$\sigma_{compression\ Max} = \frac{320,790}{40,330} = 7.95$ KSF

$= 55.2$ psi < $0.45 f_c' = 2700$ psi


7
15
2
11.85
10.65
11
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14
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1.25
17.12
39.53
36.15
10.5
12
3.84
15
6.5'
El 1.0
42.15
1.25
10.5
22.32
2
14.75'
2.25
13
3.84
16
6
8
31
2
6
7
18.25
4
6
5
20.25
8.25
15
55
2
12.75
2
12.75
2
8
12.75
1.25
3
12.37
8
4
6.88
6.88
4
8
1

IHNC Lock Replacement
Setting Conditions - determination of Neutral Axis & Moment of Inertia – CHAMBER

Determine Neutral Axis

Area No.	# of Areas	'b' (ft)	'h' (ft)	A (sf)	y (ft)	y*A (cf)
1	1	86	12	1032	6.000	6192.00
2	-3	12.75	8	-306	6.000	-1836.00
3	-1	12.37	8	-98.96	6.000	-593.76
4	-2	6.88	8	-110.08	6.000	-660.48
5	1	31	20.25	627.75	22.125	13888.97
6	-2	4	18.25	-146	21.125	-3084.25
7	-1	15	18.25	-273.75	21.125	-5782.97
8	1	31	6	186	35.250	6556.50
9	1	15	36.15	542.25	56.325	30542.23
10	1	16	36.15	289.2	50.300	14546.76
11	-1	11.85	10.65	-126.203	67.075	-8465.03
12	-1	17.12	10.5	-179.76	55.250	-9931.74
13	-1	22.32	10.5	-234.36	43.500	-10194.66
14	-1	3.9	10.65	-20.7675	65.300	-1356.12
15	-1	3.84	10.5	-20.16	53.500	-1078.56
16	-1	3.84	10.5	-20.16	41.750	-841.68
		Sum (A) =		1141	Sum (y*A) =	27901.21

Centroid = $\frac{27901.21}{1141}$ = 24.45 ft from bottom of slab

Determine Moment of Inertia
Ix=Sum(I+Ad^2) = Sum(bh^3/12+Ad^2) for a rectangular shape
= Sum(bh^3/36+Ad^2) for a triangular shape

Area No.	# of Areas	'b' (ft)	'B' (in)	'h' (ft)	'H' (in)	'd' (ft)	'D' (in)	'a' (sf)	'A' (sq. in)	I
1	1	86	1032	12	144	18.453	221.440	1032.00	148608.00	7.54E+09
2	-3	12.75	153	8	96	18.453	221.440	102.00	14688.00	-2.19E+09
3	-1	12.37	148.44	8	96	18.453	221.440	98.96	14250.24	-7.10E+08
4	-2	6.88	82.56	8	96	18.453	221.440	55.04	7925.76	-7.89E+08
5	1	31	372	20.25	243	2.328	27.940	627.75	90396.00	5.15E+08
6	-2	4	48	18.25	219	3.328	39.940	73.00	10512.00	-1.18E+08
7	-1	15	180	18.25	219	3.328	39.940	273.75	39420.00	-2.20E+08
8	1	31	372	6	72	10.797	129.560	186.00	26784.00	4.61E+08
9	1	15	180	36.15	433.8	31.872	382.460	542.25	78084.00	1.26E+10
10	1	16	192	36.15	433.8	25.847	310.160	289.20	41644.80	4.44E+09
11	-1	11.85	142.2	10.65	127.8	42.622	511.460	126.20	18173.16	-4.78E+09
12	-1	17.12	205.44	10.5	126	30.797	369.560	179.76	25885.44	-3.57E+09
13	-1	22.32	267.84	10.5	126	19.047	228.560	234.36	33747.84	-1.81E+09
14	-1	3.9	46.8	10.65	127.8	40.847	490.160	20.77	2990.52	-7.21E+08
15	-1	3.84	46.08	10.5	126	29.047	348.560	20.16	2903.04	-3.55E+08
16	-1	3.84	46.08	10.5	126	17.297	207.560	20.16	2903.04	-1.28E+08
									Ix =	**1.02E+10** **in^4**
									=	**4.93E+05** **ft^4**

I_x FULL SECTION = 9.86 E+05 Ft^4

$$S_{x_{BOT}} = \frac{I_x}{24.45} = 40,330\ Ft^3$$

$$S_{x\,TOP} = \frac{I_x}{(74.4 - 24.45)} = 19,740\ Ft^3$$

SETTING PILES

TRAN SOURCE AXIS (see Diagram on PG 6)
(14' WIDTH)

$w_{14'} = \frac{52.1 \times 14}{172} = 4.24^{K}$

$M_{max} = \frac{4.24 \times (86-19)^2}{2} = 9,517^{'-K}$

$M_u = 9,517 \times 1.7 = 16,180^{'-K} < M_N = 93,000$ (see I-Beam Transverse Design)

$V_{max} = 4.24 \times (86-19) = 284^{K}$

$V_u = 284 \times 1.7 = 483_{K} < V_N = 1200^{K}$
18"w·6
2-#8@12"

PILE REACTION @ PAD

PILE CAPACITY = 1100K

PILES @ TWIN PADS $= \frac{13190}{2 \times 1100} = 6$ piles / PAD
USED 8

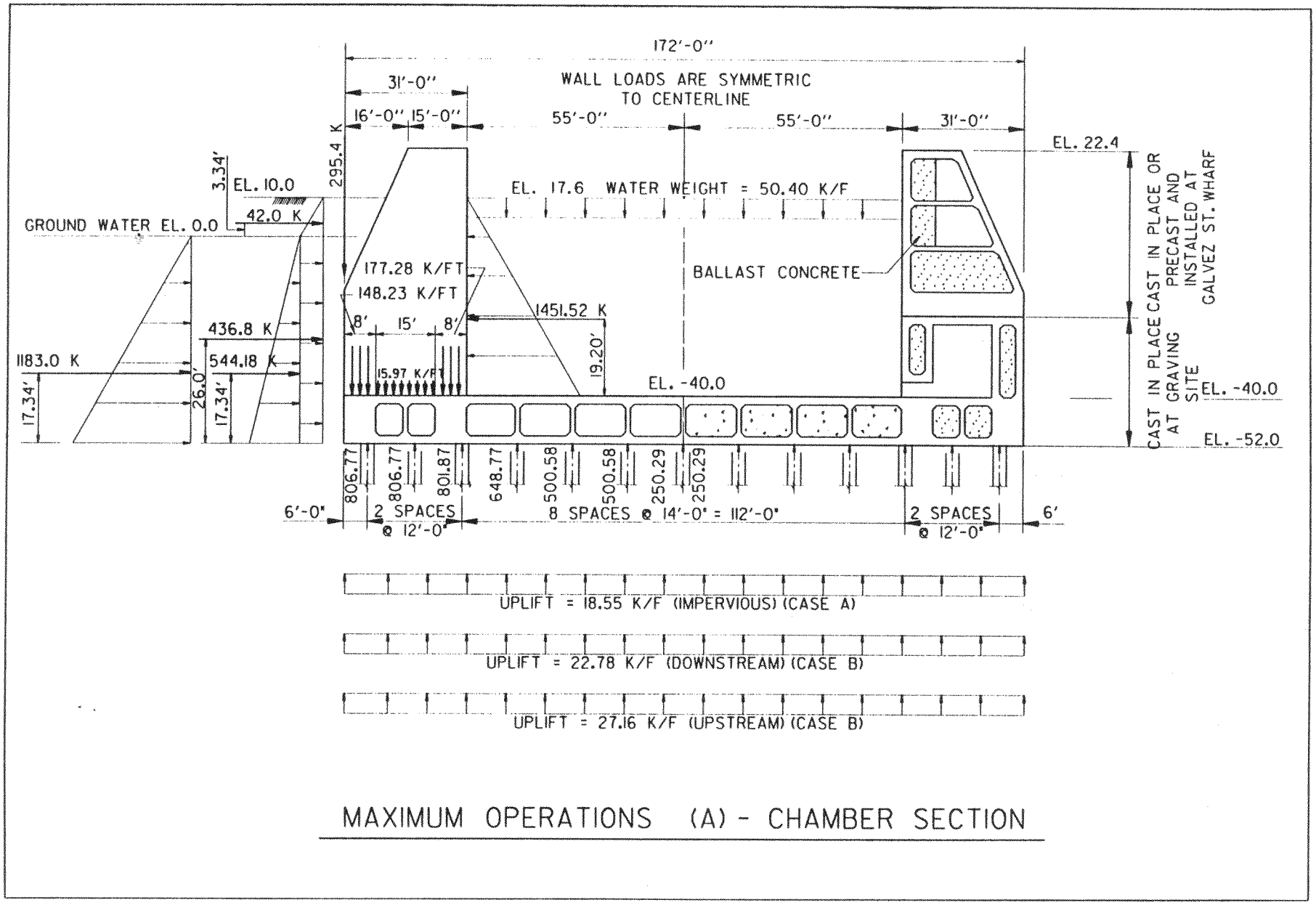
PILES @ SINGLE PAD $= \frac{10,060}{1100} = 9$ piles

BASE ANALYSIS

CHAMBER BASE ANALYSIS

TRANSVERSE I-BEAM

LOAD CASE 2A



MAXIMUM OPERATIONS (A) - CHAMBER SECTION

IHNC Lock Replacement

Designed by: P.J.S.
Checked by:

Pile Determination - Maximum Operations, Load Case 2A * Governing Case *****
Chamber: EL. 17.60
Tailwater: EL. -2.00

Concrete Weight:										
Float-in segment:	1386.00 sf (CADD)	x	14.00 ' strip	x	0.15 =	2910.60	x 2 (other half) =		5821	kips
Grout:	4.00 ft	x	14.00 ' strip	x	172.00 ft x	0.1500 =		=	1445	kips
Walls:	786.12 sf (CADD)	x	14.00 ' strip	x	0.15 =	1650.85	x 2 (other half) =		3302	kips
Water:										
Chamber @ EL. 17.6:	57.60 ft	x	14.00 ' strip	x	110.00 ft x	0.0625 =		=	5544	kips
Water in culvert:	273.75 sf	x	14.00 ' strip	x	0.0625 =	239.53	x 2 (other half) =		479	kips
Soil:										
Soil with water:	124.83 sf (CADD)	x	14.00 ' strip	x	0.12 =	209.71	x 2 (other half) =		419	kips
Drag:	295.43 kips (from C. Balint)						x 2 (other half) =		591	kips
Uplift:										
Tailwater @ EL.-2.0:	54.00 ft	x	14.00 ' strip	x	172.00 ft x	-0.0625 =		=	-8127	kips
							Total weight:		9474	kips

Distribute 9474 kips over 172.0 ft: 9474 / 172 = 55.08 kips/ft for a 14' strip

Distribute 125% of load at both ends of monolith and rest of load in middle:

44.00 ft on each end, load is: 55.08 kips/ft x 1.25 = 68.85 kips/ft

so, for 88' of monolith, load is: 88.00 ft x 68.85 = 6058.99 kips

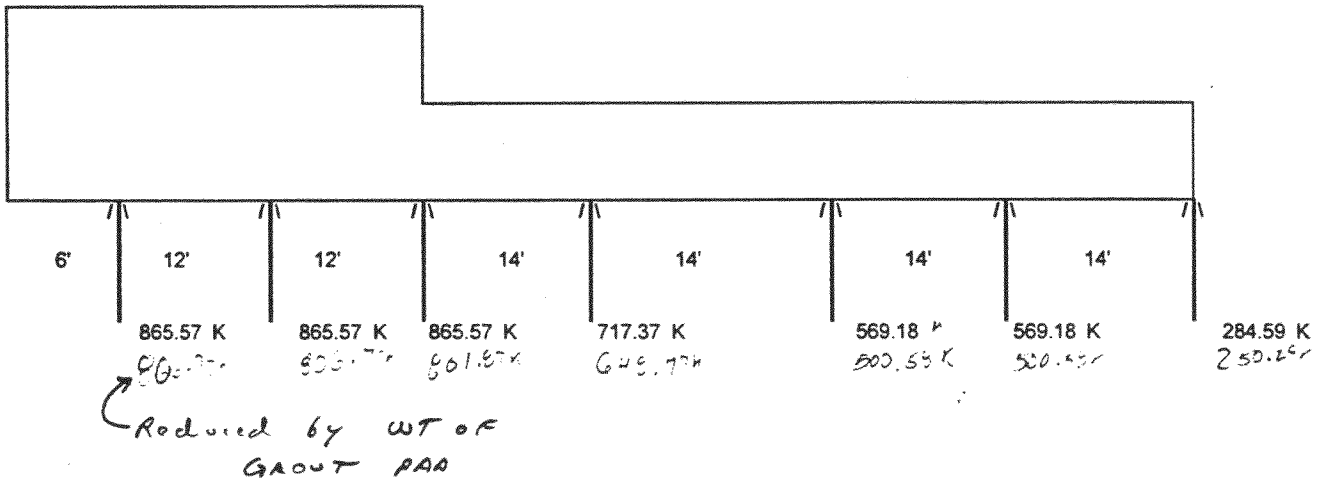
therefore, remaining 84' of monolith will have load of:[(55.08 x 172.00) 6058.99] / 84 = 40.66 kips/ft

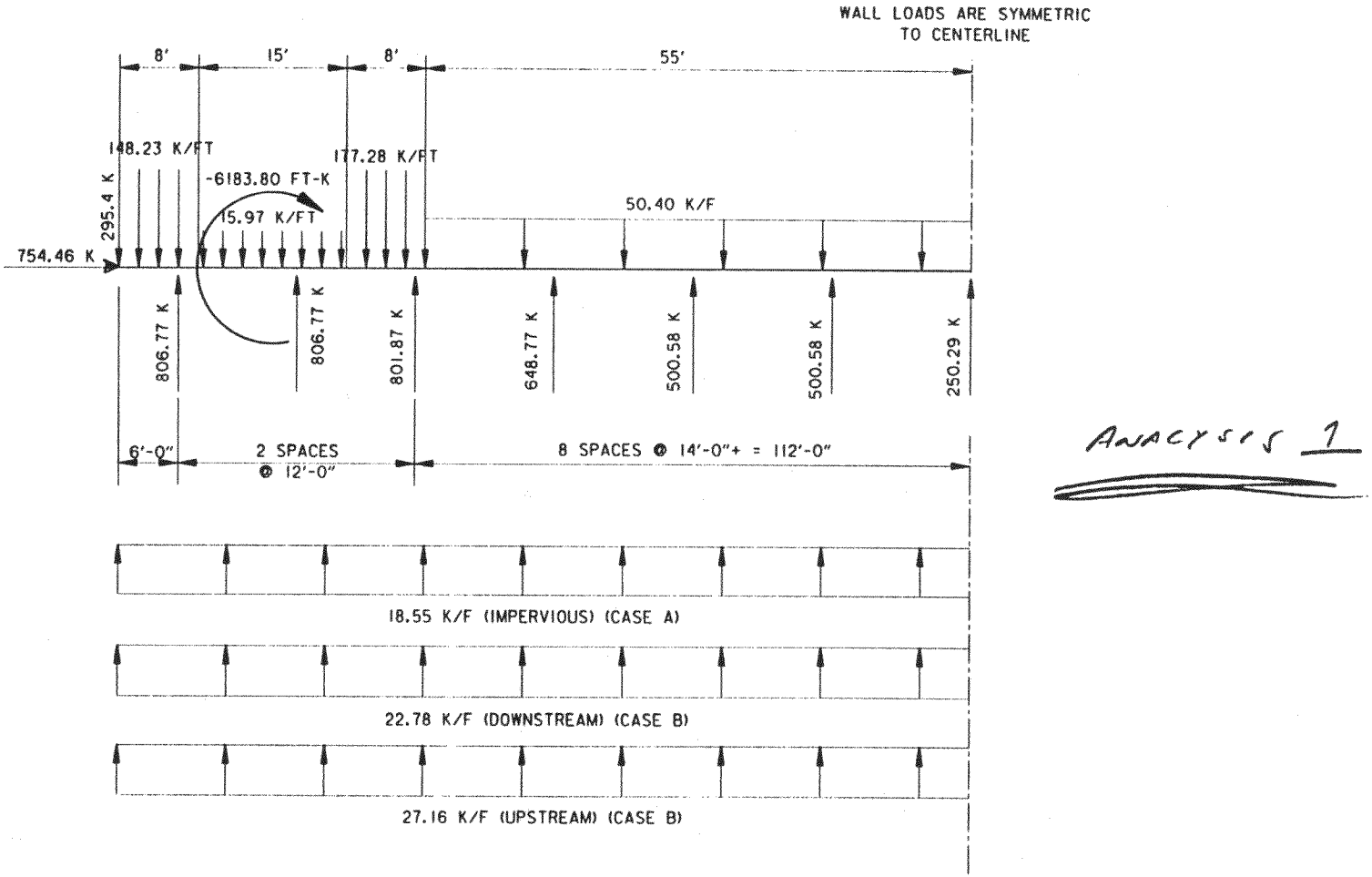
For 44.00 ft on each end: 88.00 ft x 68.85 / 7.0 piles = 865.57 kips/pile

Using a factor of safety = 2.0, this equates to **865.57 tons/pile**

For 84.00 ft in the middle: 84.00 ft x 40.66 / 6.0 piles = 569.18 kips/pile

Using a factor of safety = 2.0, this equates to **569.18 tons/pile**





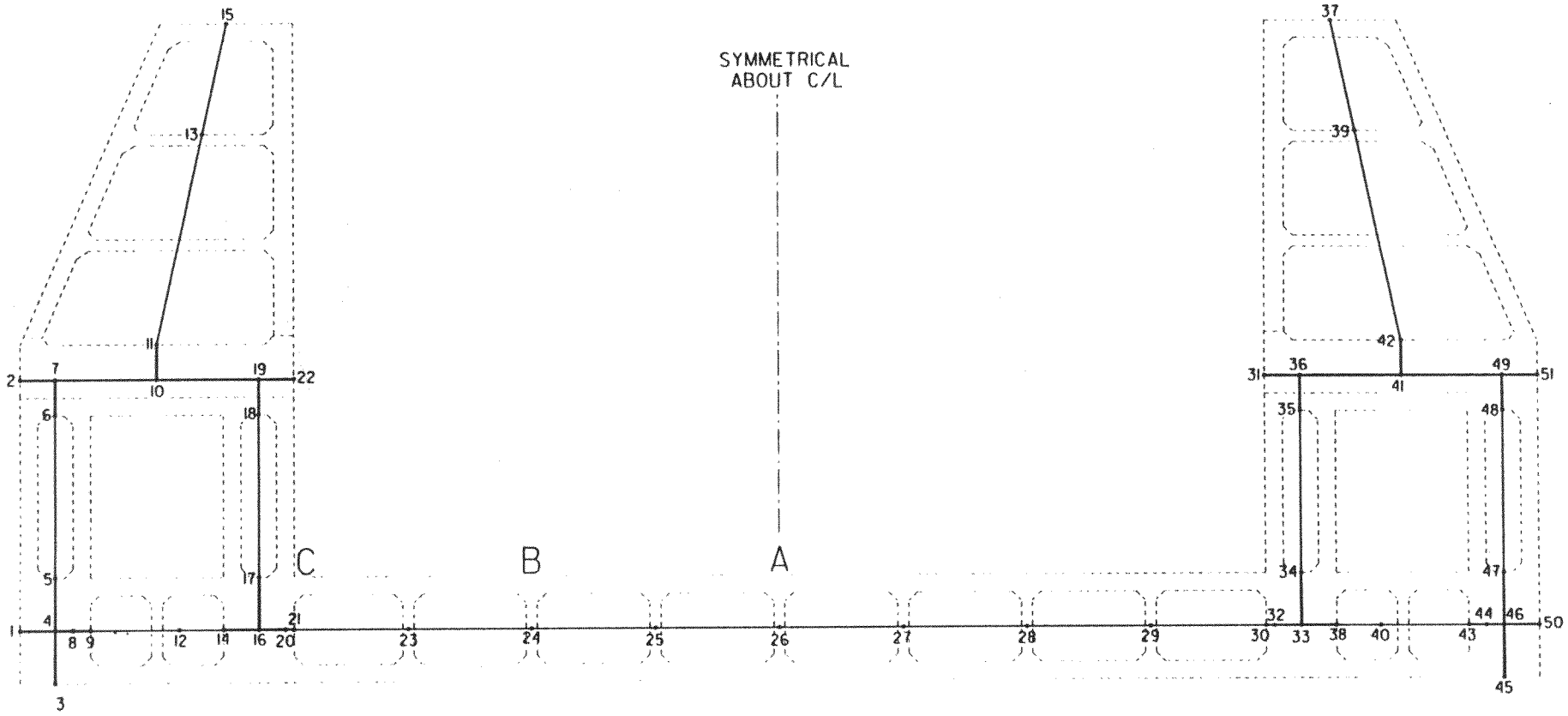
ANALYSIS 1

MAXIMUM OPERATIONS (A) - CHAMBER SECTION

```
1000    IHNC LOCK - MAX. OPERATING LOAD IIA, ANALYSIS 1
1100    KSI FT FT IN KIP
1200    51 52 1 3600 0.15
1300    1 -86.0 6.0 2 -86.0 34.25 3 -82.0 0.0 4 -82.0 6.0
1301    5 -82.0 12.0 6 -82.0 30.25 7 -82.0 34.25 8 -80.0 6.0
1302    9 -78.0 6.0 10 -70.5 34.25 11 -70.5 38.25 12 -68.0 6.0
1303    13 -65.3 62.0 14 -63.0 6.0 15 -62.5 74.4 16 -59.0 6.0
1304    17 -59.0 12.0 18 -59.0 30.25 19 -59.0 34.25
1305    20 -56.0 6.0 21 -55.0 6.0 22 -55.0 34.25 23 -42.0 6.0
1306    24 -28.0 6.0 25 -14.0 6.0 26 0.0 6.0 27 14.0 6.0
1307    28 28.0 6.0 29 42.0 6.0 30 55.0 6.0 31 55.0 34.25
1308    32 56.0 6.0 33 59.0 6.0 34 59.0 12.0 35 59.0 30.25
1309    36 59.0 34.25 37 62.5 74.4 38 63.0 6.0 39 65.3 62.0
1310    40 68.0 6.0 41 70.5 34.25 42 70.5 38.25 43 78.0 6.0
1311    44 80.0 6.0 45 82.0 0.0 46 82.0 6.0 47 82.0 12.0
1312    48 82.0 30.25 49 82.0 34.25 50 86.0 6.0 51 86.0 34.25
1400    FIX X 26 FIX Y 26 FIX R 26
1600    1 3 4 2 45 46 3 1 4 4 4 8 5 8 9 6 9 12 7 12 14
1601    8 14 16 9 16 20 10 20 21 11 21 23 12 23 24 13 24 25
1602    14 25 26 15 26 27 16 27 28 17 28 29 18 29 30
1603    19 30 32 20 32 33 21 33 38 22 38 40 23 40 43
1604    24 43 44 25 44 46 26 46 50 27 4 5 28 16 17
1605    29 33 34 30 46 47 31 5 6 32 17 18 33 34 35
1606    34 47 48 35 6 7 36 18 19 37 35 36 38 48 49
1607    39 2 7 40 7 10 41 10 19 42 19 22 43 31 36
1608    44 36 41 45 41 49 46 49 51 47 10 11 48 41 42
1609    49 11 13 50 42 39 51 13 15 52 39 37
1700    597.3 96.0 96.0 1 TO 5 8 9 10 19 20 21 24 TO 30
1701    1472.0 49.5 49.5 6 7 11 TO 18 22 23
1702    529.3 73.0 73.0 31 TO 34
1703    597.3 248.0 248.0 35 TO 48
1704    9788.7 44.63 44.63 49 50
1705    4170.5 45.63 45.63 51 52
1800    E 36000.0 0.15 1 TO 5 8 9 10 20 21 24 TO 30 35 TO 48
1900    LOAD CASE 1 0 51 0 4 0 MAX. OPERATING LOAD IIA, ANALYSIS 1
1901    0.0 31.85 14.0 31.85 0. 11 12 13 14 15 16 17 18
1902    0.0 -2.581 10.0 -2.581 0. 6 7 22 23
1903    0.0 19.775 4.0 19.775 0. 3 4 5 8 9 10 19 20 21 24 25 26
1904    0.0 90.605 4.0 90.605 0. 42 43
1905    8.5 90.605 11.5 90.605 0. 41
1906    0.0 90.605 3.0 90.605 0. 44
1907    0.0 48.05 11.5 48.05 0. 39 40 45 46
1908    0.0 48.05 8.5 48.05 0. 41
1909    3.0 48.05 11.5 48.05 0. 44
1910    0.0 15.086 4.0 15.086 0. 39 46
1911    0.0 15.086 6.5 15.086 0. 40
1912    5.0 15.086 11.5 15.086 0. 45
1913    0.0 9.865 4.0 9.865 0. 39 46
1914    0.0 9.865 1.2 9.865 0. 40
1915    10.3 9.865 11.5 9.865 0. 45
1916    0.0 -6.65 7.6 0.0 0. 51
1917    0.0 -27.43 24.31 -6.65 0. 49
1918    0.0 -30.93 4.0 -27.43 0. 47
1919    0.0 -34.43 4.0 -30.93 0. 36
1920    0.0 -50.4 18.25 -34.43 0. 32
1921    0.0 6.65 7.6 0.0 0. 52
1922    0.0 27.43 24.31 6.65 0. 50
1923    0.0 30.93 4.0 27.43 0. 48
1924    0.0 34.43 4.0 30.93 0. 37
1925    0.0 50.4 18.25 34.43 0. 33
```

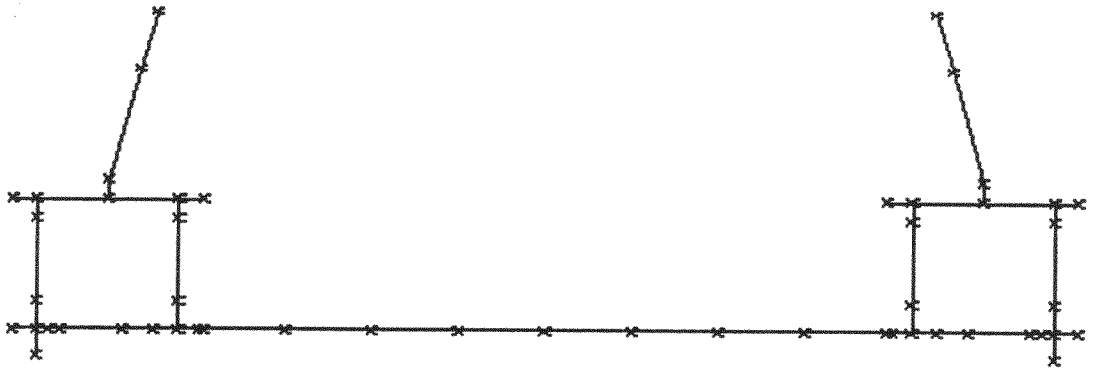
```
1926    0.0 10.28 12.03 0.0 0. 49
1927    0.0 13.78 4.0 10.28 0. 47
1928    0.0 17.28 4.0 13.78 0. 35
1929    0.0 33.25 18.25 17.28 0. 31
 30     0.0 38.5 6.0 33.25 0. 27
 31     0.0 43.75 6.0 38.5 0. 1
 32     0.0 -10.28 12.03 0.0 0. 50
1933    0.0 -13.78 4.0 -10.28 0. 48
1934    0.0 -17.28 4.0 -13.78 0. 38
1935    0.0 -33.25 18.25 -17.28 0. 34
1936    0.0 -38.5 6.0 -33.25 0. 27
1937    0.0 -43.75 6.0 -38.5 0. 2
1938    15.10 10.08 24.31 0.0 0. 49
1939    0.0 14.809 15.10 10.08 0. 49
1940    0.0 16.149 4.0 14.809 0. 47
1941    0.0 18.029 4.0 16.149 0. 35
1942    0.0 25.375 18.25 18.029 0. 31
1943    0.0 27.79 6.0 25.375 0. 27
1944    0.0 30.205 6.0 27.79 0. 1
1945    15.10 -10.08 24.31 0.0 0. 50
1946    0.0 -14.809 15.10 -10.08 0. 50
1947    0.0 -16.149 4.0 -14.809 0. 48
1948    0.0 -18.029 4.0 -16.149 0. 38
1949    0.0 -25.375 18.25 -18.029 0. 34
1950    0.0 -27.79 6.0 -25.375 0. 30
1951    0.0 -30.205 6.0 -27.79 0. 2
1952    0.0 806.77 0. 8 12 20 32 40 44
1953    0.0 648.77 0. 23 29
1954    0.0 500.58 0. 24 25 27 28
 55     0.0 -295.43 0. 1 50
```

CFRAME COMPUTER MODEL



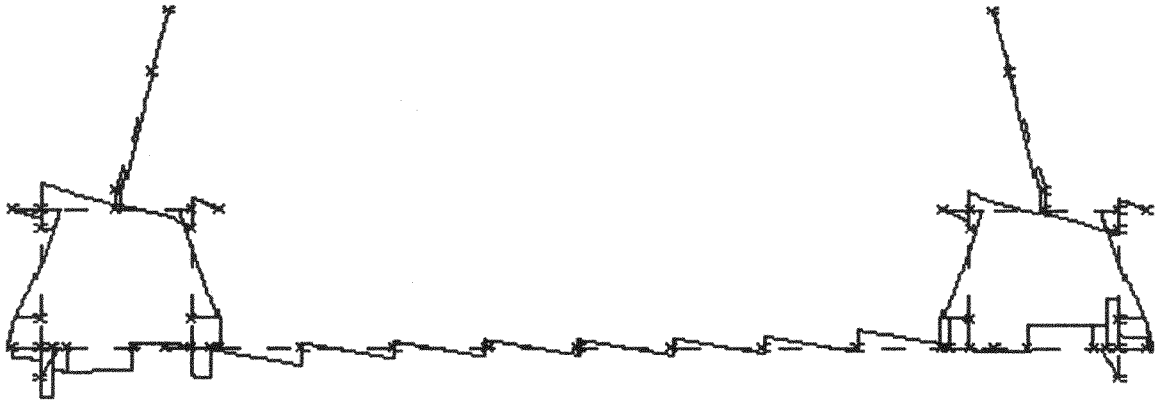
NOTE:
JOINT NUMBERS SHOWN

IHNC LOCK - MAX. OPERATING LOAD IIA, ANALYSIS 1



10-JUL-1996 12.45.09

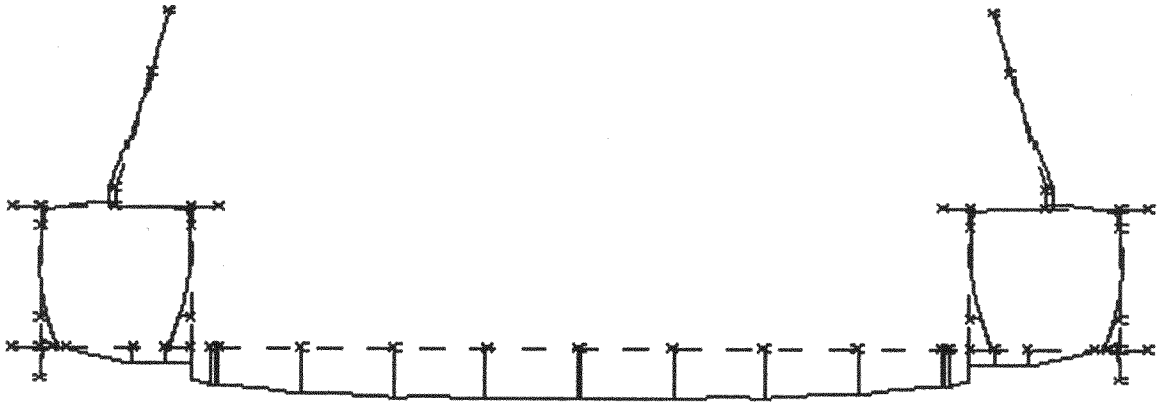
IHNC LOCK - MAX. OPERATING LOAD IIA, ANALYSIS 1



= 1490. KIP SHEAR 10-JUL-1996 12.50.14

LOAD CASE 1 MAX. OPERATING LOAD IIA ANALYSIS 1

IHNC LOCK - MAX. OPERATING LOAD IIA, ANALYSIS 1



⌊___⌋ = .2443E+5 FT-KIP MOMENT 10-JUL-1996 12.50.14

LOAD CASE 1 MAX. OPERATING LOAD IIA ANALYSIS 1

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1*-*-*-
```

42	70.50	38.25
43	78.00	6.00
44	80.00	6.00
45	82.00	.00
46	82.00	6.00
47	82.00	12.00
48	82.00	30.25
49	82.00	34.25
50	86.00	6.00
51	86.00	34.25

*** MEMBER DATA ***

MEMBER	END A	END B	LENGTH FT	I FT**4	A FT**2	AS FT**2	E KSI	G KSI
1	3	4	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
2	45	46	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
3	1	4	4.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
4	4	8	2.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
5	8	9	2.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
6	9	12	10.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
7	12	14	5.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
8	14	16	4.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
9	16	20	3.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
10	20	21	1.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
11	21	23	13.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
12	23	24	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
13	24	25	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
14	25	26	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
15	26	27	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
16	27	28	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
17	28	29	14.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
18	29	30	13.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
19	30	32	1.00	.5973E+03	.9600E+02	.9600E+02	.3600E+04	.1565E+04
20	32	33	3.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
21	33	38	4.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
22	38	40	5.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
23	40	43	10.00	.1472E+04	.4950E+02	.4950E+02	.3600E+04	.1565E+04
24	43	44	2.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
25	44	46	2.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
26	46	50	4.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
27	4	5	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
28	16	17	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
29	33	34	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
30	46	47	6.00	.5973E+03	.9600E+02	.9600E+02	.3600E+05	.1565E+05
31	5	6	18.25	.5293E+03	.7300E+02	.7300E+02	.3600E+04	.1565E+04
32	17	18	18.25	.5293E+03	.7300E+02	.7300E+02	.3600E+04	.1565E+04
33	34	35	18.25	.5293E+03	.7300E+02	.7300E+02	.3600E+04	.1565E+04
34	47	48	18.25	.5293E+03	.7300E+02	.7300E+02	.3600E+04	.1565E+04
35	6	7	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
36	18	19	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
37	35	36	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
38	48	49	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
39	2	7	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
40	7	10	11.50	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
41	10	19	11.50	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05

42	19	22	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
43	31	36	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
44	36	41	11.50	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
45	41	49	11.50	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
46	49	51	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
47	10	11	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
48	41	42	4.00	.5973E+03	.2480E+03	.2480E+03	.3600E+05	.1565E+05
49	11	13	24.31	.9789E+04	.4463E+02	.4463E+02	.3600E+04	.1565E+04
50	42	39	24.31	.9789E+04	.4463E+02	.4463E+02	.3600E+04	.1565E+04
51	13	15	12.71	.4171E+04	.4563E+02	.4563E+02	.3600E+04	.1565E+04
52	39	37	12.71	.4171E+04	.4563E+02	.4563E+02	.3600E+04	.1565E+04

*** LOAD CASE 1 MAX. OPERATING LOAD IIA ANALYSIS 1

MEMBER	LA FT	PA KIP / FT	LB FT	PB KIP / FT	ANGLE DEG
1	.00	.4375E+02	6.00	.3850E+02	.00
1	.00	.3020E+02	6.00	.2779E+02	.00
2	.00	-.4375E+02	6.00	-.3850E+02	.00
2	.00	-.3020E+02	6.00	-.2779E+02	.00
3	.00	.1977E+02	4.00	.1977E+02	.00
4	.00	.1977E+02	2.00	.1977E+02	.00
5	.00	.1977E+02	2.00	.1977E+02	.00
6	.00	-.2581E+01	10.00	-.2581E+01	.00
7	.00	-.2581E+01	5.00	-.2581E+01	.00
8	.00	.1977E+02	4.00	.1977E+02	.00
9	.00	.1977E+02	3.00	.1977E+02	.00
10	.00	.1977E+02	1.00	.1977E+02	.00
11	.00	.3185E+02	13.00	.3185E+02	.00
12	.00	.3185E+02	14.00	.3185E+02	.00
13	.00	.3185E+02	14.00	.3185E+02	.00
14	.00	.3185E+02	14.00	.3185E+02	.00
15	.00	.3185E+02	14.00	.3185E+02	.00
16	.00	.3185E+02	14.00	.3185E+02	.00
17	.00	.3185E+02	14.00	.3185E+02	.00
18	.00	.3185E+02	13.00	.3185E+02	.00
19	.00	.1977E+02	1.00	.1977E+02	.00
20	.00	.1977E+02	3.00	.1977E+02	.00
21	.00	.1977E+02	4.00	.1977E+02	.00
22	.00	-.2581E+01	5.00	-.2581E+01	.00
23	.00	-.2581E+01	10.00	-.2581E+01	.00
24	.00	.1977E+02	2.00	.1977E+02	.00
25	.00	.1977E+02	2.00	.1977E+02	.00
26	.00	.1977E+02	4.00	.1977E+02	.00
27	.00	.3850E+02	6.00	.3325E+02	.00
27	.00	-.3850E+02	6.00	-.3325E+02	.00
27	.00	.2779E+02	6.00	.2538E+02	.00
30	.00	-.2779E+02	6.00	-.2538E+02	.00
31	.00	.3325E+02	18.25	.1728E+02	.00
31	.00	.2538E+02	18.25	.1803E+02	.00
2	.00	-.5040E+02	18.25	-.3443E+02	.00
33	.00	.5040E+02	18.25	.3443E+02	.00
34	.00	-.3325E+02	18.25	-.1728E+02	.00
34	.00	-.2538E+02	18.25	-.1803E+02	.00
35	.00	.1728E+02	4.00	.1378E+02	.00

35	.00	.1803E+02	4.00	.1615E+02	.00
36	.00	-.3443E+02	4.00	-.3093E+02	.00
37	.00	.3443E+02	4.00	.3093E+02	.00
38	.00	-.1728E+02	4.00	-.1378E+02	.00
38	.00	-.1803E+02	4.00	-.1615E+02	.00
39	.00	.4805E+02	4.00	.4805E+02	.00
39	.00	.1509E+02	4.00	.1509E+02	.00
39	.00	.9865E+01	4.00	.9865E+01	.00
40	.00	.4805E+02	11.50	.4805E+02	.00
40	.00	.1509E+02	6.50	.1509E+02	.00
40	.00	.9865E+01	1.20	.9865E+01	.00
41	8.50	.9061E+02	11.50	.9061E+02	.00
41	.00	.4805E+02	8.50	.4805E+02	.00
42	.00	.9061E+02	4.00	.9061E+02	.00
43	.00	.9061E+02	4.00	.9061E+02	.00
44	.00	.9061E+02	3.00	.9061E+02	.00
44	3.00	.4805E+02	11.50	.4805E+02	.00
45	.00	.4805E+02	11.50	.4805E+02	.00
45	5.00	.1509E+02	11.50	.1509E+02	.00
45	10.30	.9865E+01	11.50	.9865E+01	.00
46	.00	.4805E+02	4.00	.4805E+02	.00
46	.00	.1509E+02	4.00	.1509E+02	.00
46	.00	.9865E+01	4.00	.9865E+01	.00
47	.00	-.3093E+02	4.00	-.2743E+02	.00
47	.00	.1378E+02	4.00	.1028E+02	.00
47	.00	.1615E+02	4.00	.1481E+02	.00
48	.00	.3093E+02	4.00	.2743E+02	.00
48	.00	-.1378E+02	4.00	-.1028E+02	.00
48	.00	-.1615E+02	4.00	-.1481E+02	.00
49	.00	-.2743E+02	24.31	-.6650E+01	.00
49	.00	.1028E+02	12.03	.0000E+00	.00
49	15.10	.1008E+02	24.31	.0000E+00	.00
49	.00	.1481E+02	15.10	.1008E+02	.00
50	.00	.2743E+02	24.31	.6650E+01	.00
50	.00	-.1028E+02	12.03	.0000E+00	.00
50	15.10	-.1008E+02	24.31	.0000E+00	.00
50	.00	-.1481E+02	15.10	-.1008E+02	.00
51	.00	-.6650E+01	7.60	.0000E+00	.00
52	.00	.6650E+01	7.60	.0000E+00	.00

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
1	.0000E+00	-.2954E+03	.0000E+00
8	.0000E+00	.8068E+03	.0000E+00
12	.0000E+00	.8068E+03	.0000E+00
20	.0000E+00	.8068E+03	.0000E+00
23	.0000E+00	.6488E+03	.0000E+00
24	.0000E+00	.5006E+03	.0000E+00
25	.0000E+00	.5006E+03	.0000E+00
27	.0000E+00	.5006E+03	.0000E+00
28	.0000E+00	.5006E+03	.0000E+00
29	.0000E+00	.6488E+03	.0000E+00
32	.0000E+00	.8068E+03	.0000E+00
0	.0000E+00	.8068E+03	.0000E+00
44	.0000E+00	.8068E+03	.0000E+00
50	.0000E+00	-.2954E+03	.0000E+00

1 LOAD CASE 1 MAX. OPERATING LOAD IIA ANALYSIS 1

STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
26	.0000E+00	.4419E+03	-.8127E-04
TOTAL	.0000E+00	.4419E+03	

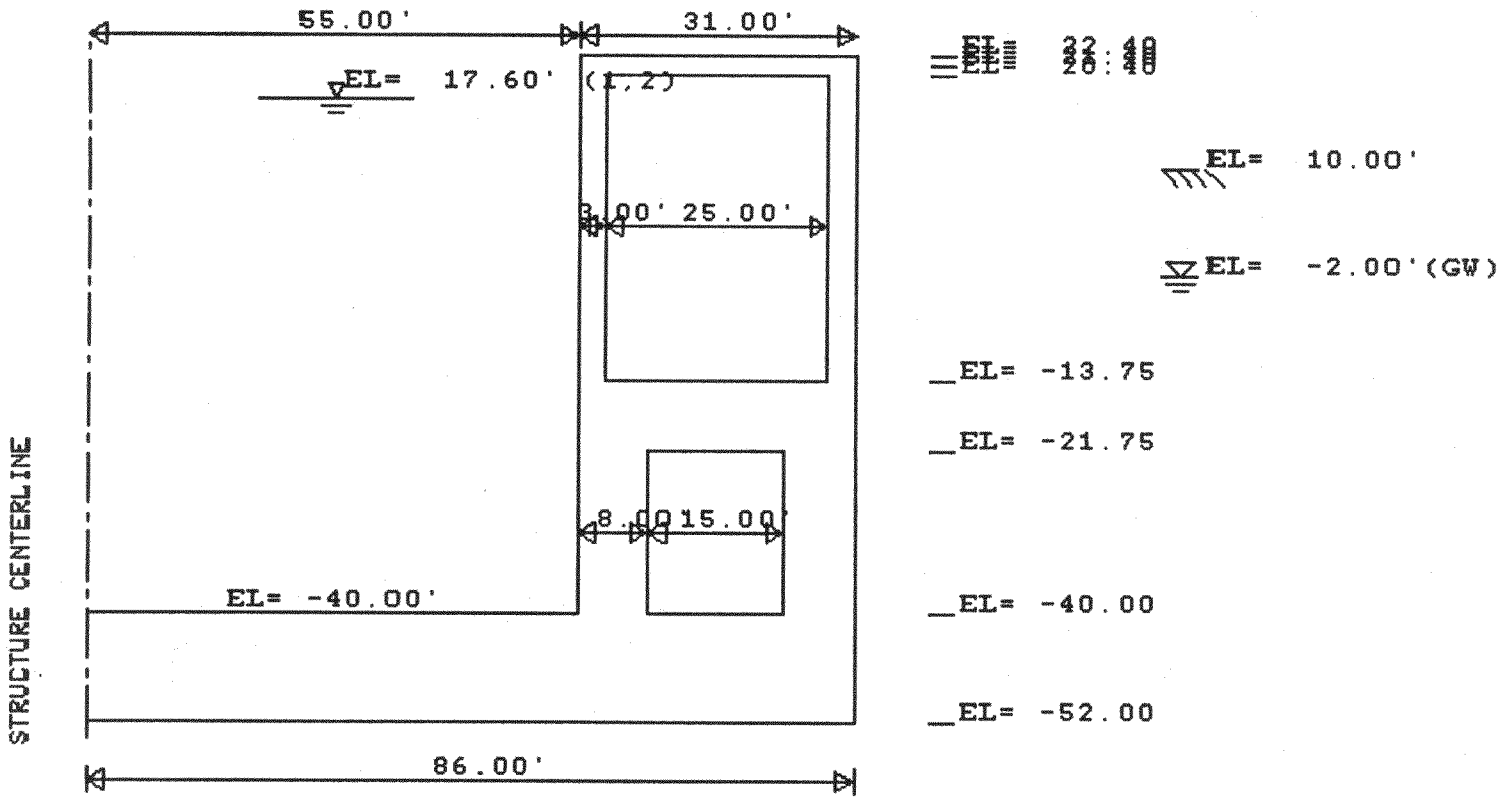
1 MEMBER END FORCES

MEMBER	LOAD CASE	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	3	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.00
		4	.0000E+00	.4207E+03	-.1285E+04	-.1285E+04	6.00
2	1	45	.0000E+00	.0000E+00	.0000E+00	.1285E+04	6.00
		46	.0000E+00	-.4207E+03	.1285E+04	.0000E+00	.00
3	1	1	.0000E+00	-.2954E+03	.0000E+00	.0000E+00	.00
		4	.0000E+00	.3745E+03	-.1340E+04	-.1340E+04	4.00
4	1	4	-.1138E+04	-.1450E+04	.3445E+04	.3445E+04	.00
		8	-.1138E+04	.1490E+04	.5049E+03	.5049E+03	2.00
5	1	8	-.1138E+04	-.6829E+03	.5049E+03	.5049E+03	.00
		9	-.1138E+04	.7225E+03	-.9005E+03	-.9005E+03	2.00
6	1	9	-.1138E+04	-.7225E+03	-.9005E+03	-.9005E+03	.00
		12	-.1138E+04	.6967E+03	-.7996E+04	-.7996E+04	10.00
7	1	12	-.1138E+04	.1101E+03	-.7996E+04	-.7413E+04	5.00
		14	-.1138E+04	-.1230E+03	-.7413E+04	-.7996E+04	.00
8	1	14	-.1138E+04	.1230E+03	-.7413E+04	-.7080E+04	4.00
		16	-.1138E+04	-.4391E+02	-.7080E+04	-.7413E+04	.00
9	1	16	-.5164E+03	-.8468E+03	-.1521E+05	-.1521E+05	.00
		20	-.5164E+03	.9061E+03	-.1784E+05	-.1784E+05	3.00
10	1	20	-.5164E+03	-.9935E+02	-.1784E+05	-.1784E+05	.00
		21	-.5164E+03	.1191E+03	-.1795E+05	-.1795E+05	1.00
11	1	21	-.5164E+03	-.1191E+03	-.1795E+05	-.1795E+05	.00
		23	-.5164E+03	.5332E+03	-.2219E+05	-.2219E+05	13.00
12	1	23	-.5164E+03	.1156E+03	-.2219E+05	-.2198E+05	3.64
		24	-.5164E+03	.3303E+03	-.2369E+05	-.2369E+05	14.00
13	1	24	-.5164E+03	.1703E+03	-.2369E+05	-.2323E+05	5.32

		25	-.5164E+03	.2756E+03	-.2443E+05	-.2443E+05	14.00
14	1	25	-.5164E+03	.2250E+03	-.2443E+05	-.2363E+05	7.00
		26	-.5164E+03	.2209E+03	-.2440E+05	-.2443E+05	.00
15	1	26	-.5164E+03	.2209E+03	-.2440E+05	-.2363E+05	7.00
		27	-.5164E+03	.2250E+03	-.2443E+05	-.2443E+05	14.00
16	1	27	-.5164E+03	.2756E+03	-.2443E+05	-.2323E+05	8.68
		28	-.5164E+03	.1703E+03	-.2369E+05	-.2443E+05	.00
17	1	28	-.5164E+03	.3303E+03	-.2369E+05	-.2198E+05	10.36
		29	-.5164E+03	.1156E+03	-.2219E+05	-.2369E+05	.00
18	1	29	-.5164E+03	.5332E+03	-.2219E+05	-.1795E+05	13.00
		30	-.5164E+03	-.1191E+03	-.1795E+05	-.2219E+05	.00
19	1	30	-.5164E+03	.1191E+03	-.1795E+05	-.1784E+05	1.00
		32	-.5164E+03	-.9935E+02	-.1784E+05	-.1795E+05	.00
20	1	32	-.5164E+03	.9061E+03	-.1784E+05	-.1521E+05	3.00
		33	-.5164E+03	-.8468E+03	-.1521E+05	-.1784E+05	.00
21	1	33	-.1138E+04	-.4391E+02	-.7080E+04	-.7080E+04	.00
		38	-.1138E+04	.1230E+03	-.7413E+04	-.7413E+04	4.00
22	1	38	-.1138E+04	-.1230E+03	-.7413E+04	-.7413E+04	.00
		40	-.1138E+04	.1101E+03	-.7996E+04	-.7996E+04	5.00
23	1	40	-.1138E+04	.6967E+03	-.7996E+04	-.9005E+03	10.00
		43	-.1138E+04	-.7225E+03	-.9005E+03	-.7996E+04	.00
24	1	43	-.1138E+04	.7225E+03	-.9005E+03	.5049E+03	2.00
		44	-.1138E+04	-.6829E+03	.5049E+03	-.9005E+03	.00
25	1	44	-.1138E+04	.1490E+04	.5049E+03	.3445E+04	2.00
		46	-.1138E+04	-.1450E+04	.3445E+04	.5049E+03	.00
26	1	46	.0000E+00	.3745E+03	-.1340E+04	.0000E+00	4.00
		50	.0000E+00	-.2954E+03	.0000E+00	-.1340E+04	.00
27	1	4	-.1076E+04	.7170E+03	-.6070E+04	-.2254E+04	6.00
		5	-.1076E+04	-.5575E+03	-.2254E+04	-.6070E+04	.00
28	1	16	-.8907E+03	-.6213E+03	.8128E+04	.8128E+04	.00
		17	-.8907E+03	.6213E+03	.4400E+04	.4400E+04	6.00
29	1	33	-.8907E+03	.6213E+03	-.8128E+04	-.4400E+04	6.00
		34	-.8907E+03	-.6213E+03	-.4400E+04	-.8128E+04	.00
30	1	46	-.1076E+04	-.7170E+03	.6070E+04	.6070E+04	.00
		47	-.1076E+04	.5575E+03	.2254E+04	.2254E+04	6.00
31	1	5	-.1076E+04	.5575E+03	-.2254E+04	.6155E+03	10.95
		6	-.1076E+04	.2997E+03	-.5485E+03	-.2254E+04	.00
32	1	17	-.8907E+03	-.6213E+03	.4400E+04	.4400E+04	.00
		18	-.8907E+03	-.1527E+03	.5674E+03	.2408E+03	13.87
33	1	34	-.8907E+03	.6213E+03	-.4400E+04	-.2408E+03	13.87

		35	-.8907E+03	.1527E+03	-.5674E+03	-.4400E+04	.00
34	1	47	-.1076E+04	-.5575E+03	.2254E+04	.2254E+04	.00
		48	-.1076E+04	-.2997E+03	.5485E+03	-.6155E+03	10.95
35	1	6	-.1076E+04	-.2997E+03	-.5485E+03	-.5485E+03	.00
		7	-.1076E+04	.4301E+03	-.2015E+04	-.2015E+04	4.00
36	1	18	-.8907E+03	.1527E+03	.5674E+03	.1444E+04	4.00
		19	-.8907E+03	-.2835E+03	.1444E+04	.5674E+03	.00
37	1	35	-.8907E+03	-.1527E+03	-.5674E+03	-.5674E+03	.00
		36	-.8907E+03	.2835E+03	-.1444E+04	-.1444E+04	4.00
38	1	48	-.1076E+04	.2997E+03	.5485E+03	.2015E+04	4.00
		49	-.1076E+04	-.4301E+03	.2015E+04	.5485E+03	.00
39	1	2	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.00
		7	.0000E+00	.2920E+03	-.5840E+03	-.5840E+03	4.00
40	1	7	-.4301E+03	.7836E+03	-.2599E+04	.2297E+04	11.50
		10	-.4301E+03	-.1211E+03	.2297E+04	-.2599E+04	.00
41	1	10	-.2835E+03	.1520E+03	-.5481E+03	-.3079E+03	3.22
		19	-.2835E+03	.5283E+03	-.2169E+04	-.2169E+04	11.50
42	1	19	.0000E+00	.3624E+03	-.7248E+03	.0000E+00	4.00
		22	.0000E+00	.0000E+00	.0000E+00	-.7248E+03	.00
43	1	31	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.00
		36	.0000E+00	.3624E+03	-.7248E+03	-.7248E+03	4.00
44	1	36	-.2835E+03	.5283E+03	-.2169E+04	-.3079E+03	8.28
		41	-.2835E+03	.1520E+03	-.5481E+03	-.2169E+04	.00
45	1	41	-.4301E+03	-.1211E+03	.2297E+04	.2297E+04	.00
		49	-.4301E+03	.7836E+03	-.2599E+04	-.2599E+04	11.50
46	1	49	.0000E+00	.2920E+03	-.5840E+03	.0000E+00	4.00
		51	.0000E+00	.0000E+00	.0000E+00	-.5840E+03	.00
47	1	10	.3082E+02	-.1467E+03	.2845E+04	.2845E+04	.00
		11	.3082E+02	.1400E+03	.2270E+04	.2270E+04	4.00
48	1	41	.3082E+02	.1467E+03	-.2845E+04	-.2270E+04	4.00
		42	.3082E+02	-.1400E+03	-.2270E+04	-.2845E+04	.00
49	1	11	.1652E+00	-.1433E+03	.2270E+04	.2270E+04	.00
		13	.1652E+00	.2527E+02	.6402E+02	.6402E+02	24.31
50	1	42	.1652E+00	.1433E+03	-.2270E+04	-.6402E+02	24.31
		39	.1652E+00	-.2527E+02	-.6402E+02	-.2270E+04	.00
51	1	13	.0000E+00	-.2527E+02	.6402E+02	.6402E+02	.00
		15	.0000E+00	.0000E+00	.0000E+00	-.6264E-04	9.41
52	1	39	.0000E+00	.2527E+02	-.6402E+02	.6264E-04	9.41
		37	.0000E+00	.0000E+00	.0000E+00	-.6402E+02	.00

'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

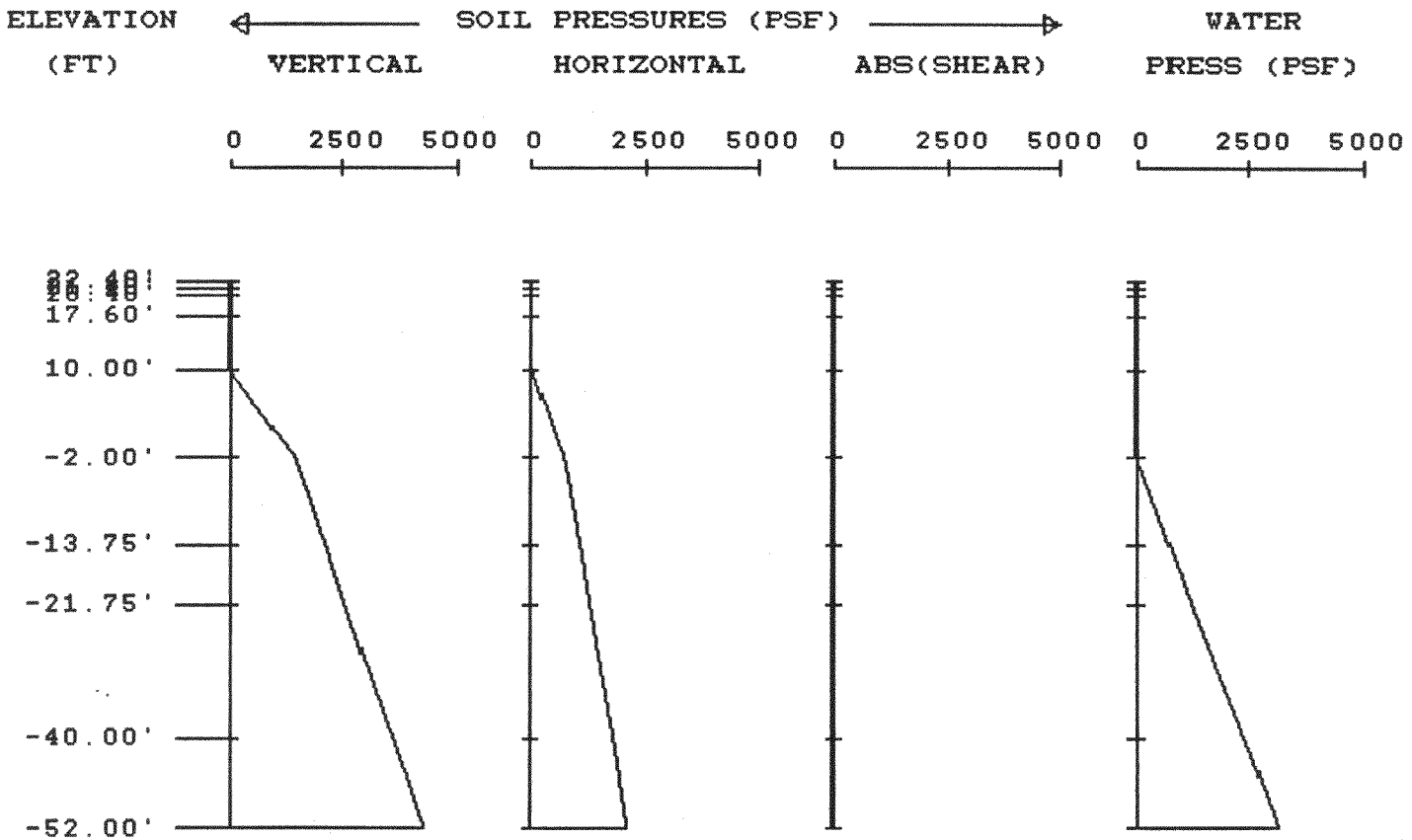


*** RIGHTSIDE ***

(1) CHAMBER (2) RIGHTSIDE CULVERT

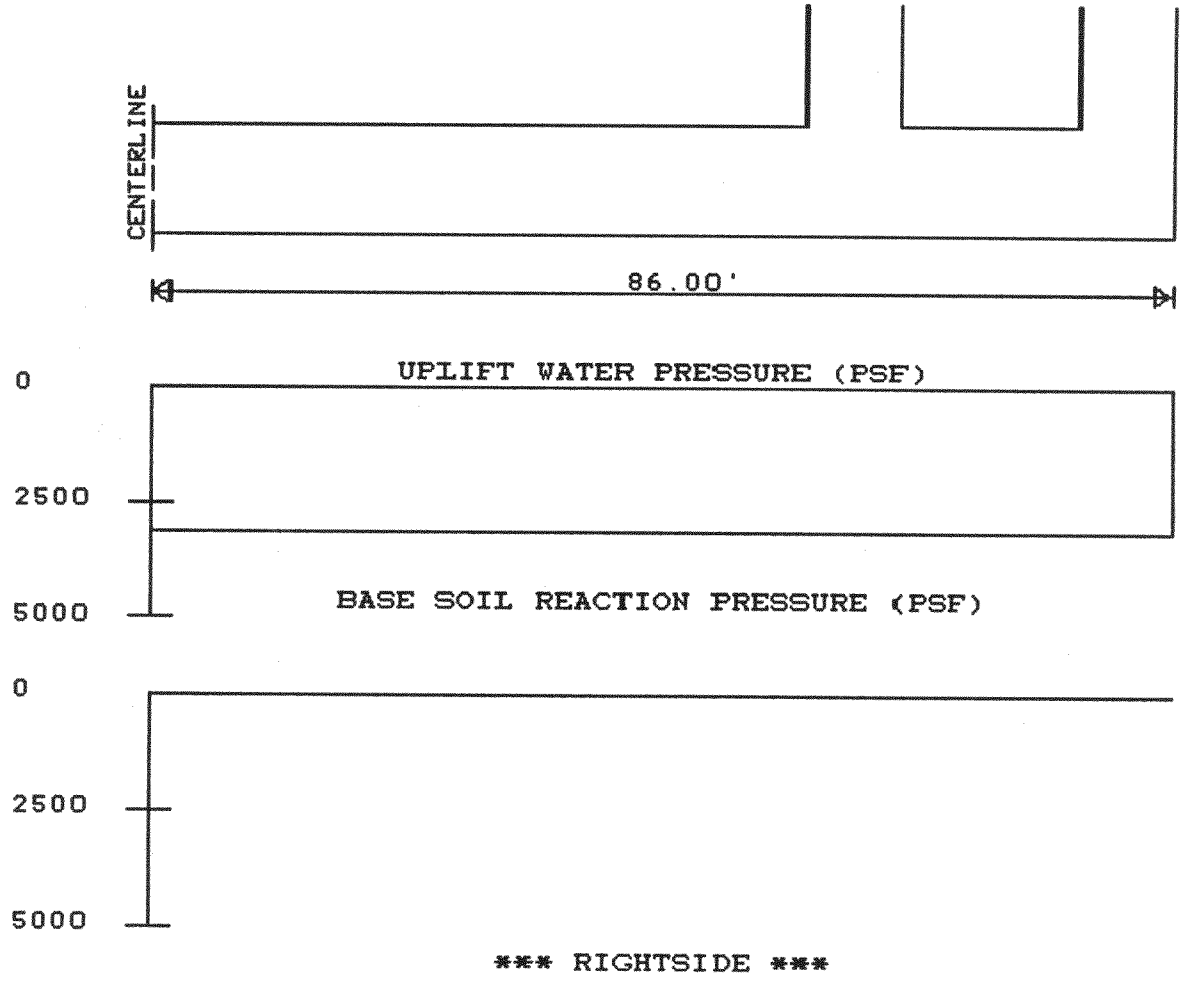
Analysis 2

'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'



*** RIGHTSIDE ***

'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'



*** RIGHTSIDE ***

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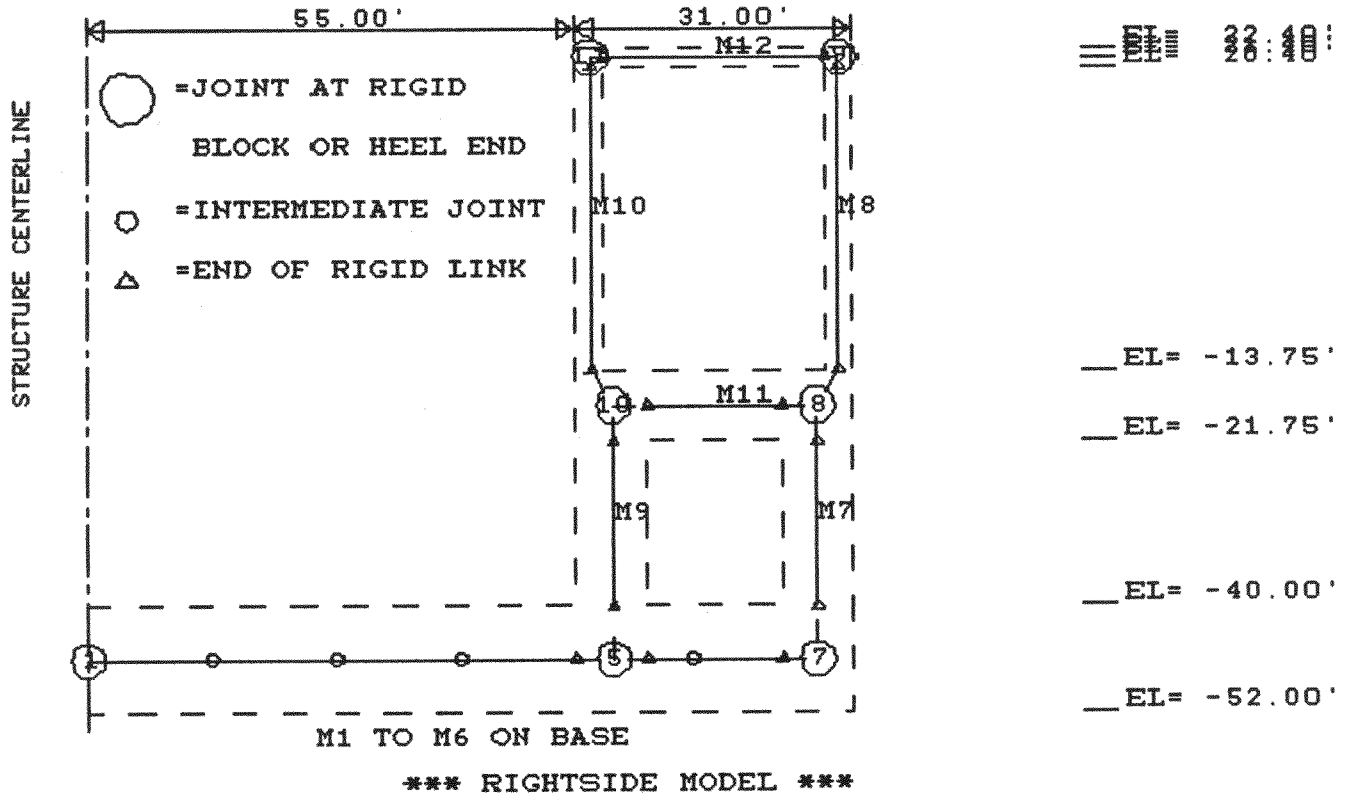

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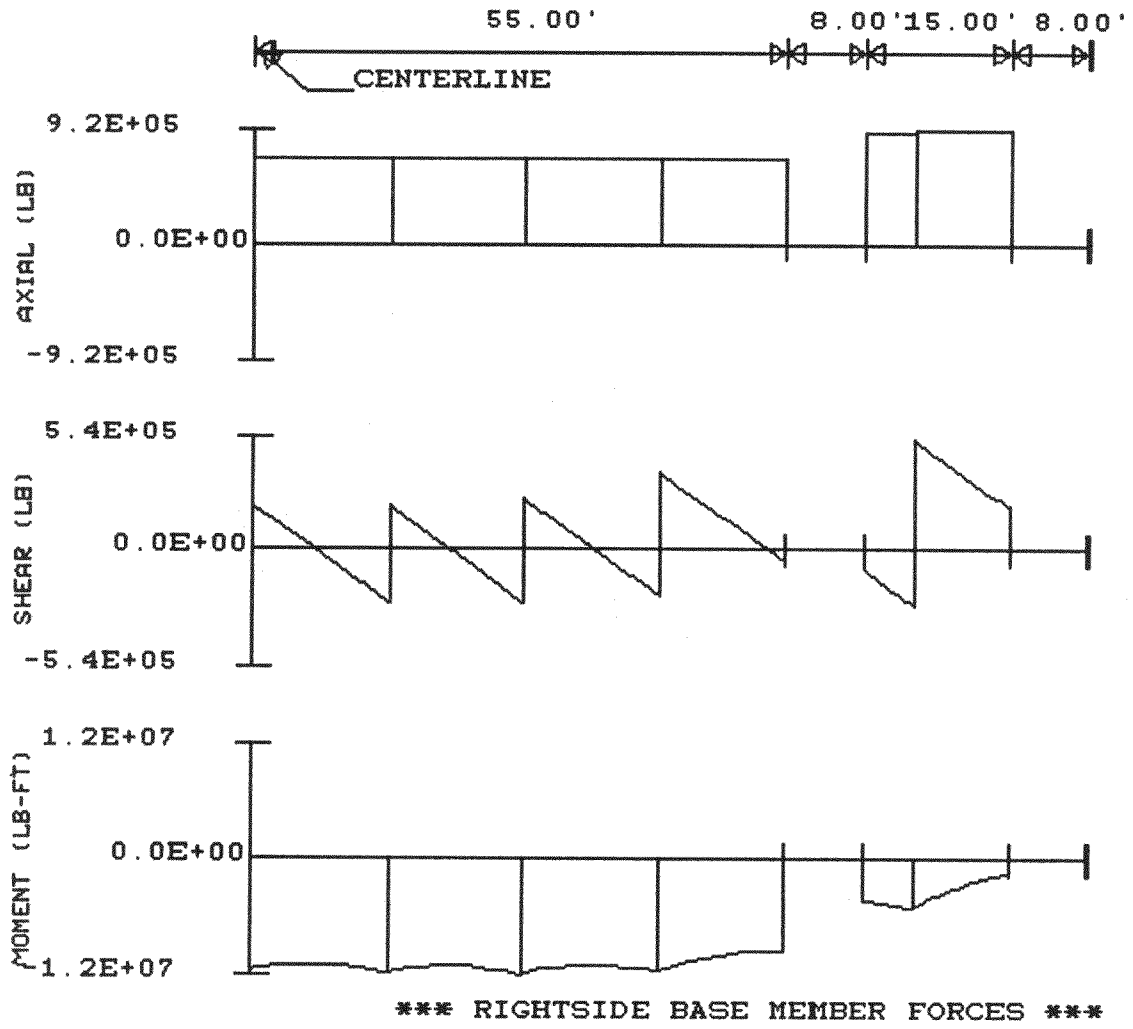


*** RIGHTSIDE BASE MEMBER FORCES ***

```
1000    'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'
1100    METHOD FR 1.00 1.00
1200    STRUCTURE 3600000.0 0.15 150.0 14.0
1300    FLOOR 55.0 -40.0
1400    BASE BOTH 86.0 -52.0
1500    STEM BOTH 7
1510            31.0 22.4 31.0 21.4 31.0 20.4 31.0 -13.75
1520            31.0 -21.75 31.0 -40.0 31.0 -40.0
1600    CULVERT BOTH 8.0 15.0 -40.0 18.25
1700    VOID BOTH 3.0 25.0 -13.75 34.15
1800    BACKFILL BOTH SOIL 1 0.0
1810            10.0 120.0 120.0 0.5 0.5
1900    REACTION PILE
1910    PILE BOTH
1920    LAYOUT 1 0.0
1930    LAYOUT 2 14.0
1940    LAYOUT 3 28.0
1950    LAYOUT 4 42.0
1960    LAYOUT 5 56.0
1970    LAYOUT 6 68.0
1980    LAYOUT 7 80.0
2000    PROPERTIES 1 29000000.0 74.61 21045.5 150.0 1.0 0.0 0.0 7.4 7 1
2100    WATER 62.5
2200    EXTERNAL BOTH ELEVATION -2.0
2300    UPLIFT ELEVATION -2.0
2400    INTERNAL 17.6 17.6 17.6
2500    LOAD BOTH STEM TOP
2600    DISTRIBUTED 2 0.0 0.0 2110.0
2610            31.0 0.0 2110.0
2700    OUTPUT MEMBERS BOTH ALL
2800    FINISH
```

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.39.33

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

****
* INPUT DATA *
****

II.--PLANE FRAME ANALYSIS
RIGID LINK FACTOR = 1.00
MEMBER FORCE FACTOR = 1.00

III.--STRUCTURE DATA

III.A.--MATERIAL PROPERTIES
MODULUS OF ELASTICITY OF CONCRETE = 3.600E+06 (PSI)
POISSON'S RATIO FOR CONCRETE = .15
UNIT WEIGHT OF CONCRETE = 150.0 (PCF)
THICKNESS OF TWO-DIMENSIONAL SLICE = 14.00 (FT)

III.B.--FLOOR DATA
FLOOR WIDTH = 55.00 (FT)
FLOOR ELEVATION = -40.00 (FT)
FLOOR FILLET SIZE = .00 (FT)

III.C.--BASE DATA

III.C.1.--RIGHTSIDE
DISTANCE FROM

CENTERLINE (FT)	ELEVATION (FT)
86.00	-52.00

III.C.2.--LEFTSIDE
SYMMETRIC WITH RIGHTSIDE.

III.D.--STEM DATA

III.D.1.--RIGHTSIDE
DISTANCE FROM

STEM FACE (FT)	ELEVATION (FT)
31.00	22.40
31.00	21.40
31.00	20.40
31.00	-13.75
31.00	-21.75
31.00	-40.00
31.00	-40.00

III.D.2.--LEFTSIDE
SYMMETRIC WITH RIGHTSIDE.

III.E.--CULVERT DATA

III.E.1.--RIGHTSIDE

DISTANCE FROM STEM FACE TO INTERIOR SIDE	=	8.00 (FT)
CULVERT WIDTH	=	15.00 (FT)
ELEVATION AT CULVERT FLOOR	=	-40.00 (FT)
CULVERT HEIGHT	=	18.25 (FT)
CULVERT FILLET SIZE	=	.00 (FT)

III.E.2.--LEFTSIDE
SYMMETRIC WITH RIGHTSIDE

III.F.--VOID DATA

III.F.1.--RIGHTSIDE

DISTANCE FROM STEM FACE TO INTERIOR SIDE	=	3.00 (FT)
VOID WIDTH	=	25.00 (FT)
ELEVATION AT VOID BOTTOM	=	-13.75 (FT)
VOID HEIGHT	=	34.15 (FT)
VOID TIES		NONE

III.F.2.--LEFTSIDE
SYMMETRIC WITH RIGHTSIDE

IV.--BACKFILL DATA

IV.A.--RIGHTSIDE SOIL LAYER DATA (SURFACE SURCHARGE = .00 (PSF))

ELEV AT TOP (FT)	SATURATED UNIT WT. (PCF)	MOIST UNIT WT. (PCF)	<-PRESSURE COEFFICIENTS-> HORIZONTAL TOP	HORIZONTAL BOT.	SHEAR TOP	SHEAR BOT.
10.00	120.0	120.0	.500	.500	.000	.000

IV.B.--LEFTSIDE SOIL LAYER DATA
SYMMETRIC WITH RIGHTSIDE

V.--BASE REACTION DATA

V.A.--RIGHTSIDE PILE DATA

V.A.1.--PILE LAYOUT DATA

<------START-----> PILE NO.	DIST. FROM CENTERLINE (FT)	STOP PILE NO.	PILE NO. STEP	STEP IN CL DIST. (FT)
1	.00	1	1	.00
2	14.00	2	1	.00
3	28.00	3	1	.00
4	42.00	4	1	.00
5	56.00	5	1	.00
6	68.00	6	1	.00
7	80.00	7	1	.00

V.A.2.--PILE PROPERTIES

<----------START----------> STOP PILE

PILE NO.	MODULUS OF ELASTICITY (PSI)	SECT AREA (SQIN)	MOMENT OF INERTIA (IN**4)	LENGTH (FT)	AXIAL COEFF	HEAD FIXITY	PILE NO.	NO. STEP
1	2.90E+07	74.61	21045.50	150.00	1.00	.00	7	1

V.A.3.--SOIL PROPERTIES

<----------START----------> PILE NO.	CONSTANT COEFFICIENT (PSI)	LINEAR COEFFICIENT (PCI)	STOP PILE NO.	PILE NO. STEP
1	.000	7.400	7	1

V.A.4.--PILE HEAD STIFFNESS MATRICES
NONE

V.A.4.--PILE BATTER DATA
NONE

V.A.5.--PILE LOAD COMPARISON DATA
NONE

V.B.-- LEFTSIDE PILE DATA
SYMMETRIC WITH RIGHTSIDE

VI.--WATER DATA
WATER UNIT WEIGHT = 62.5 (PCF)

VI.A.--EXTERNAL WATER DATA

VI.A.1.--RIGHTSIDE EXTERNAL WATER DATA
GROUND WATER ELEVATION = -2.00 (FT)
SURCHARGE WATER NONE

VI.A.2.-- LEFTSIDE EXTERNAL WATER DATA
SYMMETRIC WITH RIGHTSIDE

VI.B.--UPLIFT WATER DATA
RIGHTSIDE UPLIFT WATER ELEVATION = -2.00 (FT)
LEFTSIDE UPLIFT WATER ELEVATION = -2.00 (FT)

VI.C.--INTERNAL WATER DATA
WATER ELEVATION IN CHAMBER = 17.60 (FT)
WATER ELEVATION IN RIGHTSIDE CULVERT = 17.60 (FT)
WATER ELEVATION IN LEFTSIDE CULVERT = 17.60 (FT)

VII.--ADDITIONAL LOAD DATA

VII.A.1.--ADDITIONAL LOADS ON RIGHTSIDE EXTERNAL STEM FACE
NONE

VII.A.2.--ADDITIONAL LOADS ON LEFTSIDE EXTERNAL STEM FACE
NONE

VII.B.1.--ADDITIONAL LOADS ON RIGHTSIDE INTERIOR STEM FACE
NONE

VII.B.2.--ADDITIONAL LOADS ON LEFTSIDE INTERIOR STEM FACE
NONE

VII.C.1.--ADDITIONAL LOADS ON RIGHTSIDE STEM TOP

CONCENTRATED LOAD DATA
NONE

DISTRIBUTED LOAD DATA

DIST FROM STEM FACE (FT)	HORIZONTAL LOAD (PSF)	VERTICAL LOAD (PSF)
.00	.00	2110.00
31.00	.00	2110.00

VII.C.2.--ADDITIONAL LOADS ON LEFTSIDE STEM TOP

CONCENTRATED LOAD DATA
NONE

DISTRIBUTED LOAD DATA
SYMMETRIC WITH RIGHTSIDE

VII.D.1.--ADDITIONAL LOADS ON RIGHTSIDE OF CHAMBER FLOOR
NONE

VII.D.2.--ADDITIONAL LOADS ON LEFTSIDE OF CHAMBER FLOOR
NONE

VII.E.1.--ADDITIONAL LOADS ON RIGHTSIDE OF STRUCTURE BASE
NONE

VII.E.2.--ADDITIONAL LOADS ON LEFTSIDE OF STRUCTURE BASE
NONE

VII.F.--EARTHQUAKE ACCELERATIONS
NONE

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.40.05

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

****
* RESULTS OF EQUILIBRIUM ANALYSIS *
****

II.--EFFECTS ON STRUCTURE RIGHTSIDE

II.A.--PRESSURES ON RIGHTSIDE SURFACE
(POSITIVE VERTICAL IS DOWN)
(POSITIVE HORIZONTAL IS TOWARD CENTERLINE)
(POSITIVE SHEAR IS DOWN)
(UNITS ARE POUNDS AND FEET)

<---------BACKFILL PRESSURE---------> GRND/SURCH

ELEVATION	VERTICAL	HORIZONTAL	SHEAR	WATER PRESSURE
22.400	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
21.400	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20.400	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
17.600	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-2.000	1.4400E+03	7.2000E+02	0.0000E+00	0.0000E+00
-13.750	2.1156E+03	1.0578E+03	0.0000E+00	7.3438E+02
-21.750	2.5756E+03	1.2878E+03	0.0000E+00	1.2344E+03
-40.000	3.6250E+03	1.8125E+03	0.0000E+00	2.3750E+03
-52.000	4.3150E+03	2.1575E+03	0.0000E+00	3.1250E+03

II.B.--PRESSURE ON RIGHTSIDE BASE
(POSITIVE PRESSURE IS UP; UNITS ARE POUNDS AND FEET)

DIST FROM CENTERLINE	SOIL REACTION PRESSURE	UPLIFT WATER PRESSURE
.000	0.0000E+00	3.1250E+03
14.000	0.0000E+00	3.1250E+03
28.000	0.0000E+00	3.1250E+03
42.000	0.0000E+00	3.1250E+03
55.000	0.0000E+00	3.1250E+03
56.000	0.0000E+00	3.1250E+03
63.000	0.0000E+00	3.1250E+03
68.000	0.0000E+00	3.1250E+03
78.000	0.0000E+00	3.1250E+03
80.000	0.0000E+00	3.1250E+03
86.000	0.0000E+00	3.1250E+03

II.C.--RESULTANTS OF LOADS ON STRUCTURE RIGHTSIDE
(POSITIVE VERTICAL IS DOWN)
(POSITIVE HORIZONTAL IS TOWARD CENTERLINE)
(POSITIVE MOMENT IS COUNTERCLOCKWISE ABOUT CHAMBER FLOOR CENTERLINE)
(UNITS ARE POUNDS AND FEET)

ITEM	HORIZONTAL	VERTICAL	MOMENT
BACKFILL	1.0676E+06	0.0000E+00	1.1440E+07
GROUND/SURCH WATER	1.0938E+06	0.0000E+00	5.1042E+06
INTERNAL WATER	-1.4515E+06	3.0115E+06	-1.2099E+08
UPLIFT WATER	0.0000E+00	-3.7625E+06	1.6179E+08
ADDL TOP STEM LOADS	0.0000E+00	9.1574E+05	-6.4560E+07
CONCRETE	0.0000E+00	3.8617E+06	-2.1265E+08
TOTAL THIS SIDE	7.0983E+05	4.0265E+06	-2.1987E+08

III.--EFFECTS ON STRUCTURE LEFTSIDE
SYMMETRIC WITH RIGHTSIDE

IV.--NET RESULTANTS OF ALL LOADS
(POSITIVE HORIZONTAL IS TO THE RIGHT)
(POSITIVE VERTICAL IS DOWN)
(POSITIVE MOMENT IS COUNTERCLOCKWISE ABOUT CENTERLINE)
(UNITS ARE POUNDS AND FEET)

TOTAL HORIZONTAL = 0.0000E+00
TOTAL VERTICAL = 8.0529E+06
TOTAL MOMENT = 0.0000E+00

V.--CONCRETE AREAS

RIGHTSIDE AREA	=	1.8389E+03	(SQFT)
LEFTSIDE AREA	=	1.8389E+03	(SQFT)
TOTAL AREA	=	3.6778E+03	(SQFT)

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.40.48

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

****
* FRAME MODEL DATA *
****

II.--RIGHTSIDE FRAME MODEL DATA

II.A.--RIGID BLOCK DATA (FT) - TYPE 31 MONOLITH
(NOTE 'X-COORD.' IS DISTANCE FROM CENTERLINE.)

BLOCK	CORNER NO.	<----------CORNER LOCATIONS----------> 1	2	3	4	5	6	CENTROID
1	X-COORD.	78.00	78.00	86.00	86.00	86.00	78.00	82.00
	ELEVATION	-52.00	-40.00	-40.00	-40.00	-52.00	-52.00	-46.00
2	X-COORD.	55.00	55.00	63.00	63.00	63.00	55.00	59.00
	ELEVATION	-52.00	-40.00	-40.00	-40.00	-52.00	-52.00	-46.00
3	X-COORD.	55.00	55.00	58.00	63.00	63.00	63.00	59.00
	ELEVATION	-21.75	-13.75	-13.75	-13.75	-21.75	-21.75	-17.75
4	X-COORD.	78.00	78.00	86.00	86.00	86.00	86.00	82.00
	ELEVATION	-21.75	-13.75	-13.75	-13.75	-21.75	-21.75	-17.75
5	X-COORD.	55.00	55.00	58.00	58.00	58.00	58.00	56.50
	ELEVATION	20.40	22.40	22.40	20.40	20.40	20.40	21.40
6	X-COORD.	83.00	83.00	86.00	86.00	86.00	86.00	84.50
	ELEVATION	20.40	22.40	22.40	21.40	20.40	20.40	21.40

II.B.--JOINT COORDINATES (FT)
(NOTE 'X-COORD.' IS DISTANCE FROM CENTERLINE.)

JOINT NO.	X-COORD.	ELEVATION
1	.00000	-46.00000
2	14.00000	-46.00000
3	28.00000	-46.00000
4	42.00000	-46.00000
5	59.00000	-46.00000
6	68.00000	-46.00000
7	82.00000	-46.00000
8	82.00000	-17.75000
9	84.50000	21.40000
10	59.00000	-17.75000
11	56.50000	21.40000

II.C.--MEMBER DATA (FT)
(NOTE 'X-COORD.' IS DISTANCE FROM CENTERLINE.)

MEM NO	FROM JT	TO JT	<COORDS AT ENDS OF FLEX LENGTH> <--FROM END--> X	ELEV	<---TO END---> X	ELEV	<-MEMBER DEPTH--> FROM END	TO END
1	1	2	.00	-46.00	14.00	-46.00	12.00	12.00
2	2	3	14.00	-46.00	28.00	-46.00	12.00	12.00
3	3	4	28.00	-46.00	42.00	-46.00	12.00	12.00
4	4	5	42.00	-46.00	55.00	-46.00	12.00	12.00
5	5	6	63.00	-46.00	68.00	-46.00	12.00	12.00
6	6	7	68.00	-46.00	78.00	-46.00	12.00	12.00
7	7	8	82.00	-40.00	82.00	-21.75	8.00	8.00
8	8	9	84.50	-13.75	84.50	20.40	3.00	3.00
9	5	10	59.00	-40.00	59.00	-21.75	8.00	8.00
10	10	11	56.50	-13.75	56.50	20.40	3.00	3.00
11	10	8	63.00	-17.75	78.00	-17.75	8.00	8.00
12	11	9	58.00	21.40	83.00	21.40	2.00	2.00

II.D.--PILE HEAD STIFFNESS COEFFICIENTS

PILE NO.	X-COORD. (FT)	BATTER (FT/FT)	<----------STIFFNESS COEFFICIENTS----------> B11 (LB/FT)	B22 (LB/FT)	B33 (LB-FT)	B13 (LB)
1	.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
2	14.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
3	28.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
4	42.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
5	56.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
6	68.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00
7	80.00	.00	8.5013E+05	1.4425E+07	0.0000E+00	0.0000E+00

III.-- LEFTSIDE FRAME MODEL DATA
SYMMETRIC WITH RIGHTSIDE

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.41.14

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

****
* RESULTS OF FRAME ANALYSIS *
****

II.--STRUCTURE DISPLACEMENTS

II.A.--RIGHTSIDE DISPLACEMENTS - TYPE 31 MONOLITH
(POSITIVE HORIZONTAL DISPLACEMENT IS TOWARD STRUCTURE CENTERLINE.)
(POSITIVE VERTICAL DISPLACEMENT IS DOWN.)
(POSITIVE ROTATION IS COUNTERCLOCKWISE.)

JT NO	DISTANCE FROM CTR-LINE (FT)	ELEVATION (FT)	<----DISPLACEMENT (FT OR RADIANS)----> HORIZONTAL	VERTICAL	ROTATION
		***** BASE JOINTS *****			
1	.00	-46.00	0.000E+00	2.956E-02	0.000E+00
2	14.00	-46.00	1.116E-04	3.060E-02	-1.501E-04
3	28.00	-46.00	2.233E-04	3.376E-02	-3.025E-04
4	42.00	-46.00	3.353E-04	3.907E-02	-4.539E-04
5	59.00	-46.00	4.397E-04	4.821E-02	-5.802E-04
6	68.00	-46.00	4.920E-04	5.346E-02	-6.016E-04
7	82.00	-46.00	5.971E-04	6.227E-02	-6.289E-04
		***** OUTSIDE STEM JOINTS *****			
8	82.00	-17.75	-1.701E-02	6.261E-02	-6.300E-04
9	84.50	21.40	-5.219E-02	6.520E-02	-1.251E-04
		***** INSIDE STEM JOINTS *****			
10	59.00	-17.75	-1.710E-02	4.843E-02	-6.277E-04
11	56.50	21.40	-5.242E-02	4.782E-02	-1.485E-03

II.B.-- LEFTSIDE DISPLACEMENTS - TYPE 31 MONOLITH
SYMMETRIC WITH RIGHTSIDE

III.--UNFACTORED FORCES AT ENDS OF MEMBERS
(MEMBER FORCES ARE GIVEN AT ENDS OF FLEXIBLE LENGTH.)

III.A.--RIGHTSIDE MEMBERS - TYPE 31 MONOLITH
(POSITIVE AXIAL FORCE IS COMPRESSION.)
(POSITIVE SHEAR FORCE TENDS TO MOVE MEMBER UPWARD OR TOWARD STRUCTURE CENTERLINE.)
(POSITIVE MOMENT PRODUCES COMPRESSION ON TOP OF MEMBER OR ON SIDE OF MEMBER TOWARD STRUCTURE CENTERLINE.)

MEM NO	DISTANCE FROM CTR-LINE (FT)	ELEVATION (FT)	<--------FORCES (LBS OR LB-FT)--------> AXIAL	SHEAR	MOMENT
		***** BASE MEMBERS *****			
1	.00	-46.00	6.941E+05	2.132E+05	-1.166E+07
	14.00	-46.00	6.941E+05	2.327E+05	-1.179E+07
2	14.00	-46.00	6.950E+05	2.086E+05	-1.180E+07
	28.00	-46.00	6.950E+05	2.373E+05	-1.200E+07
3	28.00	-46.00	6.967E+05	2.497E+05	-1.201E+07
	42.00	-46.00	6.967E+05	1.962E+05	-1.163E+07
4	42.00	-46.00	6.993E+05	3.674E+05	-1.165E+07
	55.00	-46.00	6.993E+05	4.669E+04	-9.565E+06
5	63.00	-46.00	9.117E+05	-8.326E+04	-4.127E+06
	68.00	-46.00	9.117E+05	2.425E+05	-4.941E+06
6	68.00	-46.00	9.152E+05	5.286E+05	-4.962E+06
	78.00	-46.00	9.152E+05	-2.101E+05	-1.269E+06
		***** OUTSIDE STEM MEMBERS *****			
7	82.00	-40.00	1.239E+06	-1.234E+05	7.524E+05
	82.00	-21.75	9.319E+05	4.036E+04	-5.384E+05
8	84.50	-13.75	7.569E+05	-1.296E+05	-4.485E+05
	84.50	20.40	5.418E+05	-1.375E+05	2.253E+06
		***** INSIDE STEM MEMBERS *****			
9	59.00	-40.00	8.552E+05	2.091E+05	-2.713E+06
	59.00	-21.75	5.486E+05	-2.091E+05	1.103E+06
10	56.50	-13.75	7.193E+05	2.925E+05	-1.524E+06
	56.50	20.40	5.042E+05	1.375E+05	-1.726E+06

		***** CULVERT ROOF *****			
11	63.00	-17.75	3.309E+05	-3.051E+05	1.578E+06
	78.00	-17.75	3.309E+05	4.061E+04	-1.015E+06
		***** VOID ROOF *****			
12	58.00	21.40	1.375E+05	4.029E+05	-1.259E+06
	83.00	21.40	1.375E+05	4.406E+05	-1.729E+06

III.B.-- LEFTSIDE MEMBERS - TYPE 31 MONOLITH
SYMMETRIC WITH RIGHTSIDE

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.41.14

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

****
* RESULTS OF FRAME ANALYSIS *
****

II.--STRUCTURE DISPLACEMENTS

II.A.--RIGHTSIDE DISPLACEMENTS - TYPE 31 MONOLITH
(POSITIVE HORIZONTAL DISPLACEMENT IS TOWARD STRUCTURE CENTERLINE.)
(POSITIVE VERTICAL DISPLACEMENT IS DOWN.)
(POSITIVE ROTATION IS COUNTERCLOCKWISE.)

JT NO	DISTANCE FROM CTR-LINE (FT)	ELEVATION (FT)	<----DISPLACEMENT (FT OR RADIANS)----> HORIZONTAL	VERTICAL	ROTATION
		***** BASE JOINTS *****			
1	.00	-46.00	0.000E+00	2.956E-02	0.000E+00
2	14.00	-46.00	1.116E-04	3.060E-02	-1.501E-04
3	28.00	-46.00	2.233E-04	3.376E-02	-3.025E-04
4	42.00	-46.00	3.353E-04	3.907E-02	-4.539E-04
5	59.00	-46.00	4.397E-04	4.821E-02	-5.802E-04
6	68.00	-46.00	4.920E-04	5.346E-02	-6.016E-04
7	82.00	-46.00	5.971E-04	6.227E-02	-6.289E-04
		***** OUTSIDE STEM JOINTS *****			
8	82.00	-17.75	-1.701E-02	6.261E-02	-6.300E-04
9	84.50	21.40	-5.219E-02	6.520E-02	-1.251E-04
		***** INSIDE STEM JOINTS *****			
10	59.00	-17.75	-1.710E-02	4.843E-02	-6.277E-04
11	56.50	21.40	-5.242E-02	4.782E-02	-1.485E-03

II.B.-- LEFTSIDE DISPLACEMENTS - TYPE 31 MONOLITH
SYMMETRIC WITH RIGHTSIDE

III.--UNFACTORED FORCES AT ENDS OF MEMBERS
(MEMBER FORCES ARE GIVEN AT ENDS OF FLEXIBLE LENGTH.)

III.A.--RIGHTSIDE MEMBERS - TYPE 31 MONOLITH
(POSITIVE AXIAL FORCE IS COMPRESSION.)
(POSITIVE SHEAR FORCE TENDS TO MOVE MEMBER UPWARD OR TOWARD STRUCTURE CENTERLINE.)
(POSITIVE MOMENT PRODUCES COMPRESSION ON TOP OF MEMBER OR ON SIDE OF MEMBER TOWARD STRUCTURE CENTERLINE.)

MEM NO	DISTANCE FROM CTR-LINE (FT)	ELEVATION (FT)	<--------FORCES (LBS OR LB-FT)--------> AXIAL	SHEAR	MOMENT
		***** BASE MEMBERS *****			
1	.00	-46.00	6.941E+05	2.132E+05	-1.166E+07
	14.00	-46.00	6.941E+05	2.327E+05	-1.179E+07
2	14.00	-46.00	6.950E+05	2.086E+05	-1.180E+07
	28.00	-46.00	6.950E+05	2.373E+05	-1.200E+07
3	28.00	-46.00	6.967E+05	2.497E+05	-1.201E+07
	42.00	-46.00	6.967E+05	1.962E+05	-1.163E+07
4	42.00	-46.00	6.993E+05	3.674E+05	-1.165E+07
	55.00	-46.00	6.993E+05	4.669E+04	-9.565E+06
5	63.00	-46.00	9.117E+05	-8.326E+04	-4.127E+06
	68.00	-46.00	9.117E+05	2.425E+05	-4.941E+06
6	68.00	-46.00	9.152E+05	5.286E+05	-4.962E+06
	78.00	-46.00	9.152E+05	-2.101E+05	-1.269E+06
		***** OUTSIDE STEM MEMBERS *****			
7	82.00	-40.00	1.239E+06	-1.234E+05	7.524E+05
	82.00	-21.75	9.319E+05	4.036E+04	-5.384E+05
8	84.50	-13.75	7.569E+05	-1.296E+05	-4.485E+05
	84.50	20.40	5.418E+05	-1.375E+05	2.253E+06
		***** INSIDE STEM MEMBERS *****			
9	59.00	-40.00	8.552E+05	2.091E+05	-2.713E+06
	59.00	-21.75	5.486E+05	-2.091E+05	1.103E+06
10	56.50	-13.75	7.193E+05	2.925E+05	-1.524E+06
	56.50	20.40	5.042E+05	1.375E+05	-1.726E+06
		***** CULVERT ROOF *****			
11	63.00	-17.75	3.309E+05	-3.051E+05	1.578E+06
	78.00	-17.75	3.309E+05	4.061E+04	-1.015E+06
		***** VOID ROOF *****			
12	58.00	21.40	1.375E+05	4.029E+05	-1.259E+06
	83.00	21.40	1.375E+05	4.406E+05	-1.729E+06

III.B.-- LEFTSIDE MEMBERS - TYPE 31 MONOLITH
SYMMETRIC WITH RIGHTSIDE

PROGRAM CWFRAM - ANALYSIS OF TWO-DIMENSIONAL U-FRAME OR W-FRAME STRUCTURES
DATE 25-JUN-1996 TIME 14.41.14

I.--HEADING
'IHNC LOCK LOAD CASE 2A - MAXIMUM OPERATION'

II.--RESULTS FOR RIGHTSIDE PILES

II.A.--PILE HEAD FORCES AND DISPLACEMENTS
(UNITS ARE POUNDS, FEET, AND RADIANS.)
(POSITIVE AXIAL FORCE IS COMPRESSION.)
(POSITIVE SHEAR TENDS TO MOVE PILE HEAD AWAY FROM CENTERLINE.)
(POSITIVE MOMENT PRODUCES COMPRESSION ON SIDE OF PILE TOWARD CENTERLINE.)
(POSITIVE AXIAL DISPLACEMENT IS DOWN.)
(POSITIVE LATERAL DISPLACEMENT IS AWAY FROM CENTERLINE.)
(POSITIVE ROTATION TENDS TO ROTATE PILE HEAD TOWARD CENTERLINE.)

PILE NO.	DIST. TO CTR-LINE	<-------PILE HEAD FORCES-------> AXIAL	SHEAR	MOMENT	<---PILE HEAD DISPLACEMENTS---> AXIAL	LATERAL	ROTATION
1	.00	4.263E+05	0.000E+00	0.000E+00	2.956E-02	0.000E+00	0.000E+00
2	14.00	4.414E+05	-8.604E+02	0.000E+00	3.060E-02	-1.012E-03	-1.501E-04
3	28.00	4.869E+05	-1.733E+03	0.000E+00	3.376E-02	-2.038E-03	-3.025E-04
4	42.00	5.636E+05	-2.600E+03	0.000E+00	3.907E-02	-3.059E-03	-4.539E-04
5	56.00	6.703E+05	-3.333E+03	0.000E+00	4.647E-02	-3.921E-03	-5.802E-04
6	68.00	7.711E+05	-3.487E+03	0.000E+00	5.346E-02	-4.102E-03	-6.016E-04
7	80.00	8.801E+05	-3.715E+03	0.000E+00	6.101E-02	-4.370E-03	-6.289E-04

II.B.--PILE ALLOWABLES COMPARISONS
ALLOWABLES DATA NOT PROVIDED FOR THIS SIDE.

III.--RESULTS FOR LEFTSIDE PILES
SYMMETRIC WITH RIGHTSIDE.

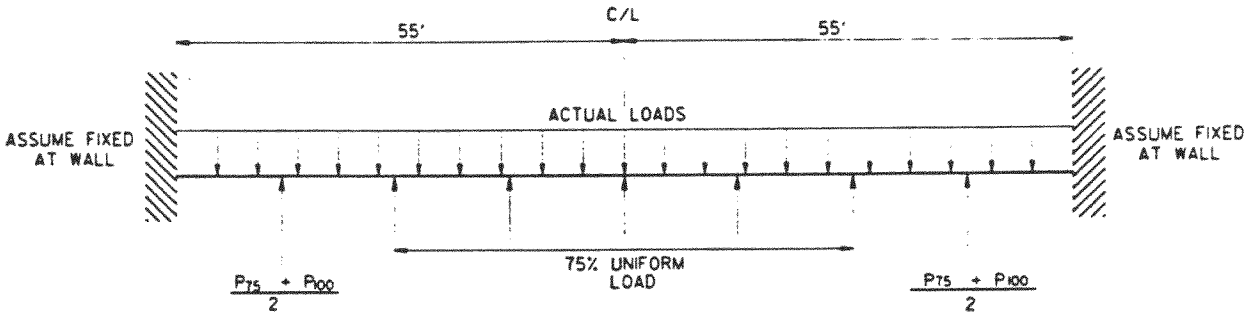
IV.--RESULTANTS OF PILE FORCES ON STRUCTURE
(POSITIVE HORIZONTAL IS TO THE RIGHT)
(POSITIVE VERTICAL IS UP)
(POSITIVE MOMENT IS COUNTERCLOCKWISE ABOUT CENTERLINE
(UNITS ARE POUNDS AND FEET)

	HORIZONTAL	VERTICAL	MOMENT
RIGHTSIDE PILES	1.5729E+04	4.0265E+06	2.0405E+08
LEFTSIDE PILES	-1.5729E+04	4.0265E+06	-2.0405E+08
TOTAL	0.0000E+00	8.0529E+06	0.0000E+00

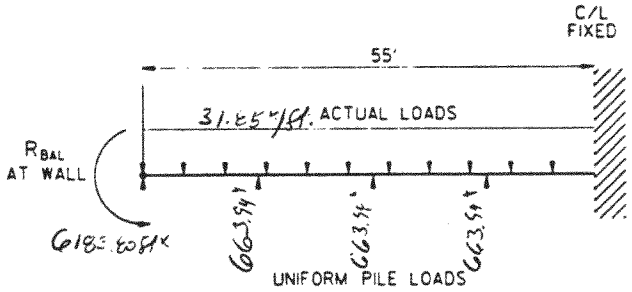
NOTE RIGHTSIDE AND LEFTSIDE RESULTANTS INCLUDE ONE HALF OF FORCES FOR VERTICAL PILES ON CENTERLINE.

MAXIMUM LOAD CASE 2A

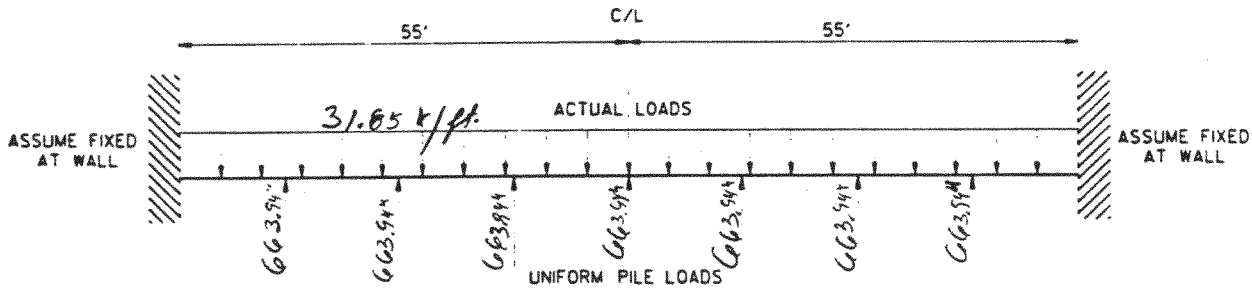
ANALYSIS 3



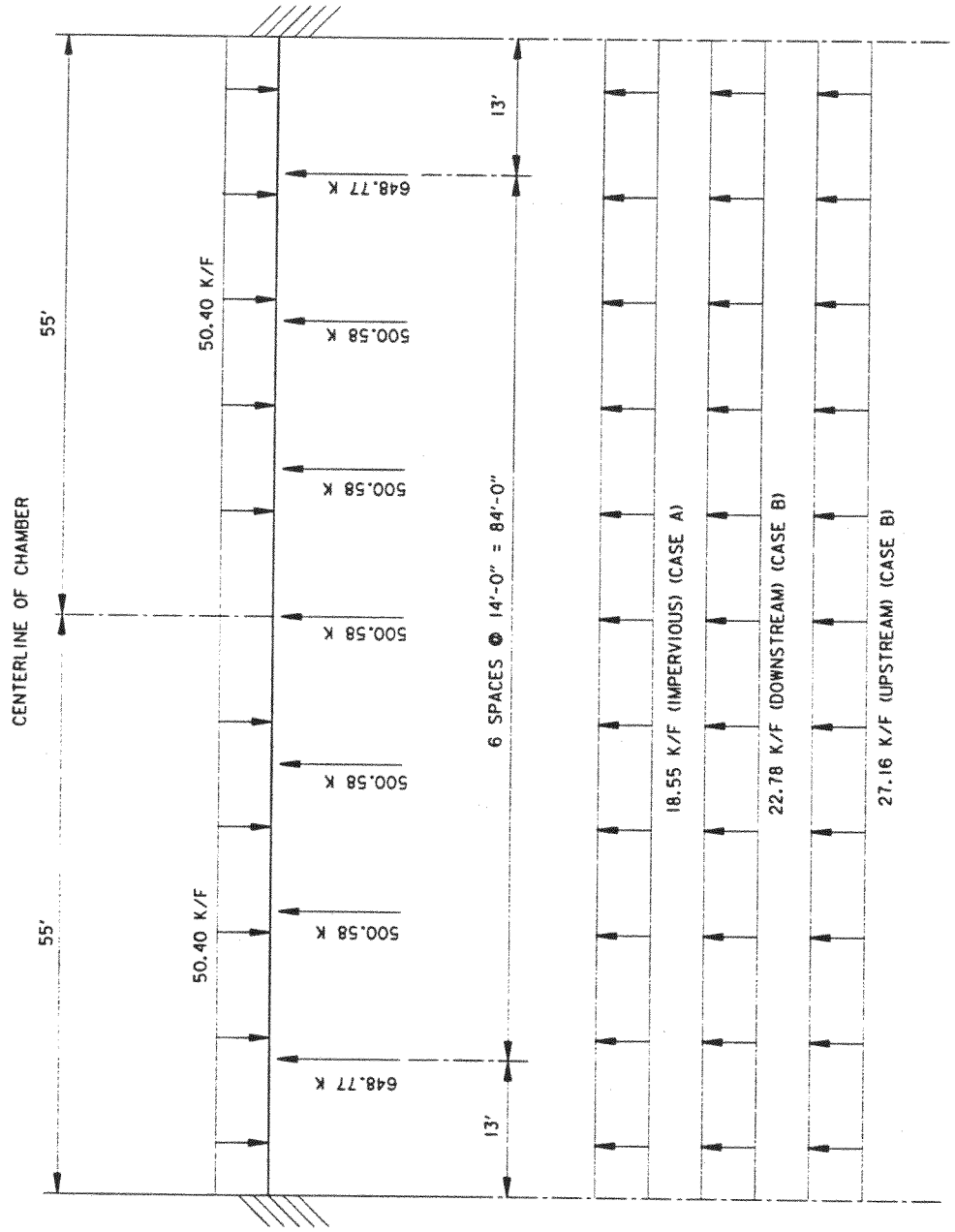
ANALYSIS 4



ANALYSIS 5



Analysis 3



MAXIMUM OPERATIONS (A) - CHAMBER SECTION

```
010 CHAMBER SECTION-FILE: c:\struc\cframe\base2aRb.cfr*
020 LOAD CASE 2A/MAXIMUM OPERATION CASE A/UPLIFT A /BASE FIXED AT WALL FACE
040 KSI FT FT IN KIP
050 9 8 1 3000 0.15
060 1 0 0 2 13 0 3 27 0 4 41 0 5 55 0 6 69 0 7 83 0 8 97 0 9 110 0
070 FIX X 1 9 FIX Y 1 9 FIX R 1 9
090 GM 1 1 2 8 1 1
100 2016 66 15 1 TO 8
120 LOAD CASE 1 0 2 0 7 0
130 0 31.85 13 31.85 0 1 8
140 0 31.85 14 31.85 0 2 TO 7
210 0 648.77 0 2
220 0 500.58 0 3
230 0 500.58 0 4
240 0 500.58 0 5
250 0 500.58 0 6
260 0 500.58 0 7
270 0 648.77 0 8
```

```
1*-*-*-
```

1 LOAD CASE 1

JOINT DISPLACEMENTS

INT	DX IN	DY IN	DR RAD
1	.0000E+00	.0000E+00	.0000E+00
2	.0000E+00	.2456E-01	.5097E-04
3	.0000E+00	.4200E-01	.5449E-04
4	.0000E+00	.5453E-01	.3340E-04
5	.0000E+00	.5905E-01	.0000E+00
6	.0000E+00	.5453E-01	-.3340E-04
7	.0000E+00	.4200E-01	-.5449E-04
8	.0000E+00	.2456E-01	-.5097E-04
9	.0000E+00	.0000E+00	.0000E+00

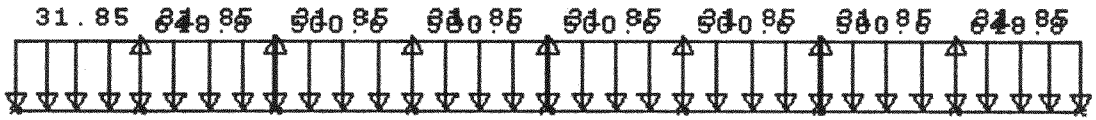
STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
1	.0000E+00	-.1485E+03	-.5277E+04
9	.0000E+00	-.1485E+03	.5277E+04
TOTAL	.0000E+00	-.2969E+03	

1 MEMBER END FORCES

MEMBER	LOAD CASE	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	1	.0000E+00	-.1485E+03	.5277E+04	.5277E+04	.00
		2	.0000E+00	.5625E+03	.6556E+03	.6556E+03	13.00
2	1	2	.0000E+00	.8625E+02	.6556E+03	.7722E+03	2.80
		3	.0000E+00	.3597E+03	-.1258E+04	-.1258E+04	14.00
3	1	3	.0000E+00	.1409E+03	-.1258E+04	-.9465E+03	4.48
		4	.0000E+00	.3050E+03	-.2407E+04	-.2407E+04	14.00
4	1	4	.0000E+00	.1956E+03	-.2407E+04	-.1806E+04	6.16
		5	.0000E+00	.2503E+03	-.2789E+04	-.2789E+04	14.00
5	1	5	.0000E+00	.2503E+03	-.2789E+04	-.1806E+04	7.84
		6	.0000E+00	.1956E+03	-.2407E+04	-.2789E+04	.00
6	1	6	.0000E+00	.3050E+03	-.2407E+04	-.9465E+03	9.52
		7	.0000E+00	.1409E+03	-.1258E+04	-.2407E+04	.00
7	1	7	.0000E+00	.3597E+03	-.1258E+04	.7722E+03	11.20
		8	.0000E+00	.8625E+02	.6556E+03	-.1258E+04	.00
8	1	8	.0000E+00	.5625E+03	.6556E+03	.5277E+04	13.00
		9	.0000E+00	-.1485E+03	.5277E+04	.6556E+03	.00

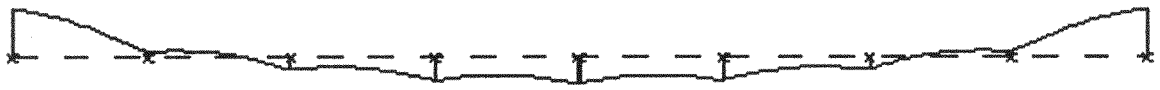
CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION CASE A/UPLIFT A /BASE FIXED AT WALL



19-JUN-1996 15.35.30

LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION CASE A/UPLIFT A /BASE FIXED AT WALL



└──┘ = 5277. FT-KIP MOMENT 19-JUN-1996 15.35.30

LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION CASE A/UPLIFT A /BASE FIXED AT WALL



└──┘ = 562.5 KIP SHEAR 19-JUN-1996 15.35.30
LOAD CASE 1

COMPUTATION SHEET

PROJECT	[illegible]	PAGE OF	COMPUTED BY	DATE
SUBJECT	[illegible]		CHECKED BY	DATE

Analysis 4

Avg Pile Loads

$P_{avg} = [(806.77^k)(4) + (801.87^k)(2) + (648.77)(2) + (500.58[illegible])]/13$

$= 663.94^k$

Unbalanced Load

$F = (663.94^k)(3'/2) - (31.85^k/ft)(55')$

$= 572.04^k$

Moment $-6183.80 ft\text{-}k + (663.94^k)(14' + 75' + 42') - 572.04^k(55') - 31.85 ft\text{-}k(55')^2/2$

$= -30,0[illegible].17 ft\text{-}k$

```
010 CHAMBER SECTION-FILE: c:\precast.loc\bas2anl4.cfr*
020 LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 4*
030 USE Igross FOR BASE SECTIONS
040 KSI FT FT IN KIP
050 5 4 1 3000 0.15
060 1 0 0 2 13 0 3 27 0 4 41 0 5 55 0
080 FIX X 5 FIX Y 5 FIX R 5
090 GM 1 1 2 4 1 1
100 2016 66 15 1 TO 4
120 LOAD CASE 1 0 2 0 4 0
130 0 31.85 13 31.85 0 1
140 0 31.85 14 31.85 0 2 TO 4
200 0 -572.04 6183.80 1
210 0 663.94 0 2
220 0 663.94 0 3
230 0 663.94 0 4
```

```
1*-*-*-
```

1 LOAD CASE 1

JOINT DISPLACEMENTS

JOINT	DX IN	DY IN	DR RAD
1	.0000E+00	-.6299E+00	.1352E-02
2	.0000E+00	-.3864E+00	.1191E-02
3	.0000E+00	-.1786E+00	.8757E-03
4	.0000E+00	-.4569E-01	.4624E-03
5	.0000E+00	.0000E+00	.0000E+00

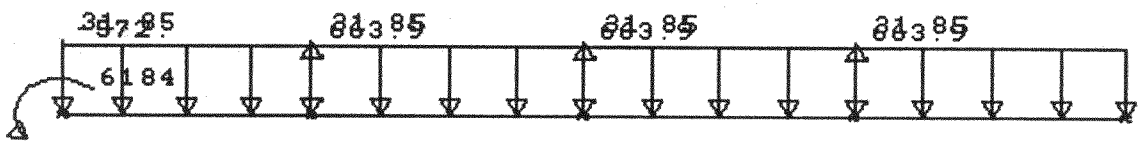
STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
5	.0000E+00	.3320E+03	-.3005E+05
TOTAL	.0000E+00	.3320E+03	

1 MEMBER END FORCES

MEMBER	LOAD CASE	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	1	.0000E+00	-.5720E+03	-.6184E+04	-.6184E+04	.00
		2	.0000E+00	.9861E+03	-.1631E+05	-.1631E+05	13.00
2	1	2	.0000E+00	-.3221E+03	-.1631E+05	-.1631E+05	.00
		3	.0000E+00	.7680E+03	-.2394E+05	-.2394E+05	14.00
3	1	3	.0000E+00	-.1041E+03	-.2394E+05	-.2394E+05	.00
		4	.0000E+00	.5500E+03	-.2852E+05	-.2852E+05	14.00
4	1	4	.0000E+00	.1139E+03	-.2852E+05	-.2832E+05	3.64
		5	.0000E+00	.3320E+03	-.3005E+05	-.3005E+05	14.00

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 4
USE IGROSS FOR BASE SECTIONS



24-JUN-1996 14.26.21

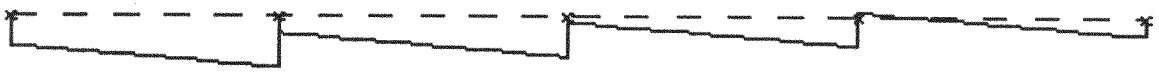
LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 4
USE IGROSS FOR BASE SECTIONS



└──┘ = .3005E+5 FT-KIP MOMENT 24-JUN-1996 14.26.21
LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 4
USE IGROSS FOR BASE SECTIONS



= 986.1 KIP SHEAR 24-JUN-1996 14.26.21

LOAD CASE 1

```
010 CHAMBER SECTION-FILE: c:\precast.loc\bas2anl5.cfr*
020 LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 5*
030 USE Igross FOR BASE SECTIONS
040 KSI FT FT IN KIP
050 0 9 8 1 3000 0.15
060 1 0 0 2 13 0 3 27 0 4 41 0 5 55 0 6 69 0 7 83 0 8 97 0 9 110 0
080 FIX X 1 9 FIX Y 1 9 FIX R 1 9
090 GM 1 1 2 8 1 1
100 2016 66 15 1 TO 8
120 LOAD CASE 1 0 2 0 7 0
130 0 31.85 13 31.85 0 1 8
140 0 31.85 14 31.85 0 2 TO 7
210 0 663.94 0 2
220 0 663.94 0 3
230 0 663.94 0 4
240 0 663.94 0 5
250 0 663.94 0 6
260 0 663.94 0 7
270 0 663.94 0 8
```

```
1*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*
 PROGRAM CFRAME
 *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*
 RUN DATE = 24-JUN-1996
  JN TIME = 14.39.53
 CHAMBER SECTION-FILE: C:\PRECAST.LOC\BAS2ANL5.CFR
 LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 5
 USE IGROSS FOR BASE SECTIONS

 *** JOINT DATA ***
```

JOINT	X	Y	FIXITY X	FIXITY Y	FIXITY R	KX	KY	KR
	--- FT ---					---KIP / IN---		IN-KIP/RAD
1	.00	.00	*	*	*			
2	13.00	.00						
3	27.00	.00						
4	41.00	.00						
5	55.00	.00						
6	69.00	.00						
7	83.00	.00						
8	97.00	.00						
9	110.00	.00	*	*	*			

*** MEMBER DATA ***

MEMBER	END A	END B	LENGTH	I	A	AS	E	G
			FT	FT**4	FT**2	FT**2	KSI	KSI
1	1	2	13.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
2	2	3	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
3	3	4	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
4	4	5	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
5	5	6	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
6	6	7	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
7	7	8	14.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04
8	8	9	13.00	.2016E+04	.6600E+02	.1500E+02	.3000E+04	.1304E+04

*** LOAD CASE 1

MEMBER	LA	PA	LB	PB	ANGLE
	FT	KIP / FT	FT	KIP / FT	DEG
1	.00	.3185E+02	13.00	.3185E+02	.00
2	.00	.3185E+02	14.00	.3185E+02	.00
3	.00	.3185E+02	14.00	.3185E+02	.00
4	.00	.3185E+02	14.00	.3185E+02	.00
5	.00	.3185E+02	14.00	.3185E+02	.00
6	.00	.3185E+02	14.00	.3185E+02	.00
7	.00	.3185E+02	14.00	.3185E+02	.00
8	.00	.3185E+02	13.00	.3185E+02	.00

JOINT	FORCE X	FORCE Y	MOMENT
	KIP	KIP	FT-KIP
2	.0000E+00	.6639E+03	.0000E+00
3	.0000E+00	.6639E+03	.0000E+00
4	.0000E+00	.6639E+03	.0000E+00
5	.0000E+00	.6639E+03	.0000E+00
6	.0000E+00	.6639E+03	.0000E+00
7	.0000E+00	.6639E+03	.0000E+00
8	.0000E+00	.6639E+03	.0000E+00

1 LOAD CASE 1

JOINT DISPLACEMENTS

JOINT	DX IN	DY IN	DR RAD
1	.0000E+00	.0000E+00	.0000E+00
2	.0000E+00	.5746E-01	.1584E-03
3	.0000E+00	.1207E+00	.1874E-03
4	.0000E+00	.1669E+00	.1182E-03
5	.0000E+00	.1837E+00	.0000E+00
6	.0000E+00	.1669E+00	-.1182E-03
7	.0000E+00	.1207E+00	-.1874E-03
8	.0000E+00	.5746E-01	-.1584E-03
9	.0000E+00	.0000E+00	.0000E+00

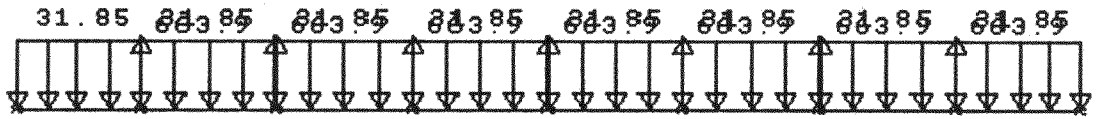
STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
1	.0000E+00	-.5720E+03	-.1523E+05
9	.0000E+00	-.5720E+03	.1523E+05
TOTAL	.0000E+00	-.1144E+04	

1 MEMBER END FORCES

MEMBER	LOAD CASE	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	1	.0000E+00	-.5720E+03	.1523E+05	.1523E+05	.00
		2	.0000E+00	.9861E+03	.5099E+04	.5099E+04	13.00
2	1	2	.0000E+00	-.3222E+03	.5099E+04	.5099E+04	.00
		3	.0000E+00	.7681E+03	-.2533E+04	-.2533E+04	14.00
3	1	3	.0000E+00	-.1041E+03	-.2533E+04	-.2533E+04	.00
		4	.0000E+00	.5500E+03	-.7112E+04	-.7112E+04	14.00
4	1	4	.0000E+00	.1139E+03	-.7112E+04	-.6908E+04	3.64
		5	.0000E+00	.3320E+03	-.8638E+04	-.8638E+04	14.00
5	1	5	.0000E+00	.3320E+03	-.8638E+04	-.6908E+04	10.36
		6	.0000E+00	.1139E+03	-.7112E+04	-.8638E+04	.00
6	1	6	.0000E+00	.5500E+03	-.7112E+04	-.2533E+04	14.00
		7	.0000E+00	-.1041E+03	-.2533E+04	-.7112E+04	.00
7	1	7	.0000E+00	.7681E+03	-.2533E+04	.5099E+04	14.00
		8	.0000E+00	-.3222E+03	.5099E+04	-.2533E+04	.00
8	1	8	.0000E+00	.9861E+03	.5099E+04	.1523E+05	13.00
		9	.0000E+00	-.5720E+03	.1523E+05	.5099E+04	.00

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 5
USE IGROSS FOR BASE SECTIONS



24-JUN-1996 14.39.53

LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 5
USE IGROSS FOR BASE SECTIONS



└──┘ = .1523E+5 FT-KIP MOMENT 24-JUN-1996 14.39.53
LOAD CASE 1

CHAMBER SECTION-FILE: C:
LOAD CASE 2A/MAXIMUM OPERATION/UPLIFT A /ANALYSIS 5
USE IGROSS FOR BASE SECTIONS



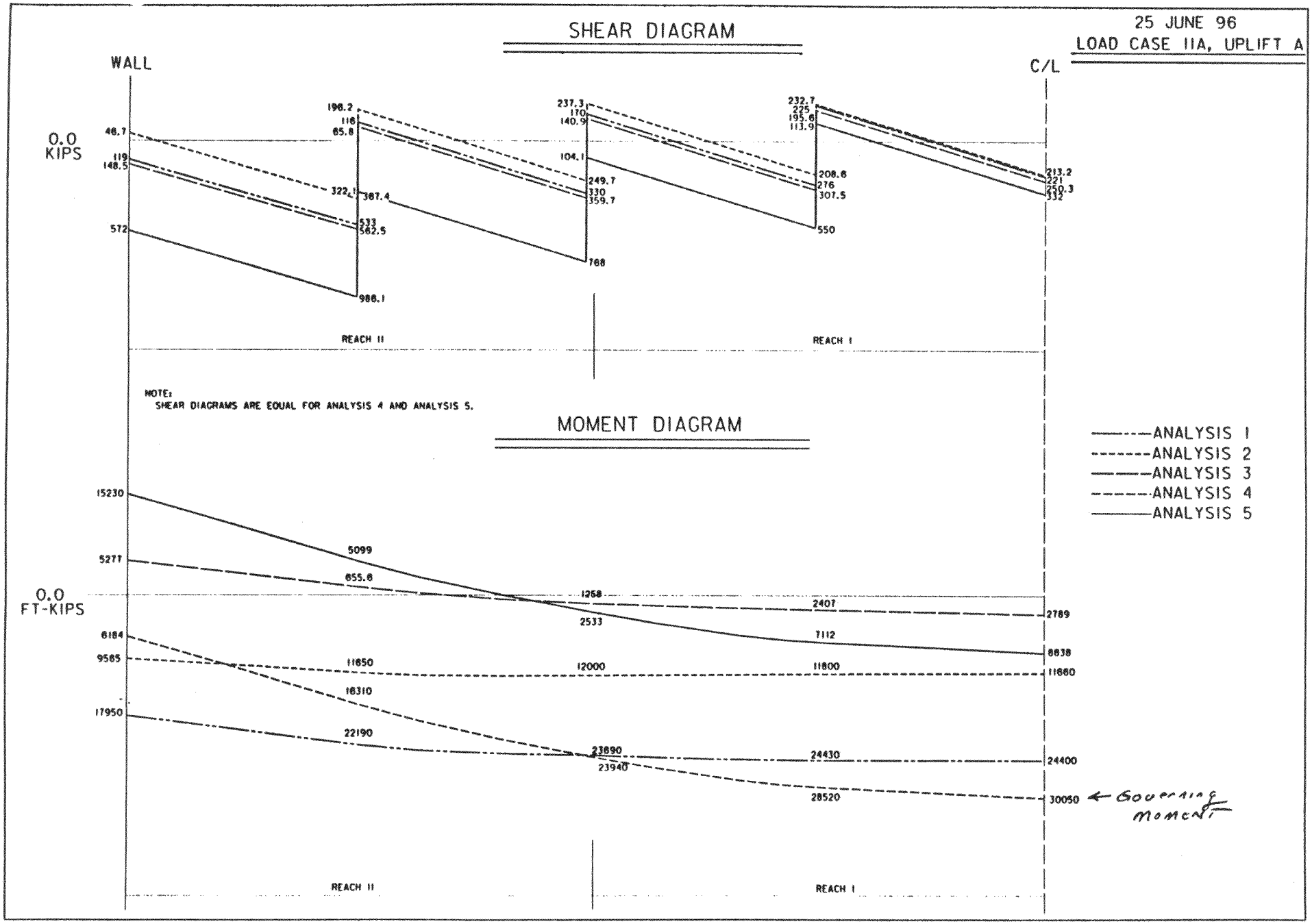
└──┘ = 986.1 KIP SHEAR 24-JUN-1996 14.39.53
LOAD CASE 1

1200 x 110 x 36

Chamber Section

Load Case	U	Reach I V (kips)	Reach I Vu (kips)	Reach I M (ft - kips)	Reach I Mu (ft - kips)	Reach II V (kips)	Reach II Vu (kips)	Reach II M (ft - kips)	Reach II Mu (ft - kips)
1 - Normal Operation	2.21	338	747	22430	49570	694	1534	20600	45526
	2.21	543	1200	24050	53151	1057	**2336**	18100	40001
2A - Maximum Operation	2.21	308	681	24400	53924	563	1244	23690	52355
	2.21	550	**1216**	30050	**66411**	986	2179	23940	**52907**
2B - Maximum Operation	2.21	427	944	25300	55913	908	2007	18610	41128
	2.21	440	972	15460	34167	922	2038	22170	48996
3 - Dewatering	1.7	388	660	16500	28050	1444	2455	28400	48280
	1.7	493	838	6903	11735	1270	2159	30390	51663
Design Values			***Vu =***	***1216***	***Mu =***	***66411***	***Vu =***	***2336***	***Mu =***	***52907***

* For Load Case 3, Reach II, a reduction "d" from the face is allowed; therefore, this case does not govern for shear.


SHEAR DIAGRAM
25 JUNE 96
LOAD CASE IIA, UPLIFT A
WALL
C/L
0.0
KIPS
46.7
119
148.5
572
322.1
533
562.5
986.1
196.2
118
65.8
387.4
237.3
170
140.9
104.1
249.7
330
359.7
768
232.7
225
195.6
113.9
208.6
276
307.5
550
213.2
221
250.3
332
REACH II
REACH I
NOTE:
SHEAR DIAGRAMS ARE EQUAL FOR ANALYSIS 4 AND ANALYSIS 5.
MOMENT DIAGRAM
ANALYSIS 1
ANALYSIS 2
ANALYSIS 3
ANALYSIS 4
ANALYSIS 5
0.0
FT-KIPS
15230
5277
6184
9585
17950
5099
655.6
2533
1268
2407
2789
7112
8838
11650
12000
11800
11660
16310
22190
23890
23940
24430
24400
28520
30050
← Governing Moment

BASE DESIGN
TRANSVERSE DIRECTION

COMPUTATION SHEET

PROJECT	PAGE 1 OF 12	COMPUTED BY MZ	DATE 8/96
SUBJECT		CHECKED BY	

EFFECTIVE FLANGE

ACI 8.10 $b_{effective}$ is lesser of:

- $\frac{l_n}{4}$ where l_n = Lock Wall − Lock Wall = 110'

$\frac{110}{4} = 27.5'$

- $t_w + 2(8 \times \text{slab thick})$ (OVERHANG) $= 33.5'$

$= t_w + 2(6.25) = 14'$ ←

ACI 10.6.6 USABLE FLANGE WIDTH FOR FLEXURAL REINFORCEMENT

Reference Letter from S. Moustafa (WJE, INC) dated 20 Sept 96

Recommends using full 14' for flexural rebar distribution

ACI 10.6.7 Web Horiz Steel

$A_{sk}/_{FOOT} \geq 0.012(d - 30)$ $d = 144'' - 4\frac{1}{2}'' = 139.5$

$A_{sk} = 1.31''^2/12''$

USE # 11 @ 12" $A_{sk} = 1.56''^2/_{LF}$

ACI 8.10.5 The base design, w/ WEBS SPANNING both directions, is similar to joist construction and therefore not applicable. However, the spacing of bars in the opposite direction shall not exceed the requirements of 8.10.5.2. The perpendicular A_s shall be designed to resist the greater of the moment acting on the I-BEAM and the moment acting on the Flange as a continuous slab spanning supports @ 14' O.C.

COMPUTATION SHEET

PROJECT	PAGE 2 OF 12	COMPUTED BY gmr	DATE 8/96
SUBJECT		CHECKED BY	DATE

ACI 10.5.1

$$\rho_{min} = \frac{200}{f_y} = 0.0033$$

$$\rho_{ACT} = \frac{A_s}{b \cdot d}$$

conservatively include only rebar above I-Beam C.G

TRANSVERSE DIRECTION

$$d = \frac{(2 \times 24 \times 1.56 \times 138) + (2 \times 24 \times 1.56 \times 125) + (2 \times 1.56 \times 114) + (2 \times 1.56 \times 102) + (2 \times 1.56 \times 90) + (2 \times 1.56 \times 78)}{162.24}$$

$$= \frac{20,892}{162.24} = 128.77''$$

$$b = b_w = 18''$$

$$\rho = \frac{162.24''^2}{18 \times 128.8} = 0.070 > 0.0033$$

FLEXURAL DESIGN

- Normal & Max Operation - Neglect Axial Load
- USE #11 BARS, AS RECOMMENDED BY MOUSTAFA, TO Reduce cracks.

w/ 4 ROWS OF #11 @ 8" in Flange
#11 @ 12" HORIZ BARS IN WEB

	Applied Moment M	Mu	fs	ϕMN	
WSD NORMAL OPER	24,050 1-K	—	16.44 KSI	—	$< F_s = 17$ KSI Table 4.1 ACI 357
WSD MAX OPER	30,050 1-K	—	20.54 KSI	—	$< F_s = 23$ KSI Table 4.1 ACI 357
USD NORMAL	—	53,150 1-K	—	94,000	
USD MAXIMUM	—	66,410 1-K	—	94,000	

Wiss, Janney, Elstner Associates, Inc.

4. ACI 357, Para. 4.4.2: Since you are designing for zero tension in the concrete, Δps will essentially equal zero according to the definition given in the ACI. For the sake of satisfying this section of 357, I agree with your interpretation of using the allowable value in Table 4.1.

5. The use of lightweight concrete: The type of aggregate and mix design have a great deal of influence on the durability and performance of lightweight concrete. The specified concrete mix should have substantial documentation of its performance to assure that is meets the project service life requirements.

I hope this answers your questions. If you require additional explanation or have additional questions, please do not hesitate to call.

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

Saad E. Moustafa, Ph.D., P.E.
Consultant

SEM:mjv.2204

WJE **Wiss, Janney, Elstner Associates, Inc.**
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J.P. DONNELLY
M.C. FARMER
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R. LEISTNOW
A.F. LISSE
L. LEHUZKANSKI
R.A. MARTINEZ
D.B. McDONALD
L.R. MEYERS
M.R. MORDEN
L.L. PHELPS
R. REESE
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T.R. WEGENER
S. WONNEBERGER

PAST PRESIDENT
J.M. HANSON

September 20, 1996

Sent by Fax and U.S. Mail

Mr. Mark Gonski
U.S. Army Corps of Engineers
New Orleans District
Foot of Prytania Street
New Orleans, LA 70118

Re: IHNC Lock Replacement
WJE No. 960888

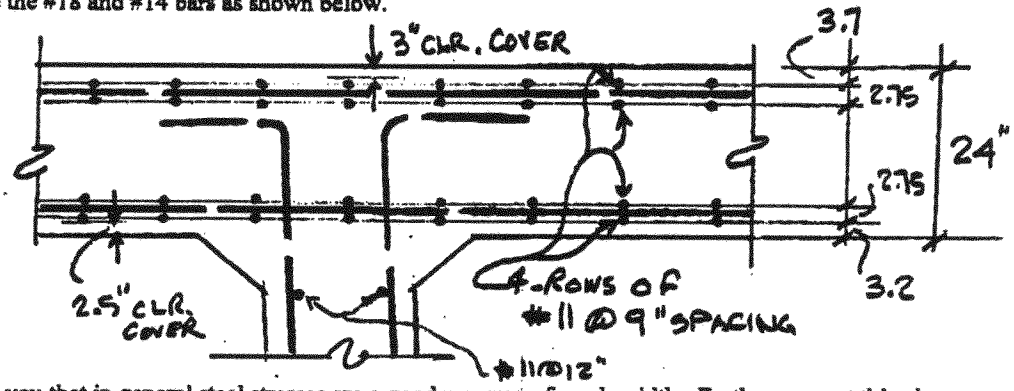
Dear Mark:

The following is in response to your letter of September 17, 1996.

1. ACI Para. 10.6.6: I recommend using the entire 14 ft distance as effective flange width. Note the span is somewhere between 110 ft and 180 ft and the assumption of 140 ft is reasonable.

2. ACI Para. 10.6.7: I recommend using #11 bars at 12 in. spacing each face of the web. This will help control web cracking due to flexural stresses and will also assist in the shear resistance.

3. Crack Criteria: Cracks are undesirable in structures subject to marine environment. Small hairline cracks (width < 0.01 in.) may be tolerated. Cracks of widths less than or equal to 0.005 in. apparently seal themselves and do not cause corrosion problems. Unfortunately, there is no reliable analytical method for predicting crack width especially for #18 bars. ACI crack width equation is limited to #11 bars or smaller. The value of β for this cross section is about 1.16. Smaller diameter bars at closer spacing with 2.0 to 3.0 in. cover will perform better. I recommend the use of four rows of #11 bars at 9 in. spacing to replace the #18 and #14 bars as shown below.



I agree with you that in general steel stresses are a good measure of crack width. Furthermore, at this phase of design I do not think you should be concerned with crack width control. However, I would recommend prestressing in both horizontal directions. Prestressing assures a structure that is essentially crack-free, and that has high quality of performance and long service life.

1200 x 110 x 36

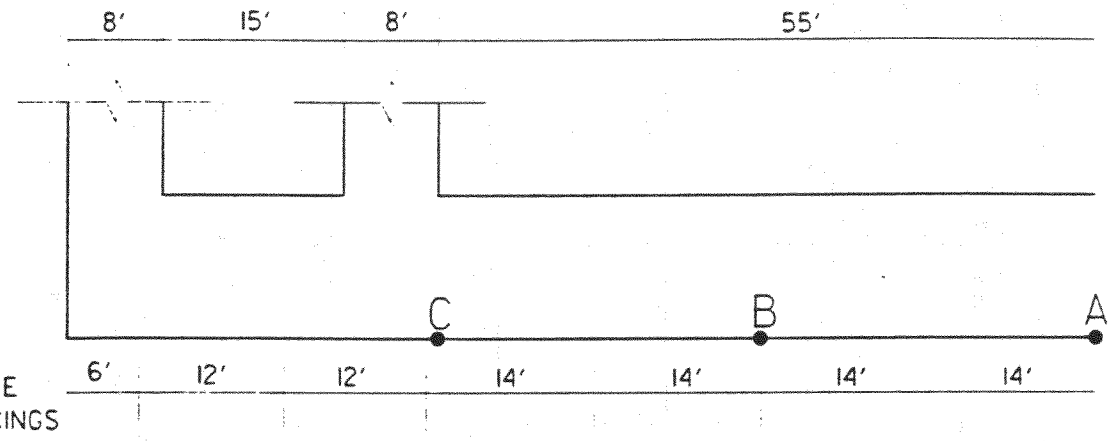
Chamber Section

Load Case	U	Reach I V (kips)	Reach I Vu (kips)	Reach I M (ft - kips)	Reach I Mu (ft - kips)	Reach II V (kips)	Reach II Vu (kips)	Reach II M (ft - kips)	Reach II Mu (ft - kips)
1 - Normal Operation	2.21	338	747	22430	49570	694	1534	20600	45526
	2.21	543	1200	24050	53151	1057	**2336**	18100	40001
2A - Maximum Operation	2.21	308	681	24400	53924	563	1244	23690	52355
	2.21	550	**1216**	30050	**66411**	986	2179	23940	**52907**
2B - Maximum Operation	2.21	427	944	25300	55913	908	2007	18610	41128
	2.21	440	972	15460	34167	922	2038	22170	48996
3 - Dewatering	1.7	388	660	16500	28050	1444	2455	28400	48280
	1.7	493	838	6903	11735	1270	2159	30390	51663
Design Values		***Vu =***	***1216***	***Mu =***	***66411***	***Vu =***	***2336***	***Mu =***	***52907***

* For Load Case 3, Reach II, a reduction "d" from the face is allowed; therefore, this case does not govern for shear.

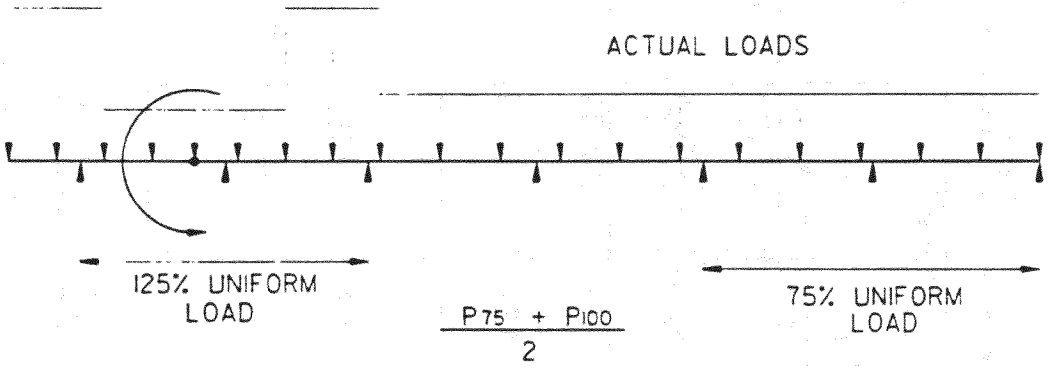
NOTE: EACH LOAD CASE HAS TWO V & M SHOWN, THE UPPER ROW IS FOR ANALYSIS ASSUMPTIONS 1, 2 & 3; THE LOWER ROW IS FOR ASSUMPTIONS 4 & 5

SYMMETRICAL
ABOUT C/L



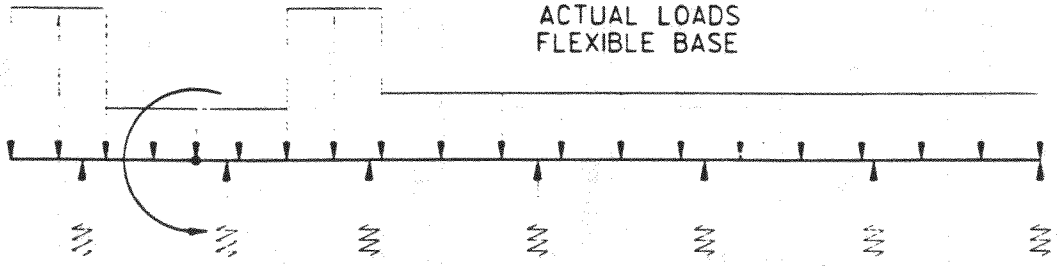
ANALYSIS 1

C/L



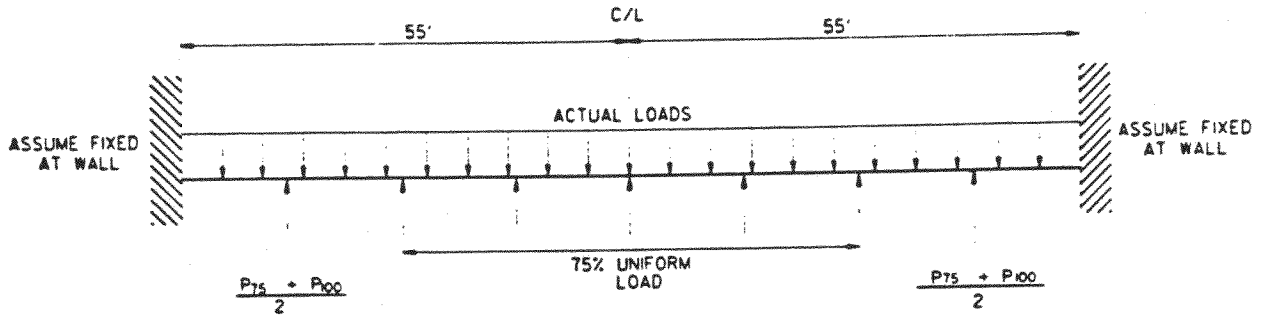
ANALYSIS 2

C/L

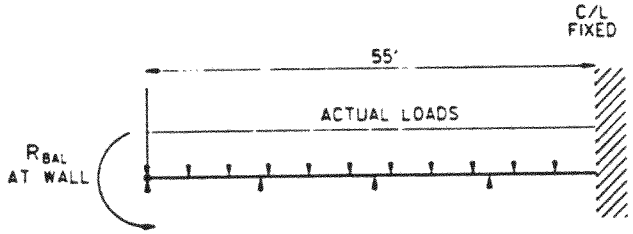


PILE LOADS DETERMINED BY SOIL
SUBGRADE MODULUS (CWFRAME & CFRAME)

ANALYSIS 3

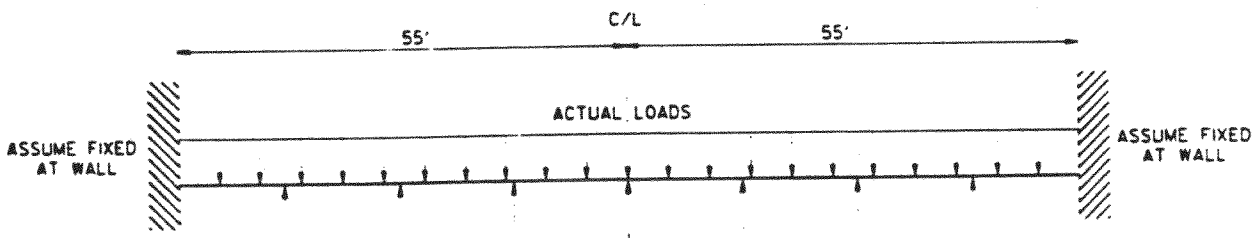


ANALYSIS 4



UNIFORM PILE LOADS

ANALYSIS 5



UNIFORM PILE LOADS

```
010 SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) NORMAL OPER. LOAD
020 13 16 1
030 1 -84 72 84 72 84 48
040 1 9 48 9 -48 84 -48
050 1 84 -72 -84 -72 -84 -48
060 1 -9 -48 -9 48 -84 48
070 1 -84 72
080 2 1.56 -81 67.4 24 81 67.4
081 2 1.56 -81 64.5 24 81 64.5
082 2 1.56 -81 54.5 24 81 54.5
083 2 1.56 -81 51.75 24 81 51.75
100 2 1.56 -4.5 42 2 4.5 42
110 2 1.56 -4.5 30 2 4.5 30
120 2 1.56 -4.5 18 2 4.5 18
130 2 1.56 -4.5 6 2 4.5 6
140 2 1.56 -4.5 -6 2 4.5 -6
150 2 1.56 -4.5 -18 2 4.5 -18
160 2 1.56 -4.5 -30 2 4.5 -30
170 2 1.56 -4.5 -42 2 4.5 -42
200 2 1.56 -81 -51.75 24 81 -51.75
201 2 1.56 -81 -54.5 24 81 -54.5
202 2 1.56 -81 -64.5 24 81 -64.5
203 2 1.56 -81 -67.4 24 81 -67.4
230 3 0 0 -288600 6.6 0.15 0.01
240
250 0 0 0
```

WSO @ NORMAL OPER.
CHAMBER - SHIPLOCK
TRANSVERSE I-BEAM
FLGS - 4 ROWS #11 @ 8"

```
^P
Bad command or file name

C:\STRUC\CGFAG (Type HELP for menu!)>»x8008
*********************************
   CORPS PROGRAM  #  X8008       *
   MICRO VERSION  # 86/02/12     *
*********************************


ENTER 0 IF USING GRAPHICS TERMINAL.
   OR 1 IF NOT.
0

COMPUTER WILL PAUSE TO ALLOW OUTPUT COPYING.
THEN PRESS CARRIAGE RETURN TO CONTINUE.

ENTER 1 TO GET DETAILED STRESS TABLES,
   OR 0 TO GET MAXIMUM VALUES ONLY.
1

INPUT COMPLETE FILENAME OF DATA FILE
OR
PRESS RETURN TO USE INTERACTIVE INPUT

?ibeam106.wsc



 PROGRAM CORPS/X8008   CONCRETE GENERAL FLEXURE ANALYSIS  REV 86
 SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) NORMAL OPER. LOAD
 **  I N P U T   L O A D I N G   A N D   P A R A M E T E R S  **

LD. CASE       P     Y-AXIS MOM. X-AXIS MOM.     N      R     ACCURACY
     3          .00          .00  -288600.00   6.60    .15      .010

 S T R E S S   E Q U A T I O N   A N D   N E U T R A L   A X I S:

   UNIT STRESS =       .00000 X  +      -.02420 Y  +      -.86014

  AT Y = 0, NEUTRAL AXIS CROSSES X-AXIS AT X =    -.10357420E+13
  AT X = 0, NEUTRAL AXIS CROSSES Y-AXIS AT Y =    -35.543720


         MAXIMUM CONCRETE STRESS =       .88 AT POINT 8
         MAXIMUM STEEL STRESS    =     16.44 T
                                 =       .76 C
```

COMPRESSIVE STRESS IS SHOWN PLUS, TENSION MINUS (CONC. & STEEL)

C O N C R E T E S T R E S S E S F O R O U T L I N E 1:

POINT	X-COORD	Y-COORD	COMPRESSIVE STRESS	POINT	X-COORD	Y-COORD	COMP. STRESS
1	-84.00	72.00		2	84.00	72.00	
3	84.00	48.00		4	9.00	48.00	
5	9.00	-48.00	.301	6	84.00	-48.00	.301
7	84.00	-72.00	.882	8	-84.00	-72.00	.882
9	-84.00	-48.00	.301	10	-9.00	-48.00	.301
11	-9.00	48.00		12	-84.00	48.00	
13	-84.00	72.00					

STEEL STRESSES FOR PATTERN NO. 2:

EA OF ONE BAR	QUAN. OF BARS/ROW	ROW END	X COORDINATE	Y COORDINATE	STRESS IN BAR
1.560	24	1	-81.000	67.400	-16.442
		2	81.000	67.400	-16.442
1.560	24	1	-81.000	64.500	-15.979
		2	81.000	64.500	-15.979
1.560	24	1	-81.000	54.500	-14.381
		2	81.000	54.500	-14.381
1.560	24	1	-81.000	51.750	-13.942
		2	81.000	51.750	-13.942
1.560	2	1	-4.500	42.000	-12.385
		2	4.500	42.000	-12.385
1.560	2	1	-4.500	30.000	-10.468
		2	4.500	30.000	-10.468
1.560	2	1	-4.500	18.000	-8.552
		2	4.500	18.000	-8.552
1.560	2	1	-4.500	6.000	-6.635
		2	4.500	6.000	-6.635
1.560	2	1	-4.500	-6.000	-4.719
		2	4.500	-6.000	-4.719
1.560	2	1	-4.500	-18.000	-2.802
		2	4.500	-18.000	-2.802
1.560	2	1	-4.500	-30.000	-.885
		2	4.500	-30.000	-.885
1.560	2	1	-4.500	-42.000	.155
		2	4.500	-42.000	.155
1.560	24	1	-81.000	-51.750	.388
		2	81.000	-51.750	.388
1.560	24	1	-81.000	-54.500	.454
		2	81.000	-54.500	.454
1.560	24	1	-81.000	-64.500	.694
		2	81.000	-64.500	.694
1.560	24	1	-81.000	-67.400	.763
		2	81.000	-67.400	.763

```
0 SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) NORMAL OPER. LOAD
0 13 16 1
0 1 -84 72 84 72 84 48
0 1 9 48 9 -48 84 -48
0 1 84 -72 -84 -72 -84 -48
0 1 -9 -48 -9 48 -84 48
0 1 -84 72
0 2 1.56 -81 67.4 24 81 67.4
1 2 1.56 -81 64.5 24 81 64.5
2 2 1.56 -81 54.5 24 81 54.5
3 2 1.56 -81 51.75 24 81 51.75
0 2 1.56 -4.5 42 2 4.5 42
0 2 1.56 -4.5 30 2 4.5 30
0 2 1.56 -4.5 18 2 4.5 18
0 2 1.56 -4.5 6 2 4.5 6
0 2 1.56 -4.5 -6 2 4.5 -6
0 2 1.56 -4.5 -18 2 4.5 -18
0 2 1.56 -4.5 -30 2 4.5 -30
0 2 1.56 -4.5 -42 2 4.5 -42
0 2 1.56 -81 -51.75 24 81 -51.75
1 2 1.56 -81 -54.5 24 81 -54.5
2 2 1.56 -81 -64.5 24 81 -64.5
3 2 1.56 -81 -67.4 24 81 -67.4
0 3 0 0 -360600 6.6 0.15 0.01
0
0 0 0 0
```

WSD @ MAXIMUM OPER

CHAMBER - SHIPLOCK

TRANSVERSE I-BEAM

FIGS - 4 ROWS #11 @ 8"

```
^P
Bad command or file name

C:\STRUC\CGFAG (Type HELP for menu!)>»x8008
*********************************
*  CORPS PROGRAM  #  X8008      *
*  MICRO VERSION  # 86/02/12    *
*********************************


ENTER 0 IF USING GRAPHICS TERMINAL.
   OR 1 IF NOT.
0

COMPUTER WILL PAUSE TO ALLOW OUTPUT COPYING.
THEN PRESS CARRIAGE RETURN TO CONTINUE.

ENTER 1 TO GET DETAILED STRESS TABLES,
   OR 0 TO GET MAXIMUM VALUES ONLY.
1

INPUT COMPLETE FILENAME OF DATA FILE
OR
PRESS RETURN TO USE INTERACTIVE INPUT

?ibeam106.wsd
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```
 PROGRAM CORPS/X8008   CONCRETE GENERAL FLEXURE ANALYSIS  REV 86
 SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) NORMAL OPER. LOAD
 **  I N P U T   L O A D I N G   A N D   P A R A M E T E R S  **

LD. CASE       P     Y-AXIS MOM.  X-AXIS MOM.     N      R     ACCURACY
     3         .00          .00  -360600.00   6.60    .15       .010

 S T R E S S   E Q U A T I O N   A N D   N E U T R A L   A X I S:

   UNIT STRESS =      .00000 X  +     -.03024 Y  +    -1.07472

  AT Y = 0, NEUTRAL AXIS CROSSES X-AXIS AT X =    -.10357420E+13
  AT X = 0, NEUTRAL AXIS CROSSES Y-AXIS AT Y =    -35.543720


          MAXIMUM CONCRETE STRESS =     1.10 AT POINT 7
          MAXIMUM STEEL STRESS    =    20.54 T
                                  =      .95 C
```

COMPRESSIVE STRESS IS SHOWN PLUS, TENSION MINUS (CONC. & STEEL)

C O N C R E T E S T R E S S E S F O R O U T L I N E 1:

POINT	X-COORD	Y-COORD	COMPRESSIVE STRESS	POINT	X-COORD	Y-COORD	COMP. STRESS
1	-84.00	72.00		2	84.00	72.00	
3	84.00	48.00		4	9.00	48.00	
5	9.00	-48.00	.377	6	84.00	-48.00	.377
7	84.00	-72.00	1.102	8	-84.00	-72.00	1.102
9	-84.00	-48.00	.377	10	-9.00	-48.00	.377
11	-9.00	48.00		12	-84.00	48.00	
13	-84.00	72.00					

S T E E L S T R E S S E S F O R P A T T E R N NO. 2:

AREA OF ONE BAR	QUAN. OF BARS/ROW	ROW END	X COORDINATE	Y COORDINATE	STRESS IN BAR
1.560	24	1	-81.000	67.400	-20.544
		2	81.000	67.400	-20.544
1.560	24	1	-81.000	64.500	-19.965
		2	81.000	64.500	-19.965
1.560	24	1	-81.000	54.500	-17.969
		2	81.000	54.500	-17.969
1.560	24	1	-81.000	51.750	-17.421
		2	81.000	51.750	-17.421
.560	2	1	-4.500	42.000	-15.475
		2	4.500	42.000	-15.475
1.560	2	1	-4.500	30.000	-13.080
		2	4.500	30.000	-13.080
1.560	2	1	-4.500	18.000	-10.685
		2	4.500	18.000	-10.685
1.560	2	1	-4.500	6.000	-8.291
		2	4.500	6.000	-8.291
1.560	2	1	-4.500	-6.000	-5.896
		2	4.500	-6.000	-5.896
1.560	2	1	-4.500	-18.000	-3.501
		2	4.500	-18.000	-3.501
1.560	2	1	-4.500	-30.000	-1.106
		2	4.500	-30.000	-1.106
1.560	2	1	-4.500	-42.000	.193
		2	4.500	-42.000	.193
1.560	24	1	-81.000	-51.750	.485
		2	81.000	-51.750	.485
1.560	24	1	-81.000	-54.500	.567
		2	81.000	-54.500	.567
1.560	24	1	-81.000	-64.500	.867
		2	81.000	-64.500	.867
1.560	24	1	-81.000	-67.400	.954
		2	81.000	-67.400	.954

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1000 GONSKI
1010 MEMBER, CHAMBASE
1020 SECTION, CENTER
1030 MATERIALS, 6000.0000, 60000.0000
  40 DIMENSION, IN
 )50 POINTS, 13
1060 0.0000, 0.0000
1070 0.0000, 24.0000
1080 75.0000, 24.0000
1090 75.0000, 120.0000
1100 0.0000, 120.0000
1110 0.0000, 144.0000
1120 168.0000, 144.0000
1130 168.0000, 120.0000
1140 93.0000, 120.0000
1150 93.0000, 24.0000
1160 168.0000, 24.0000
1170 168.0000, 0.0000
1180 0.0000, 0.0000
1190 REINFORCE, 12
1195 24, 3.1200, 4.50000, 138.0000, 163.5000, 138.0000
1196 24, 3.12, 4.5, 125.1, 163.5, 125.1
1200 2, 1.56, 79.8, 114.0, 88.2, 114.00
1201 2, 1.56, 79.8, 102.0, 88.2, 102.00
1202 2, 1.56, 79.8, 90.0, 88.2, 90.00
1203 2, 1.56, 79.8, 78.0, 88.2, 78.00
1204 2, 1.56, 79.8, 66.0, 88.2, 66.00
1205 2, 1.56, 79.8, 54.0, 88.2, 54.00
1206 2, 1.56, 79.8, 42.0, 88.2, 42.00
1207 2, 1.56, 79.8, 30.0, 88.2, 30.00
  13 24, 3.12, 4.5, 18.90, 163.5, 18.90
 .14 24, 3.12, 4.5, 6.1, 163.5, 6.1
1240 USE, 0.9000, 0.0030, 4410000.0000, 0.7500, 0.80
1250 LOAD, SHIPCNOR, 1
1260 -53150.0000, 0.0000, 00000.00, 84.0000, 72.0000
1270 EXIT
```

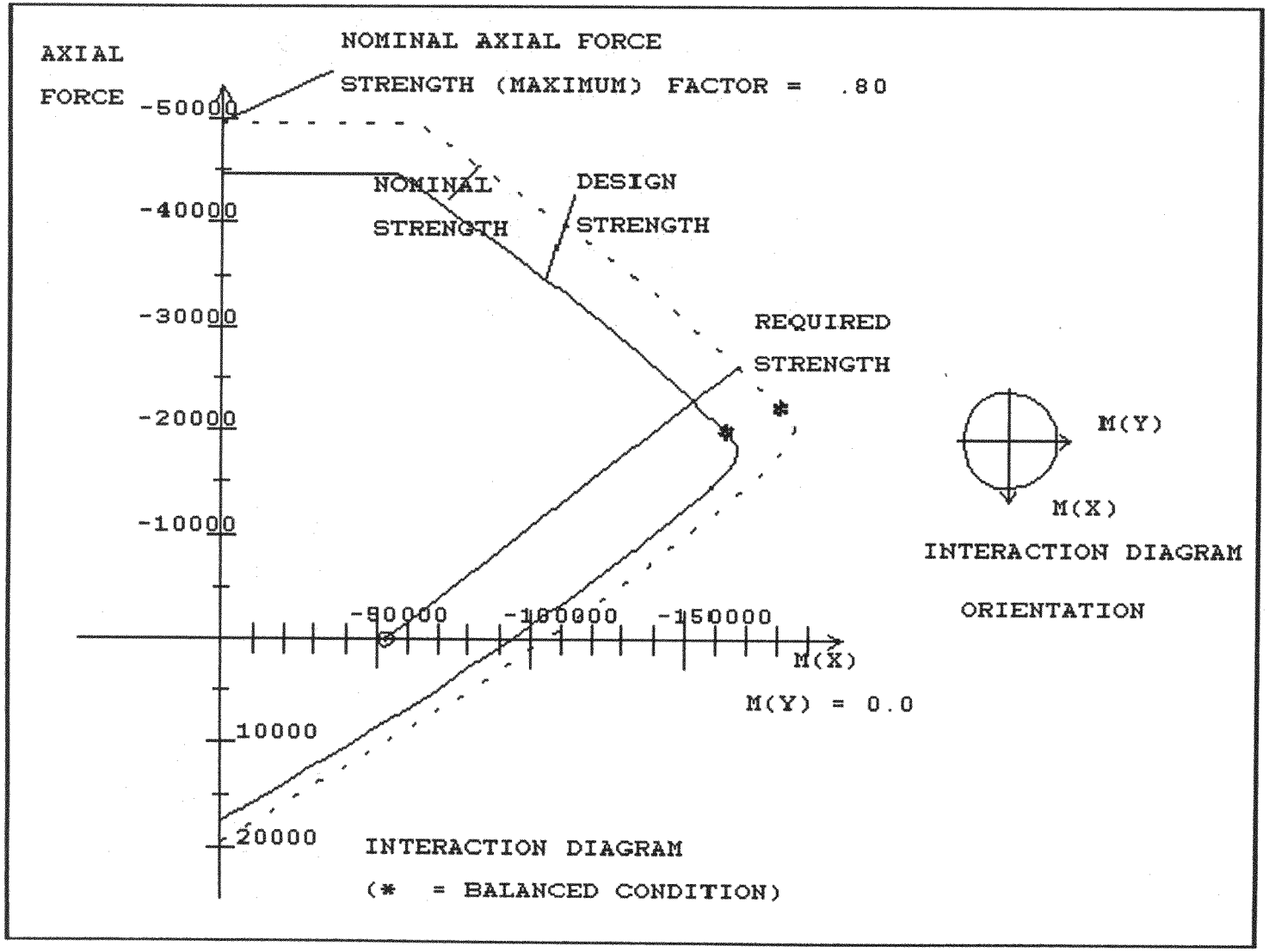
USO @ NORMAL OPER.

CHAMBER - SHIPLOCK

TRANSVERSE I-BEAM

FLGS - 4 ROWS #11 @ 8

(Due to Program limitation Flg steel shown as one row with A_s = 2 #11)


AXIAL
FORCE
NOMINAL AXIAL FORCE
STRENGTH (MAXIMUM) FACTOR = .80
-50000
-40000
-30000
-20000
-10000
NOMINAL
STRENGTH
DESIGN
STRENGTH
REQUIRED
STRENGTH
-90000
-100000
-150000
M(X)
M(Y) = 0.0
10000
20000
INTERACTION DIAGRAM
(* = BALANCED CONDITION)
M(Y)
M(X)
INTERACTION DIAGRAM
ORIENTATION

X0061 -- 713-F3-R0061 -- September 1983
Concrete General Strength Investigation

Output - X0061 - Loads

Fig. 2. 1 .

Strain Analysis and Interaction
Diagram for Load SHIPCNOR

Required Strength (U)
(Referenced to XC,YC)

P(U) =	0.000 kips
M(UX) =	-53150.000 kip-ft
M(UY) =	0.000 kip-ft

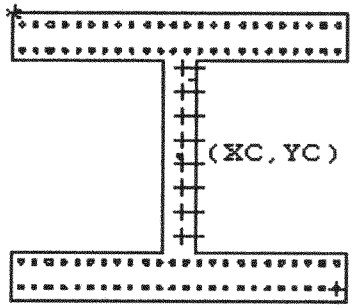
(XC,YC) = 84.000, 72.000

Percentage of Balanced Reinforcement = 26.83%

Press Up, Down, PgUp, and PgDn to Scroll, Enter to Continue.

ACTUAL STRAINS
VS. BALANCED
(BALANCED = ...)





* MAX. CONC. STR.=.00043
\+ MAX. STEEL STR.=.00137

MEMBER CHAMBASE SECTION CENTER

```
1000 GONSKI
1010 MEMBER, CHAMBASE
1020 SECTION, CENTER
1030 MATERIALS, 6000.0000, 60000.0000
  40 DIMENSION, IN
1050 POINTS, 13
1060 0.0000, 0.0000
1070 0.0000, 24.0000
1080 75.0000, 24.0000
1090 75.0000, 120.0000
1100 0.0000, 120.0000
1110 0.0000, 144.0000
1120 168.0000, 144.0000
1130 168.0000, 120.0000
1140 93.0000, 120.0000
1150 93.0000, 24.0000
1160 168.0000, 24.0000
1170 168.0000, 0.0000
1180 0.0000, 0.0000
1190 REINFORCE, 12
1195 24, 3.1200, 4.50000, 138.0000, 163.5000, 138.0000
1196 24, 3.12, 4.5, 125.1, 163.5, 125.1
1200 2, 1.56, 79.8, 114.0, 88.2, 114.00
1201 2, 1.56, 79.8, 102.0, 88.2, 102.00
1202 2, 1.56, 79.8, 90.0, 88.2, 90.00
1203 2, 1.56, 79.8, 78.0, 88.2, 78.00
1204 2, 1.56, 79.8, 66.0, 88.2, 66.00
1205 2, 1.56, 79.8, 54.0, 88.2, 54.00
1206 2, 1.56, 79.8, 42.0, 88.2, 42.00
1207 2, 1.56, 79.8, 30.0, 88.2, 30.00
  13 24, 3.12, 4.5, 18.90, 163.5, 18.90
1214 24, 3.12, 4.5, 6.1, 163.5, 6.1
1240 USE, 0.9000, 0.0030, 4410000.0000, 0.7500, 0.80
1250 LOAD, SHIPCMAX, 1
1260 -66411.0000, 0.0000, 00000.00, 84.0000, 72.0000
1270 EXIT
```

LSD @ MAXIMUM OPERATI

CHAMBER - SHIPLOCK

TRANSVERSE I-BEAM

FLGS - 4 ROWS #11@8

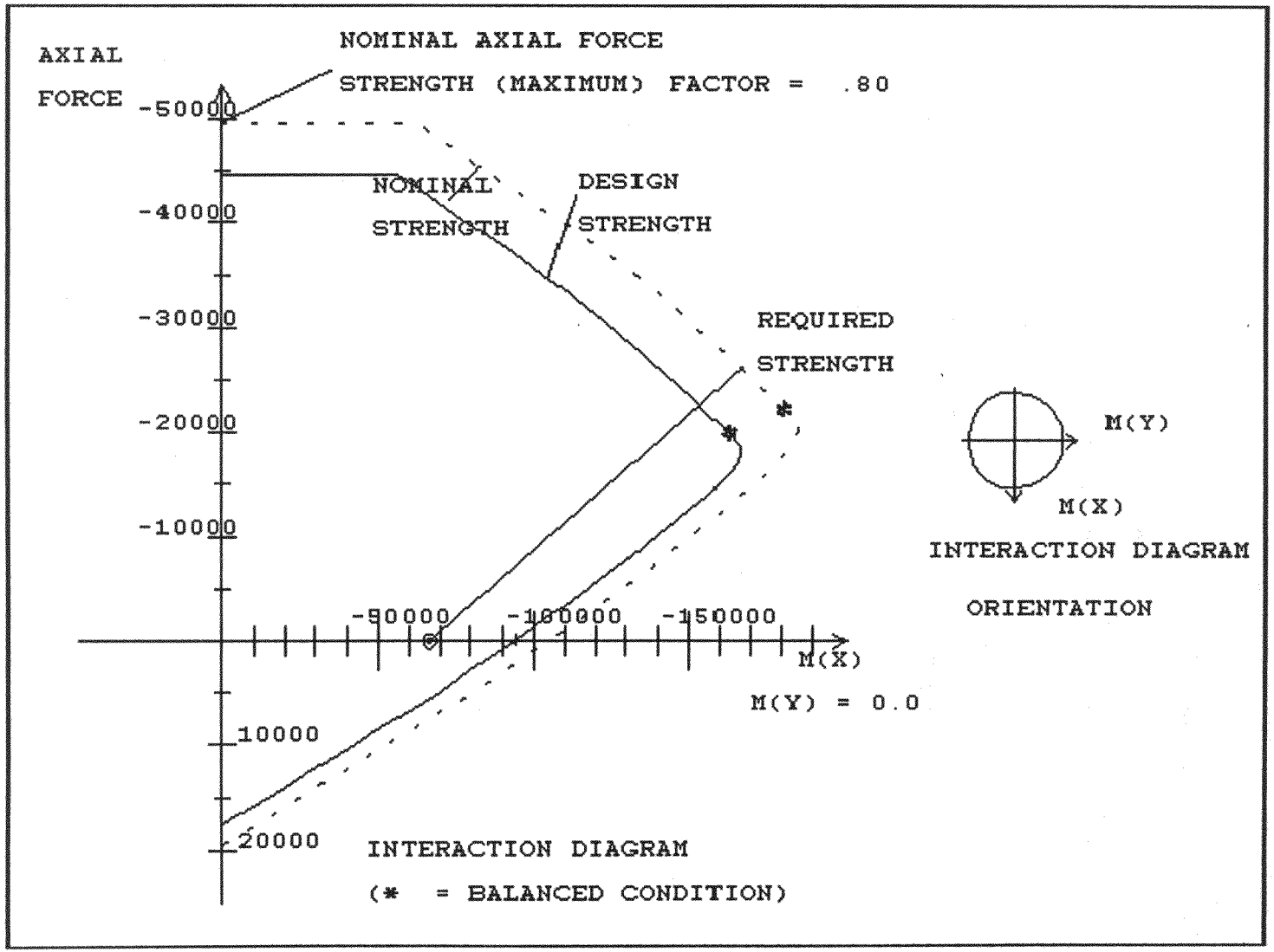
(DUE TO PROGRAM LIMITATIONS, FLG STE SHOWN AS ONE ROW WITH AS = 2 #11)

X0061 -- 713-F3-R0061 -- September 1983
Concrete General Strength Investigation

Output - X0061 - File Input Data

ROW	NO.	AREA (IN2)	X1 (IN)	Y1 (IN)	X2 (IN)	Y2 (IN)
1R	24	3.12	4.500	138.000	163.500	138.000
2R	24	3.12	4.500	125.100	163.500	125.100
3R	2	1.56	79.800	114.000	88.200	114.000
4R	2	1.56	79.800	102.000	88.200	102.000
5R	2	1.56	79.800	90.000	88.200	90.000
6R	2	1.56	79.800	78.000	88.200	78.000
7R	2	1.56	79.800	66.000	88.200	66.000
8R	2	1.56	79.800	54.000	88.200	54.000
9R	2	1.56	79.800	42.000	88.200	42.000
10R	2	1.56	79.800	30.000	88.200	30.000
11R	24	3.12	4.500	18.900	163.500	18.900
12R	24	3.12	4.500	6.100	163.500	6.100

Press Up, Down, PgUp, and PgDn to Scroll, Enter to Continue.


AXIAL
FORCE
NOMINAL AXIAL FORCE
STRENGTH (MAXIMUM) FACTOR = .80
-50000
-40000
-30000
-20000
-10000
10000
20000
NOMINAL
STRENGTH
DESIGN
STRENGTH
REQUIRED
STRENGTH
-50000
-100000
-150000
M(X)
M(Y) = 0.0
INTERACTION DIAGRAM
(* = BALANCED CONDITION)
M(Y)
M(X)
INTERACTION DIAGRAM
ORIENTATION

X0061 -- 713-F3-R0061 -- September 1983
Concrete General Strength Investigation

Output - X0061 - Loads

Fig. 2. 1 .

Strain Analysis and Interaction
Diagram for Load SHIPCMAX

Required Strength (U)
(Referenced to XC,YC)

P(U) =	0.000 kips
M(UX)=	-66411.000 kip-ft
M(UY)=	0.000 kip-ft

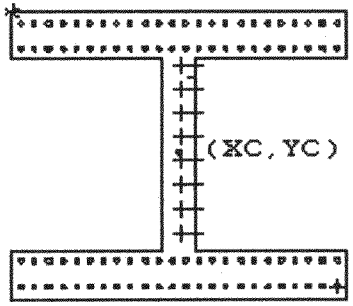
(XC,YC)= 84.000, 72.000

Percentage of Balanced Reinforcement = 26.83%

Press Up, Down, PgUp, and PgDn to Scroll, Enter to Continue.

ACTUAL STRAINS
VS. BALANCED
(BALANCED = ...)





* MAX. CONC. STR.= .00054

\+ MAX. STEEL STR.= .00171

MEMBER CHAMBASE SECTION CENTER

IHNC SHIP LOCK 3 12 8/96

CHAMBER BASE DESIGN - TRANSVERSE

POST TENSION LONG. DIRECTION FOR CONSTR. WAVE LOAD

CONVENTIONAL Rebar IN TRANSVERSE

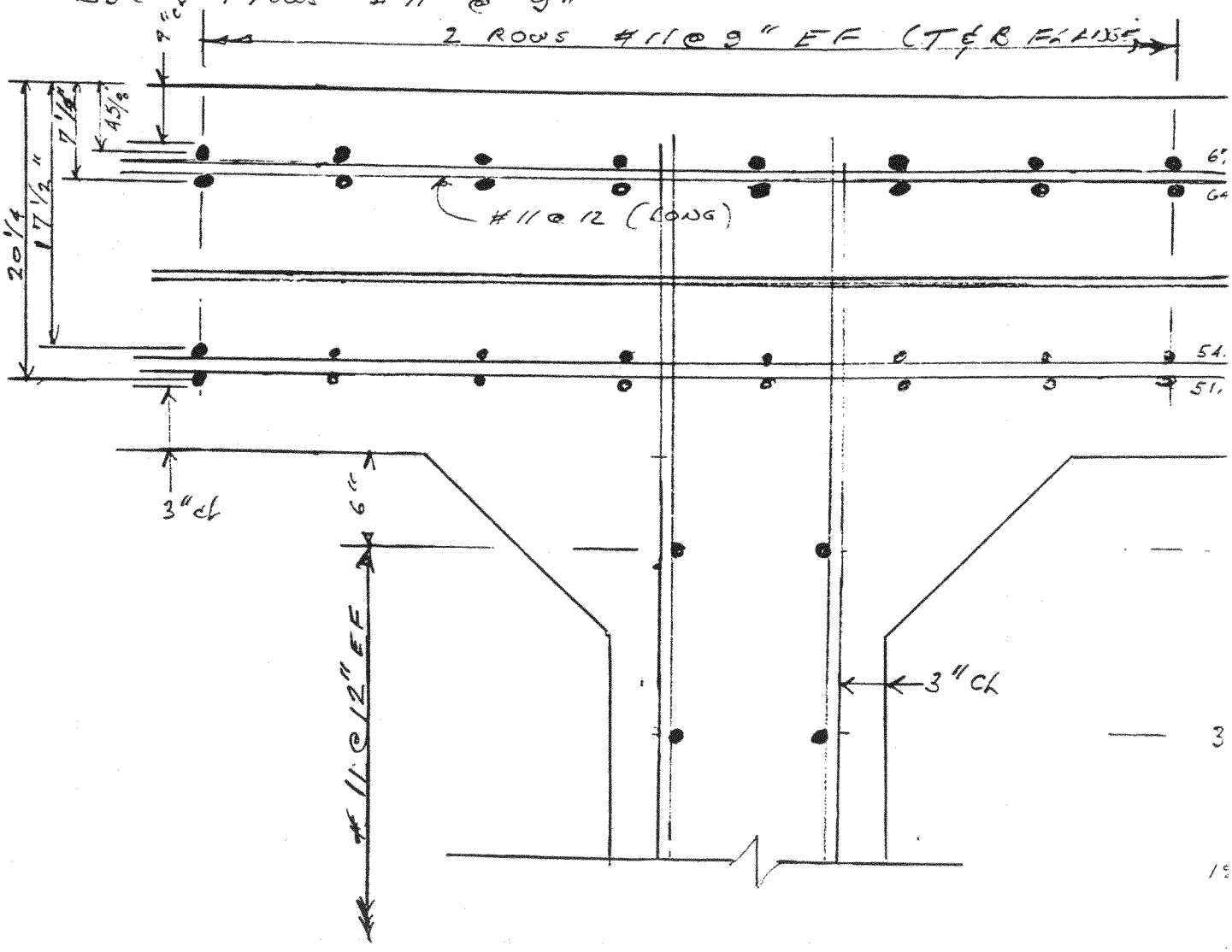
Redesign flange steel to comply w/ S. Moustafa's recommendation to eliminate #18 & #14 as a crack control measure

A_s required/12" $= (4 + 2.25 -) \frac{12}{9"} = 8.33$

$8.33 / 1.56 = 5.34$ #11 Bars

Try 4 rows #11 $S = \frac{4 \times 1.56}{8.33} = 0.75$

USE 4 rows #11 @ 9"



CHAMBER BASE - TRANSVERSE DESIGN

CRACK WIDTH & FLEXURAL REIN. DIST.

The I-BEAM SECTION, CONSERVATIVELY ASSUMING THAT BALLAST CONCRETE DOES NOT INCREASE STRUCTURAL CAPACITY, HAS FLANGE COMPONENTS THAT ARE IN TENSION FOR THE COMPLETE CYCLE. CRACK CONTROL SHALL BE PROVIDED BY limiting tensile stress in accordance w/ Table 4.1 of ACI 350. Also rebar shall be distributed to limit crack width to 0.010" @ normal operation.

$w = 0.076 \beta \cdot f_s \sqrt{d_c \cdot A}$ (Thousands of inch)

ACI 10.6.4

where $\beta = 1.16$ (see shaded letter from Manuel)

CONSIDER 16" (#11 BARS @ 3") width of Tension Flange

$f_{s\ \text{normal ops}} = 16.44$ KSI

$d_c = 4\ 5/8$"

$d_{ca} = \frac{1.56(4.625 + 7.5 + 17.5 + 20.25)}{4 \times 1.56} = 12.47$

$A = 12.47 \times 2 \times 16 = 399$

$A/\text{BAR} = \frac{399}{8} = 49.88$

$w = 0.076 \times 1.16 \times 16.44 \sqrt[3]{4.625 \times 49.9}$

$= 0.0089 < 0.010$ OK ← CONTROLS

Maximum Operation

$f_s = 20.54$ KSI

$w = 0.076 \times 1.16 \times 20.54 \sqrt[3]{4.625 \times 49.9}$

$= 0.011$" NOT EXCESSIVE CONSIDERING MAX. OPERATION IS A RARE EVENT

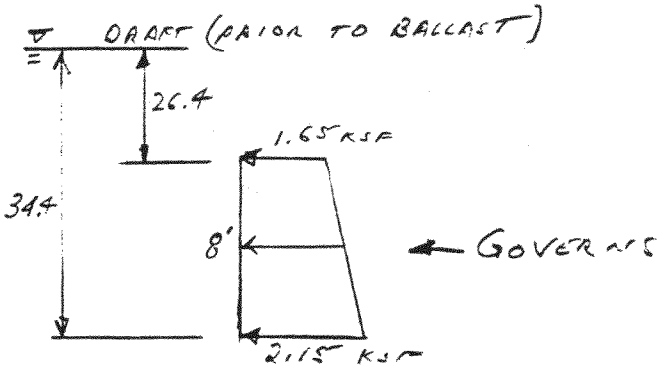
WEB REINFORCEMENT

HORIZONTAL BARS

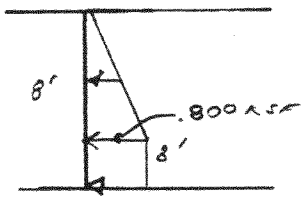
1) ACI 10.6.7 (see pg 1) Need # 11 @ 12

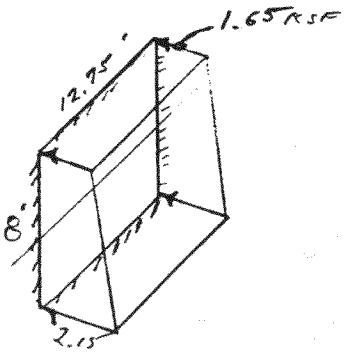
2) Web as a Rectangular Plate Fixed @ 4 edges, for the largest load created by: 1) Transport Flooding
2) Full U-Frame, Base Unballasted
3) Concrete Coat

U-FRAME DEPTH > TRANSPORT



CONCRETE FORMING FROM ONE SIDE
rate of pour = 5'/hr





$$M_{HOR.12\ MAX} = \frac{w l_n^2}{10} = \frac{1.90 \times 12.75^2}{10} = 30.9^{k}_{ft}$$

$$= 370''\text{-}K \qquad M_a = 370 \times \frac{2.21}{1.33} = 615''$$

$$M_a/\phi = A_s F_y \left[d - \frac{A_s F_y}{2 \times 0.85 \times f_c' \times b} \right]$$

$b = 12''$

$d = 18 - 5'' = 13''$

$f_c' = 6000$ $\quad f_y = 60{,}000$

$$615/0.9 = A_s \cdot 60 \left[13 - \frac{A_s \cdot 60}{2 \times 0.85 \times 6 \times 12} \right]$$

$$0 = A_s^2 - 26.52 A_s + 23.23$$

$$A_s = \frac{26.52 \pm \sqrt{26.52^2 - (4)(23.23)}}{2}$$

$$= 0.91''^2 < A_{s\,K}$$

TEMP STEEL = 0.0014 Ag
= 0.0014 x 12 x 18
= 0.30 in² < Ask

Ask = 1.31 in²/12 ft/face Controls. ACI 10.6.7 adds web reinforcement to control cracks, this is not an additive bar area.

VERTICAL BARS

Same loading as horizontal, use greater of $M_0 = \frac{wl_n^2}{10}$ and $M_{rect.\ plate}$ per Roark Formulas for Stress and Strain

$M_0 = \frac{1.90 \times 8^2}{10} = 12.16$ k/ft
= 146 in-k

ROARK FORMULAS FOR STRESS & STRAIN 6th Edition pg 465
COMBINE UNIFORM CASE (8A) and LINEARLY VARYING (CASE 8D).

UNIFORM LOAD

$\frac{a}{b} = \frac{12.75}{8} = 1.6$ $\beta_1 = 0.4680$

$q = 1650$ psf

σ_{max} @ Center of bottom edge $= \frac{-\beta_1 \cdot q \cdot b^2}{t^2} = \frac{0.468 \times 1.650 \times 8^2}{1.5^2}$
= 21.96 KSF

Linearly Varying

$\sigma_m = \frac{-0.3092 (2.150 - 1.650) 8^2}{1.5^2}$
= 4.40 KSF

$\Sigma \sigma$ = 26.36 KSF

$M_2 = \sigma \cdot S_x$ $S_x = \frac{1 \cdot 1.5^2}{6} = 0.375$ ft³

= 26.36 x 0.375
= 9.89 k-ft
= 118.6 in-k < M_0 = 146 in-k ← Controls

$M_u = \frac{2.2}{1.33} \times 146 = 243$ in-k

$243/0.90 = 60A_s\left[d - \frac{60A_s}{2\times0.85\times f'_c\times b}\right]$

$270 = 858.8A_s - 29.41A_s^2$

$0 = A_s^2 - 29.2A_s + 9.18$

$A_s = \frac{29.2 \pm \sqrt{29.2^2 - (4)(9.18)}}{2} = 0.32'' > A_{s_{temp}}$

$b = 12''$

$d = 18 - 3.68''$

$= 14.31''$

The tensile stress on the vertical bars is in the same direction as shear stress.

$A_6 = A_{s_{\substack{\text{FLEXURE}\\\text{WEB}}}} + \frac{A_s}{2}_{\substack{\text{web}\\\text{shear}}}$ (REBAR IN ONE FACE)

FOR THE SETTING CONDITION (see pg 10 of 10) $V_{max_{TRANS}} = 284\ K$ @ Wall Face

$V_u = \frac{2.21}{1.33} \times 284 = 472\ K$

Recalculate $A_{s_{Flexure}}$ w/ correct web thickness = 27"

$d = 27 - 3.68 = 23.32''$

$b = 12$

$270 = 1399.2A_s - 29.41A_s^2$

$0 = A_s^2 - 47.57A_s + 9.18$

$A_s = \frac{47.57 \pm \sqrt{47.57^2 - (4)(9.18)}}{2} = 0.20\ in^2$

$V_u = 472\ K$

$V_c = 2\sqrt{f'_c}\ b_w \cdot d$ (ACI 11-3)

$= 2\sqrt{6000} \cdot 27 \cdot 140$

$= 586\ kips$

$\phi V_c = 0.85(586) = 498\ kip$

$\phi V_c > V_u$ USE Minimum Shear Reinforcement

$A_{v\,min} = 50\frac{b_w \cdot s}{f_y}$ (ACI 11.5.5)

$A_{v\,min} = \frac{50 \times 27 \cdot 12}{60{,}000}$

$= 0.27\ in^2$

$\Sigma A_b = \frac{0.27\ in^2}{2} + 0.20 = 0.34\ in^2 @ 12"$ $< A_{TEMP} = 0.0018 \times 12 \times 27 = 0.45\ in^2$

USE # 7 @ 12" EF $A_b = 0.60\ in^2$ ← DOES NOT GOVERN SEE PG 11 - SECTION "A"

Check Wall w/ h = 21" (SECOND PANEL)

$d = 21" - 3.68 = 17.3"$

$270 = 1038 A_s - 29.41 A_s^2$

$0 = A_s^2 - 35.29 A_s + 9.18$

$A_s = \frac{35.29 \pm \sqrt{35.29^2 - (4)(9.18)}}{2} = 0.26\ in^2$

$V = 284\ K$ (USE $V_{max.}$ Throughout)

$V_u = 472\ K$

$V_c = 2\sqrt{6000} \times 21 \times 140$

$= 455\ K$

$\phi V_c = (0.85) V_c = 387\ K$

$V_s = 472 - 387 = 85\ K$

$A_v = \frac{85 \cdot 12}{60 \cdot 132}$ (ACI 11.5.6)

$= 0.13\ in^2$

$A_{v\,min} = \frac{50 \times 21 \times 12}{60{,}000}$

$= 0.21\ in^2$

$A_b = \frac{0.21}{2} + 0.26$

$= 0.37\ in^2$ $> A_{TEMP} = 0.0014 \times 12 \times 21 = 0.35\ in^2$

USE # 6 @ 12" EF $A_b = 0.60\ in^2$ ← DOES NOT GOVERN SEE PG 12 - SECTION "B"

Check Wall @ h = 18'

$V = 284^K$

$V_u = 472$

$V_c = 2\sqrt{6000} \times 18 \times 140$

$= 390$

$V_{s_{req'd}} = 472 - 390(0.85) \leq 140^K$

$A_v = \frac{140 \times 12}{60 \times 132} = 0.21^{in^2}$ $>$ $A_{v\,min} = \frac{50 \times 18 \times 12}{60{,}000} = 0.18^{in^2}$

$A_s = 0.32^{in^2}$ (see pg 7)

$A_b = \frac{0.21}{2} + 0.32 = 0.43^{in^2} > A_{temp}$

USE #7 @ 12 EF ← DOES NOT GOVERN SEE PG 12 SECTION "C"

Flange Reinforcement

Long - Prestress $1\frac{3}{8}$" ϕ @ 12"
Rebar # 11 @ 12" c 2 rows/flange

TRANS - # 11 @ 8" 4 rows/flange

Check Shear & Flexure Considering Bolted Concrete not placed

BOTTOM SLAB @ 36.4' DRAFT

$w_B = (36.4 \times 0.0625) - (2 \times 0.15) = 1.98^{KSF}$

$l_{n\,max} = 14 - 1.25 = 12.75$

$M_{max} = \frac{1.98 \times 12.75^2}{10} = -32.2^{'K}$

$= 386^{"K}$

Top Slab

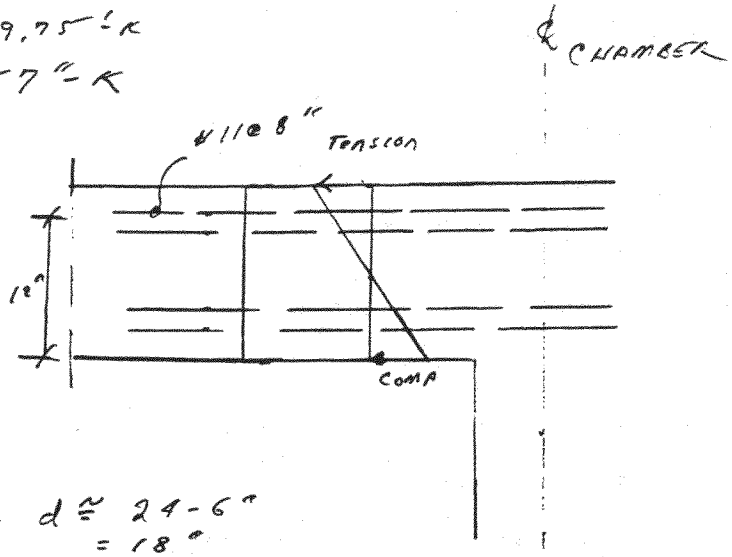
$M_{max} = M_{I\text{-}BEAM} + M_{plate}$

Note: Prior to setting the bottom flange is only in compression so Design of the top flange will govern

$w_T = (24.4 \times 0.0625) + (2 \times 0.15) = 1.83^{KSF}$

$M_{plate} = \frac{1.83 \times 12.75^2}{10} = 29.75'\text{-}K$
$= 357''\text{-}K$

$M_{I\text{-}BEAM} = 17850'\text{-}K$



USE WSD

From CGFAG

$f_{s_{I\text{-}BEAM}} = 12{,}200$ PSI

plate

$357 = A_s f_s j d$ where $d \cong 24 - 6''$
$= 18''$

$f_s = \frac{357}{4.68(0.85 \times 18)}$

$= 4.99$ KSI

$A_s = 1.56 \times 2 \times \frac{12}{8}$
$= 4.68\ ''^2/LF$

$j = 1 - \frac{K}{3}$ $K = \frac{n}{n+r}$

$= 1 - \frac{0.47}{3}$ $n = \frac{E_s}{E_c} = \frac{29{,}000}{4.41} = 6.6$

$= 0.85$

$r = \frac{f_s}{f_c} = \frac{20{,}000}{2700} = 7.4$

$K = 0.47$

$\Sigma f_s = 12{,}200 + 4{,}990$
$= 17{,}190$ KSI

$F_{s_{allow}} = 23$ KSI & f_s ok
Table 4.1

SHEAR - BOTTOM FLANGE

$w = 1.98$

$V_u = \left(1.98 \times \frac{12.75}{2}\right) \frac{2.21}{1.33} = 21\ K$

$V_c = 2\sqrt{6000} \times 12 \times 18 = 33.46\ K$

$\phi V_c = 0.85(33.46) = 28.44\ K > V_u$

```
010 SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) ~~NORMAL OPER~~. TRANSPORT LOAD
020 13 16 1
030 1 -84 72 84 72 84 48
040 1 9 48 9 -48 84 -48
  0 1 84 -72 -84 -72 -84 -48
  0 1 -9 -48 -9 48 -84 48
070 1 -84 72
080 2 1.56 -81 67.4 24 81 67.4
081 2 1.56 -81 64.5 24 81 64.5
082 2 1.56 -81 54.5 24 81 54.5
083 2 1.56 -81 51.75 24 81 51.75
100 2 1.56 -4.5 42 2 4.5 42
110 2 1.56 -4.5 30 2 4.5 30
120 2 1.56 -4.5 18 2 4.5 18
130 2 1.56 -4.5 6 2 4.5 6
140 2 1.56 -4.5 -6 2 4.5 -6
150 2 1.56 -4.5 -18 2 4.5 -18
160 2 1.56 -4.5 -30 2 4.5 -30
170 2 1.56 -4.5 -42 2 4.5 -42
200 2 1.56 -81 -51.75 24 81 -51.75
201 2 1.56 -81 -54.5 24 81 -54.5
202 2 1.56 -81 -64.5 24 81 -64.5
203 2 1.56 -81 -67.4 24 81 -67.4
230 3 0 0 -214200 6.6 0.15 0.01
240
250 0 0 0
```

1

PROGRAM CORPS/X8008 CONCRETE GENERAL FLEXURE ANALYSIS REV 86
SHIP LOCK CHAMBER TRANS IBEAM ANALYSIS(WSD) NORMAL OPER. LOAD
** I N P U T L O A D I N G A N D P A R A M E T E R S **

LD. CASE	P	Y-AXIS MOM.	X-AXIS MOM.	N	R	ACCURACY
3	.00	.00	-214200.00	6.60	.15	.010

S T R E S S E Q U A T I O N A N D N E U T R A L A X I S:

UNIT STRESS = .00000 X + -.01796 Y + -.63840

AT Y = 0, NEUTRAL AXIS CROSSES X-AXIS AT X = -.10357420E+13
AT X = 0, NEUTRAL AXIS CROSSES Y-AXIS AT Y = -35.543720

MAXIMUM CONCRETE STRESS = .65 AT POINT 7
MAXIMUM STEEL STRESS = 12.20 T
= .57 C
COMPRESSIVE STRESS IS SHOWN PLUS, TENSION MINUS (CONC. & STEEL)

C O N C R E T E S T R E S S E S F O R O U T L I N E 1:

POINT	X-COORD	Y-COORD	COMPRESSIVE STRESS	POINT	X-COORD	Y-COORD	COMP. STRESS
1	-84.00	72.00		2	84.00	72.00	
3	84.00	48.00		4	9.00	48.00	
5	9.00	-48.00	.224	6	84.00	-48.00	.224
7	84.00	-72.00	.655	8	-84.00	-72.00	.655
9	-84.00	-48.00	.224	10	-9.00	-48.00	.224
11	-9.00	48.00		12	-84.00	48.00	
13	-84.00	72.00					

STEEL STRESSES FOR PATTERN NO. 2:

AREA OF ONE BAR	QUAN. OF BARS/ROW	ROW END	X COORDINATE	Y COORDINATE	STRESS IN BAR
1.560	24	1	-81.000	67.400	-12.203
		2	81.000	67.400	-12.203
1.560	24	1	-81.000	64.500	-11.859
		2	81.000	64.500	-11.859
1.560	24	1	-81.000	54.500	-10.674
		2	81.000	54.500	-10.674
1.560	24	1	-81.000	51.750	-10.348
		2	81.000	51.750	-10.348
1.560	2	1	-4.500	42.000	-9.192
		2	4.500	42.000	-9.192
1.560	2	1	-4.500	30.000	-7.770
		2	4.500	30.000	-7.770
1.560	2	1	-4.500	18.000	-6.347
		2	4.500	18.000	-6.347
1.560	2	1	-4.500	6.000	-4.925
		2	4.500	6.000	-4.925
1.560	2	1	-4.500	-6.000	-3.502
		2	4.500	-6.000	-3.502
1.560	2	1	-4.500	-18.000	-2.080
		2	4.500	-18.000	-2.080
1.560	2	1	-4.500	-30.000	-.657
		2	4.500	-30.000	-.657
1.560	2	1	-4.500	-42.000	.115
		2	4.500	-42.000	.115
1.560	24	1	-81.000	-51.750	.288
		2	81.000	-51.750	.288
1.560	24	1	-81.000	-54.500	.337
		2	81.000	-54.500	.337
1.560	24	1	-81.000	-64.500	.515
		2	81.000	-64.500	.515
1.560	24	1	-81.000	-67.400	.566
		2	81.000	-67.400	.566

SHEAR

For the normal & maximum operation the axial loads, induced by lateral loads acting on the H-Frame, are too small to consider axial compression.

SECTION A

$b_w = 27''$

$V_{u,} = 2336\ K$

$V_c = 2\sqrt{f_c'}\, b_w \cdot d$

$= 2\sqrt{6000}\ 27 \times 132$

$= 552\ K$

$V_s = V_u/\phi - V_c = 2336/0.85 - 552 = 2196\ K$

$V_{s\,max} = 8\sqrt{f_c'}\, b_w d$ (ACI 11.5.6.8)

$= 2208\ K < V_s$ OK

$V_s = \dfrac{A_v \cdot f_y \cdot d}{s}$ USE MAX PERMITTED #8 BARS

$s = \dfrac{2 \times 0.79 \times 60 \times 132}{2196} = 5.7$ USE 6" SPACING

TRY $b_w = 30''$

$V_c = 2\sqrt{6000} \times 30 \times 132$

$= 613$

$V_s = 2336/0.85 - 613 = 2018$

$s = \dfrac{2 \times 0.79 \times 60 \times 132}{2018} = 6.2''$

USE $b_w = 30''$ w/ 2-#8" STIRRUP BARS @ 6"

12 12 8/96

SECTION B

$b_w = 21''$

$V_{u\,max} = 800 \times 2.21 = 1768\,K$ (LOAD CASE 1)

$V_c = 2\sqrt{6000} \times 21 \times 132$

$= 429\,K$

$V_s = 1768/0.85 - 429 = 1651\,K$

$V_{s\,max} = 4V_c = 1716 > 1651$ OK

$S_{2-\#8} = \frac{2 \times 0.79 \times 60K \times 132}{1650} = 7.5''$ USE 2-#8@3"

SECTION C

$b_w = 18''$

$V_{u\,max} = 1216$ (LOAD CASE 2A)

$V_c = 2\sqrt{6000} \times 18 \times 132$

$= 368\,K$

$V_s = 1216/0.85 - 368 = 1060\,K$

$V_{s\,max} = 4V_c = 1472\,K > V_s$ OK

$S_{2-\#8} = \frac{2 \times 0.79 \times 60K \times 132}{1060} = 11.8''$ USE 2-#8@12"

WAVE LOADING

COMPUTATION SHEET

PROJECT	CHAMBER MODULE	PAGE 1 OF 18	COMPUTED BY MHG	DATE 6/96
SUBJECT	WAVE LOADING		CHECKED BY	DATE

H&H DATA

1. Transport Case 4-6' wave, use h = 4' as large ship passage can be restricted to h = 3' (6' wave) as per para 2 of H&H Memo dated 17 Jun 96
   d = L module = 440'
2. Construction Case - Assume a earthen wall is constructed and wave height is negligible.
3. Hurricane Wave - The construction site (Golver Street Wharf) is far enough from the open lake that the 13' rise will be a gradual rise and not a wave; the max wave ht @ the Construction site is 7'.

WAVE LOADING AS PER "STRUCTURAL CONSIDERATIONS and CONFIGURATIONS II JEAN MULLER

From Para 3.2

1) Head on Wave - Long Direction ($\alpha = 0$)

$$M_{@L/2} = \frac{\gamma \cdot B \cdot L^2 \cdot h}{2\pi^2}$$

B = 172'
L = 440'
h = 3'

$$= \frac{0.063 \cdot 172 \cdot 440^2 \cdot 3}{2 \cdot \pi^2}$$

$$= 320,000 \text{ ft-k}$$

$$V_{@L/2} = \frac{\gamma \cdot B \cdot L \cdot h}{2\pi}$$

$$= \frac{0.063 \cdot 172 \cdot 440 \cdot 3}{2\pi}$$

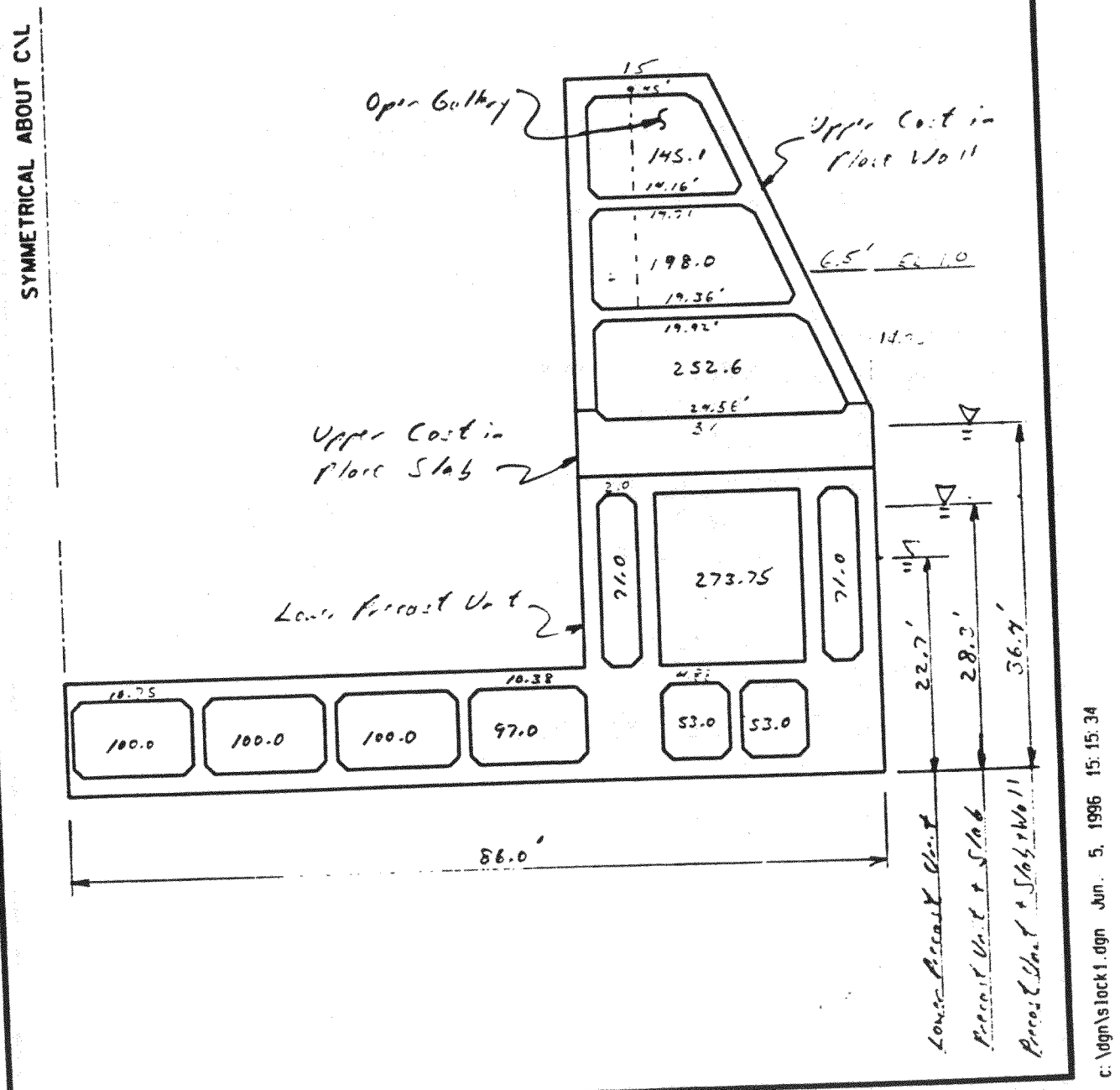
$$= 2,280 \text{ K}$$

LOAD CASE (CONSTRUCTION)

CHAMBER MONOLITH - 14' STRIP

DRAFT COMPUTATIONS

CHAMBER 446 x 172



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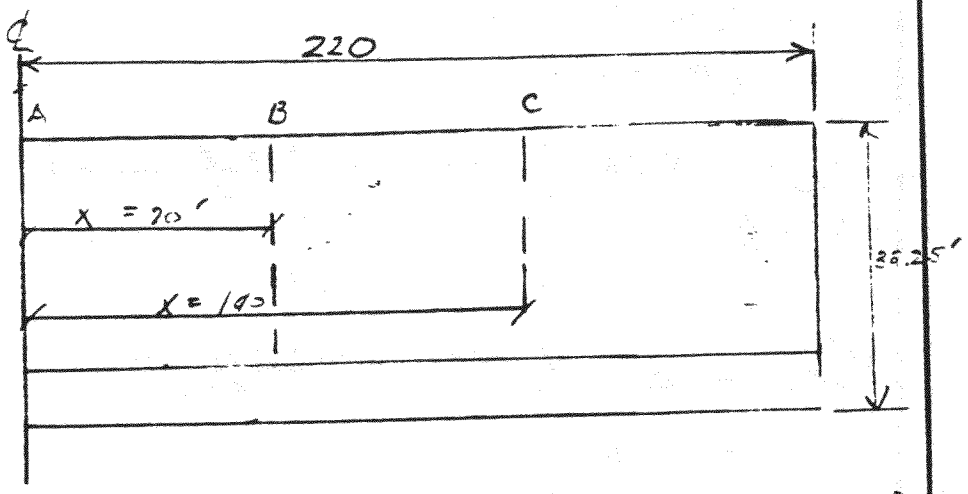
COMPUTATION SHEET

PROJECT	PAGE 2 OF 18	COMPUTED BY MGS	DATE 9/96
SUBJECT		CHECKED BY	DATE

2) Determine M & V @ Various Sections along Long. Dir w/ Head On Wave

TRANSPORT SECTION



Moment

$\alpha = 0 \quad \gamma = 0$

$$M_x = M_{℄} \cdot \frac{\pi^2}{2\beta^2}\left(\frac{4x^2 - L^2}{2L^2}\beta \cdot \sin\beta + \cos 2\beta\frac{x}{L} - \cos\beta\right)$$

where $\beta = \frac{\pi L}{d}$

select $d = L \therefore \beta = \pi$

$x = 70'$

$$M_{70} = 320{,}000 \cdot \tfrac{1}{2}\left(0 + \cos(2\pi)\frac{70}{440} - \cos\pi\right)$$

$$= 320{,}000 \cdot \tfrac{1}{2}(0.541 + 1)$$

$$= 246{,}600 \text{ '-K}$$

$$M_{140} = 320{,}000 \cdot \tfrac{1}{2}(0 - 0.415 + 1)$$

$$= 93{,}600 \text{ '-K}$$

SHEAR @ $\alpha = 0 \quad \gamma = 0$

$$V_x = \frac{\gamma B h}{2\beta}\left(L \cdot \sin 2\beta\frac{x}{L} - 2x\sin\beta\right)$$

$V_{℄} = 0$

$x = 70'$

COMPUTATION SHEET

PROJECT	PAGE 3 OF 18	COMPUTED BY MR	DATE 10/96
SUBJECT		CHECKED BY	DATE

$$V_{70} = \frac{0.063 \times 172 \times 3}{2 \cdot 3.14} \left(440 \cdot \sin \frac{2 \cdot 3.14 \cdot 70}{440} + 2(70) \underbrace{\sin \pi}_{0} \right)$$

$$= 5.18 \ (370)$$

$$= 1{,}920 \text{ K}$$

$$V_{110} = 5.18 \left(440 \cdot \sin \frac{2 \cdot 3.14 \cdot 110}{440} \right)$$

(QUARTER PT

$$= 2{,}280 \text{ K} = V_{max}$$

$$V_{140} = 5.18 \left(440 \cdot \sin \frac{2 \cdot 3.14 \cdot 140}{440} \right)$$

$$= 2080 \text{ K}$$

$$V_{180} = 5.18 \left(440 \cdot \sin \frac{2 \cdot 3.14 \times 180}{440} \right)$$

$$= 1{,}235 \text{ K}$$

Maximum moment occurs when $d = 0.89 L = 392'$

$$M_{max} = 1.027 \, M_o \qquad \alpha = 0$$

$$= 1.027 \times 320{,}000$$

$$= 328{,}600 \text{ '-K}$$

$$\beta = \frac{\pi L}{d} = \frac{\pi \cdot 440}{392} = 3.52$$

$$M_{\mathbb{C}} = 320{,}000 \cdot \frac{\pi^2}{2 \times 3.52^2} \left(1 - \cos 3.52 - \tfrac{1}{2} \cdot 3.52 \cdot \sin 3.52 \right)$$

$$= 320{,}000 \cdot 0.398 \ (2.58)$$

$$= 329{,}000 \text{ '-K}$$

$$M_{70} = \left(320{,}000 \cdot \frac{\pi^2}{2 \cdot 3.52^2} \right) \left[\left(\frac{4 \cdot 70^2 - 440^2}{2 \cdot 440^2} \cdot 3.52 \cdot \sin 3.52 \right) + \cos\left(2 \cdot 3.52 \cdot \frac{70}{440} \right) - \cos 3.52 \right]$$

$$= 127{,}320 \ [0.584 + 0.436 + 0.93]$$

$$= 248{,}300 \text{ '-K}$$

$$M_{140} = 93{,}600 \times 1.027$$

$$= 96{,}130 \text{ '-K}$$

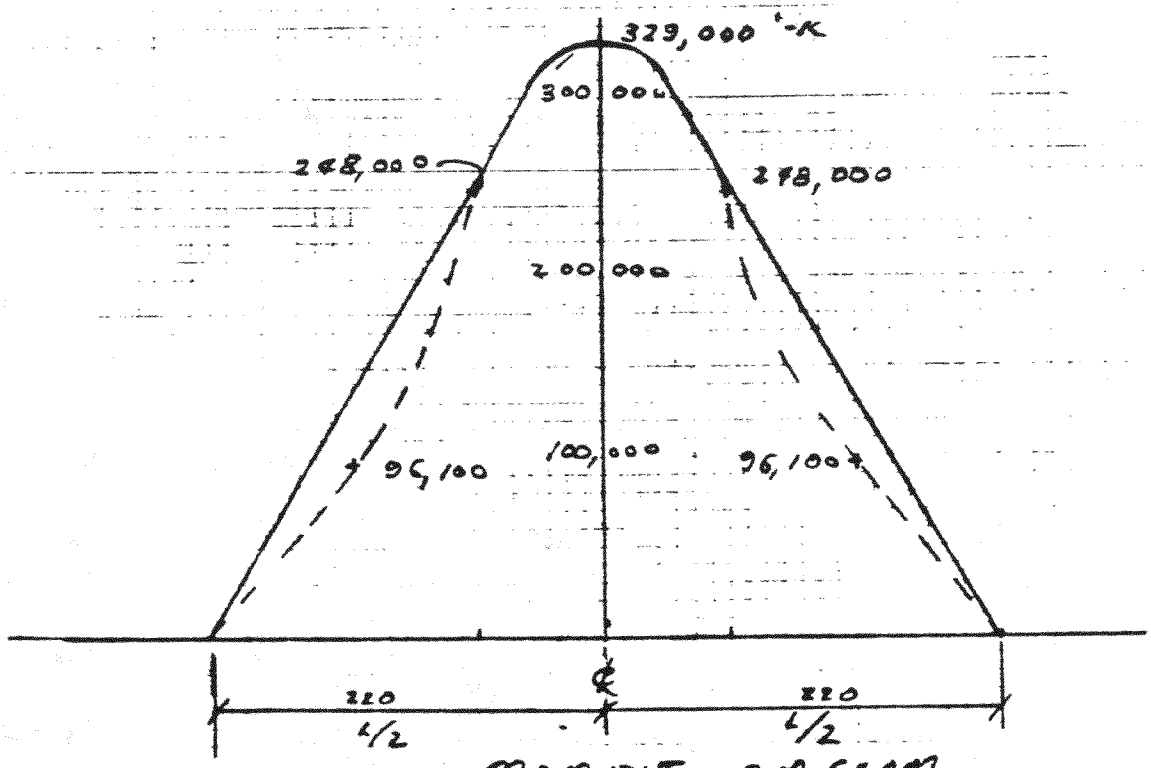
COMPUTATION SHEET

PROJECT	PAGE 4 OF 18	COMPUTED BY MH	DATE 10/96
SUBJECT		CHECKED BY	DATE

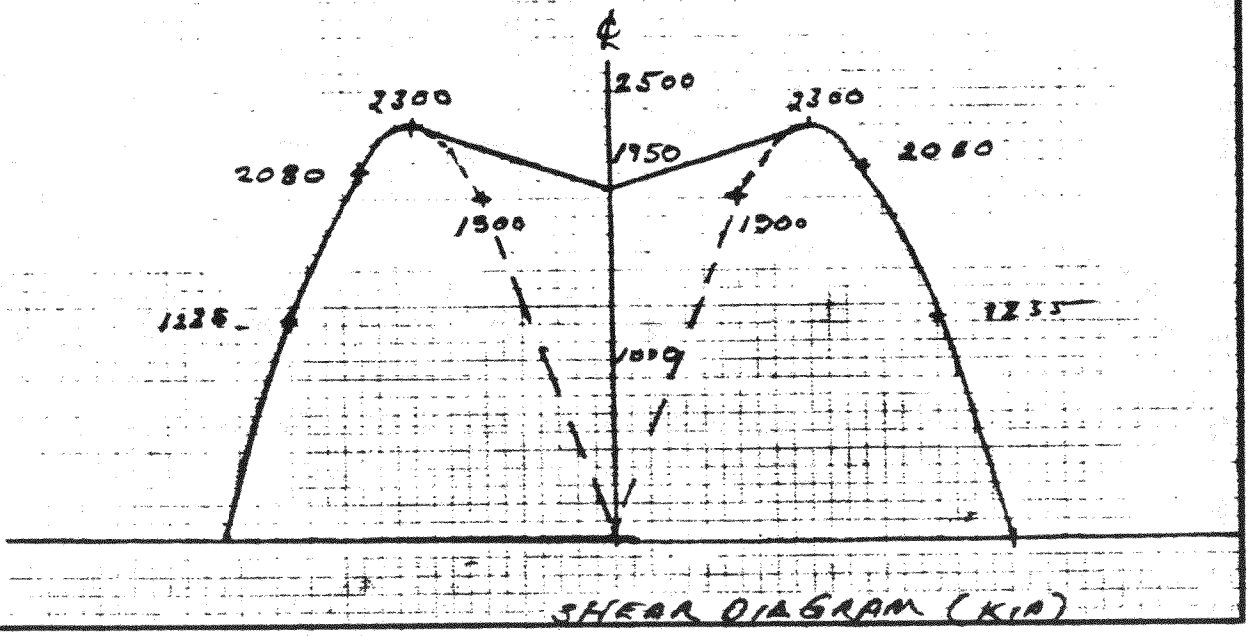
LONGITUDINAL AXIS

$\alpha = 0°$ (HEAD ON)

$h = 3'$ (TOTAL WAVE = 6') & MODULE



MOMENT DIAGRAM
LONG. AXIS (FT-KIP)



SHEAR DIAGRAM (KIP)

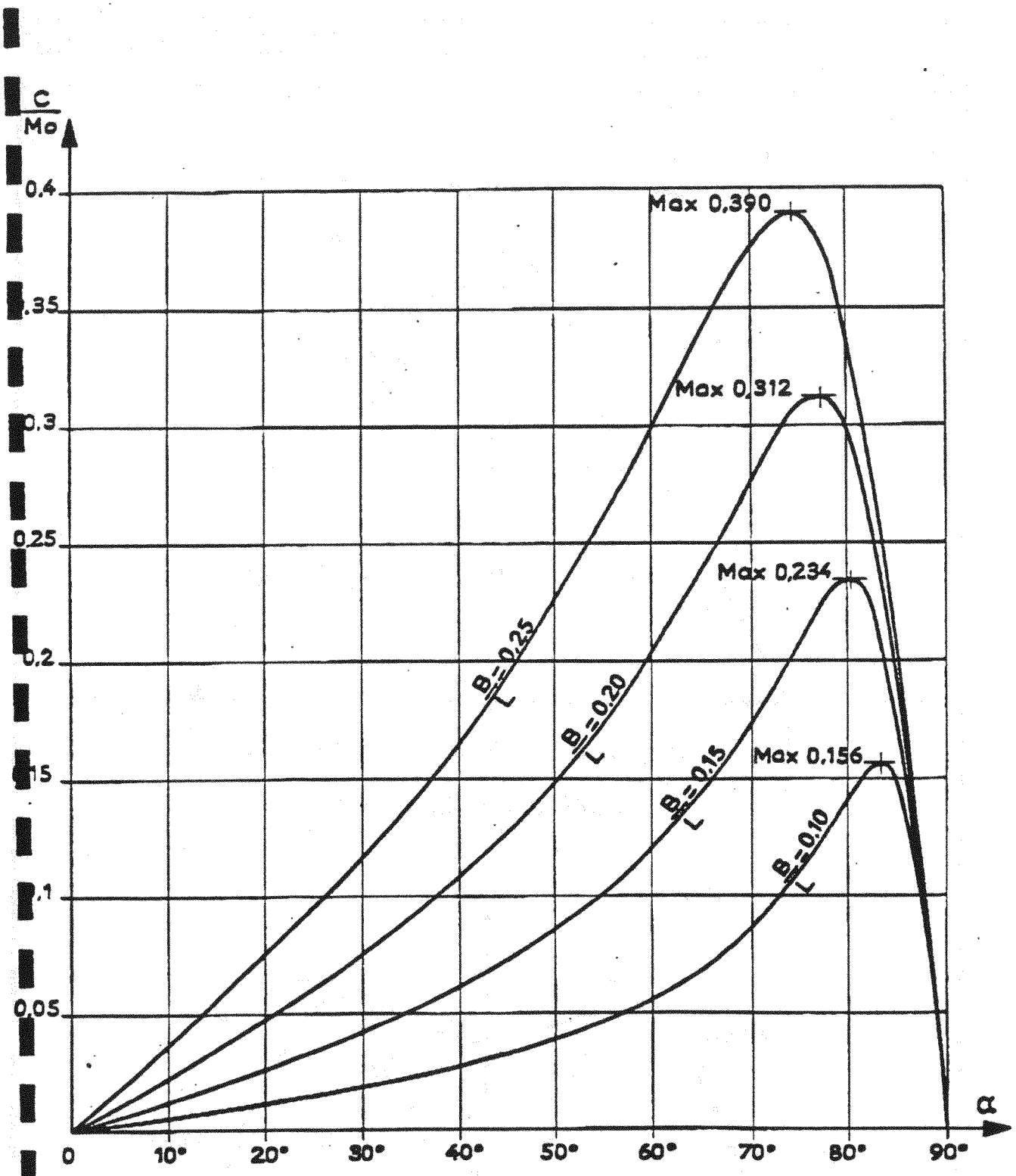


Fig.16 _ VARIATION OF TORQUE MOMENT VERSUS DIRECTION OF WAVE

COMPUTATION SHEET

PROJECT	PAGE 5 OF 18	COMPUTED BY MG	DATE 10/96
SUBJECT		CHECKED BY	DATE

@ $d = 0.70L$ $\quad V \cong 0.85\, V_0$

$= 0.85 \times 2300$

$= 1950\,K$ @ ℄

TORGUE $\quad h = 3 \quad \alpha = 65°$* (see Fig 16) $\quad \frac{B}{L}$ = 0.39

$$C = \frac{\gamma_{H_2O} \cdot B^2 L h}{4} \cdot \frac{\cos(2B\frac{x}{L}) - \cos B}{B} \cdot \frac{\sin\gamma - \gamma\cos\gamma}{\gamma^2}$$

where $\gamma = 0.063$

$B = 172$

$d = L = 440$

$h = 3'$

$$\beta = \frac{\pi \cdot L \cos\alpha}{d}$$

w/ $L = d$

$$\beta = \pi \cdot \cos\alpha$$

$= 1.33$

$$\gamma = \frac{\pi \cdot B \cdot \sin\alpha}{d}$$

$$= \frac{\pi \cdot 172 \cdot \sin 65}{440}$$

$= 1.11$

$$C_{℄} = \frac{0.063 \cdot 172^2 \cdot 440 \cdot 3}{4} \cdot \frac{\cos 0 - \cos 1.33}{1.33} \cdot \frac{\sin 1.11 - 1.11 \cos 1.11}{1.11^2}$$

$= 615{,}050 \times 0.572 \times 0.326$

$= 115{,}000'\text{-}K$

$C_{x=70'} = 615{,}050 \cdot 0.506 \times 0.326$

$= 101{,}600$

$C_{x=110} = 615{,}050 \times 0.412 \times 0.326$

$C_{x=140} = 615{,}050 \times 0.319 \times 0.326$

$= 63{,}800K$

* $\alpha_{critical} = \tan^{-1}\alpha = 0.893 \frac{L}{B} = 0.893 \frac{440}{172}$

$\alpha = 66.5°$ use 65°

COMPUTATION SHEET

PROJECT	PAGE 6 OF 18	COMPUTED BY	DATE 10/96
SUBJECT		CHECKED BY	DATE

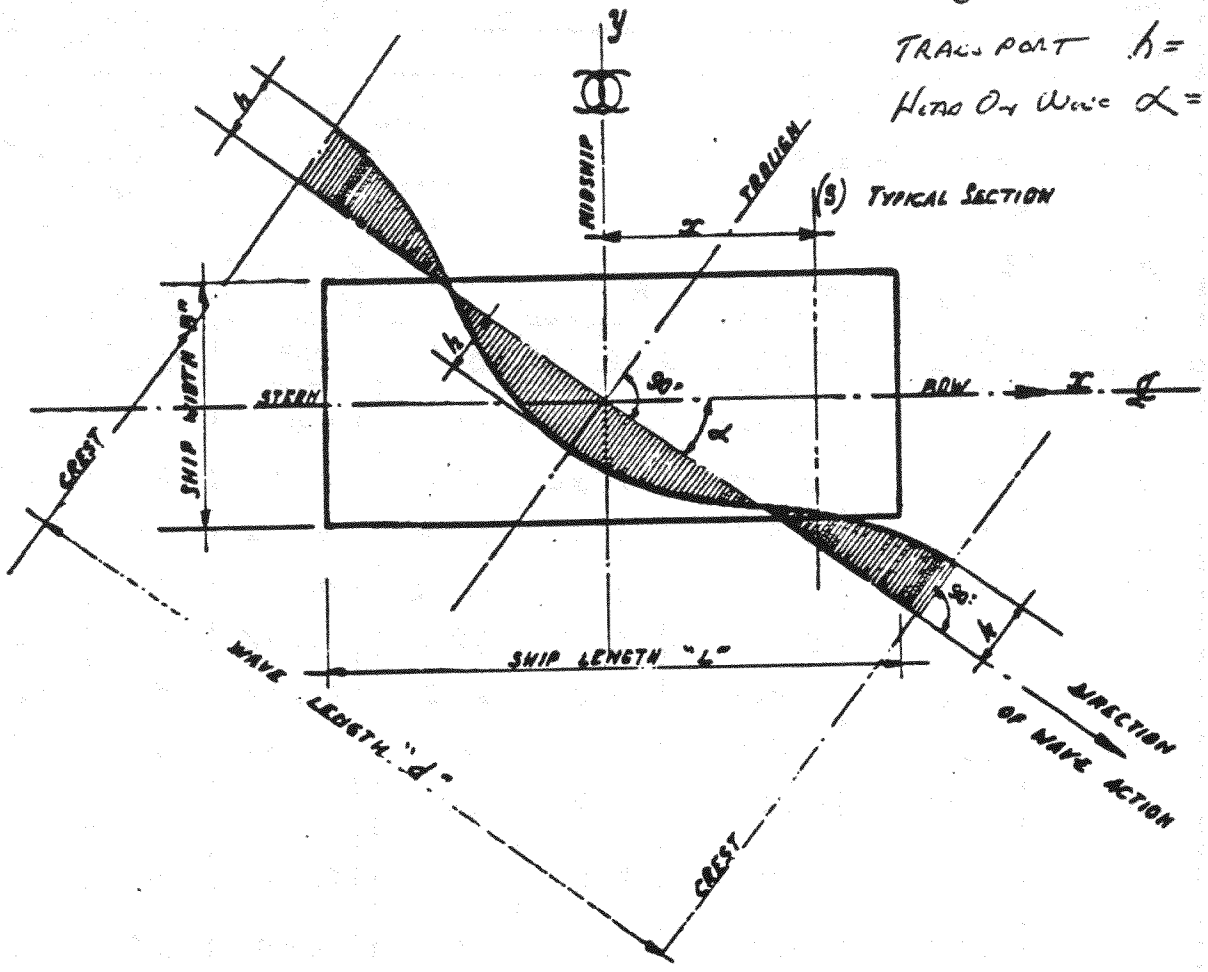
$*M_{max} = \pm 329{,}000$ 'K @ ℄ (± accounts for hogging & sagging)

$V_{max} = 2300$ 'K @ 1/4 from ℄

$T_{max} = 115{,}000$ 'K @ ℄

* Wave loading acting on short D-Frame that leaves GRADING Site.

CHAMBER
TRANSPORT $h = 3'$
HEAD ON WAVE $\alpha = 0$



SPECIFIC WEIGHT OF LIQUID : ϖ

WAVE LENGTH = d = L

TOTAL WAVE HEIGHT = 2 h (CREST + TROUGH)

$$\beta = \frac{\pi L \cos\alpha}{d} \qquad \gamma = \frac{\pi B \sin\alpha}{d}$$

$\beta = \pi$ $\qquad \gamma = 0$

$L = 446'$
$B = 172'$
$h = 3'$

Characteristic bending moment

$$M_o = \frac{\varpi B L^2 h}{2\pi^2} = \frac{V_o L}{\pi}$$

Characteristic shear force

$$V_o = \frac{\varpi B L h}{2\pi} = \frac{\pi M_o}{L}$$

Fig. 8 - WAVE ACTION ON RECTANGULAR SHIP - NOTATIONS AND DIMENSIONS

COMPUTATION SHEET

PROJECT	PAGE 8 OF 18	COMPUTED BY MR	DATE 10/96
SUBJECT		CHECKED BY	DATE

$h = 3'$ $(H_w = 6')$

H_w = Wave height = 6'

$L = 440$

$B = 172$

Hogging & Sagging Coeff. taken from pg 207 of "Principles of Naval Architecture", Rossell & Chapman.

STA	DIST FROM END	(CREST @ ℄) HOGGING COEFF	HOGGING DIST.	K/L² HOGGING PRESSURE	(CREST @ ENDS) SAGGING COEFF.	SAG DIST	SAG PRESSURE
0	0	1.00	6'	64.5	0.0	0	0
1	22	0.982	5.9	63.4	0.034	0.2	2.2
2	44	0.927	5.56	59.8	0.128	0.77	8.3
3	66	0.839	5.0	53.8	0.266	1.6	17.2
4	88	0.720	4.3	46.2	0.421	2.5	26.9
5	110	0.577	3.5	37.6	0.577	3.5	37.6
6	132	0.421	2.5	26.9	0.720	4.3	46.2
7	154	0.266	1.6	17.2	0.839	5.0	53.8
8	176	0.128	0.77	8.3	0.927	5.56	59.8
9	198	0.034	0.2	2.2	0.982	5.9	63.4
℄ 10	220	0.0	0	0	1.00	6'	64.5
SYMMETRIC @		℄					

PRINCIPLES OF NAVAL ARCHITECTURE

VOLUME ONE

Written by a Group of Authorities

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85-d-754

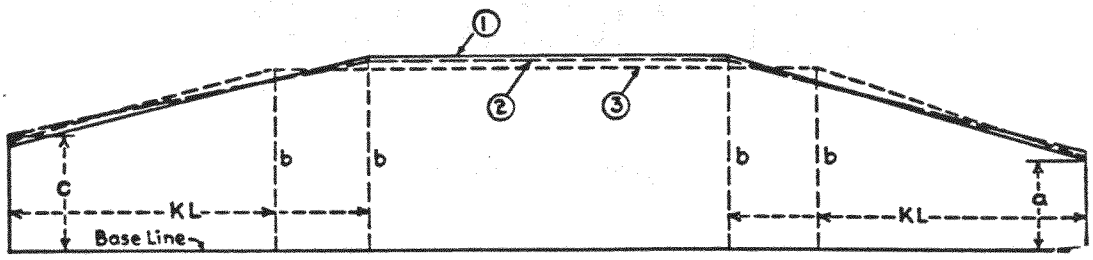
Property of
U.S. ENGINEER OFFICE
New Orleans District
NEW ORLEANS, LA.



Published by

THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS
29 WEST 39th STREET, NEW YORK, N. Y.

1942



	1	2	3
K	.333	.333	.250
a	.567	.596	.572
b	1.195	1.174	1.125
c	.653	.706	.676
C.G. Aft	.0052L	.0017L	.0054L

Ordinate = Coeff. × $\frac{\text{Hull W}}{\text{Length}}$
1 Fine Ships - Merchant Type
2 Full Ships - Merchant Type
3 Great Lakes Bulk Freighters

FIG. 5.—APPROXIMATION TO HULL WEIGHT CURVE WITH PARALLEL MIDDLE BODY

(*b*) *The Buoyancy Curve.* When the vessel is assumed to be supported on a wave, the buoyancy curve is predicated on the following assumptions:

(1) That the wave is trochoidal in form.

(2) That the wave length between crests is equal to the length of the vessel = L.

(3) That the wave height is equal to $L/20$.

(4) That the direction of wave travel is opposite to that of the vessel; i.e., that the vessel is head-on into the waves.

(5) It is customary to assume at least two conditions of wave support; one with the wave crest amidships, the other with the trough amidships. These two conditions of support are termed, respectively:

(*a*) *Hogging.* A condition of the vessel wherein the buoyancy is more than the weight over approximately the midship half-length with less buoyancy than weight at both ends, so that the tendency of the vessel is to arch up or hog amidships. Such a condition results in a bending moment, denoted hogging moment, which stresses the top members of the vessel in tension, the bottom members in compression. The stresses are termed hogging stresses.

(*b*) *Sagging.* The condition opposite to hogging, wherein the excess of weight over buoyancy amidships with a corresponding excess of buoyancy over weight at the ends causes a tendency to arch down or sag at about mid-length. Thus the sagging moment will result in the sagging stresses of compression in the top members and tension in the bottom members.

The buoyancy curve of a vessel among waves is made by laying out the wave profile on that of the ship so that correct heights for Bonjean's curve readings may be obtained. The wave profile may be constructed geometrically by the methods given in Chapter I, Volume II, or by use of the coefficients in Table 1, in which the length is divided into 20 equal spaces, and the distance, measured down from the wave crest, is the factor f_w multiplied by the wave height a_w. Since the wave is symmetrical about the middle of its length, the ordinates need be given for one-half length only. For the standard calculations a_w will be $0.05L$, so that for any station the distance of the wave contour below the line of crests will be equal to $0.05\, f_w L$.

TABLE 1.—f_w COEFFICIENTS FOR CONSTRUCTION OF TROCHOIDAL WAVE PROFILE

	Station No.	f_w Hogging	f_w Sagging
End perpendicular	0	1.000	0.000
	1	0.982	0.034
	2	0.927	0.128
	3	0.839	0.266
	4	0.720	0.421
	5	0.577	0.577
	6	0.421	0.720
	7	0.266	0.839
	8	0.128	0.927
	9	0.034	0.982
½*LBP*	10	0.000	1.000

Ordinarily sufficient accuracy may be obtained by the use of 10 instead of 20 displacement stations, half-stations being introduced near the ends of the ship. In that case the correct station number may be obtained by dividing the first column of figures in the table by two.

The wave contour must be moved vertically to obtain the correct displacement, and it must be trimmed longitudinally to bring the center of buoyancy in vertical line with the center of gravity.

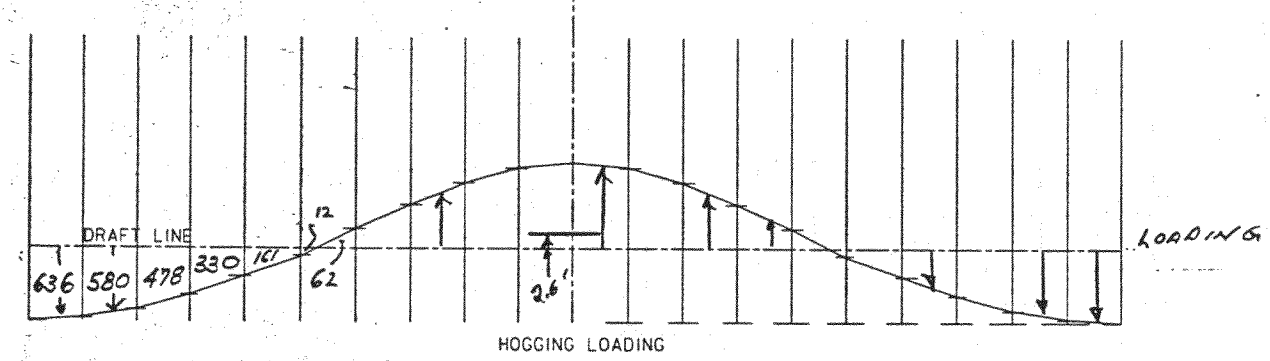
Since the area under a trochoid is less than the length times half the height, the line of centers

Ship Lock Chamber

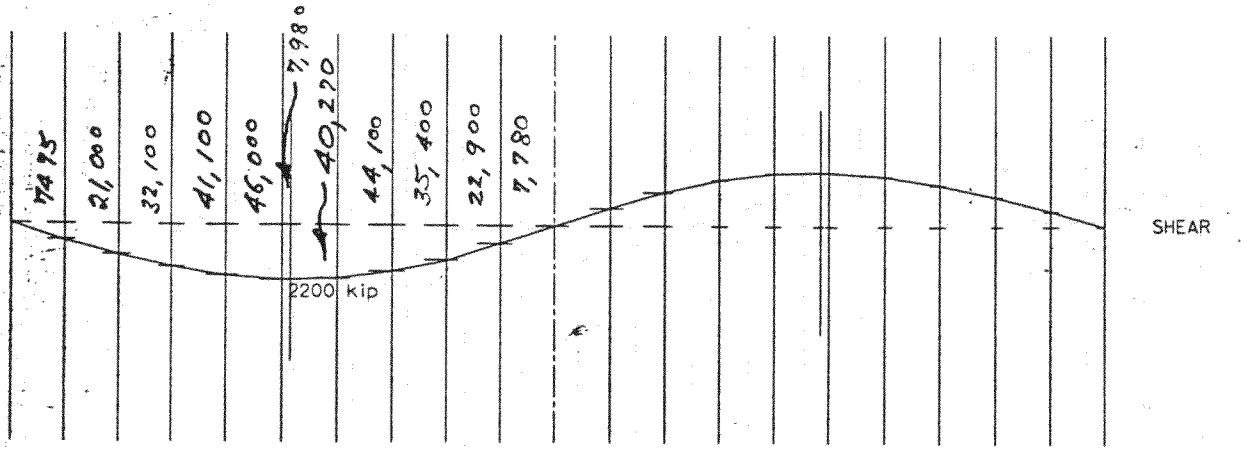
TRANSPORTATION - HOGGING CASE

$H_{wave} = 6'$

$L_{wave} = L_{module}$

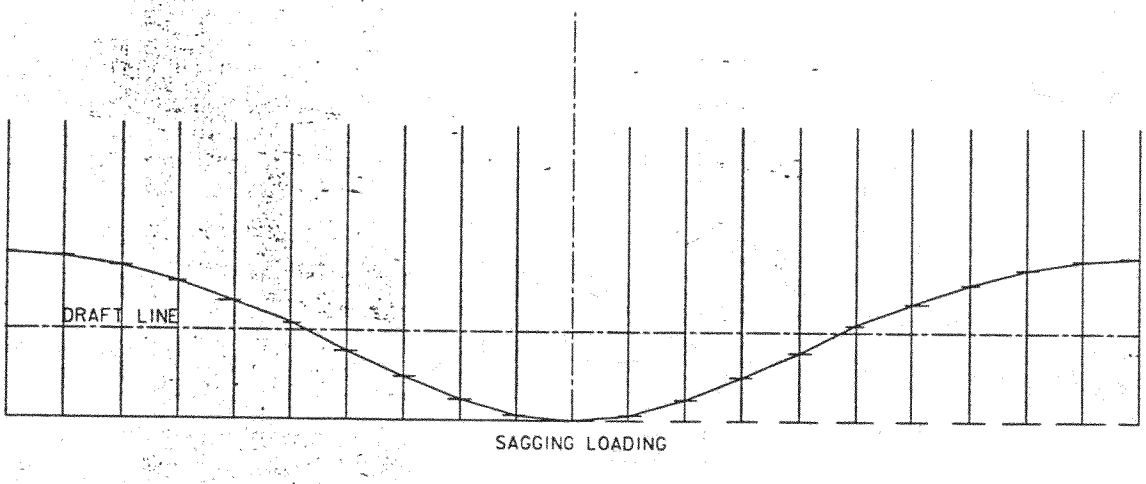


$V_{max} = 2200\ K$

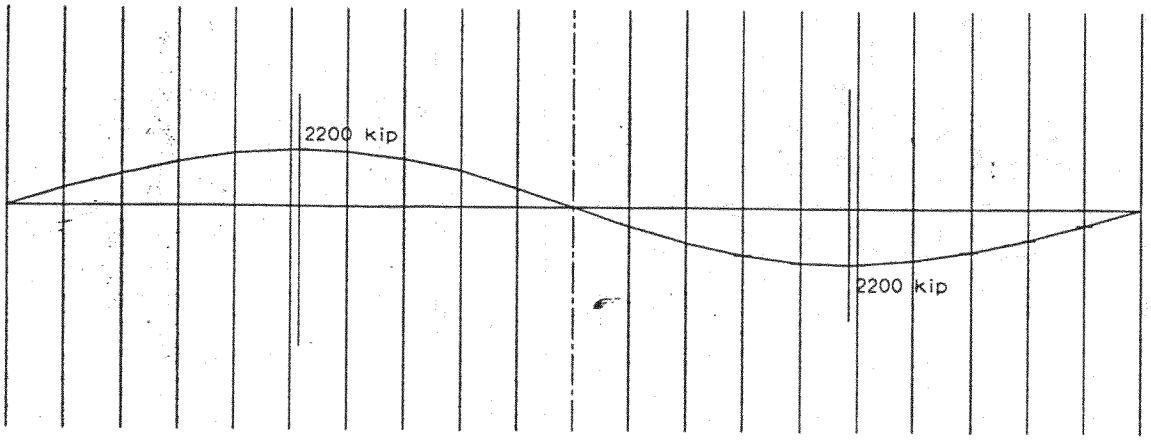


$M_{\mathbb{C}} = -306,100'\text{-}K$ (Tension on Top Flange)

SHIP LOCK CHAMBER
TRANSPORTATION - SAGGING CASE
$H_{WAVE} = 6'$



SAGGING LOADING



SHEAR

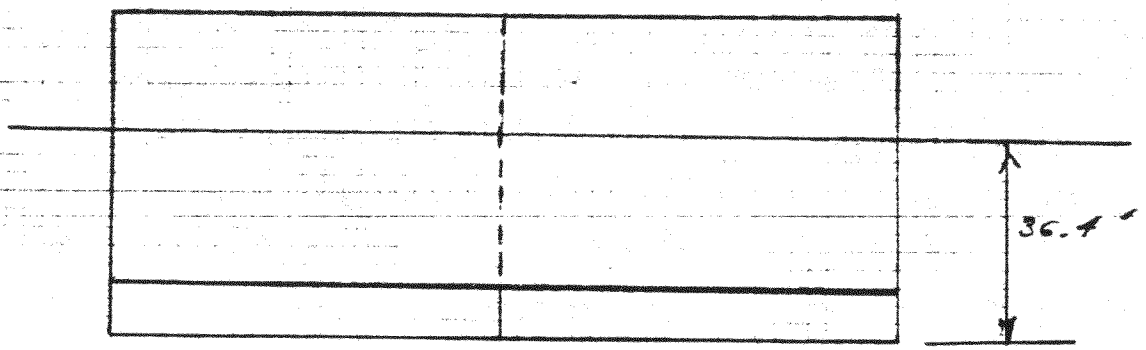
$M_{\ell} = +306,100'\text{-}K$ (comp. on Top Flange)

SHIP LOCK - CHAMBER MODULE
SAGGING CONDITION Hw = 6'

COMPUTATION SHEET

PROJECT	PAGE 11 OF 18	COMPUTED BY	DATE 10/96
SUBJECT CHAMBER - CONSTRUCTION		CHECKED BY	DATE

FULL WALL - STILL WATER



WT REQ'D TO SETTLE MODULE

Buoyancy/mod = (53 x 0.0625) x 172 x 446 = 254,100 K

STRUCT. WT = (36.4 x 0.0625) x 172 x 446 = 174,500 K

MIN. BALLAST = 79,600 K

Fill 95% w/ concrete so as float is possible

WT. CONC mod = (254,100 x 0.95) - 175,900 = 65,500 K

BASE CONC = (1030 - 305) # x 400 x 0.15 = 43,440 CONC

VOIDS w/ TENSION PILES

CULVERT VOIDS CONC 4 x 7.1 x 400 x 0.15 = 17,040 CONC

LOWER WALL VOID 253 x 2 x 100 x 0.0625 = 12,630 H_2O

MID-AT WALL VOID 198 x 2 x 400 x 0.0625 = 9,990

83,030 K > 79,600

NOTE: BALLAST WT NEEDED FOR SETTING PILE DESIGN WILL BE ADDED ONCE MODULE IS ON SETTING PADS. SEE SETTING PILE DESIGN

COMPUTATION SHEET

PROJECT	PAGE 12 OF 13	COMPUTED BY MG	DATE 10/86
SUBJECT		CHECKED BY	DATE

CONSTRUCTION SEQUENCE

1) UPPER WALLS COMPLETED - UNIFORM LOAD IN LONG. DIR.

2) PLACE CONCRETE BALLAST IN IT'S ENTIRETY. FINISH BALLAST W/ WATER PLACE IN UPPER WALL AFTERWARDS

3) CONSIDER 3 BALLAST PLACEMENT STAGES. MINIMUM OF 4 PANEL ROWS PER PLACEMENT

STAGE 1 - FILL 4 CENTER PANELS

STAGE 2 - 4 CENTER PANELS FILLED, THEN FILL 4 @ QUARTER POINTS (CONSIDER 1 IST TO HEAVIER END)

STAGE 3 - STAGE 2 PLUS 4 PANELS @ OPPOSITE QUARTER POINT (LEVEL)

UNIFORM LOAD IS EXCEEDED BY CONC BALLAST PLACED IN BASE & WALL

$$W_u/LF = \frac{43,440 + 170\,90}{446} = 135.6\ K/LF$$

$$\text{Buoyant Draft} = \frac{(135.6 \times 14 \times 4) + 174,500}{172 \times 446 \times 0.0625} \quad \text{(\# PANELS)}$$

• STAGE 1

$$= 38.0'$$

Buoyant Force = $38.0 \times 0.0625 = 2.38\ KSF$
$= 106.5\ K/LF$

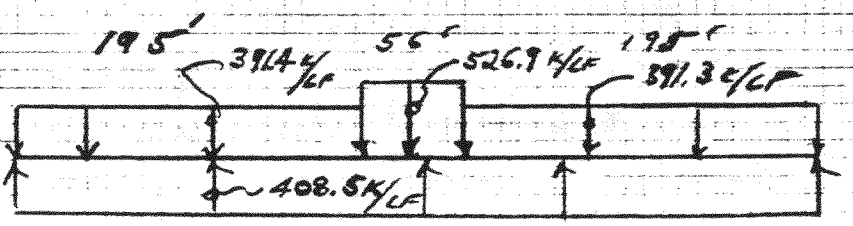
UNBALLASTED STRUCT. UNIFORM LOAD = $36.4 \times 0.0625 = 2.28\ KSF$
$= 391.4\ K/LF$

BALLASTED SECTION UNIFORM LOAD = $2.28 + \frac{135.6}{192} = 3.06\ KSF$
$= 526.9\ K/LF$

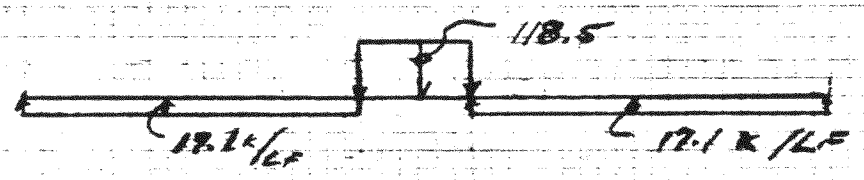
COMPUTATION SHEET

PROJECT	PAGE 13 OF 18	COMPUTED BY MAG	DATE 10/96
SUBJECT		CHECKED BY	DATE

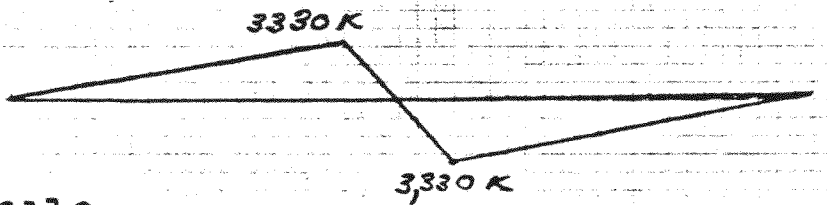
STAGE 1



NET LOADING



V



$V_{max} = 3330\ K$

$M_{max} = (3330 \times 195/2) + (3330 \times 28/2) = 371{,}300\ ^{!}K$

STAGE 2

$$\text{Buoyant Draft (8 panels ballasted)} = \frac{174{,}500 + (135.6 \times 14 \times 8)}{172 \times 446 \times 0.0625} = 39.56'$$

Buoyant Force $= (39.56 \times 0.0625) = 2.47\ KSF$
$= 425.3\ K/LF$

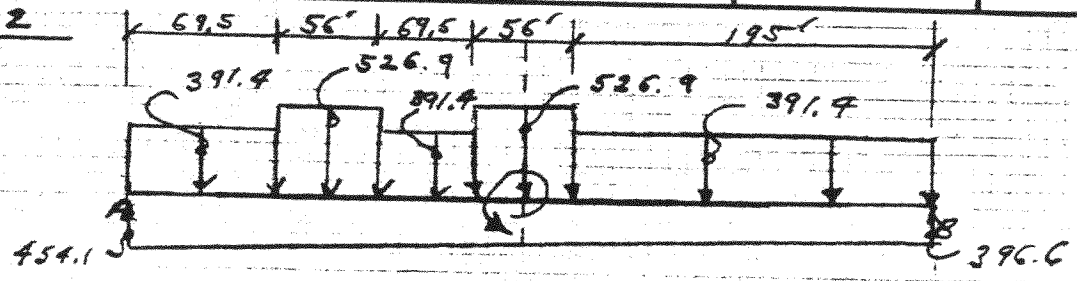
UNBALLASTED STRUCT UNIFORM LOAD $= 2.28\ KSF$
$= 391.4\ K/LF$

BALLASTED PANEL (UNIFORM LOAD) $= 3.06\ KSF$
$= 526.9\ K/LF$

COMPUTATION SHEET

PROJECT	PAGE 14 OF 18	COMPUTED BY MG	DATE 10/96
SUBJECT		CHECKED BY	DATE

STAGE 2



DETERMINED UNBALANCED BOUYANT FORCE

$M_{@R} = (391.4 \times 69.5 \times 188.25) + (56 \times 526.9 \times 125.5) + (391.4 \times 69.5 \times 62.75)$
$+ CCW \quad - (391.4 \times 195 \times 125.5)$

$= 952,294$ ft-K

$P = 189,687$ K

$A = 172 \times 446 = 76,912$ in²

$I = \frac{172 \times 446^3}{12} = 1271.6 \times 10^6$

$\sigma_A = P/A + Mc/I = \frac{189,687}{76,912} + \frac{952,294 \times 223}{1271.6 \times 10^6}$

$= 2.473 + 0.167$

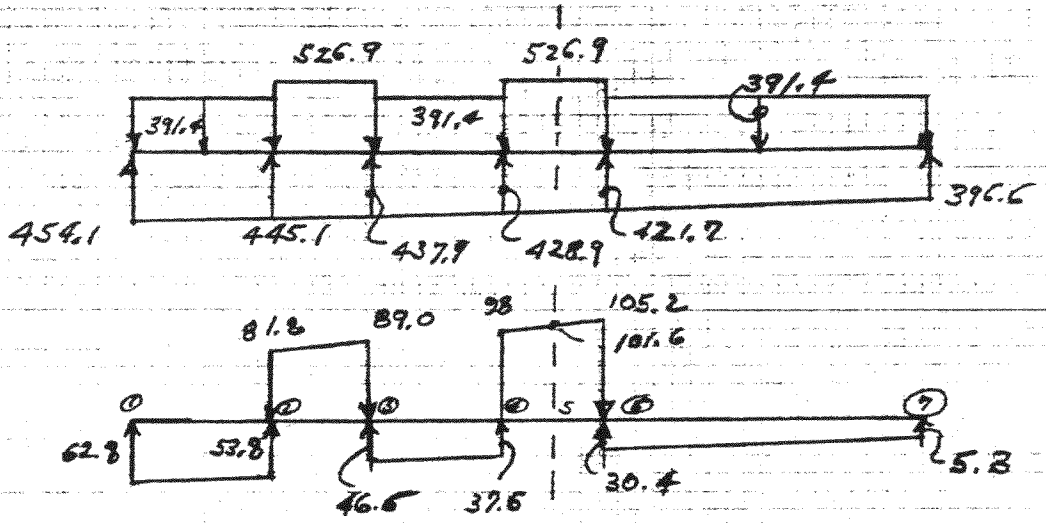
$= 2.64$ KSF $= 454.1$

$\sigma_R = 2.473 - 0.167$

$= 2.306$ KSF

$= 396.6$ K/LF

PROJECT	PAGE 15 OF 18	COMPUTED BY MHG	DATE 10/96
SUBJECT		CHECKED BY	DATE

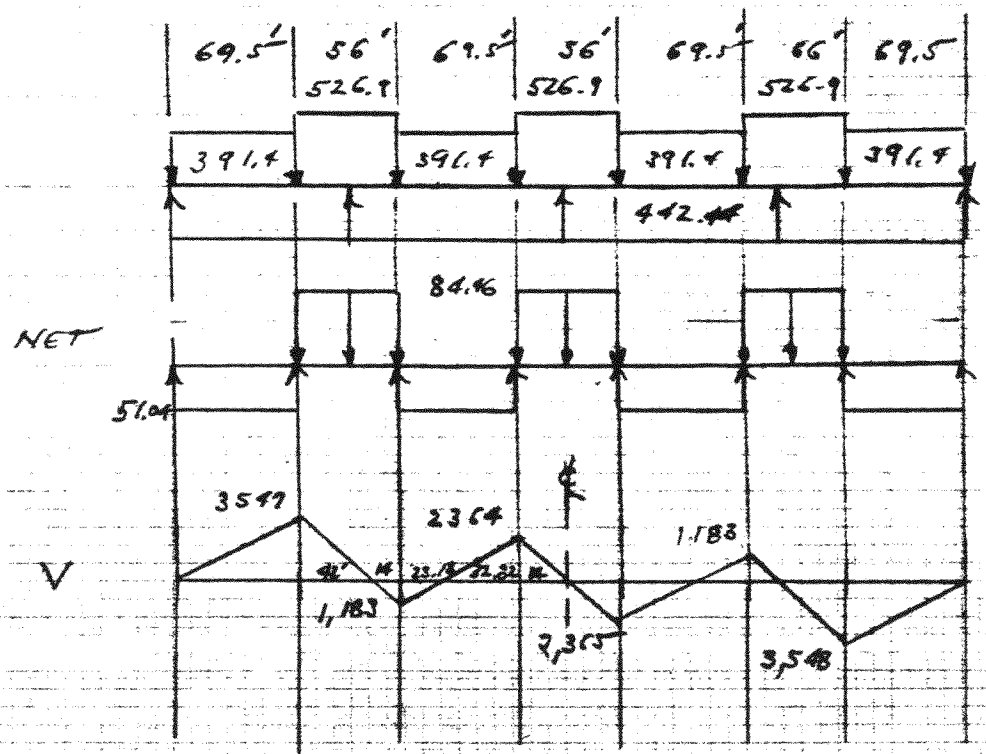


V_{max} = 4052 K

M_{max} = 318,000 'K @ Center

C FRAME RESULTS (PINNED JOINT ? MINIMAL EFFECT)

STAGE 3



V_{max} = 3550 K

M_{max} @ ℄ = $(3547 \times 69.5/2) + (3547 \times 43/2) - (1183 \times 37.0/2) + (2364 \times \frac{46.8}{2})$

= +231,100 'K

```
010 CHAMBER LONG. WVE LOADING\\ STILL WATER CONSTRUCT. STAGE 2*
015 FILE C:\PRECAST.LOC\WAVCHST2.CFR
020 KSI FT FT IN KIP
030 7 6 1 3000 0.15
(   1 0 0 2 69.5 0 3 125.5 0 4 195 0 5 223 0 6 251 0 7 446 0
050 FIX X 7
060 FIX Y 7
070 GM 1 1 2 6 1 1
080 986000 2280 2280 1 TO 6
090 LOAD CASE 1 0 6 0 0
100 0 -62.8 69.5 -53.8 0 1
110 0 81.8 56 89 0 2
120 0 -46.6 69.5 -37.6 0 3
130 0 98 28 101.6 0 4
140 0 101.6 28 105.2 0 5
150 0 -30.6 195 -5.5 0 6
```

^P
COMMAND MUST BE ONE OF THE FOLLOWING
 D N F A L N E S
E

LOAD CASE 1

JOINT DISPLACEMENTS

JOINT	DX IN	DY IN	DR RAD
1	.0000E+00	-.2102E+11	.3928E+07
2	.0000E+00	-.1775E+11	.3928E+07
3	.0000E+00	-.1511E+11	.3928E+07
4	.0000E+00	-.1183E+11	.3928E+07
5	.0000E+00	-.1051E+11	.3928E+07
6	.0000E+00	-.9191E+10	.3928E+07
7	.0000E+00	.0000E+00	.3928E+07

STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
7	.0000E+00	.2627E+03	-.6338E+04

TOTAL	.0000E+00	.2627E+02

MEMBER END FORCES

MEMBER	LOAD CASE	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	1	.0000E+00	-.3256E+00	.1935E+01	.1444E+06	69.50
		2	.0000E+00	-.4052E+04	.1444E+06	.1935E+01	.00
2	1	2	.0000E+00	.4050E+04	.1444E+06	.2422E+06	48.16
		3	.0000E+00	.7325E+03	.2391E+06	.1444E+06	.00
3	1	3	.0000E+00	-.7307E+03	.2392E+06	.2937E+06	69.50
		4	.0000E+00	-.2195E+04	.2937E+06	.2334E+06	16.68
4	1	4	.0000E+00	.2191E+04	.2937E+06	.3180E+06	21.84
		5	.0000E+00	.6032E+03	.3163E+06	.2937E+06	.00
5	1	5	.0000E+00	-.6127E+03	.3162E+06	.3162E+06	.00
		6	.0000E+00	.3508E+04	.2588E+06	.2588E+06	28.00
6	1	6	.0000E+00	-.3507E+04	.2587E+06	.2587E+06	.00
		7	.0000E+00	.2627E+02	-.6232E+04	-.6232E+04	195.00

CHAMBER LONG. WVE LOADING
FILE C:



ENTER OUTPUT GRAPHICS COMMAND

|___| = 4052. KIP SHEAR 96/10/10 13.50.57

LOA CASE 1

$$\text{Buoyant DRAFT} = \frac{(391.4 \times 278) + (526.9 \times 168)}{172 \times 446 \times 0.0625} = 41.157'$$

$$\text{Buoyant FORCE} = 41.157 \times 0.0625 = 2.572 \text{ KSF}$$

$$= 442.44 \text{ K/LF}$$

UNBALLASTED Len = 391.4 K/LF

BALLASTED Len = 526.9 K/LF

GOVERNING LOAD

$V_{max} = 4050$ K STAGE 2

$M_{max} = 371{,}300$ 'K STAGE 1

STRESSES BASED ON CONCRETE SHELL

$$v = \frac{4050}{2282 \#} = 1.77 \text{ KSF}$$

$$= 12.3 \text{ psi} < 1.1\sqrt{5000}_{(5c'\,ave)} = 78 \text{ psi}$$

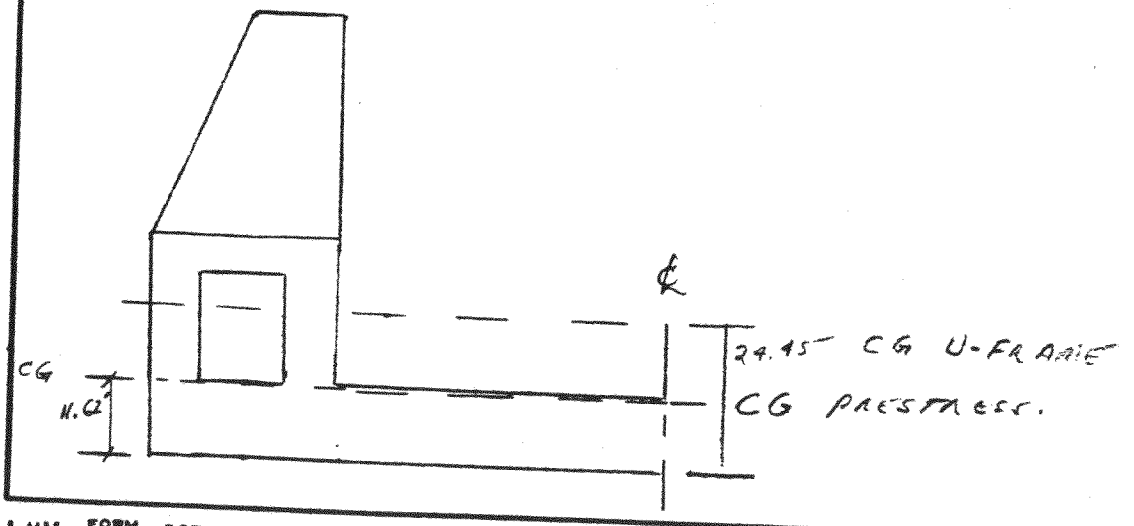
$$f_{comp} = f_{Top} = \frac{371{,}300 \times 49.75}{9.86 \times 10^5} = 18.81 \text{ KSF}$$

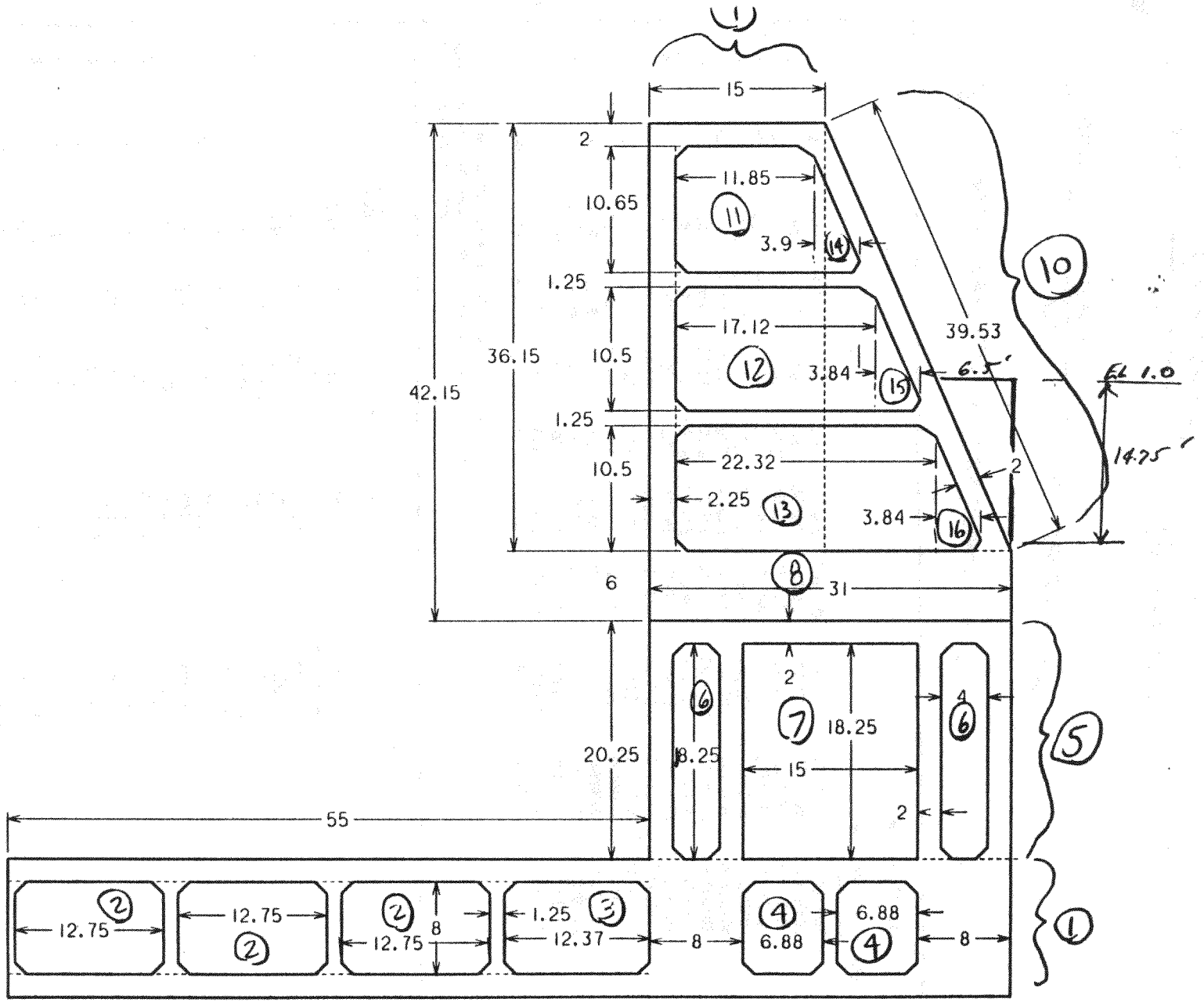
$$= 130 \text{ psi} < 0.4 f_c' = 1800 \text{ psi}$$

$$f_{Ten} = f_{BOT} = \frac{371{,}300 \times 24.15}{9.86 \times 10^5} = 9.21 \text{ KSF}$$

$$= 64 \text{ psi} < 6\sqrt{f_c'} = 460 \text{ psi}$$

EFFECT OF PRETENSIONED BASE





1
15
2
10.65
11.85
11
3.9
14
1.25
17.12
12
3.84
15
10.5
36.15
42.15
1.25
10.5
22.32
2.25
13
3.84
16
2
39.53
6.5'
EL 1.0
14.75'
10
6
8
31
20.25
18.25
6
2
7
18.25
15
2
4
6
5
55
2
12.75
2
12.75
2
12.75
8
1.25
3
12.37
8
4
6.88
6.88
4
8
1

IHNC Lock Replacement
Setting Conditions - determination of Neutral Axis & Moment of Inertia – CHAMBER

Determine Neutral Axis

Area No.	# of Areas	'b' (ft)	'h' (ft)	A (sf)	y (ft)	y*A (cf)
1	1	86	12	1032	6.000	6192.00
2	-3	12.75	8	-306	6.000	-1836.00
3	-1	12.37	8	-98.96	6.000	-593.76
4	-2	6.88	8	-110.08	6.000	-660.48
5	1	31	20.25	627.75	22.125	13888.97
6	-2	4	18.25	-146	21.125	-3084.25
7	-1	15	18.25	-273.75	21.125	-5782.97
8	1	31	6	186	35.250	6556.50
9	1	15	36.15	542.25	56.325	30542.23
10	1	16	36.15	289.2	50.300	14546.76
11	-1	11.85	10.65	-126.203	67.075	-8465.03
12	-1	17.12	10.5	-179.76	55.250	-9931.74
13	-1	22.32	10.5	-234.36	43.500	-10194.66
14	-1	3.9	10.65	-20.7675	65.300	-1356.12
15	-1	3.84	10.5	-20.16	53.500	-1078.56
16	-1	3.84	10.5	-20.16	41.750	-841.68
		Sum (A) =		1141	Sum (y*A) =	27901.21

Centroid = $\frac{27901.21}{1141}$ = 24.45 ft from bottom of slab

Determine Moment of Inertia
Ix=Sum(I+Ad^2) = Sum(bh^3/12+Ad^2) for a rectangular shape
= Sum(bh^3/36+Ad^2) for a triangular shape

Area No.	# of Areas	'b' (ft)	'B' (in)	'h' (ft)	'H' (in)	'd' (ft)	'D' (in)	'a' (sf)	'A' (sq. in)	I
1	1	86	1032	12	144	18.453	221.440	1032.00	148608.00	7.54E+09
2	-3	12.75	153	8	96	18.453	221.440	102.00	14688.00	-2.19E+09
3	-1	12.37	148.44	8	96	18.453	221.440	98.96	14250.24	-7.10E+08
4	-2	6.88	82.56	8	96	18.453	221.440	55.04	7925.76	-7.89E+08
5	1	31	372	20.25	243	2.328	27.940	627.75	90396.00	5.15E+08
6	-2	4	48	18.25	219	3.328	39.940	73.00	10512.00	-1.18E+08
7	-1	15	180	18.25	219	3.328	39.940	273.75	39420.00	-2.20E+08
8	1	31	372	6	72	10.797	129.560	186.00	26784.00	4.61E+08
9	1	15	180	36.15	433.8	31.872	382.460	542.25	78084.00	1.26E+10
10	1	16	192	36.15	433.8	25.847	310.160	289.20	41644.80	4.44E+09
11	-1	11.85	142.2	10.65	127.8	42.622	511.460	126.20	18173.16	-4.78E+09
12	-1	17.12	205.44	10.5	126	30.797	369.560	179.76	25885.44	-3.57E+09
13	-1	22.32	267.84	10.5	126	19.047	228.560	234.36	33747.84	-1.81E+09
14	-1	3.9	46.8	10.65	127.8	40.847	490.160	20.77	2990.52	-7.21E+08
15	-1	3.84	46.08	10.5	126	29.047	348.560	20.16	2903.04	-3.55E+08
16	-1	3.84	46.08	10.5	126	17.297	207.560	20.16	2903.04	-1.28E+08
									Ix =	1.02E+10 in^4
									=	4.93E+05 ft^4

I_x FULL SECTION = 9.86 E+05 Ft^4

$$S_{x_{BOT}} = \frac{I_x}{24.45} = 40,330\ Ft^3$$

$$S_{x_{TOP}} = \frac{I_x}{(74.4 - 24.45)} = 19,740\ Ft^3$$

COMPUTATION SHEET

PROJECT	PAGE 17 OF 18	COMPUTED BY	DATE 10/96
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$P_{pe} = (0.60\ f_{pu})\ A = 151.7\ K/BAR$ $\quad f_{pu} = 160\ KSI$

$A_{1\frac{1}{8}} = 1.58\ in^2$

$P_{pc} = 2 \times 474 \times 151.7 = 143,810\ K$

FULL U-FRAME PROPERTIES

$A = 2282\ Ft^2$
$= 328,610\ IN^2$

$I_x = 2.04 \times 10^{10}$

$S_{x_{Top}} = 34,110,700\ IN^3$

$S_{x_{BOT}} = 69,690,240\ IN^3$

EFFECTIVE STRESS

$e' = (24.45 - 11.12)12 = 154"$

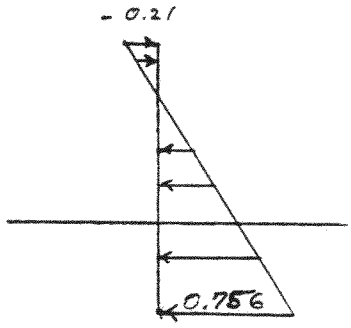
$$\sigma_{TOP} = \frac{P}{A} - \frac{Pe'}{S_{x\,TOP}}$$

$$= \frac{143,810}{328,610} - \frac{143,810 \times 154"}{34,110,700}$$

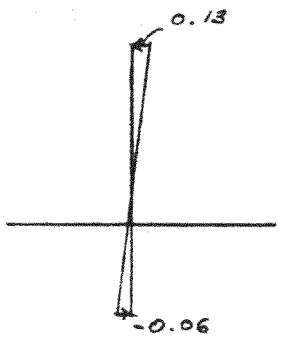
$$= 0.438 - 0.649 = -0.211\ KSI\ (Tension)$$

$$\sigma_{BOT} = 0.438 + \frac{143,810 \times 154}{69,690,240}$$

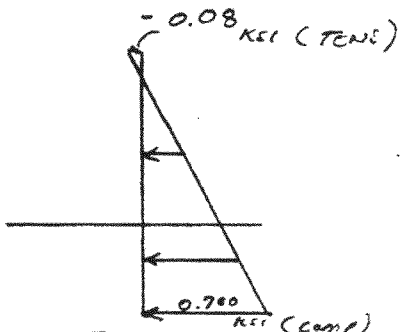
$$= 0.438 + 0.318 = 0.756\ KSI\ (Comp)$$



EFFECTIVE STRESS



STAGE 1 STRESS



FINAL STRESS @ S.L.

$Tension_{max} = 80\ psi < 2\sqrt{f_c'} = 126\ psi$

$Comp_{max} = 0.70\ KSI < 2.40_{KSI} = \sigma_{ALL}$

COMPUTATION SHEET

PROJECT	PAGE 18 OF 18	COMPUTED BY	DATE 10/96
SUBJECT		CHECKED BY	DATE

For the one or two day duration the low tensile stress is not a problem. The $2\sqrt{f_c'}$ allowable was recommended by Dr. Moustafa's being a tolerable amount. Where the U-frame will be floating for 6 months - 1 year, the stage 1 moment will only last 1-2 days.

TRANSERSE DIRECTION

B = 14 (I-BEAM WIDTH)

L = 172'

Hw = 6'

$$M_{o/2} = \frac{\gamma \cdot B \cdot L^2 \cdot h}{2\pi^2}$$

$$= \frac{0.0625 \times 14 \times 172^2 \times 3}{2 \cdot \pi^2}$$

$$= 3940 \text{ 'K}$$

$$V_o = \frac{\gamma \cdot B \cdot L \cdot h}{2\pi}$$

$$= \frac{0.0625 \times 14 \times 172 \times 3}{2\pi}$$

$$= 72 \text{ K}$$

WAVE INDUCED STRESS ARE NEGLIGIBLE

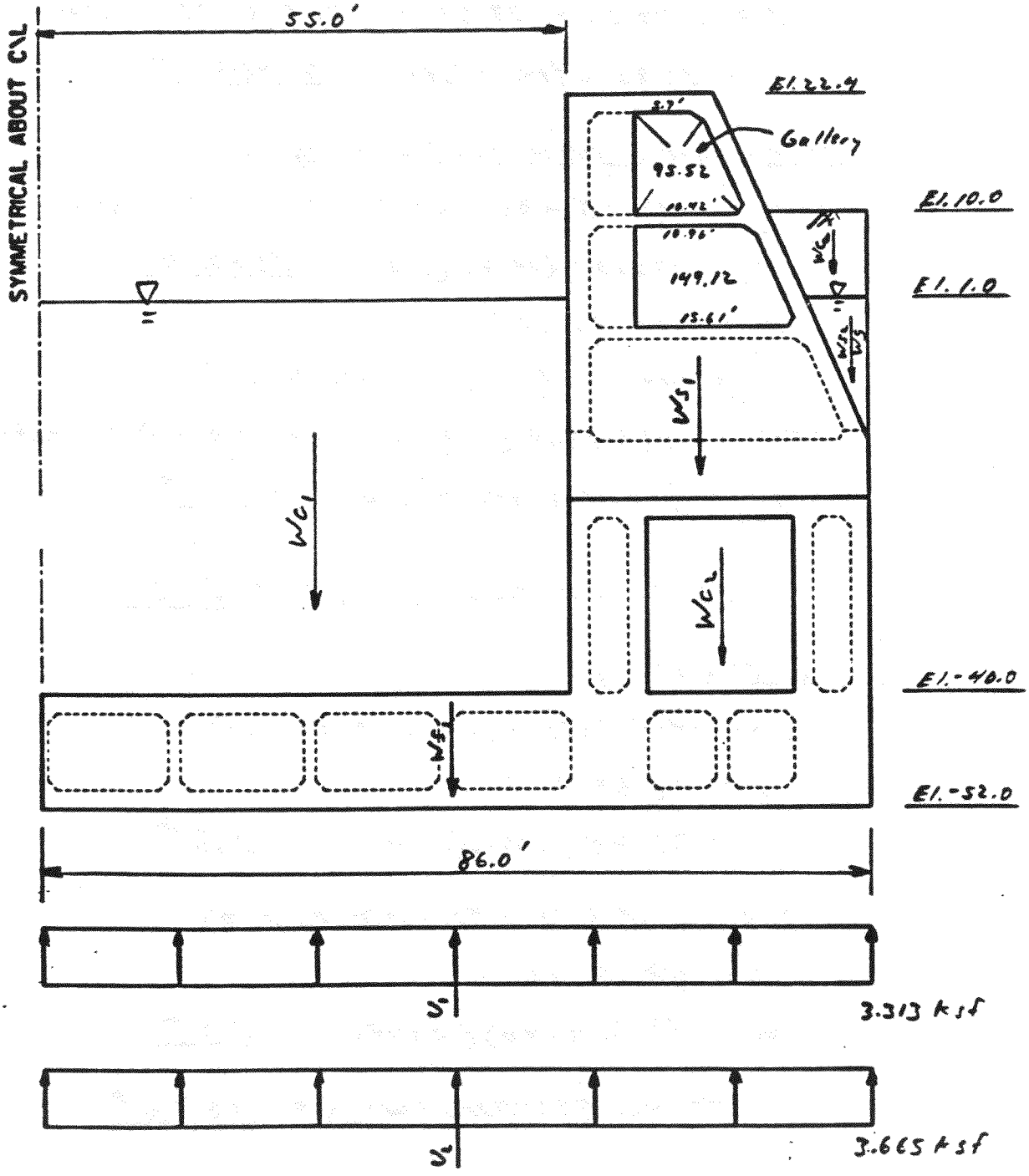
BASE DESIGN
LONGITUDINAL DIRECTION

LOAD CASE 1 (NORMAL OPERATION)

RS = 10.0, LS = 1.0

FLOTATION (UNBONDED)*

* Grout pad assumed not bonded to precast unit.



c:\dgn\slock1.dgn Jun. 6, 1996 17:21:47

PROJECT IHNC Lock	PAGE 2 OF 41	COMPUTED BY OCB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

FLOTATION - CASE 1 (NORMAL OPERATION)

Concrete (WS_1)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0\ ft.^2$ (CAAA)

$W = 1386.0(14.0)(.15) = \underline{2,910.6^k}$

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81\ ft^2$

$W_v = 772.81(14.0)(.15) = \underline{1622.9^k}$

$A_o = 149.12\ ft.^2$

$V_o = 149.12\ (1.25) = 186.4\ ft.^3$

$V_L = .5(1.0)(1.0)(2)(6.2 + 10.92 + 11.46 + 16.11) = 44.69\ ft.^3$

$W_{oc} = (186.4 + 44.69).15 = \underline{34.7^k}$

TOTAL CONCRETE (WS_1) = $\underline{4568.2^k}$

Backfill (WS_2)

Saturated Soil (El. 10.0 to 1.0)

$A = 76.68\ ft.^2$

$W = 76.68(14.0)(.120) = \underline{128.8^k}$

Submerged Soil (El. -13.75 to 1.0)

$A = 48.15\ ft.^2$

$W = 48.15(14.0)(.0575) = \underline{38.8^k}$

TOTAL BACKFILL (WS_2) = $\underline{167.6^k}$

PROJECT JHNC Lock	PAGE 3 OF	COMPUTED BY DLB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Water (Wc)

Operator Controled

$A = 41.0(55.0) + 18.25(15.0) = 2,528.75$ ft.²

$W = 2528.75(14.0)(.0625) = \underline{2,212.7}$ K

Water (Wg)

Gravity Controled

$A = 48.15$ ft.²

$W = 48.15(14.0)(.0625) = \underline{42.1}$ K

Uplift-1 (U_1)

$U_1 = 3.313(86.0)(14.0) = \underline{3988.9}$ K

Uplift-2 (U_2)

$U_2 = .5(3.594 + 3.736)(86.0)(14.0) = \underline{4,412.7}$

FACTORS OF SAFETY

CASE I -1

$$FS = \frac{4568.2 + 167.6 + 2212.7}{3988.9 - 42.1}$$

$FS = \underline{1.76}$

CASE I -2

$$FS = \frac{4568.2 + 167.6 + 2212.7}{4412.7 - 42.1}$$

$FS = \underline{1.59}$ *

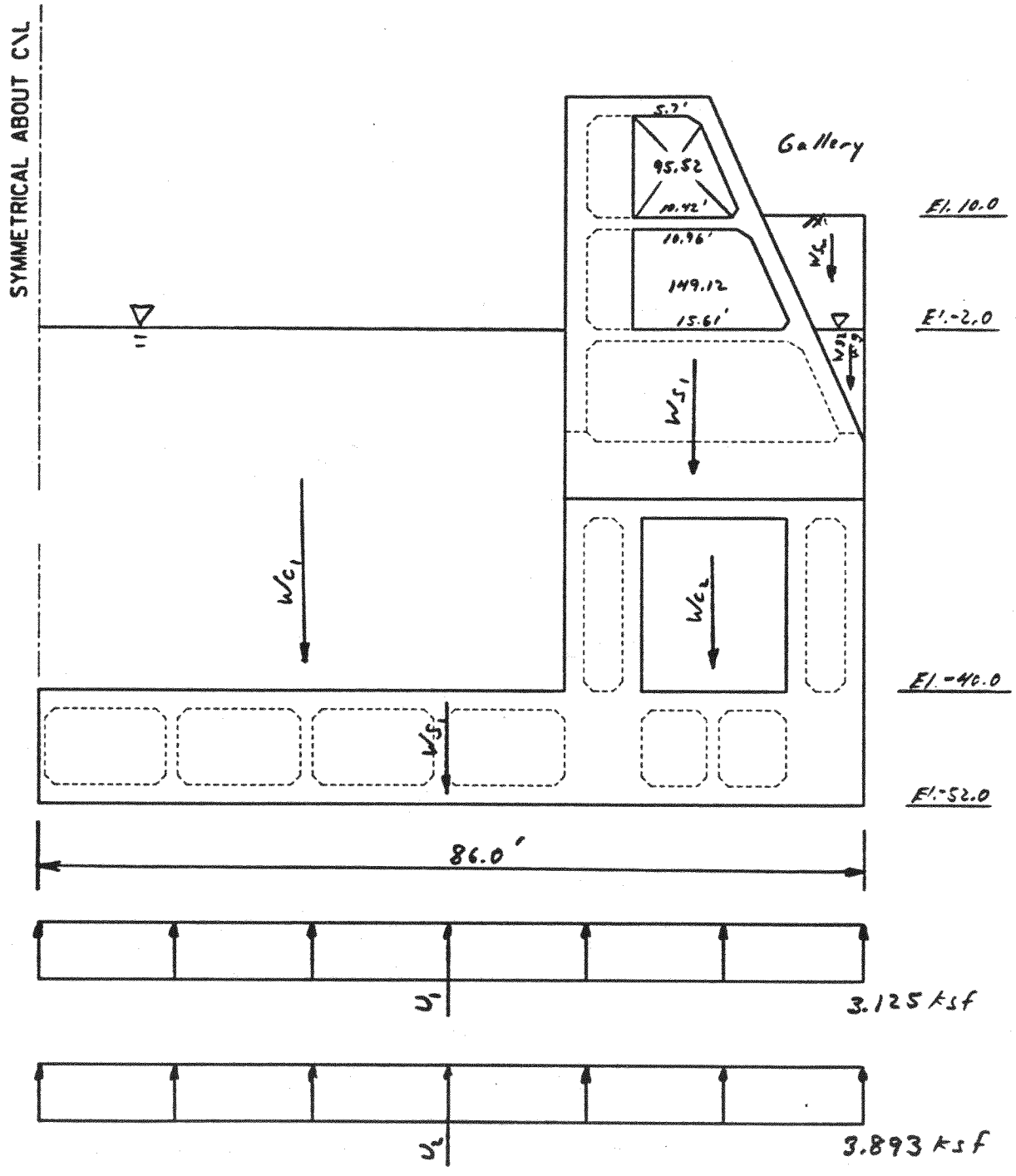
* Tension piles not required.
FS > 1.5

LOAD CASE 2A (MAXIMUM OPERATION)

RS = 17.6, LS = -2.0

FLOTATION (UNBONDED)*

* Grout pad assumed not bonded to precast unit.



COMPUTATION SHEET

PROJECT IHNC Lock	PAGE 5 OF	COMPUTED BY OCB	DATE 6/9[illegible]
SUBJECT Chamber Monolith		CHECKED BY	DATE

FLOTATION - CASE 2A (MAXIMUM OPERATION)

Concrete (WS_1)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0 \text{ ft.}^2$ (CAAO)

$W = 1386.0(14.0)(.15) = \underline{2,910.6^k}$

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81 \text{ ft}^2$

$W_v = 772.81(14.0)(.15) = \underline{1622.9^k}$

$A_o = 149.12 \text{ ft.}^2$

$V_o = 149.12(1.25) = 186.4 \text{ ft.}^3$

$V_c = .5(1.0)(1.0)(2)(6.2 + 10.92 + 11.46 + 16.11) = 44.69 \text{ ft}^3$

$W_{cc} = (186.4 + 44.69).15 = \underline{34.7^k}$

TOTAL CONCRETE (WS_1) = $\underline{\underline{4568.2^k}}$

Backfill (WS_2)

Saturated Soil (El. 10.0 to -2.0)

$A = 94.28 \text{ ft.}^2$

$W = 94.28(14.0)(.120) = \underline{158.4^k}$

Submerged Soil (El. -13.75 to -2.0)

$A = 30.55 \text{ ft.}^2$

$W = 30.55(14.0)(.0575) = \underline{24.6^k}$

TOTAL BACKFILL (WS_2) = $\underline{\underline{183.0^k}}$

PROJECT IHNC Lock	PAGE 6 OF	COMPUTED BY OCB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Water (W_c)

Operator Controled

$A = 38.0\,(55.0) + 16.25\,(15.0) = 2,363.75\ ft.^2$

$W = 2363.75\,(14.0)(.0625) = \underline{2,068.3^k}$

Water (W_g)

Gravity Controled

$A = 30.55\ ft.^2$

$W = 30.55\,(14.0)(.0625) = \underline{26.7^k}$

Uplift-1 (U_1)

$U_1 = 3.125\,(86.0)(14.0) = \underline{3,762.5^k}$

Uplift-2 (U_2)

$U_2 = .5\,(4.048 + 3.738)\,(86.0)(14.0) = \underline{4,687.2^k}$

FACTORS OF SAFETY

CASE 2A-1

$$FS = \frac{4568.2 + 183.0 + 2068.3}{3762.5 - 26.7}$$

$FS = \underline{1.83}$

CASE 2A-2

$$FS = \frac{4568.2 + 183.0 + 2068.3}{4687.2 - 26.7}$$

$FS = \underline{1.46}$ *

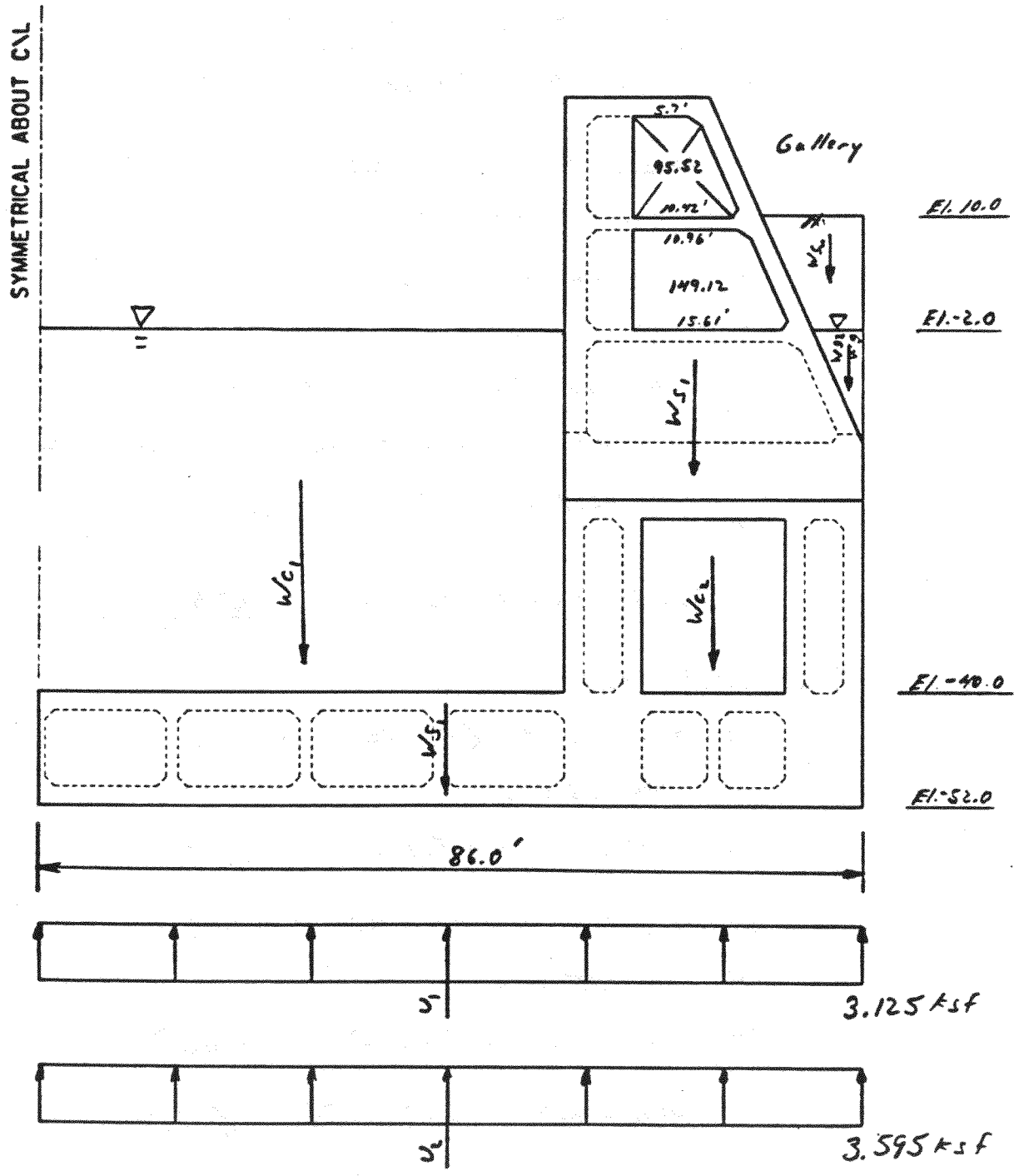
* Tension piles not required.
$FS \approx 1.5$

LOAD CASE 2B (MAXIMUM OPERATION)

RS = 10.0, LS = -2.0

FLOTATION (UNBONDED)*

* Grout pad assumed not bonded to precast unit.



PROJECT IHNC Lock	PAGE 8 OF	COMPUTED BY OCB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

FLOTATION - CASE 2B (MAXIMUM OPERATION)

Concrete (WS$_1$)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0$ ft.^{2} (CAD)

$W = 1386.0(14.0)(.15) = \underline{2,910.6}$ ↑

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81$ ft.^{2}

$W_v = 772.81(14.0)(.15) = \underline{1622.9}$ ↑

$A_o = 149.12$ ft.^{2}

$V_o = 149.12(1.25) = 186.4$ ft.^{3}

$V_L = .5(1.0)(1.0)(2)(6.2 + 10.92 + 11.46 + 16.11) = 44.69$ ft.^{3}

$W_{oc} = (186.4 + 44.69).15 = \underline{34.7}$ ↑

TOTAL CONCRETE (WS$_1$) = $\underline{4568.2}$ ↑

Backfill (WS$_2$)

Saturated Soil (El. 10.0 to -2.0)

$A = 94.28$ ft.^{2}

$W = 94.28(14.0)(.120) = \underline{158.4}$ ↑

Submerged Soil (El. -13.75 to -2.0)

$A = 30.55$ ft.^{2}

$W = 30.55(14.0)(.0575) = \underline{24.6}$ ↑

TOTAL BACKFILL (WS$_2$) = $\underline{183.0}$ ↑

COMPUTATION SHEET

PROJECT JTHNC Lock	PAGE 9 OF	COMPUTED BY DCB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Water (W_c)

Operator Controlled

$A = 38.0\,(55.0) + 18.25\,(15.0) = 2,363.75\ ft.^2$

$W = 2363.75\,(14.0)\,(.0625) = \underline{2,068.3^K}$

Water (W_g)

Gravity Controlled

$A = 30.55\ ft.^2$

$W = 30.55\,(14.0)\,(.0625) = \underline{26.7^K}$

Uplift-1 (U_1)

$U_1 = 3.125\,(86.0)\,(14.0) = \underline{3,762.5^K}$

Uplift-2 (U_2)

$U_2 = .5\,(3.690 + 3.500)\,(86.0)\,(14.0) = \underline{4,328.4^K}$

FACTORS OF SAFETY

CASE 2B-1

$$FS = \frac{4568.2 + 183.0 + 2068.3}{3762.5 - 26.7}$$

$FS = \underline{1.83}$

CASE 2B-2

$$FS = \frac{4568.2 + 183.0 + 2068.3}{4328.4 - 26.7}$$

$FS = \underline{1.59}$ *

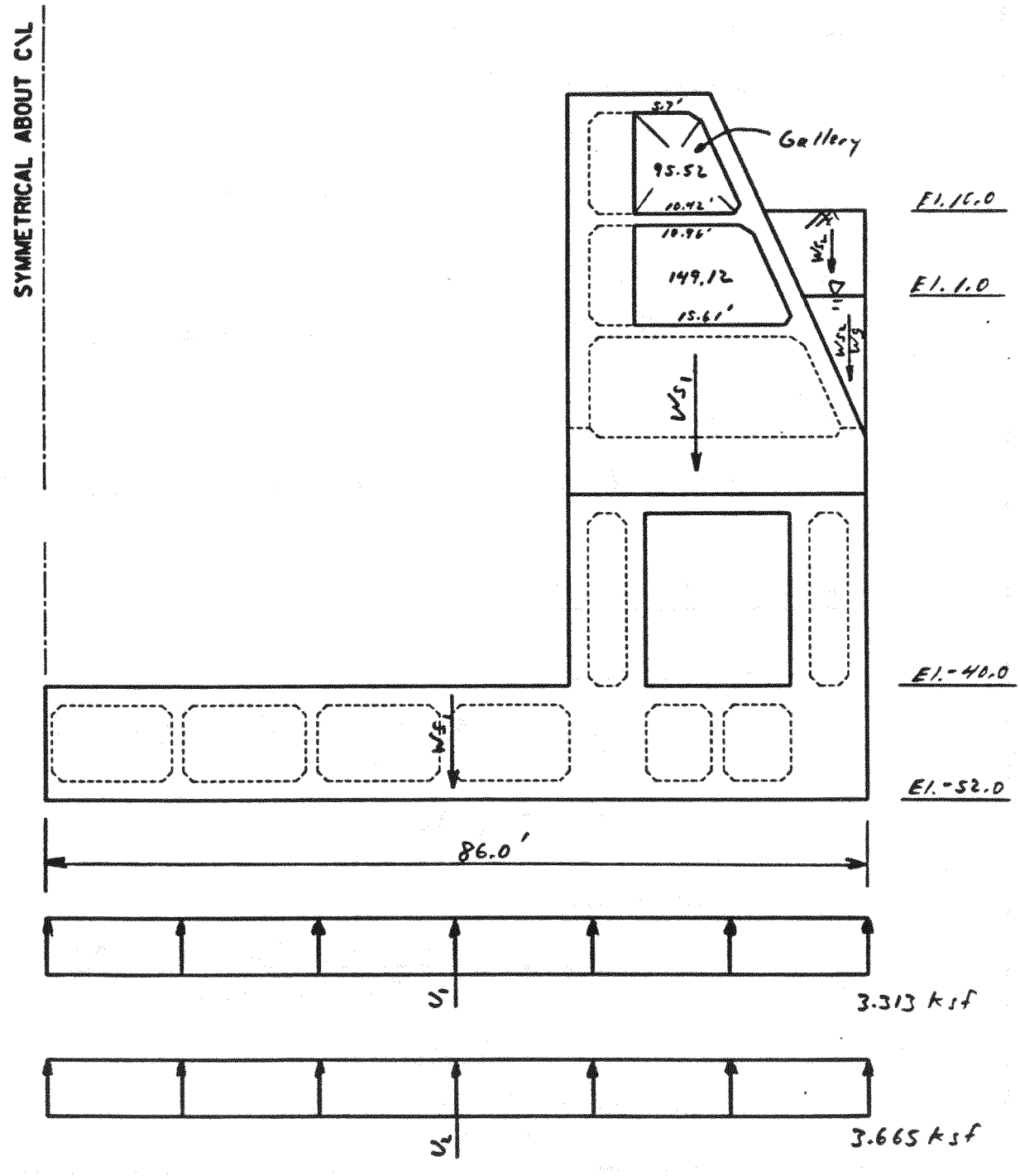
* Tension piles not required.
$FS > 1.5$

LOAD CASE 3 (MAINTENANCE DEWATERING)

RS = 10.0, LS = 1.0

FLOTATION (UNBONDED) *

* Grout pad assumed not bonded to precast unit.



c:\dgn\slock1.dgn Jun. 6, 1996 17:21:47

PROJECT IHNC Lock	PAGE 11 OF	COMPUTED BY DCB	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

FLOTATION - CASE 3 (MAINTENANCE DEWATERING)

Concrete (WS_1)

Lower Precast Unit (Filled)

$A = 1659.75 - 273.75 = 1386.0$ ft.^{2} (Cells)

$W = 1386.0(14.0)(.15) = \underline{2,910.6}$ K

Upper Cast in Place Slab and Walls

$A_v = 1017.45 - 95.52 - 149.12 = 772.81$

$W_v = 772.81(14.0)(.15) = \underline{1622.9}$ K

$A_o = 149.12$ ft.^{2}

$V_o = 149.12\ (1.25) = 186.4$ ft.^{3}

$V_c = .5(1.0)(1.0)(2)(6.2 + 10.92 + 11.46 + 16.11) = 44.69$ ft.^{3}

$W_c = (186.4 + 44.69).15 = \underline{34.7}$ K

TOTAL CONCRETE (WS_1) = 4568.2 K

Backfill (WS_2)

Saturated Soil (El. 10.0 to 1.0)

$A = 76.68$ ft.^{2}

$W = 76.68(14.0)(.120) = \underline{128.8}$ K

Submerged Soil (El. -13.75 to 1.0)

$A = 48.15$ ft.^{2}

$W = 48.15(14.0)(.0575) = \underline{38.8}$ K

TOTAL BACKFILL (WS_2) = 167.6 K

COMPUTATION SHEET

PROJECT IHNC Lock	PAGE 12 OF	COMPUTED BY DCA	DATE 6/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Water (W_c)

Operator Controlled

$W = 0$

Water (W_g)

Gravity Controlled

$A = 48.15$ ft.^{2}

$W = 48.15(14.0)(.0625) = \underline{42.1}$ K

Uplift-1 (U_1)

$U_1 = 3.313(86.0)(14.0) = \underline{3988.9}$ K

Uplift-2 (U_2)

$U_2 = .5(3.594 + 3.736)(86.0)(14.0) = \underline{4,412.7}$ K

FACTORS OF SAFETY

CASE 3-1

$$FS = \frac{4568.2 + 167.6 + 0}{3988.9 - 42.1}$$

$FS = \underline{1.20}$

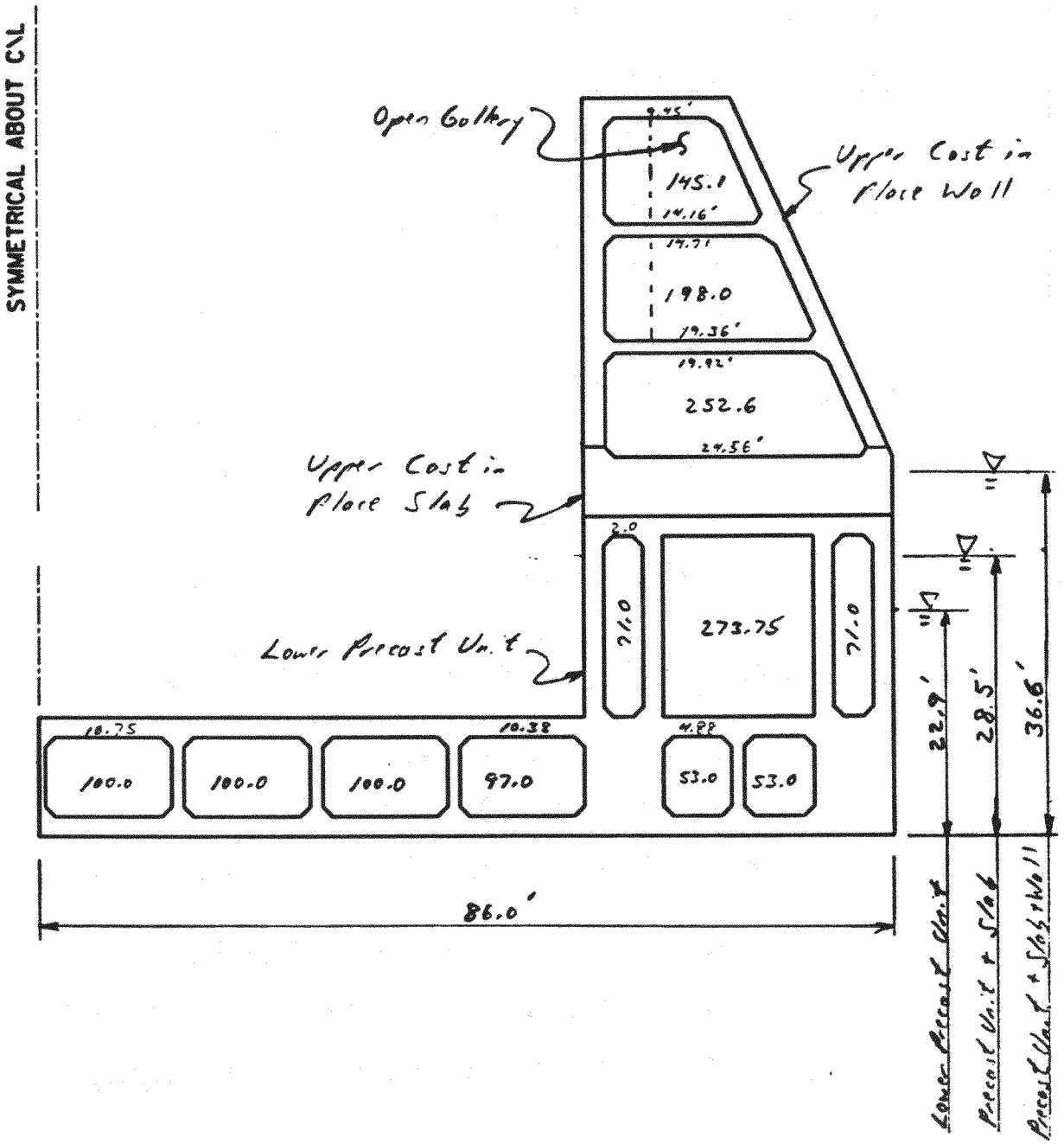
CASE 3-2

$$FS = \frac{4568.2 + 167.6 + 0}{4412.7 - 42.1}$$

$FS = \underline{1.08}$ *

* Use tension piles to bring to required factor of safety. $FS \geq 1.3$

LOAD CASE (TRASPORTATION / CONSTRUCTION)
CHAMBER MONOLITH - 14' STRIP
DRAFT COMPUTATIONS



c:\dgn\lock1.dgn Jun. 5, 1996 15:15:34

PROJECT	JHNC Lock	PAGE 14 OF	COMPUTED BY OCB	DATE 9/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

DRAFT (Lower Precast Unit - 14' Strip)

A_V = 1659.75 - 100.0 - 100.0 - 100.0 - 97.0 - 53.0 - 53.0 - 71.0 - 71.0 - 273.75 = 741.0 ft.² (CADD)

W_V = 741.0 (14.0) (.15) = 1556.1 K

$A_{O(18)}$ = 2 (100.0) = 200.0 ft.²

$A_{O(17)}$ = 100.0 ft.²

$A_{O(27)}$ = 97.0 ft.²

$A_{O(53)}$ = 2 (53.0) + 2 (71.0) = 248.0 ft.²

V_O = 200.0 (1.5) + 100.0 (1.75) + 97.0 (2.25) + 248.0 (1.25) = 1003.25 ft.³

V_H = .5 (1.0) (1.0) (2) (2) (64.39) = 128.78 ft.³

W_{O+H} = 100325 (.15) + 128.78 (.15) = 169.8 K

W_T = 1556.1 + 169.8 = 1725.9 K

Vol. to Displace = 1725.9 / .0625 = 27,614.4 ft.³

DRAFT = 27,614.4 / 86.0 (14.0) = 22.9'

DRAFT (Upper Cast in Place Slab - 14' Strip)

A_V = 191.21 ft.² (CADD)

W_V = 191.21 (14.0) (.15) = 401.5 K

W_{V_T} = 401.5 (1.05) = 421.6 K (5% Forms and Misc. Metals)

W_T = 1725.9 + 421.6 = 2147.5 K

Vol. to Displace = 2147.5 / .0625 = 34,360.0 ft.³

DRAFT = 34,360.0 / 86.0 (14.0) = 28.5'

PROJECT JHNC Lock	PAGE 15 OF	COMPUTED BY DCB	DATE 9/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

DRAFT (Upper Cast in Place Walls - 14' Strip)

$A_V = 826.24 - 145.1 - 198.0 - 252.6 = 230.54$ ft.^{2}

$W_V = 230.54\,(14.0)\,(.15) = \underline{484.1^K}$

$A_0 = 198.0 + 252.6 = 450.6$ ft.^{2}

$V_0 = 450.6\,(1.25) = 563.25$ ft.^{3}

$V_H = .5(1.0)(1.0)(2)(82.55) = 82.55$ ft.^{3}

$W_{0+H} = 563.25(.15) + 82.55(.15) = \underline{96.9^K}$

$W_{V_T} = (484.1 + 96.9)\,1.05 = 610.1^K$ (5% Forms and Misc.)

$W_T = 2147.5 + 610.1 = \underline{2757.6^K}$

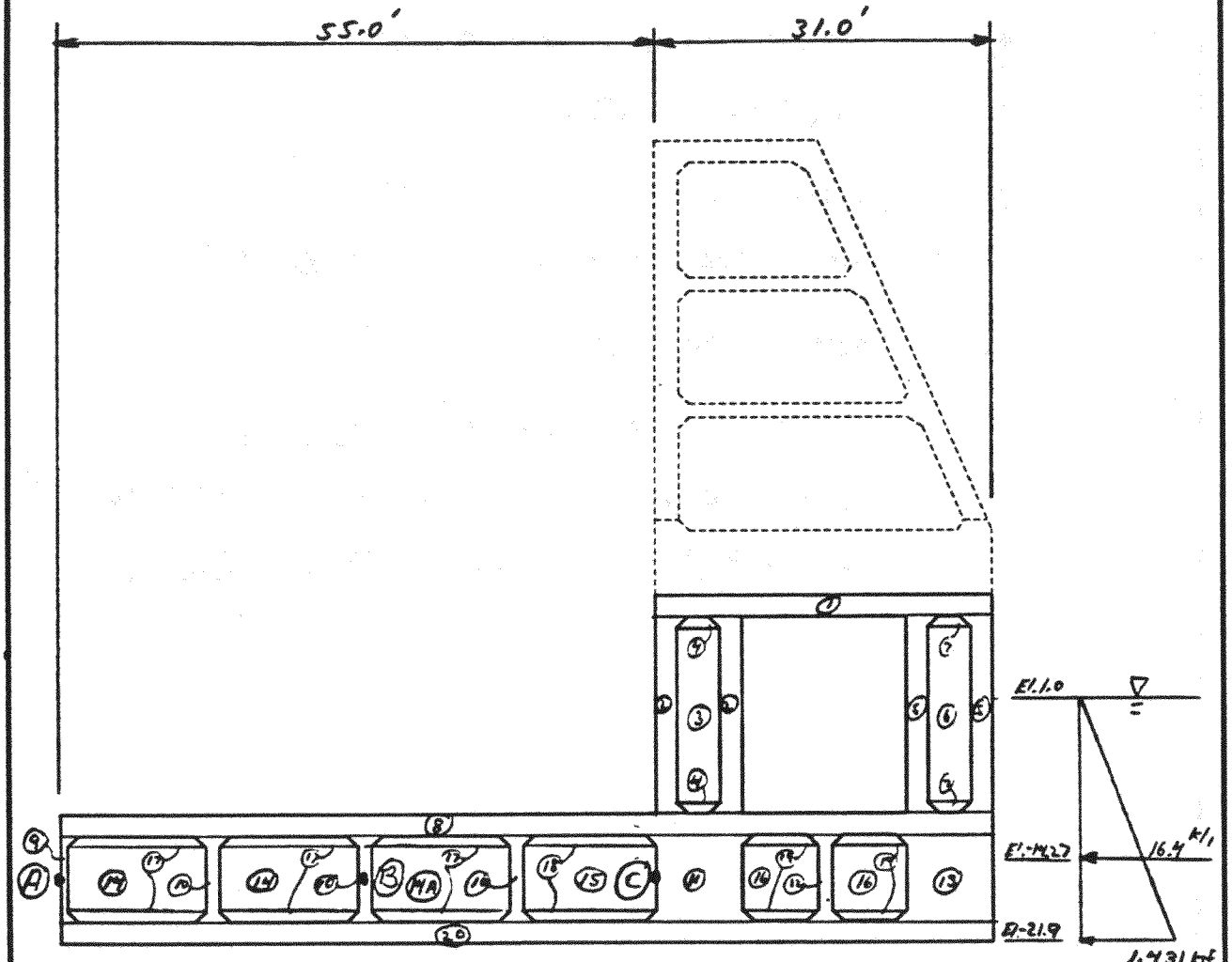
Vol. to Displace $= 2757.6 / .0625 = 44,121.6$ ft.^{3}

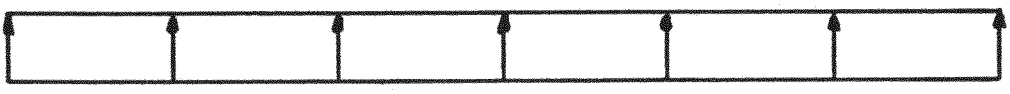
DRAFT $= 44,121.6 / 86.0\,(14.0) = \underline{36.6'}$

LOCK CHAMBER - SLAB DESIGN

LOWER PRECAST UNIT - 14' STRIP

TRANSPORTATION





1.431 KSF

COMPUTATION SHEET

PROJECT IHNC Lock	PAGE 17 OF	COMPUTED BY DCB	DATE 9/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

LOCK CHAMBER

Slab Design - Lower Precast Unit (14' Strip)

Assume water at draft line El. 1.0.

MOMENTS AND SHEARS - (A) (Const. - Transportation)

ITEM	F_x	F_z	$\bar{z}$	$\bar{x}$	M @ (A)
Concrete					
(1) 2.0(31.0)(14.0)(.15)		130.2		70.5	9,179.1
(2) (146.0-71.0)(14.0)(.15)		157.5		59.0	9,292.5
(3) 71.0(1.25)(.15)		13.3		59.0	784.7
(4) 1.0(3.0)(2)(.15)		0.9		59.0	53.1
(5) (146.0-71.0)(14.0)(.15)		157.5		82.0	12,915.0
(6) 71.0(1.25)(.15)		13.3		82.0	1,090.6
(7) 1.0(3.0)(2)(.15)		0.9		82.0	73.8
(8) 2.0(86.0)(14.0)(.15)		361.2		43.0	15,531.6
(9) 6.0(14.0)(.15)		12.6		0.4	5.0
(10) 12.0(3)(14.0)(.15)		75.6		28.0	2,116.8
(11) 66.0(14.0)(.15)		138.6		59.0	8,177.4
(12) 12.0(14.0)(.15)		25.2		70.5	1,776.6
(13) 65.0(14.0)(.15)		136.5		81.9	11,179.4
(14) 100.0(2)(1.5)(.15)		45.0		14.0	630.0
(14A) 100.0(1.75)(.15)		26.3		35.0	920.5
(15) 97.0(2.25)(.15)		32.7		48.8	1,595.8
(16) 53.0(2)(1.25)(.15)		19.9		70.5	1,403.0
(17) 1.0(11.75)(3)(2)(.15)		10.6		21.0	222.6
(18) 1.0(11.38)(2)(.15)		3.4		48.8	165.9
(19) 1.0(5.88)(2)(2)(.15)		3.5		70.5	246.8
(20) 2.0(86.0)(14.0)(.15)		361.2		43.0	15,531.6
		1725.9			92,891.8
Water (H)					
(1) .5(1.431)(22.9)(14.0)	229.4		1.63		-373.9
Uplift					
(1) 1.431(86.0)(14.0)		-1722.9		43.0	-74,084.7
TOTALS	229.4	———			18,433.2

PROJECT	IHNC Lock	PAGE 18 OF	COMPUTED BY DCR	DATE 6/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

MOMENTS AND SHEARS - ⑧

ITEM	F_x	F_z	$\bar{z}$	$\bar{x}$	M @ ⑧
Concrete					
① 2.0(31.0)(14.0)(.15)		130.2		42.5	5,533.5
② (146.0 - 71.0)(14.0)(.15)		157.5		31.0	4,882.5
③ 71.0(1.25)(.15)		13.3		31.0	412.3
④ 1.0(3.0)(2)(.15)		0.9		31.0	27.9
⑤ (146.0 - 71.0)(14.0)(.15)		157.5		54.0	8,505.0
⑥ 71.0(1.25)(.15)		13.3		54.0	718.2
⑦ 1.0(3.0)(2)(.15)		0.9		54.0	48.6
⑧ 2.0(58.0)(14.0)(.15)		243.6		29.0	7,064.4
⑩ 6.0(14.0)(.15)		12.6		0.4	5.0
⑩ 12.0(14.0)(.15)		25.2		14.0	352.8
⑪ 66.0(14.0)(.15)		138.6		31.0	4,296.6
⑫ 12.0(14.0)(.15)		25.2		42.5	1,071.0
⑬ 65.0(14.0)(.15)		136.5		53.9	7,357.4
⑭A 100.0(1.75)(.15)		26.3		7.0	184.1
⑮ 97.0(2.25)(.15)		32.7		20.8	680.2
⑯ 53.0(2)(1.25)(.15		19.9		42.5	845.8
⑰ 1.0(11.75)(2)(.15)		3.5		7.0	24.5
⑱ 1.0(11.38)(2)(.15)		3.4		20.8	70.7
⑲ 1.0(5.88)(2)(2)(.15)		3.5		42.5	148.8
⑳ 2.0(58.0)(14.0)(.15)		243.6		29.0	7,064.4
		1388.2			49,293.7
Water (H)					
① .5(1.431)(22.9)(14.0)	229.4		1.63		-373.9
Uplift					
① 1.431(58.0)(14.0)		-1162.0		29.0	-33,698.0
TOTALS		226.2			15,221.8

COMPUTATION SHEET

PROJECT	JHNC Lock	PAGE 19 OF	COMPUTED BY OCG	DATE 6/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

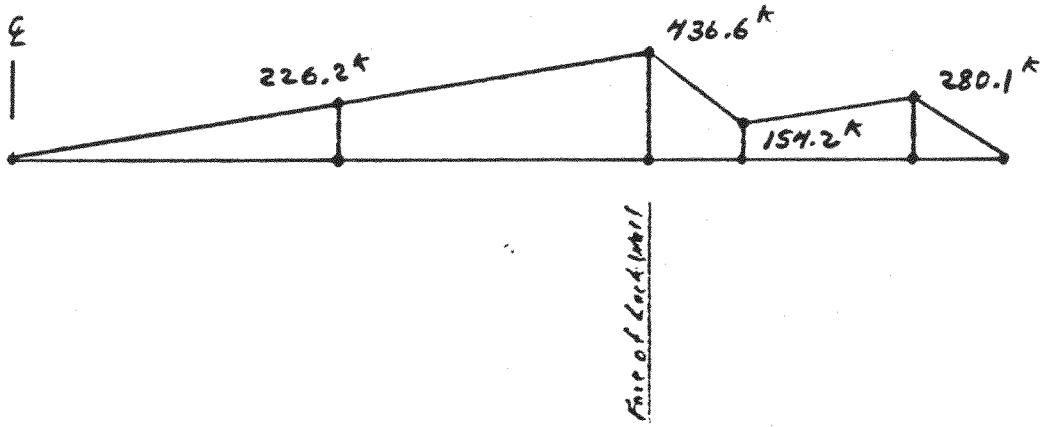
MOMENTS AND SHEARS - ©

	F_x	F_z	$\bar{z}$	$\bar{x}$	Me ©
Concrete					
① 2.0(31.0)(14.0)(.15)		130.2		15.5	2,018.1
② (146.0-71.0)(14.0)(.15)		157.5		4.0	630.0
③ 71.0(1.25)(.15)		13.3		4.0	186.2
④ 1.0(3.0)(2)(.15)		0.9		4.0	3.6
⑤ (146.0-71.0)(14.0)(.15)		157.5		27.0	4,252.5
⑥ 71.0(1.25)(.15)		13.3		27.0	359.1
⑦ 1.0(3.0)(2)(.15)		0.9		27.0	24.3
⑧ 2.0(31.0)(14.0)(.15)		130.2		15.5	2,018.1
⑪ 66.0(14.0)(.15)		138.6		4.0	554.4
⑫ 12.0(14.0)(.15)		25.2		15.5	390.6
⑬ 65.0(14.0)(.15)		136.5		26.9	3,671.9
⑯ 53.0(2)(1.25)(.15)		19.9		15.5	308.5
⑲ 1.0(5.88)(2)(2)(.15)		3.5		15.5	54.3
⑳ 2.0(31.0)(14.0)(.15)		130.2		15.5	2,018.1
		1057.7			16,489.6
Water (H)					
① .5(1.431)(22.9)(14.0)	229.4		1.63		-373.9
Uplift					
① 1.431(31.0)(14.0)		-621.1		15.5	-9627.1
TOTALS		436.6			6,488.6

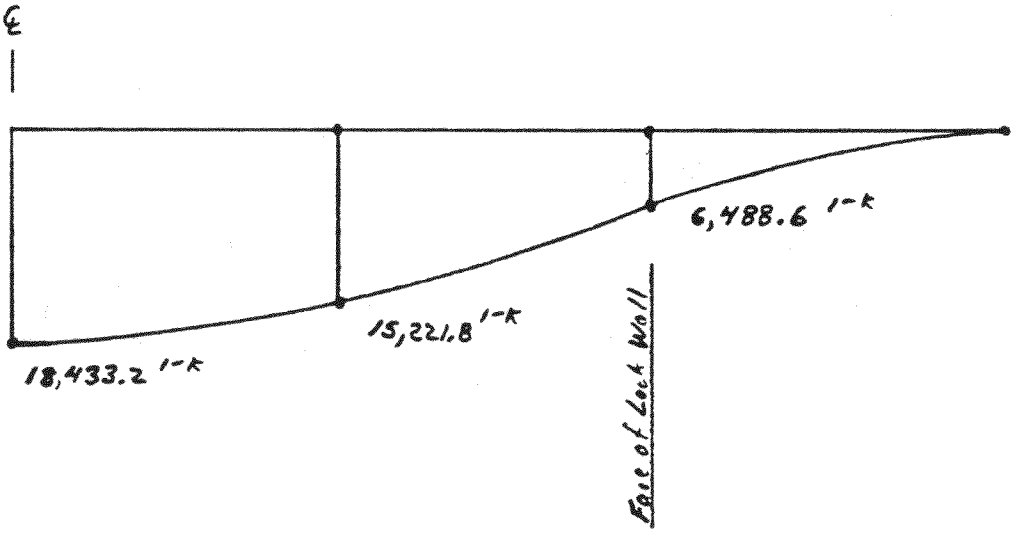
COMPUTATION SHEET

PROJECT	IHNC Lock	PAGE 20 OF	COMPUTED BY DCE	DATE 6/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

SHEAR DIAGRAM (14' STRIP)

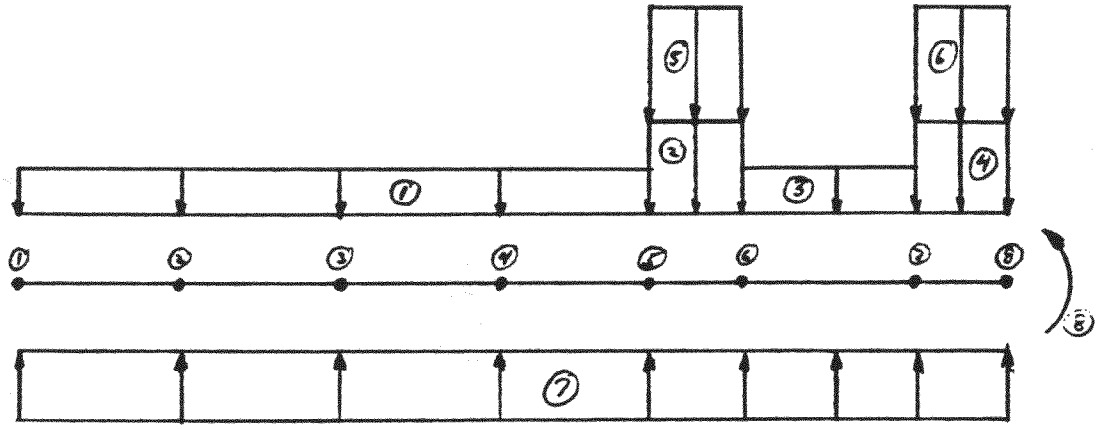


MOMENT DIAGRAM (14' STRIP)



PROJECT	IHNC Lock	PAGE 21 OF	COMPUTED BY DCB	DATE 6/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

CFRAME LOADING (14' Strip)



UNIFORM LOADING

Load ①

2.0(55.0)(14.0)(.15) + 12.6 + 75.6 + 45.0 + 26.3 + 32.7
+ 10.6 + 3.4 + 2.0(55.0)(14.0)(.15) / 55.0 = 12.15 K/I

Load ②

2.0(8.0)(14.0)(.15)(2) + 138.6 / 8.0 = 25.73 K/I

Load ③

2.0(15.0)(14.0)(.15) + 25.2 + 19.9 + 3.5
+ 2.0(15.0)(14.0)(.15) / 15.0 = 11.64 K/I

Load ④

2.0(8.0)(14.0)(.15)(2) + 136.5 / 8.0 = 25.46 K/I

Load ⑤

.5(130.2) + 157.5 + 13.3 + 0.9 / 8.0 = 29.6 K/I

Load ⑥

.5(130.2) + 157.5 + 13.3 + 0.9 / 8.0 = 29.6 K/I

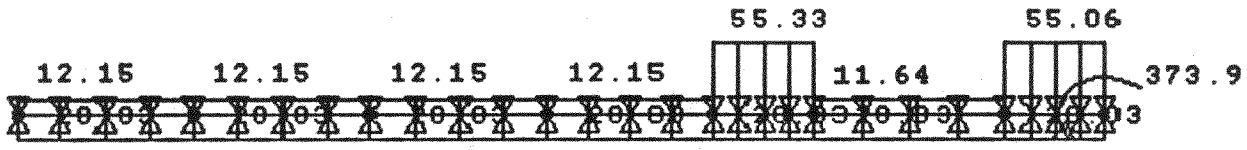
Load ⑦

1722.9 / 86.0 = 20.03 K/I

Load ⑧

16.1(14.0)(1.57) = 373.9 I-K

IHNC REPLACEMENT SHIP LOCK
CONCRETE FLOAT IN CHAMBER



SEP-1996 07.43.16

LOAD CASE 1 (TRANSPORTATION FLOAT IN)

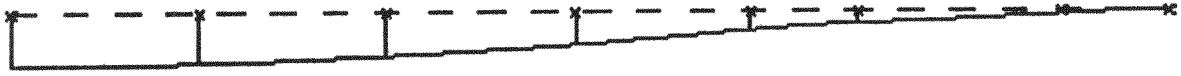
IHNC REPLACEMENT SHIP LOCK
CONCRETE FLOAT IN CHAMBER



└──┘ = 436.8 KIP SHEAR SEP-1996 07.43.16

LOAD CASE 1 (TRANSPORTATION FLOAT IN)

IHNC REPLACEMENT SHIP LOCK
CONCRETE FLOAT IN CHAMBER



└──┘ = .1848E+5 FT-KIP MOMENT SEP-1996 07.43.16

LOAD CASE 1 (TRANSPORTATION FLOAT IN)

```
          *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*
PROGRAM CFRAME
*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*

 JN DATE = SEP-1996
 UN TIME = 07.43.16

IHNC REPLACEMENT SHIP LOCK
CONCRETE FLOAT IN CHAMBER

1                LOAD CASE     1   (TRANSPORTATION FLOAT IN)
```

JOINT DISPLACEMENTS

JOINT	DX IN	DY IN	DR RAD
1	.0000E+00	.0000E+00	.0000E+00
2	.0000E+00	-.2550E-01	-.2731E-03
3	.0000E+00	-.9968E-01	-.5224E-03
4	.0000E+00	-.2166E+00	-.7245E-03
5	.0000E+00	-.3548E+00	-.8498E-03
6	.0000E+00	-.4455E+00	-.8927E-03
7	.0000E+00	-.6201E+00	-.9335E-03
8	.0000E+00	-.7131E+00	-.9334E-03

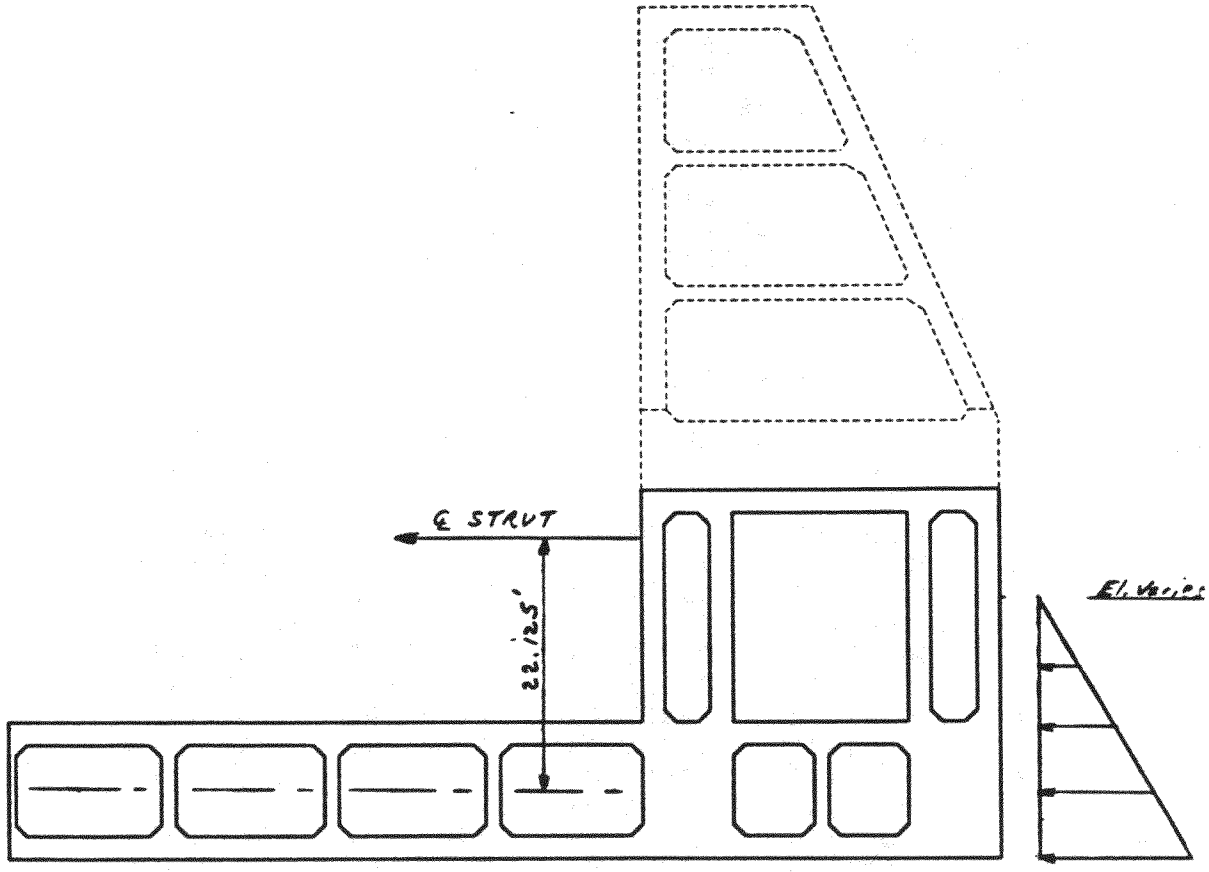
MEMBER END FORCES

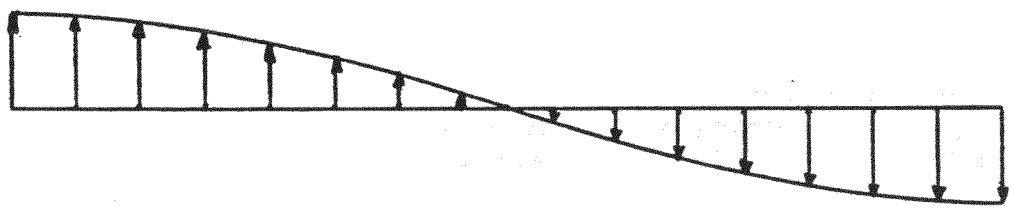
MEMBER	JOINT	AXIAL KIP	SHEAR KIP	MOMENT FT-KIP	MOMENT EXTREMA FT-KIP	LOCATION FT
1	1	.0000E+00	.3390E+01	-.1848E+05	-.1766E+05	14.00
	2	.0000E+00	-.1137E+03	-.1766E+05	-.1848E+05	.00
2	2	.0000E+00	.1137E+03	-.1766E+05	-.1529E+05	14.00
	3	.0000E+00	-.2240E+03	-.1529E+05	-.1766E+05	.00
3	3	.0000E+00	.2240E+03	-.1529E+05	-.1138E+05	14.00
	4	.0000E+00	-.3343E+03	-.1138E+05	-.1529E+05	.00
4	4	.0000E+00	.3343E+03	-.1138E+05	-.6372E+04	13.00
	5	.0000E+00	-.4368E+03	-.6372E+04	-.1138E+05	.00
5	5	.0000E+00	.4368E+03	-.6372E+04	-.4007E+04	8.00
	6	.0000E+00	-.1544E+03	-.4007E+04	-.6372E+04	.00
6	6	.0000E+00	.1544E+03	-.4007E+04	-.7471E+03	15.00
	7	.0000E+00	-.2802E+03	-.7471E+03	-.4007E+04	.00
7	7	.0000E+00	.2802E+03	-.7471E+03	.3739E+03	8.00
	8	.0000E+00	.0000E+00	.3739E+03	-.7471E+03	.00

STRUCTURE REACTIONS

JOINT	FORCE X KIP	FORCE Y KIP	MOMENT FT-KIP
1	.0000E+00	.3390E+01	.1848E+05
TOTAL	.0000E+00	.3390E+01	

TENSION STRUT DESIGN
CHAMBER SECTION
TRANSPORTATION + WAVE



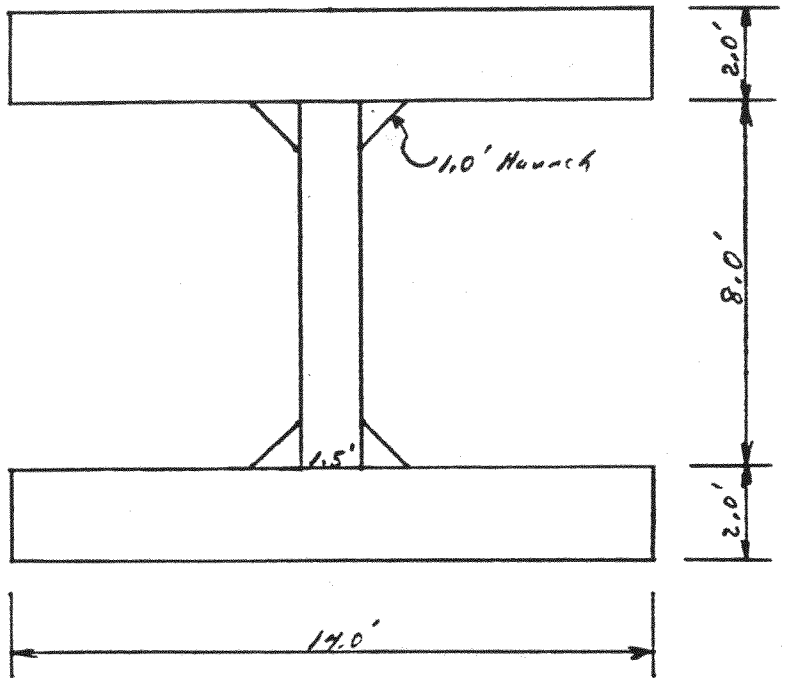


WAVE HOGGING
(Critical Loading)

COMPUTATION SHEET

PROJECT IHNC Lock	PAGE 23 OF	COMPUTED BY CCB	DATE 7/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Section Properties (14' Strip)



$$A_g = 24.0(168.0)(2) + 18.0(96.0) + .5(12.0)(12.0)(4)$$

$$A_g = \underline{10,080.0 \text{ in.}^2}$$

$$I_{xx} = \frac{168.0(144.0)^3}{12} - 2\left(\frac{75.0(96.0)^3}{12}\right) + 4\left(\frac{12.0(12.0)^3}{36}\right) + 4(72.0)(96.0 - 4.0)^2$$

$$I_{xx} = 41,803,776.0 - 11,059,200.0 + 2,304.0 + 2,437,632.0$$

$$I_{xx} = \underline{33,184,512.0 \text{ in.}^4}$$

$$S_{T\text{-}G} = 33,184,512.0 / 72.0 = \underline{460,896.0 \text{ in.}^3}$$

PROJECT IHNC	PAGE 24 OF	COMPUTED BY OCL	DATE 9/96
SUBJECT Chamber Moorings		CHECKED BY	DATE

TENSION STRUT - TRANSPORTATION (CHAMBER)

Assumptions:

1. Permissible tension in concrete, $6\sqrt{f'_c}$
2. f'_c = 6000 psi
3. 1 3/8" ϕ, 160.0 Ksi bars
4. Permissible tensile stress in bars, 0.70 f_{pu}

Design Loads:

Wave load hogging, from calcs by MHG.

$M \approx 4000.0$ ' - K

Transport moment from CFRAME.

$M \approx 18,500.0$ ' - K

$M_T \approx \underline{22,500.0}$ ' - K

Allowable slab moment

$M = f_{b_c} (I) / 12,000$

$= 6\sqrt{6,000}\,(460,896.0) / 12,000$

$\approx \underline{17,850.0}$ ' - K

Moment to be resisted by tension strut

$M = 22,500.0 - 17,850.0$

$= \underline{\underline{4,650.0}}$ ' - K

COMPUTATION SHEET

PROJECT IHNC	PAGE 25 OF	COMPUTED BY OCB	DATE 9/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

Bars Required

$F_T = .70(160.0)(1.58) = 177.0^K$/bar

$T = 4{,}650.0 / 22.125' = 210.2^K$

$N = 210.2 / 177.0 = 1.2 \Rightarrow 2^*$

* Need 2 bars for transportation, an additional bar will be required in the strut as construction progresses.

PROJECT IHNC Lock	PAGE 26 OF	COMPUTED BY OCG	DATE 7/96
SUBJECT Chamber Monolith		CHECKED BY	DATE

LONGITUDINAL POST-TENSIONING (CHAMBER)

Assumptions:

1. Non-post tensioned reinforcement in the longitudinal direction adds nothing to the flexural strength of the chamber. Flexural strength is essentially supplied by the tendons.

2. The chamber will be post-tensioned in both the top and bottom to resist the moment reversals produced by sagging and hogging.

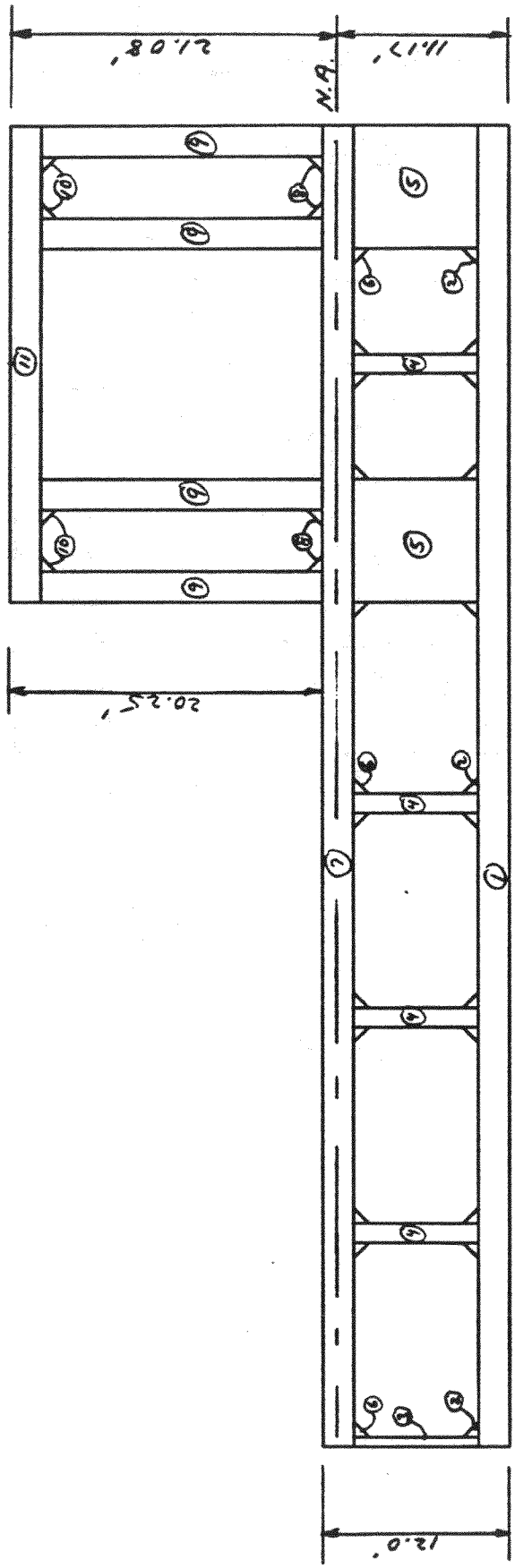
3. Design load is a 6' wave from stem to stem, during transportation.

4. No combined stresses due to transverse loading is included for this level of design.

5. No tensile stresses are allowed in the concrete.

6. f'_c = 6,000 psi
   f'_{ci} = 5,000 psi

CHAMBER MONOLITH
FLOAT-IN SECTION
SECTION PROPERTIES
(ADJACENT PORTS)



COMPUTATION SHEET

PROJECT	IHNC Lock	PAGE 28 OF	COMPUTED BY OCB	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

Float-In Section (Neutral Axis - Adjacent Ports)

No.		A	$\bar{y}$	$A\bar{y}$
①	2.0(86.0)	172.0	1.0	172.00
②	.5(1.0)(1.0)(12)	6.0	2.33	14.00
③	.63(8.0)	5.0	6.0	30.00
④	1.25(8.0)(4)	40.0	6.0	240.00
⑤	8.0(8.0)(2)	128.0	6.0	768.00
⑥	.5(1.0)(1.0)(12)	6.0	9.67	58.00
⑦	2.0(86.0)	172.0	11.0	1892.00
⑧	.5(1.0)(1.0)(4)	2.0	12.33	24.67
⑨	2.0(18.25)(4)	146.0	21.13	3084.25
⑩	.5(1.0)(1.0)(4)	2.0	29.92	59.83
⑪	2.0(31.0)	62.0	31.25	1937.5
	TOTALS	741.0		8,280.25

$$N.A. = \frac{8280.25}{741.0} = \underline{11.17'}$$

Full Area = 741.0(2) = 1,482.0 SF

= 213,408.0 in.^{2}

COMPUTATION SHEET

PROJECT	IHNC Lock	PAGE 29 OF	COMPUTED BY OCB	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

Float - Jr Section (Moment of Inertia - Adjacent Parts)

No.		I	A	d	Ad^2
①	$86.0(2.0)^3/12$	57.33	172.0	10.17	17,789.77
②	$1.0(1.0)^3/36$ (12)	0.33	6.0	8.84	468.87
③	$.63(8.0)^3/12$	26.67	5.0	5.17	133.64
④	$1.25(8.0)^3/12$ (4)	213.33	40.0	5.17	1069.16
⑤	$8.0(8.0)^3/12$ (2)	682.67	128.0	5.17	3421.30
⑥	$1.0(1.0)^3/36$ (12)	0.33	6.0	1.50	13.50
⑦	$86.0(2.0)^3/12$	57.33	172.0	0.17	4.97
⑧	$1.0(1.0)^3/36$ (4)	0.11	2.0	1.16	2.69
⑨	$2.0(18.25)^3/12$ (4)	4,052.26	146.0	9.96	14,483.43
⑩	$1.0(1.0)^3/36$ (4)	0.11	2.0	18.25	703.13
⑪	$31.0(2.0)^3/12$	20.67	62.0	20.08	24,998.80
	TOTALS	5,111.14			63,089.26

$$I_{xx} = \Sigma I + Ad^2$$

$$= 5111.14 + 63,089.26 \text{ ft.}^4$$

$$I_{xx} = 68,200.4\,(2) = 136,400.8 \text{ ft.}^4$$

$$S_B = \frac{136,400.8}{11.17} = 12,211.35 \text{ ft.}^3$$

$$= \underline{21,101,212.8 \text{ in.}^3}$$

$$S_T = \frac{136,400.8}{21.08} = 6,470.63 \text{ ft.}^3$$

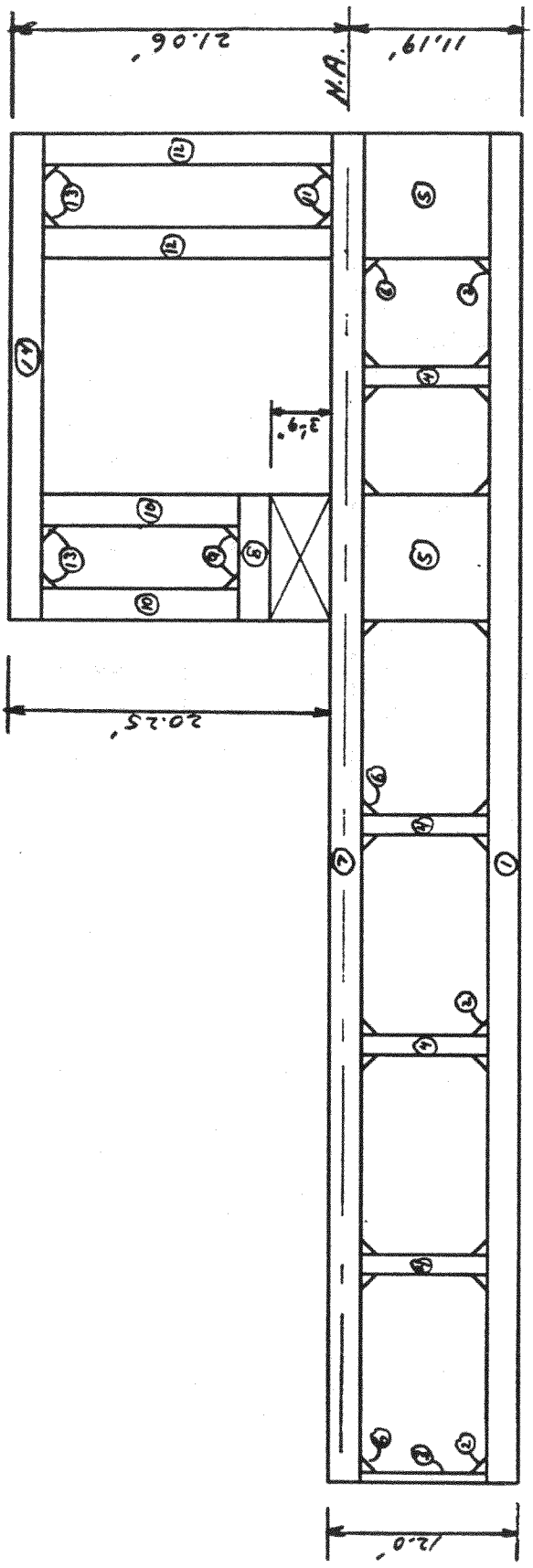
$$= \underline{11,181,248.6 \text{ in.}^3}$$

CHAMBER MONOLITH

FLOAT - IN SECTION

SECTION PROPERTIES

(AT PORT LOCATIONS)



PROJECT	IHNC Lock	PAGE 3/ OF	COMPUTED BY DCB	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

Float - In Section (Neutral Axis - At Ports)

No.		A	$\bar{y}$	$A\bar{y}$
①	2.0(86.0)	172.0	1.0	172.00
②	.5(1.0)(1.0)(12)	6.0	2.33	14.00
③	.63(8.0)	5.0	6.0	30.00
④	1.25(8.0)(4)	40.0	6.0	240.00
⑤	8.0(8.0)(2)	128.0	6.0	768.00
⑥	.5(1.0)(1.0)(12)	6.0	9.67	58.00
⑦	2.0(86.0)	172.0	11.0	1892.00
⑧	2.0(8.0)	16.0	16.75	268.00
⑨	.5(1.0)(1.0)(2)	1.0	18.08	18.08
⑩	2.0(12.5)(2)	50.0	24.0	1200.00
⑪	.5(1.0)(1.0)(2)	1.0	12.33	12.33
⑫	2.0(18.25)(2)	73.0	21.13	1542.50
⑬	.5(1.0)(1.0)(4)	2.0	29.92	59.83
⑭	2.0(31.0)	62.0	31.25	1937.5
		734.0		8,212.24

N.A. = 8,212.24 / 734.0

= 11.19"

Full Area = 734.0(2) = 1468.0 SF

= 211,392.0 in.²

PROJECT	IHNC Lock	PAGE 32 OF	COMPUTED BY DCS	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

Float-In Section (Moment of Inertia - At Axis)

No.		I	A	d	Ad²
①	86.0(2.0)³/12	57.33	172.0	10.19	17,859.81
②	1.0(1.0)³/36 (12)	0.33	6.0	8.86	471.00
③	.63(8.0)³/12	26.67	5.0	5.19	134.68
④	1.25(8.0)³/12 (4)	213.33	40.0	5.19	1,077.44
⑤	8.0(8.0)³/12 (2)	682.67	128.0	5.19	3,447.82
⑥	1.0(1.0)³/36 (12)	0.33	6.0	1.52	13.86
⑦	86.0(2.0)³/12	57.33	172.0	0.19	6.21
⑧	8.0(2.0)²/12	5.33	16.0	5.56	494.62
⑨	1.0(1.0)³/36 (2)	0.06	1.0	6.89	47.47
⑩	2.0(12.5)³/12 (2)	651.04	50.0	12.81	8,204.81
⑪	1.0(1.0)³/36 (2)	0.06	1.0	1.14	1.30
⑫	2.0(18.25)³/12 (2)	2,026.13	73.0	9.94	7,212.66
⑬	1.0(1.0)³/36 (4)	0.11	2.0	18.73	701.63
⑭	31.0(2.0)³/12	20.67	62.0	20.06	24,949.02
	TOTALS	3,741.39	734.0		64,622.33

$$I_{xx} = \Sigma I + Ad^2$$

$$= 3,741.39 + 64,622.33$$

$$I_{xx} = 68,363.7\,(2) = 136,727.4 \text{ ft.}^4$$

$$S_B = \frac{136,727.4}{11.19} = 12,218.71 \text{ ft.}^3$$

$$= \underline{21,113,936.3 \text{ in.}^3}$$

$$S_T = \frac{136,727.4}{21.06} = 6,492.28 \text{ ft.}^3$$

$$= \underline{11,218,659.8 \text{ in.}^3}$$

COMPUTATION SHEET

PROJECT	IHNC Lock	PAGE 33 OF	COMPUTED BY DCB	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

MIDSPAN STRESSES (Wave Load)

Based on the loading assumptions investigated, a moment of 300,000 ft-k will be used for design of the post-tensioning system in the longitudinal direction. Axial compression is neglected. See comps by MHG.

(Hogging - Sagging) - Adjacent Ports

$$\sigma_T = \frac{3,600,000.0}{11,181,248.6} = \pm 0.322 \text{ ksi}$$

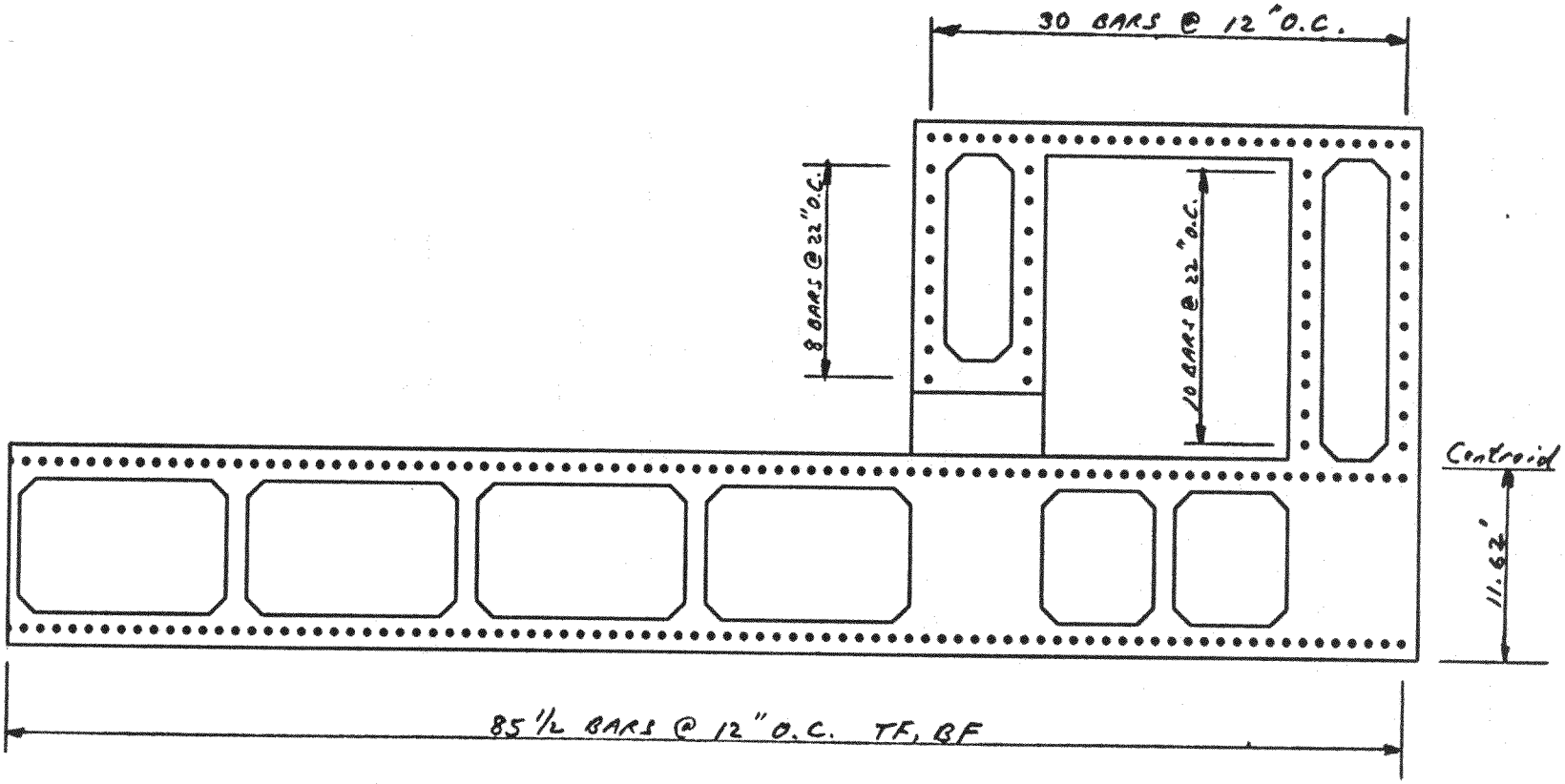
$$\sigma_B = \frac{3,600,000.0}{21,101,212.8} = \pm 0.171 \text{ ksi}$$

(Hogging - Sagging) - At Ports

$$\sigma_T = \frac{3,600,000.0}{11,218,659.8} = \pm 0.321 \text{ ksi}$$

$$\sigma_B = \frac{3,600,000.0}{21,113,936.3} = \pm 0.171 \text{ ksi}$$

CHAMBER MONOLITH
FLOAT-IN SECTION
ASSUMED BAR LAYOUT



PROJECT	IHNC Lock	PAGE 35 OF	COMPUTED BY OCB	DATE 2/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

POST-TENSIONING REQUIREMENTS (At P_{re})

Eccentricity of Assumed Bar Layout

$$\bar{y} = \frac{85.5(1.0) + 85.5(11.0) + 16(22.96) + 20(21.13) + 30(31.25)}{237}$$

$\bar{y} = 11.62'$ $\Rightarrow$ $e = 11.62' - 11.19' = 0.43'$

$$\underline{e = 5.16''}$$

Required Post-Tensioning (Wave-Hogging)

$$P_{re}/A_g + P_{re}e/S_T - 0.321 = 0$$

$$P_{re}/211,392.0 + P_{re}(5.16)/11,218,659.8 - 0.321 = 0$$

$$4.7305 \times 10^{-6} P + 4.5995 \times 10^{-7} P = 0.321$$

$$P_{re} = 61,843.8^{k}$$

$$61,843.8 / 474 = \underline{130.5^{k}/Bar}$$

Required Post-Tensioning (Wave-Sagging)

$$P_{re}/A_g - P_{re}e/S_B - 0.171 = 0$$

$$P_{re}/211,392.0 - P_{re}(5.16)/21,113,936.3 - 0.171 = 0$$

$$4.7305 \times 10^{-6} P - 2.4439 \times 10^{-7} P = 0.171$$

$$P_{re} = 38,117.7^{k}$$

$$38,117.7 / 474 = \underline{80.4^{k}/Bar}$$

PROJECT	IHNC Lock	PAGE 36 OF	COMPUTED BY OCB	DATE 2/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

POST-TENSIONING REQUIREMENTS (Adjacent Ports)

Eccentricity of Assumed Bar Layout

$$\bar{y} = \frac{85.5(1.0) + 85.5(11.0) + 16(22.96) + 20(21.13) + 30(31.25)}{237}$$

$\bar{y} = 11.62' \Rightarrow e = 11.62' - 11.17' = 0.45'$

$\underline{e = 5.40''}$

Required Post-Tensioning (Wave-Hogging)

$$P_e/A_g + P_e e/S_T - 0.322 = 0$$

$$P_e/213,408.0 + P_e(5.40)/11,181,248.6 - 0.322 = 0$$

$$4.6859 \times 10^{-6} P + 4.8295 \times 10^{-7} P = 0.322$$

$$P_e = 62,296.3^{\#}$$

$62,296.3/479 = \underline{131.4^{\#}/Bar}$

Required Post-Tensioning (Wave-Sagging)

$$P_e/A_g - P_e e/S_B - 0.171 = 0$$

$$P_e/213,408.0 - P_e(5.40)/21,101,212.8 - 0.171 = 0$$

$$4.6859 \times 10^{-6} P - 2.5591 \times 10^{-7} P = 0.171$$

$$P_e = 38,600.5^{\#}$$

$38,600.5/479 = \underline{81.4^{\#}/Bar}$

Use 1 3/8" ϕ, 160.0 ksi, Threadbar

$P_e = .60 f_{pu} = 151.7^{\#}/Bar$

THREADBAR POST-TENSIONING SYSTEM DETAILS

PRETRESSING STEEL PROPERTIES

Nominal Threadbar Diameter (inches)	Ultimate Stress (f_{pu}-ksi)	Cross Section Area (Aps-inches^2)	Ultimate Strength (f_{pu} A ps)	Prestressing Force — (kips)			Weight (lbs./ft.)	Minimum Elastic Bending Radius (ft.)	Maximum Threadbar Diameter (inches)
				$0.80f_{pu}A_{ps}$	$0.70f_{pu}A_{ps}$	$0.60f_{pu}A_{ps}$			
⅝	157	0.28	43.5	34.8	30.5	26.1	0.98	26	0.693
1	150	0.85	127.5	102.0	89.3	76.5	3.01	52	1.201
1	160	0.85	136.0	108.8	95.2	81.6	3.01	49	1.201
1¼	150	1.25	187.5	150.0	131.3	112.5	4.39	64	1.457
1¼	160	1.25	200.0	160.0	140.0	120.0	4.39	60	1.457
1⅜	150	1.58	237.0	189.6	165.9	142.2	5.56	72	1.630
1⅜	160	1.58	252.8	202.3	177.0	151.7	5.56	67	1.630

STEEL STRESS LEVELS

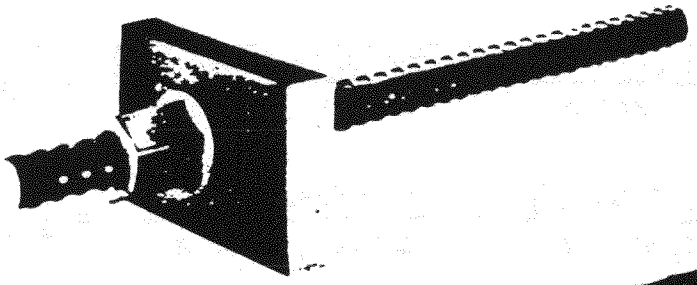
Threadbar and Smooth Bars* may be stressed to the allowable limits of ACI 318. The maximum jacking stress (temporary) may not exceed $0.80f_{pu}$, and the transfer (lockoff) may not exceed $0.70f_{pu}$.

ACI 318 does not stipulate the magnitude of prestress losses or the maximum final effective (working) prestress level.

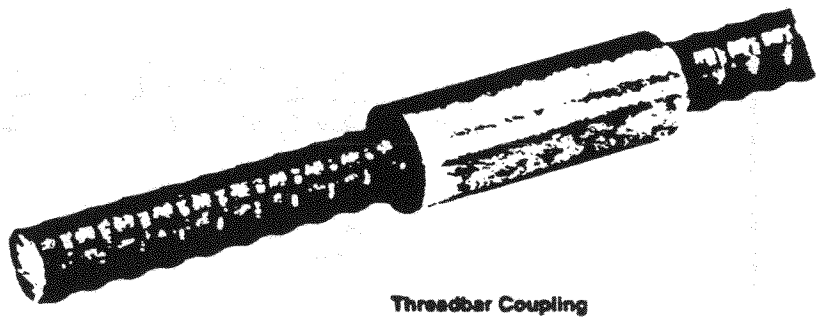
Prestress losses due to shrinkage, elastic shortening and creep of concrete as well as steel relaxation and friction must be considered.

The final effective (working) prestress level depends on the specific application. In the absence of a detailed analysis of the structural system, $0.60f_{pu}$ may be used as an approximation of the effective (working) prestress level.

Actual loss calculations require structural design information not normally present on contract documents.



Threadbar Plate Anchorage



Threadbar Coupling

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SUBJECT	Chamber Monolith		CHECKED BY	DATE

MIDSPAN STRESSES (Comp. = + , Tension = -)

Initial Prestress (Maximum Jacking)

Assumes no stresses due to DL at graving site.

$P_{pi} = 0.75 f_{pu} = 189.6$ k/bar

$$\sigma_T = \frac{474(189.6)}{213,408.0} + \frac{474(189.6)(5.40)}{11,181,248.6} = +0.465 \text{ ksi}$$

$$\sigma_B = \frac{474(189.6)}{213,408.0} - \frac{474(189.6)(5.40)}{21,101,212.8} = +0.398 \text{ ksi}$$

$$\sigma_{All.} = .55(f'_{ci}) = 2.75 \text{ ksi} \quad (C)$$

At Transfer

Assumes no stresses due to DL at graving site

$P_{pt} = 0.66 f_{pu} = 166.8$ k/bar

$$\sigma_T = \frac{474(166.8)}{213,408.0} + \frac{474(166.8)(5.40)}{11,181,248.6} = +0.409 \text{ ksi}$$

$$\sigma_B = \frac{474(166.8)}{213,408.0} - \frac{474(166.8)(5.40)}{21,101,212.8} = +0.350 \text{ ksi}$$

$$\sigma_{All.} = .55(f'_{ci}) = 2.75 \text{ ksi} \quad (C)$$

PROJECT	IHNC Lock	PAGE 38 OF	COMPUTED BY OCB	DATE 7/96
SUBJECT	Chamber Monolith		CHECKED BY	DATE

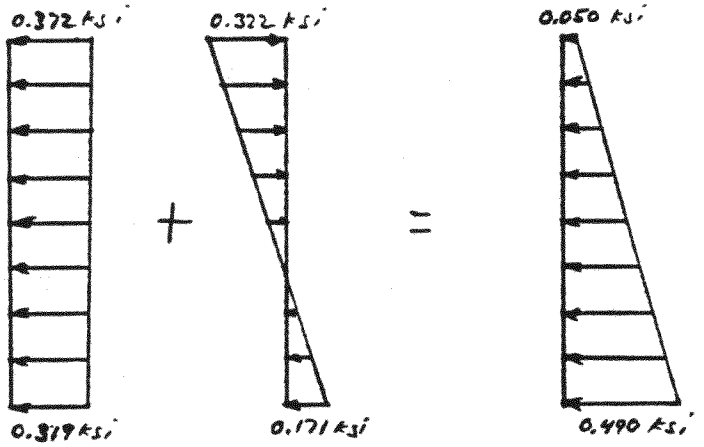
Effective (After Losses)

$$f_{pe} = 0.60\, f_{pu} = 151.7 \text{ K/bar}$$

$$\sigma_T = \frac{474(151.7)}{213,408.0} + \frac{474(151.7)(5.40)}{11,181,248.6} = +0.372 \text{ ksi}$$

$$\sigma_B = \frac{474(151.7)}{213,408.0} - \frac{474(151.7)(5.40)}{21,101,212.8} = +0.319 \text{ ksi}$$

Service Load (DL + LL, Wave - Hogging)



Effective | DL+LL | Final @ Service Load

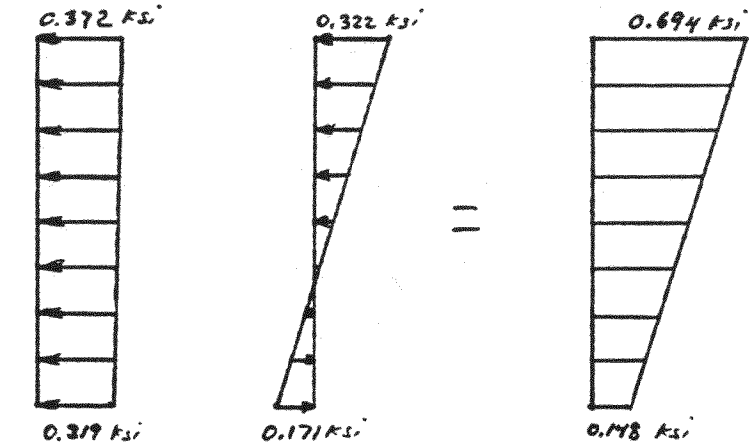
$$\sigma_T = 0.372 - 0.322 = +0.050 \text{ ksi} \quad (C)$$

$$\sigma_B = 0.319 + 0.171 = +0.490 \text{ ksi} \quad (C)$$

$$\sigma_{All} = 0.40\, f'_c = 2.40 \text{ ksi}$$

PROJECT	IHNC Lock	PAGE 39 OF	COMPUTED BY DCB	DATE 7/96
SUBJECT	Chamber Moment		CHECKED BY	DATE

Service Load (DL + LL, Wave - Sagging)



σ_T = 0.372 + 0.322 = <u>+ 0.694 ksi</u> (C)

σ_B = 0.319 − 0.171 = <u>+ 0.148 ksi</u> (C)

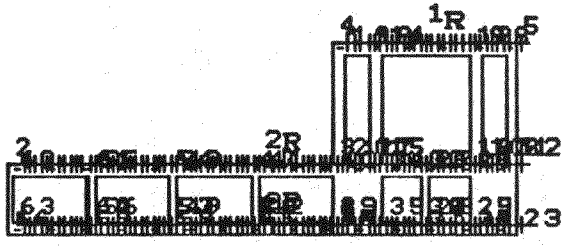
$\sigma_{All.}$ = 0.40 f'c = 2.40 ksi

PROJECT IHNC Lock	PAGE 40 OF	COMPUTED BY OCB	DATE 7/96
SUBJECT Chamber Monolith - Longitudinal		CHECKED BY	DATE

FLEXURAL CAPACITY (Ultimate Strength)

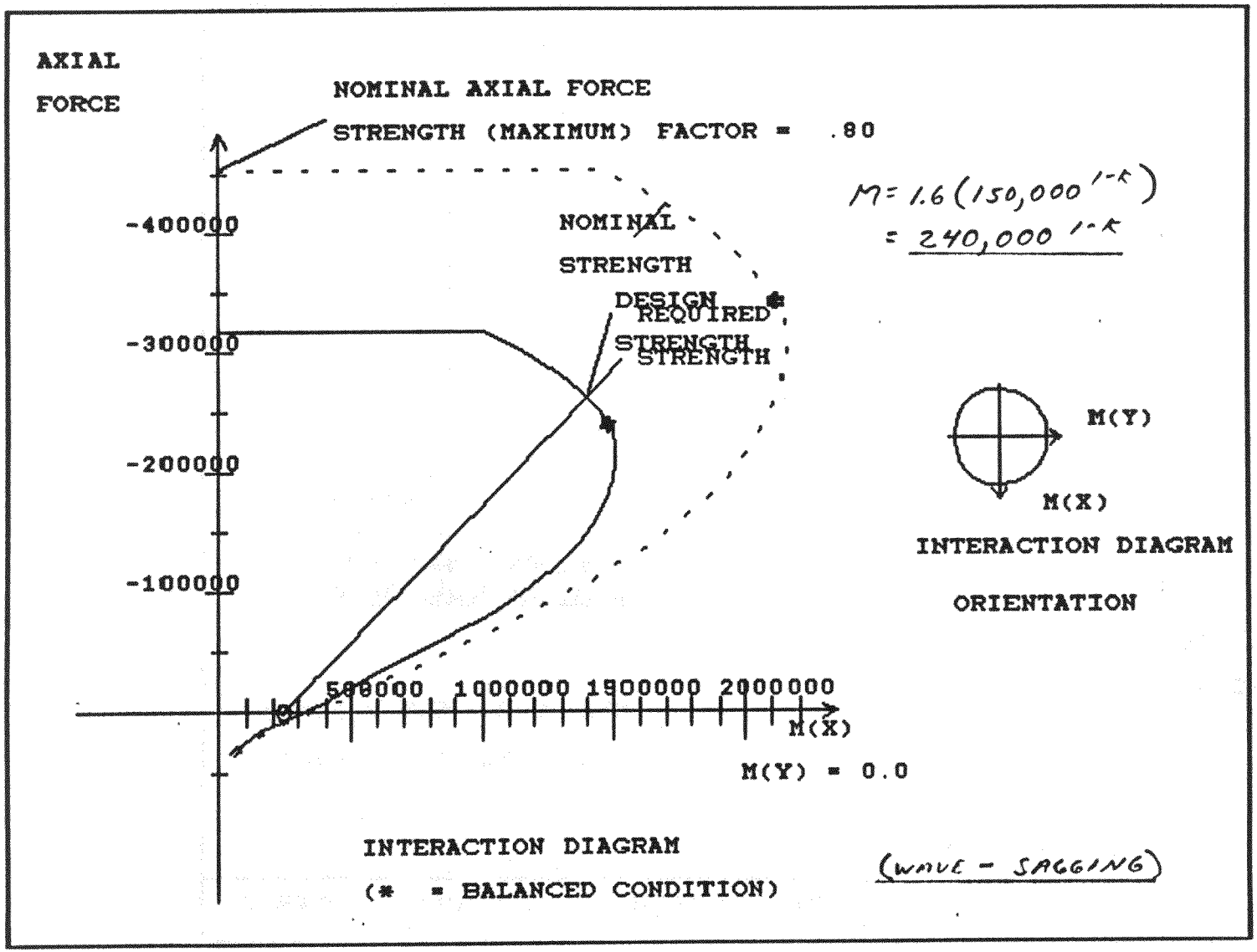
1. Assume conventional reinforcement in longitudinal direction provides the flexural strength.
2. Assume #11 @ 12" in flanges, neglect web reinforcement.
3. Due to limitations in the program CGSI (Concrete General Strength Investigation) only half the lock will be modeled.
4. No compatibility analysis will be performed to calculate the flexural strength of the section, combining prestressed and non-prestressed steel. This analysis will be performed in the design memorandum phase.
5. Load factors presented in ACI 357 shall be incorporated. Though wave loading is considered an environmental load with a corresponding load factor of 1.3, the Live Load factor of 1.6 shall be conservatively utilized.

FIG. 1. DATA INPUT CHECK



AREA OF REINFORCEMENT / GROSS AREA = .006

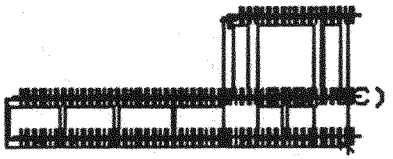
MEMBER CHAMBER SECTION TRANVERSE


AXIAL
FORCE
NOMINAL AXIAL FORCE
STRENGTH (MAXIMUM) FACTOR = .80
-400000
-300000
-200000
-100000
NOMINAL
STRENGTH
DESIGN
REQUIRED
STRENGTH
STRENGTH
500000
1000000
1500000
2000000
M(X)
M(Y) = 0.0
INTERACTION DIAGRAM
(* = BALANCED CONDITION)
M(Y)
M(X)
INTERACTION DIAGRAM
ORIENTATION
M = 1.6 (150,000 ft-k)
= 240,000 ft-k
(WAVE - SAGGING)

ACTUAL STRAINS

VS. BALANCED

(BALANCED = ...)



* MAX. CONC. STR.= .00035

\+ MAX. STEEL STR.= .00386

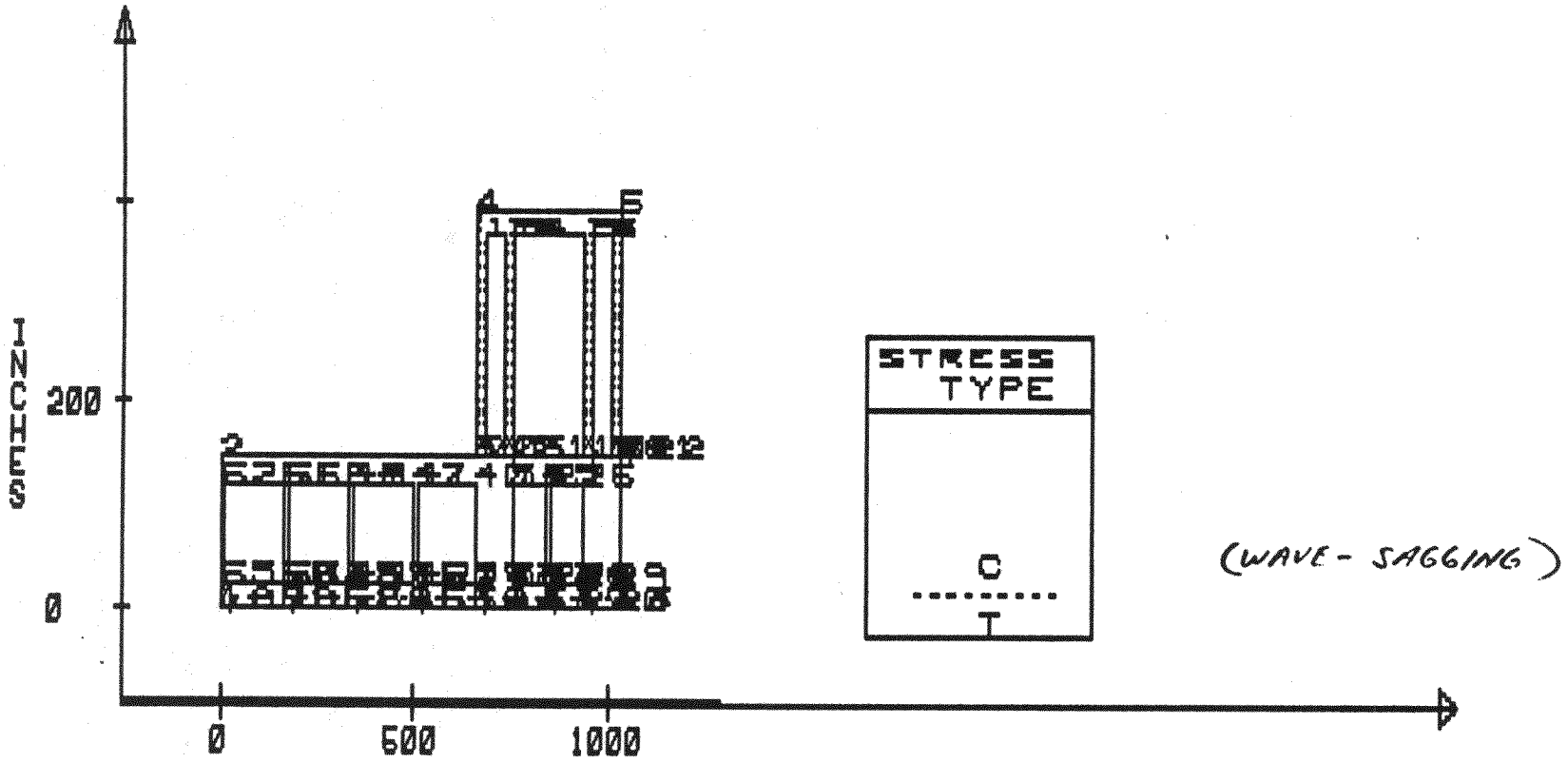


MEMBER CHAMBER SECTION TRANVERSE

PROJECT IHNC Lock	PAGE 41 OF 41	COMPUTED BY OCB	DATE 9/96
SUBJECT Chamber Monolith - Longitudinal		CHECKED BY	DATE

SERVICEABILITY REQUIREMENTS (Allowable Stress)

1. Assume conventional reinforcement in longitudinal direction provides the flexural strength.
2. Assume #11 @ 12" in flanges and at culvert walls. Neglect web reinforcement in the base slab.
3. Due to limitations in the program CGFA (Concrete General Flexure Analysis) only half the lock will be modeled.
4. Allowable stresses for reinforcing steel to control cracking presented in ACI 357 shall be utilized. (f_s = 23.0 ksi)


INCHES
200
0
0
500
1000
(INCHES)
STRESS TYPE
C
T
(WAVE - SAGGING)
----- NEUTRAL AXIS (T=TENSION, C=COMPRESSION)

```
PROGRAM CORPS/X8008   CONCRETE GENERAL FLEXURE ANALYSIS  REV 86
SHIP LOCK CHAMBER - TRANSVERSE SECTION
**  I N P U T   L O A D I N G   A N D   P A R A M E T E R S  **

LD. CASE      P    Y-AXIS MOM. X-AXIS MOM.    N     R    ACCURACY
   301       .00          .00 -1800000.00   9.20  1.00     .010

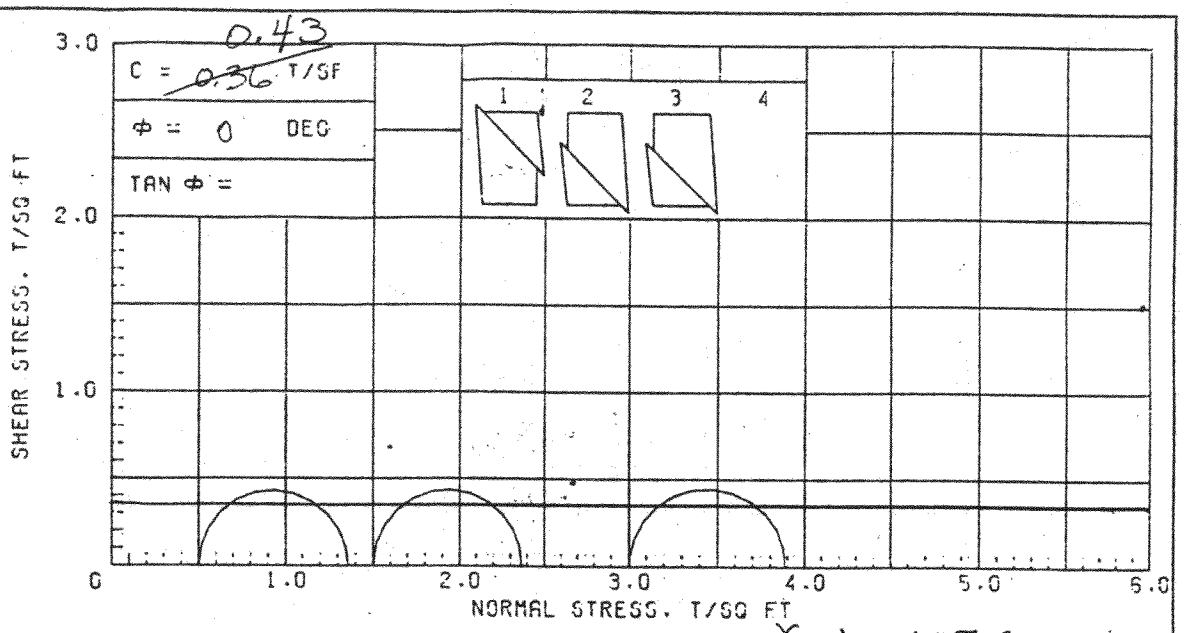
 S T R E S S   E Q U A T I O N   A N D   N E U T R A L   A X I S:

   UNIT STRESS =      .00050 X  +     -.00777 Y  +      .04745

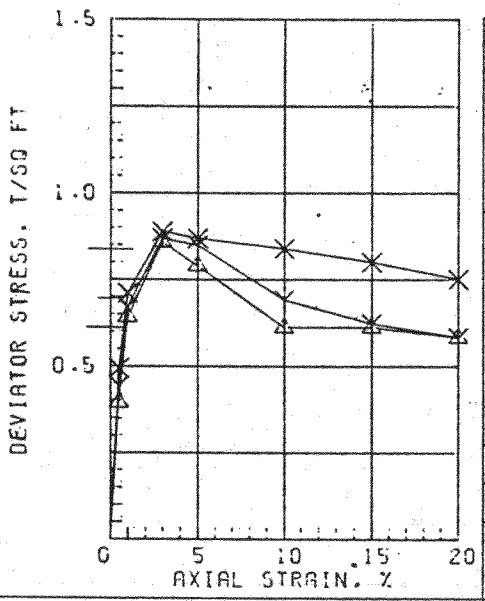
  AT Y = 0, NEUTRAL AXIS CROSSES X-AXIS AT X =   -94.233090
  AT X = 0, NEUTRAL AXIS CROSSES Y-AXIS AT Y =    6.1085330


        MAXIMUM CONCRETE STRESS =      .57 AT POINT23
        MAXIMUM STEEL STRESS    =    23.71 T
                                =     4.76 C
```

ANNEX 3
CONSOLIDATION TEST RESULTS



$\gamma_{sat.} = 107.0$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	51.2	49.9	53.7	51.6
	DRY DENSITY, PCF	70.7	72.0	69.2	70.6
	SATURATION, %	100.0	100+	100+	
	VOID RATIO	1.393	1.342	1.437	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.86	0.87	0.89	.873
TIME TO FAILURE, MIN.		5	18	18	
RATE OF STRAIN INCR, %			6	6	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS. PLASTIC CLAY (CH), GRAY

LL 88	PL 27	PI 61	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

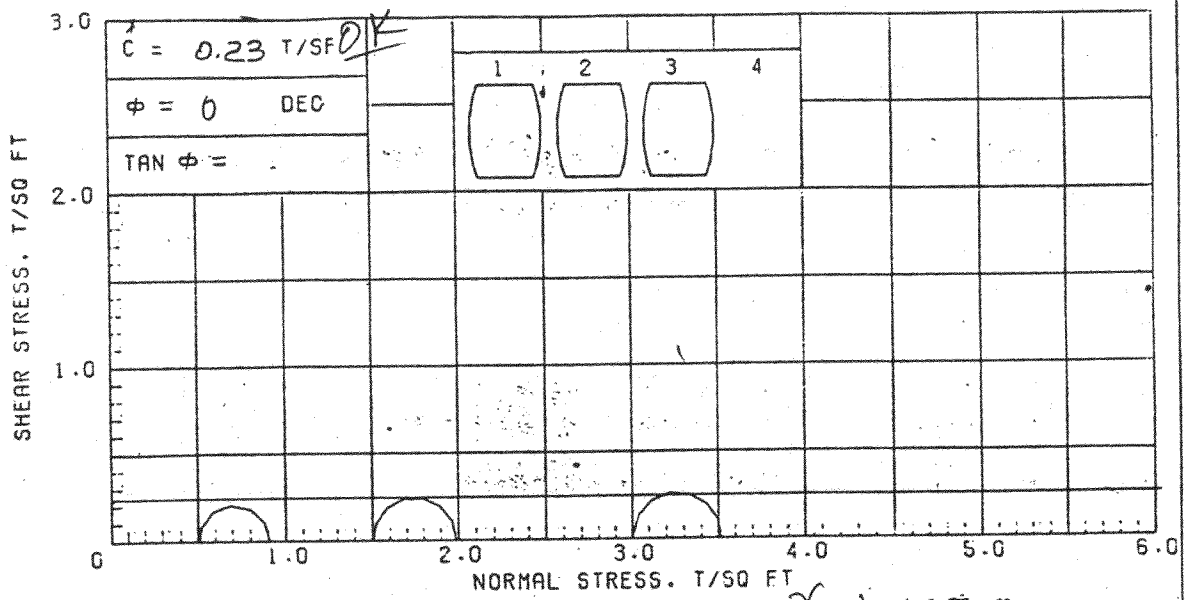
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 9-B

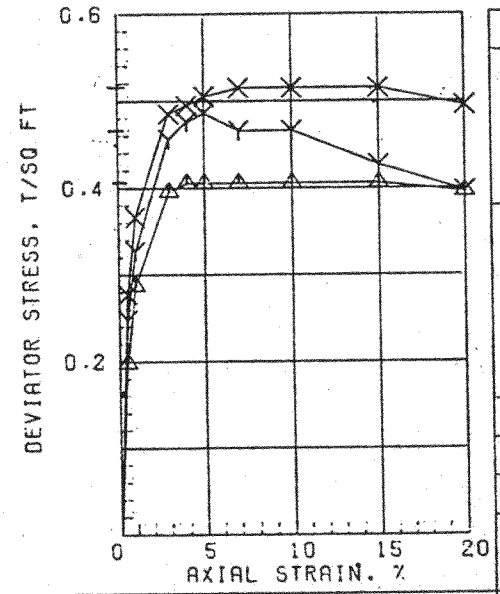
DEPTH/ELEV 28.9/-20.3 | TECH. KOC

LABORATORY USAE WES | DATE 07 JUL 91

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 107.0$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	47.8	54.9	52.1	51.6
	DRY DENSITY, PCF	73.4	67.9	70.1	70.5
	SATURATION, %	99.5	99.9	100+	
	VOID RATIO	1.297	1.484	1.404	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.40	0.49	0.51	.467
TIME TO FAILURE, MIN.		8	10	14	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 79	PL 27	PI 52	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.O.-NEW SHIPLOCK

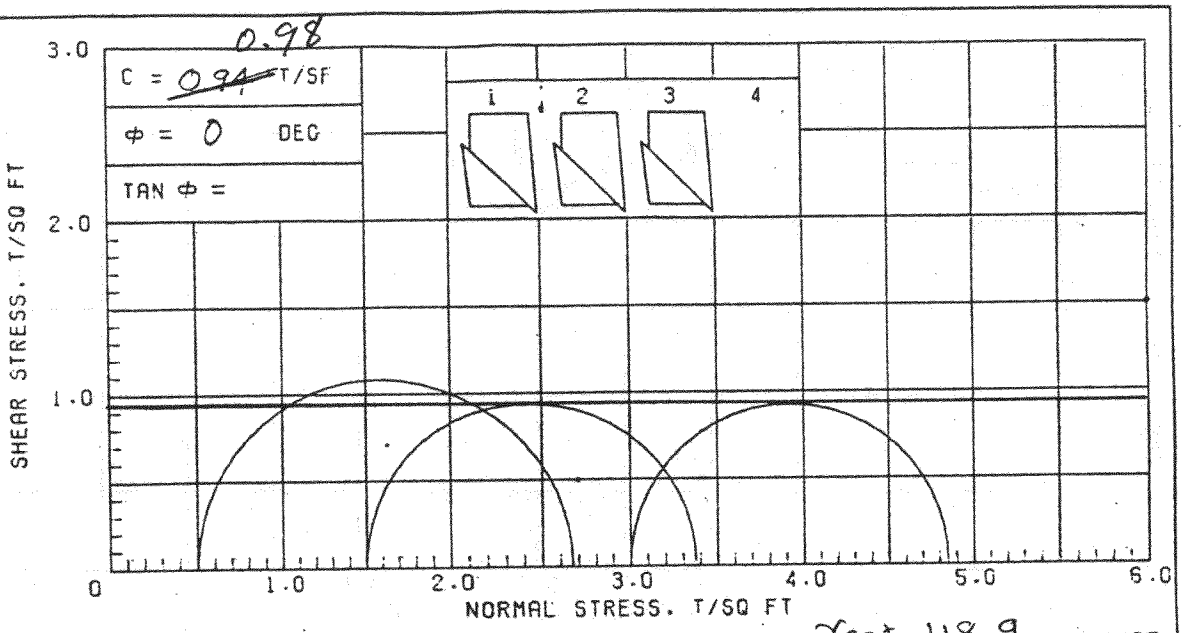
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 13-D

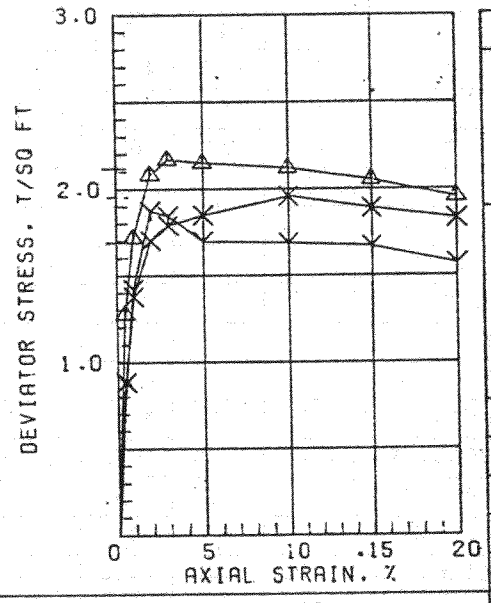
DEPTH/ELEV 50.9/-42.3 | TECH. KOC

LABORATORY USAE-WES | DATE 07 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 118.9$ AVG



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT. %	32.6	33.5	34.1	33.4
	DRY DENSITY. PCF	89.8	89.0	88.4	89.1
	SATURATION. %	100+	100+	100+	
	VOID RATIO	0.877	0.894	0.907	
BEFORE SHEAR	WATER CONTENT. %				
	DRY DENSITY. PCF				
	SATURATION. %				
	VOID RATIO				
	BACK PRESS.. TSF				
MIN PRIN. STRESS. TSF		0.5	1.5	3.0	
MAX. DEV. STRESS. TSF		2.17	1.87	1.85	1.963
TIME TO FAILURE. MIN.		6	12	29	
RATE OF STRAIN INCR.%			6	6	
INITIAL DIAMETER. IN.		1.41	1.41	1.41	
INITIAL HEIGHT. IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH). GRAY & BROWN MOTTLED

LL 57	PL 26	PI 31	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

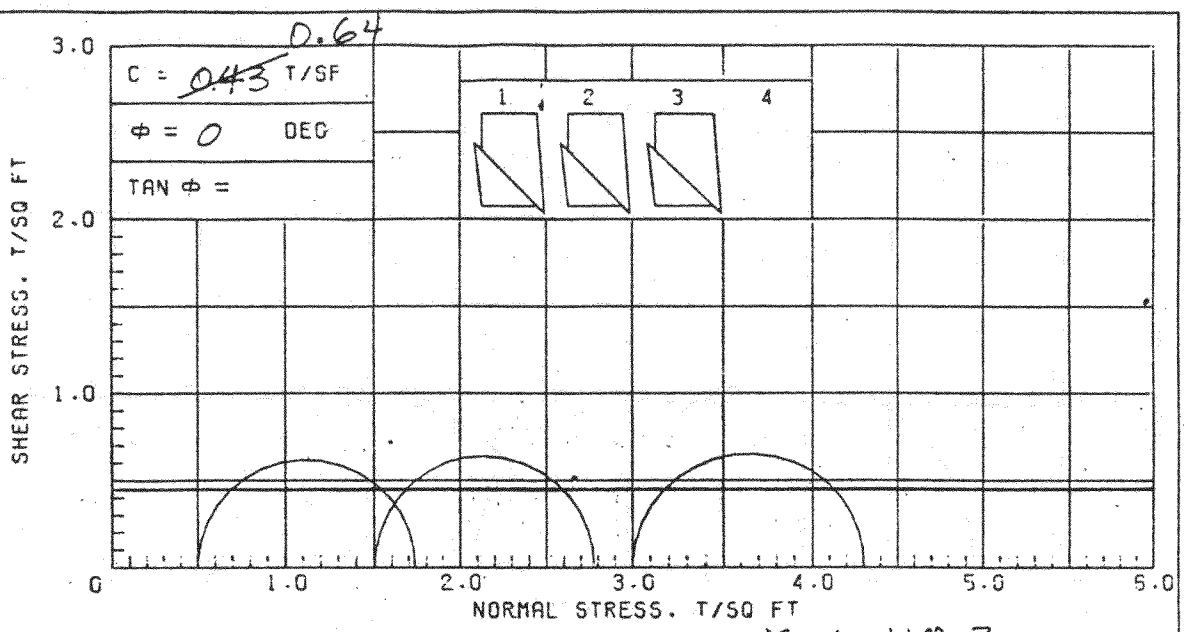
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 22-C

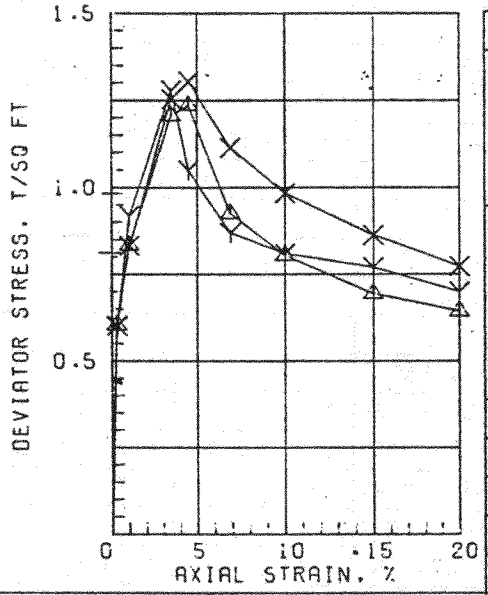
DEPTH/ELEV 85.9/-77.3 | TECH. KOC

LABORATORY USAE WES | DATE 07 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 110.3$ AVG.



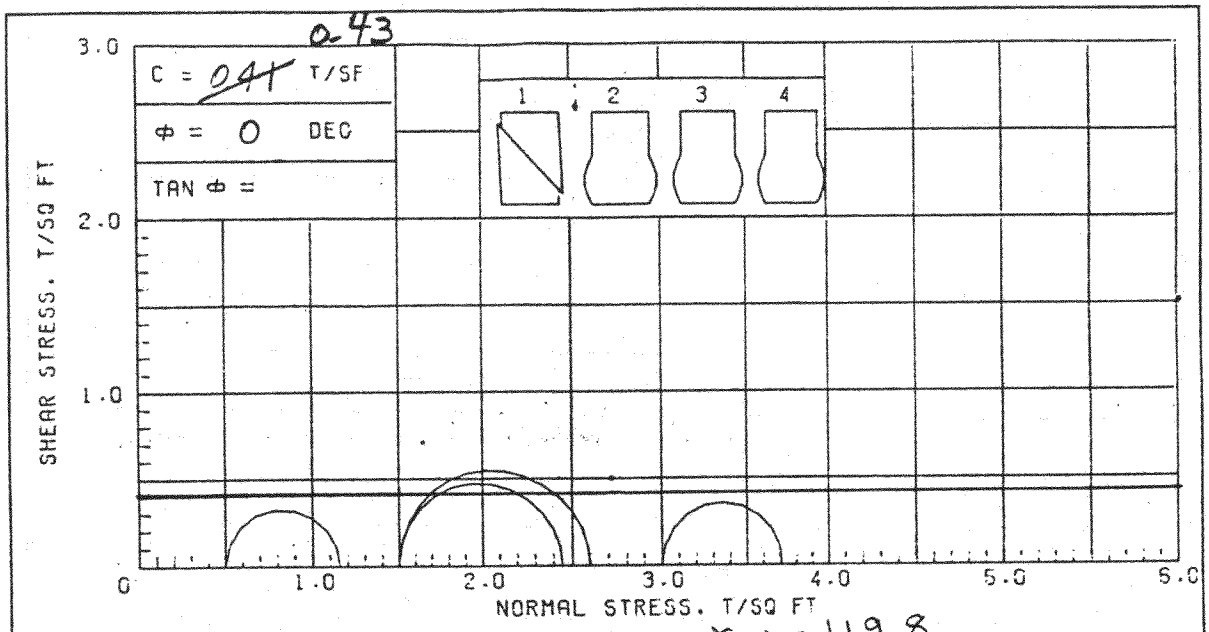
SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	45.6	47.2	45.6	46.1
	DRY DENSITY, PCF	75.9	74.9	75.8	75.5
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.220	1.250	1.224	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.24	1.28	1.30	1.273
TIME TO FAILURE, MIN.		29	19	25	
RATE OF STRAIN INCR.%		5	4	7	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

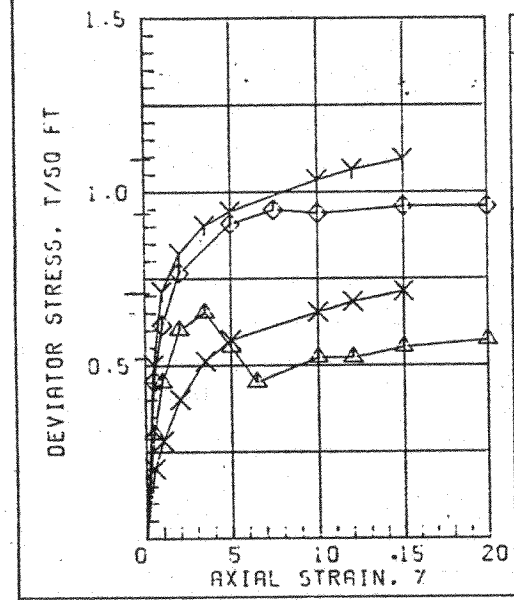
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 73	PL 24	PI 49	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT M.R.C.O.-NEW SHIPLOCK	
	IHNC SITE	
	BORING NO. 2-IU	SAMPLE NO. 28-D
	DEPTH/ELEV 111.3/-102.7	TECH. WJH
	LABORATORY USAE WES	DATE 07 JUL 81
	TRIAXIAL COMPRESSION TEST REPORT	



γ_{sat} = 119.8



SPECIMEN NO.		Δ1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	31.4	30.2	30.1	32.4
	DRY DENSITY, PCF	90.2	92.4	92.3	89.3
	SATURATION, %	97.6	98.8	98.3	98.6
	VOID RATIO	0.863	0.825	0.827	0.897
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5
MAX. DEV. STRESS, TSF		0.65	1.09	0.71	0.95
TIME TO FAILURE, MIN.		11	50	71	25
RATE OF STRAIN INCR.%		5			
INITIAL DIAMETER, IN.		1.40	1.40	1.40	1.39
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

AVG, 31.0, 91.1, .85

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL 38	PL 19	PI 19	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.O.-NEW SHIPLOCK

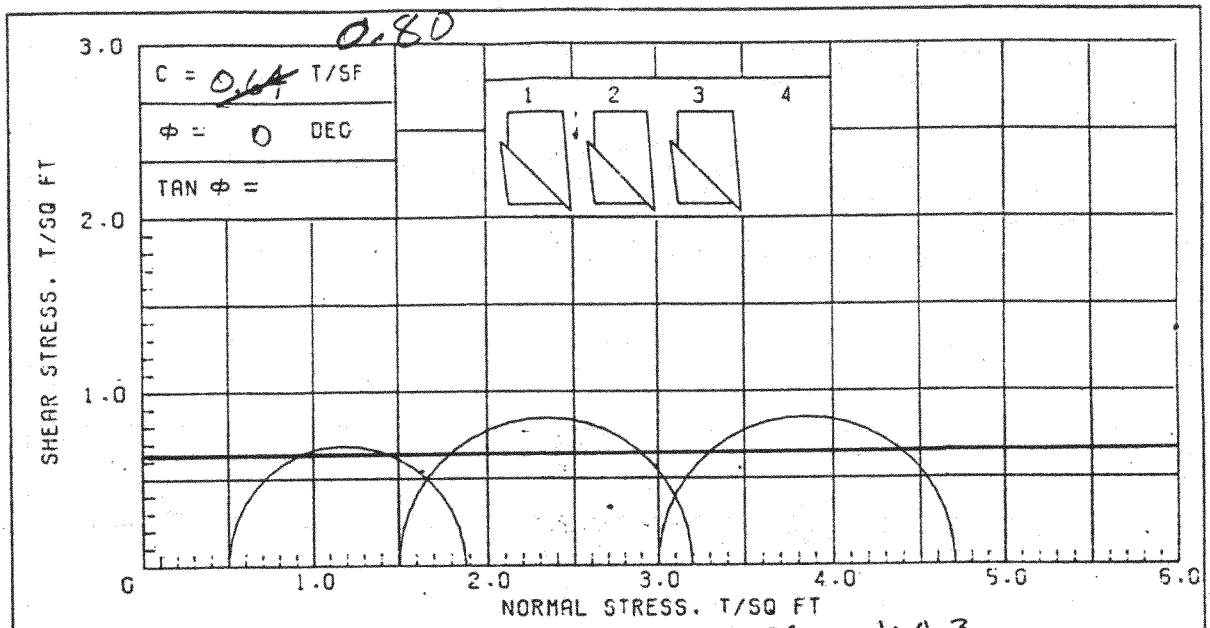
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 34-D

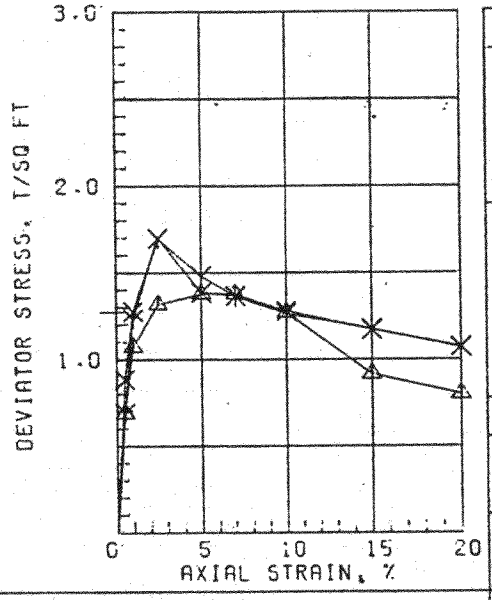
DEPTH/ELEV 135.2/-126.6 | TECH. WJH

LABORATORY USAE WES | DATE 07 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 114.3$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	37.9	40.4	37.2	38.5
	DRY DENSITY, PCF	83.0	79.9	83.9	82.3
	SATURATION, %	99.2	98.4	99.5	
	VOID RATIO	1.032	1.109	1.008	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	.
MAX. DEV. STRESS, TSF		1.39	1.70	1.70	1.593
TIME TO FAILURE, MIN.		10	5	15	
RATE OF STRAIN INCR.%				6	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	.
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 63	PL 22	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

IHNC SITE

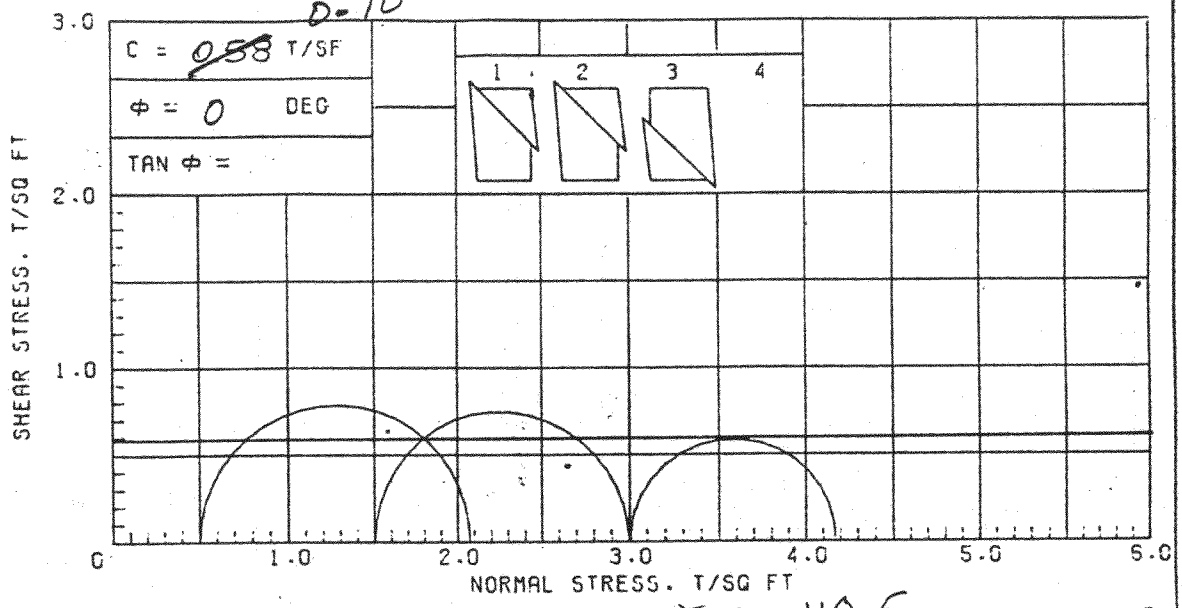
BORING NO. 2-IU | SAMPLE NO. 40-D

DEPTH/ELEV 159.3/-150.7 | TECH. KOC

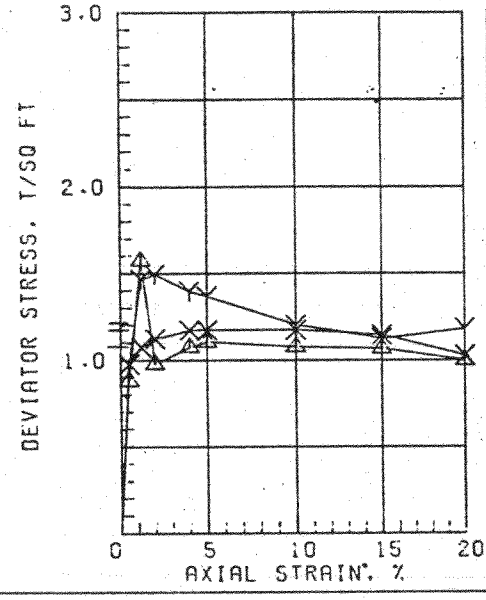
LABORATORY USAE WES | DATE 09 JUL 81

TRIAXIAL COMPRESSION TEST REPORT

D-70



σ_{sat} = 110.5



SPECIMEN NO.		Δ1	Y2	X3	4 AVG.
INITIAL	WATER CONTENT, %	45.7	45.1	44.9	45.2
	DRY DENSITY, PCF	75.7	76.5	76.1	76.1
	SATURATION, %	100+	100+	99.7	
	VOID RATIO	1.227	1.203	1.215	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.57	1.49	1.17	1.410
TIME TO FAILURE, MIN.		2	12	32	
RATE OF STRAIN INCR, %			6	5	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 86	PL 27	PI 59	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

IHNC SITE

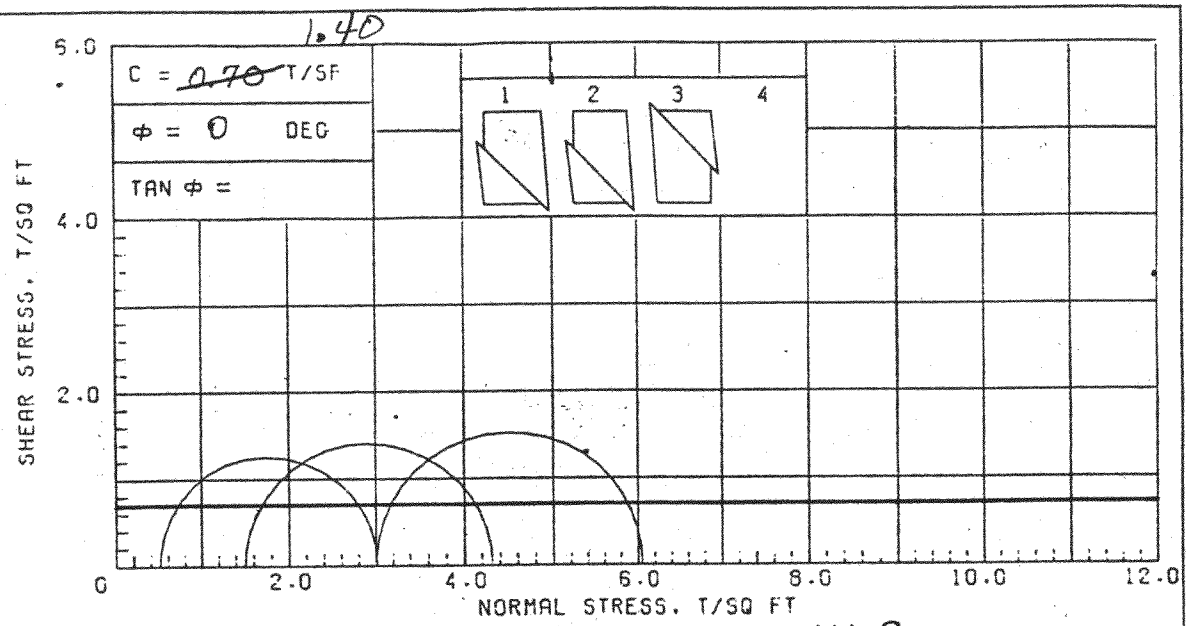
BORING NO. 2-IU | SAMPLE NO. 52-D

DEPTH/ELEV 207.3/-198.7 | TECH. KOC

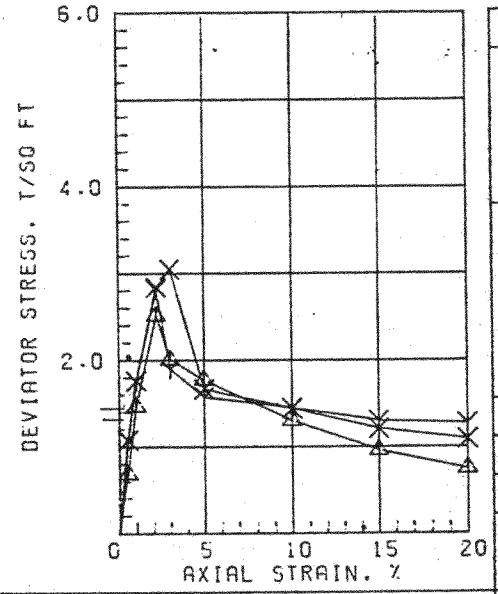
LABORATORY USAE WES | DATE 08 JUL 81

TRIAXIAL COMPRESSION TEST REPORT

1.40



$\gamma_{sat} = 111.8$



SPECIMEN NO.		Δ1	Y2	X3	AVG 4
INITIAL	WATER CONTENT, %	40.7	44.5	45.9	43.7
	DRY DENSITY, PCF	79.8	77.1	76.1	77.7
	SATURATION, %	99.7	100+	100+	
	VOID RATIO	1.114	1.187	1.215	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.51	2.82	3.05	2.793
TIME TO FAILURE, MIN.		4	13	18	
RATE OF STRAIN INCR.%			5	5	
INITIAL DIAMETER, IN.		1.42	1.42	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 75	PL 23	PI 52	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.D.-NEW SHIPLOCK

IHNC SITE

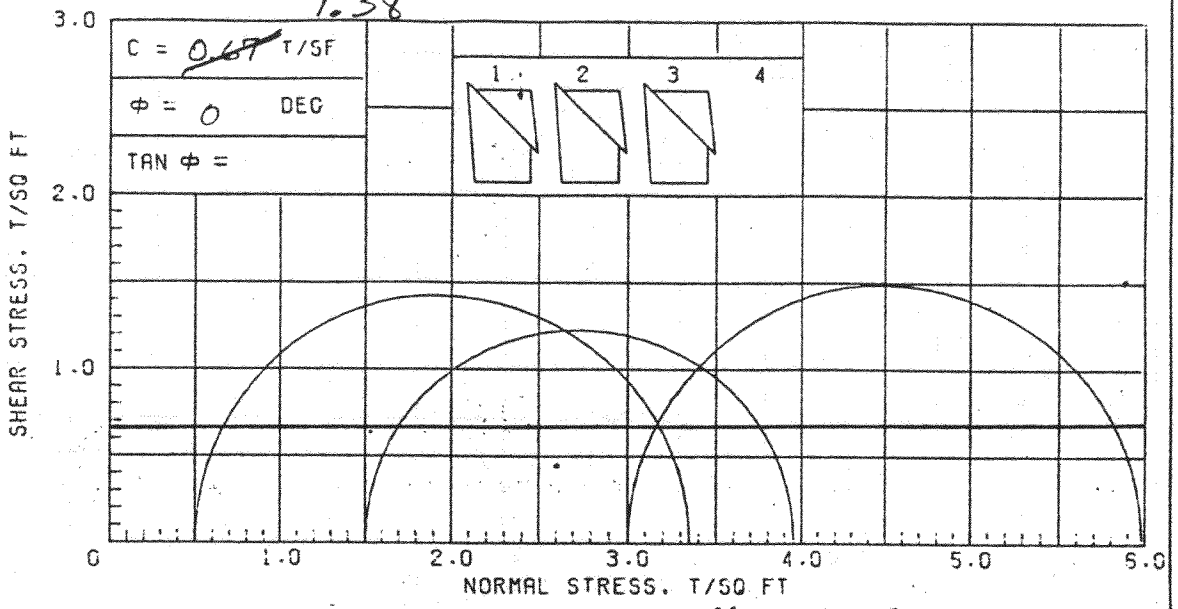
BORING NO. 2-IU | SAMPLE NO. 55-C

DEPTH/ELEV 217.9/-209.3 | TECH. KOC

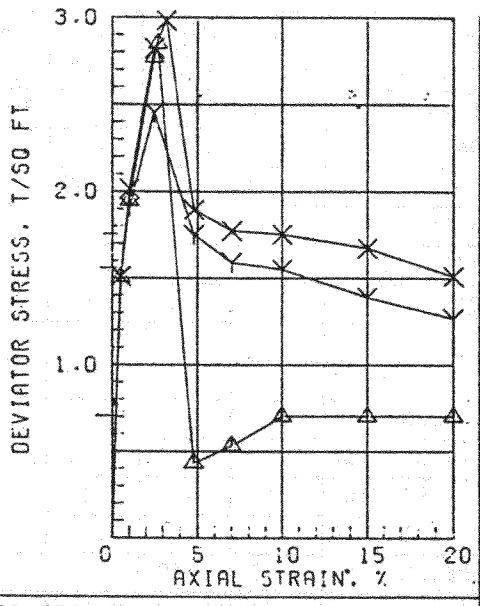
LABORATORY USAE WES | DATE 08 JUL 91

TRIAXIAL COMPRESSION TEST REPORT

1.38



γ_{sat} = 111.0 AVG



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	45.0	44.8	44.3	44.7
	DRY DENSITY, PCF	76.5	76.6	77.1	76.7
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.205	1.202	1.188	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.85	2.45	2.98	2.76
TIME TO FAILURE, MIN.		12	11	10	
RATE OF STRAIN INCR.%		4	4	4	
INITIAL DIAMETER, IN.		1.40	1.40	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SLICKENSIDED

LL 81	PL 30	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

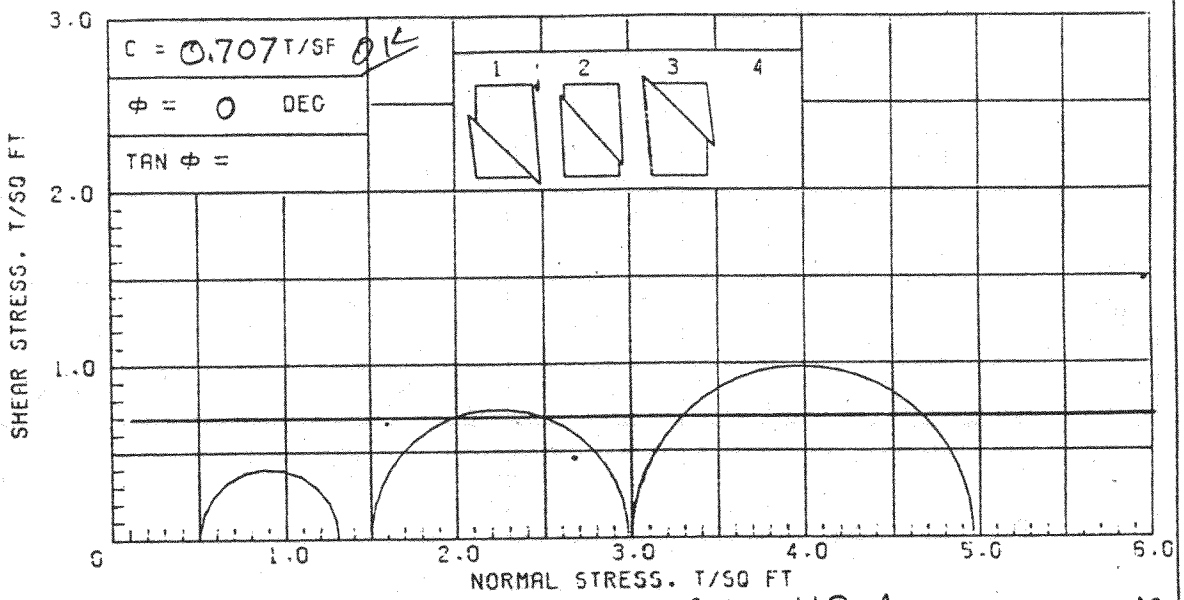
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 58-C

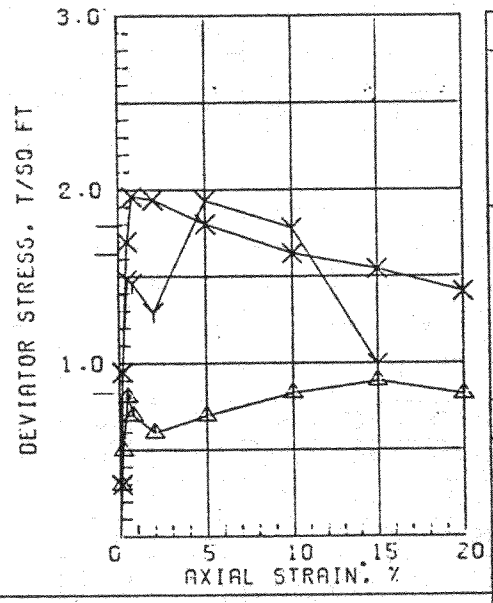
DEPTH/ELEV 230.4/-221.8 | TECH. WJH

LABORATORY USAE WES | DATE 07 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 112.4$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	42.6	42.6	42.3	42.5
	DRY DENSITY, PCF	79.0	78.7	79.0	78.9
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.134	1.141	1.135	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.81	1.48	1.96	1.42
TIME TO FAILURE, MIN.		3	8	14	
RATE OF STRAIN INCR.%		1	1	2	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SLICKENSIDED

LL 78	PL 31	PI 47	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.O.-NEW SHIPLOCK

IHNC SITE

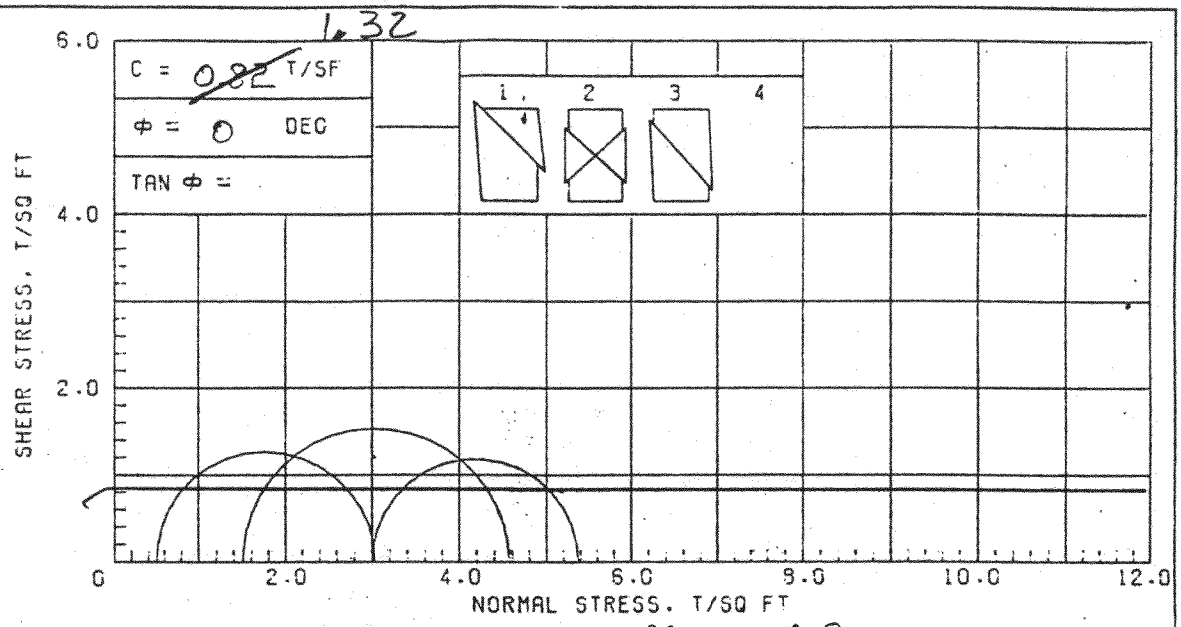
BORING NO. 2-IU | SAMPLE NO. 65-B

DEPTH/ELEV 257.5/-248.9 | TECH. WJH

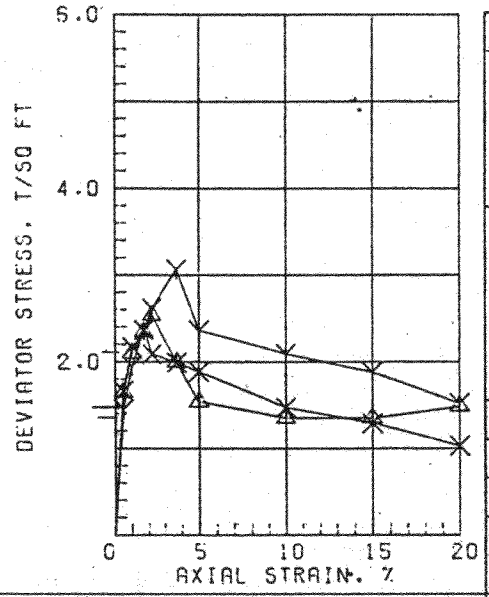
LABORATORY USAE WES | DATE 09 JUL 81

TRIAXIAL COMPRESSION TEST REPORT

1.32



γ_{sat} = 114.2 AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	39.4	39.8	39.8	39.7
	DRY DENSITY, PCF	81.6	81.7	81.8	81.7
	SATURATION, %	99.9	100+	100+	
	VOID RATIO	1.066	1.063	1.060	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.53	3.06	2.37	2.653
TIME TO FAILURE, MIN.		17	30	9	
RATE OF STRAIN INCR.%		3	5	3	
INITIAL DIAMETER, IN.		1.40	1.40	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES, SLICKENSIDED

LL 75	PL 25	PI 50	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

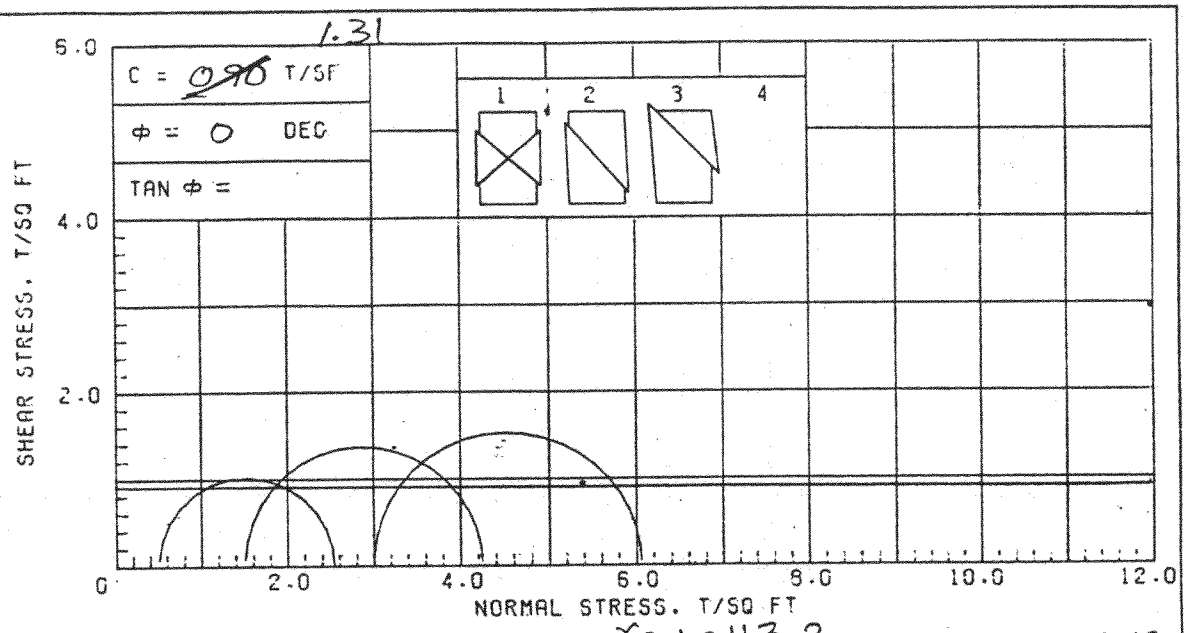
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 67-C

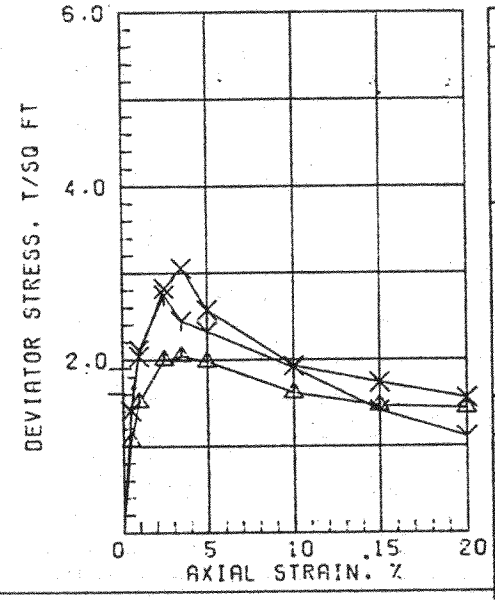
DEPTH/ELEV 265.8/-257.2 | TECH. WJH

LABORATORY USAE WES | DATE 09 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 113.2$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	40.2	40.9	40.2	40.4
	DRY DENSITY, PCF	80.6	80.3	80.9	80.6
	SATURATION, %	93.5	100+	100+	
	VOID RATIO	1.090	1.100	1.093	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.04	2.75	3.06	2.617
TIME TO FAILURE, MIN.		17	19	16	
RATE OF STRAIN INCR.%		5	4	5	
INITIAL DIAMETER, IN.		1.39	1.40	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 75	PL 28	PI 47	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O.-NEW SHIPLOCK

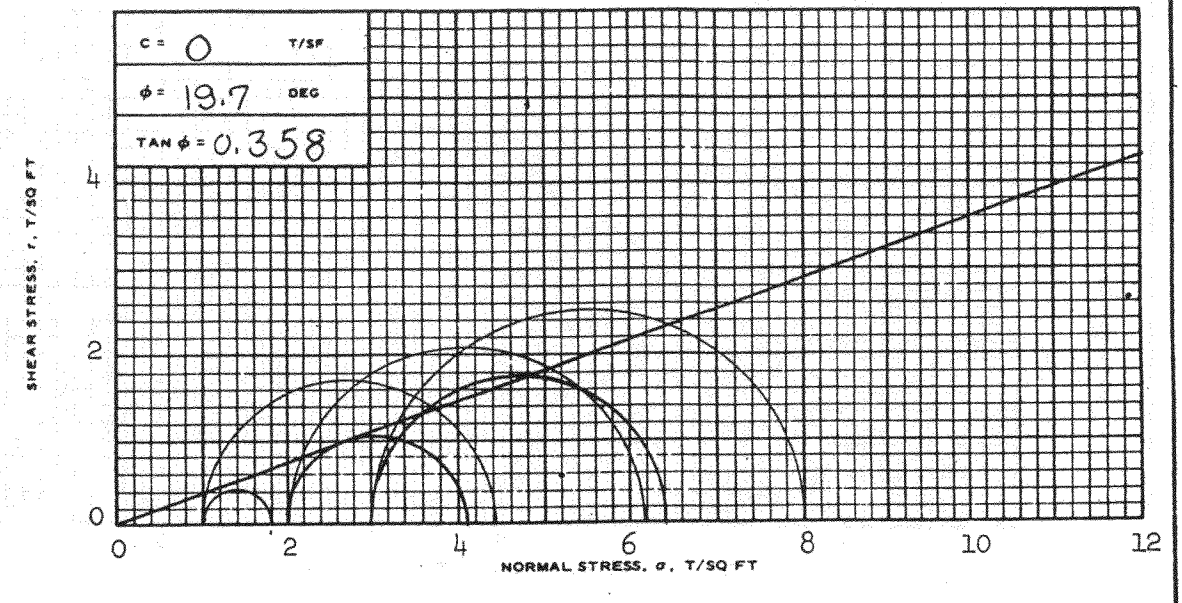
IHNC SITE

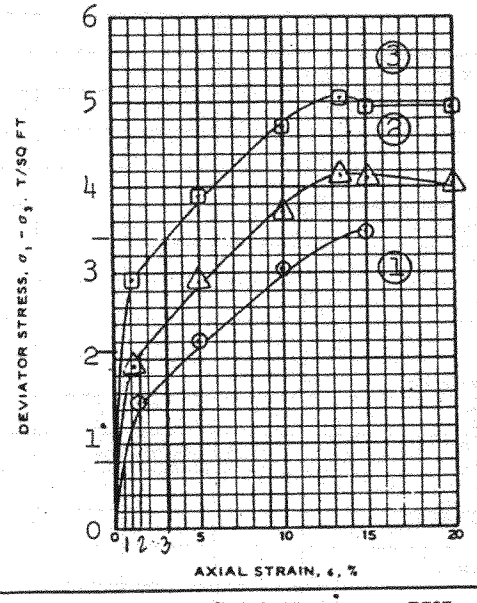
BORING NO. 2-IU | SAMPLE NO. 70-B

DEPTH/ELEV 276.9/-268.3 | TECH. WJH

LABORATORY USAE WES | DATE 09 JUL 81

TRIAXIAL COMPRESSION TEST REPORT





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	29.7	30.7	29.5
	DRY DENSITY LB/CU FT	γ_{d_o}	94.2	92.0	94.5
	SATURATION, %	S_o	100+	100+	100+
	VOID RATIO	e_o	0.776	0.818	0.771
BEFORE SHEAR	WATER CONTENT, %	w_c	28.3	28.1	27.4
	DRY DENSITY LB/CU FT	γ_{d_c}	95.0	93.1	96.1
	SATURATION, %	S_c	99.8	94.5*	99.0
	VOID RATIO	e_c	0.760	0.797	0.741
	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	3.46	4.16	5.03
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	1154	1031	1031
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$			
INITIAL DIAMETER, IN.		D_o	1.36	1.37	1.37
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS SILT (ML), GRAY

LL	PL	PI	Gs 2.68(EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST $\bar{R}$

REMARKS: *PORE PRESSURE RESPONSE INDICATED 100% SATURATION

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE

BORING NO. 2-IU SAMPLE NO. 21B

DEPTH/ELEV 81.0/-72.4

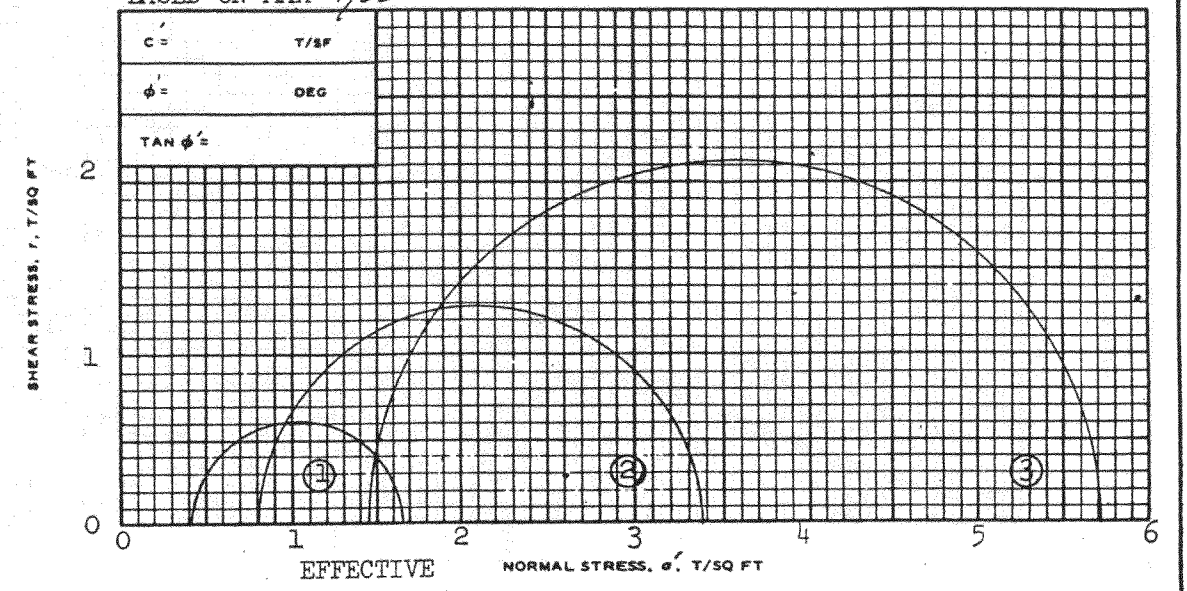
LABORATORY USAEWES DATE 13 JUNE 1981

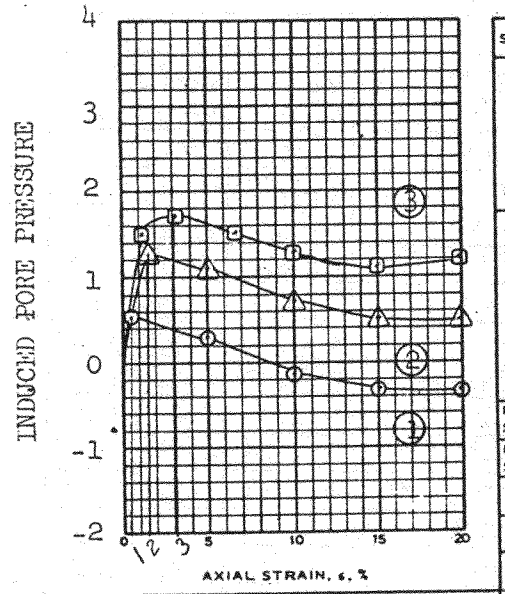
SHEET 1 OF 2 JMS

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

BASED ON MAX σ_1'/σ_3'





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.42	0.81	1.45	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.22	2.56	4.26	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK

IHNC SITE

BORING NO. 2-IU SAMPLE NO. 21-B

DEPTH/ELEV 81.0/-72.4

LABORATORY USAEWES DATE 13 JUNE 1981

SHEET 2 OF 2

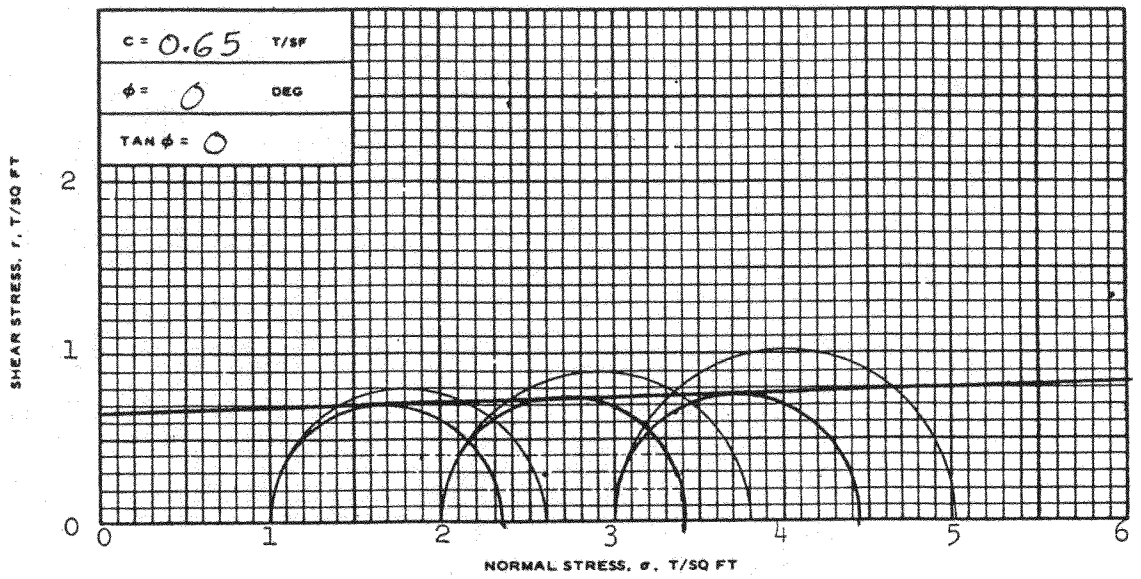
JMS

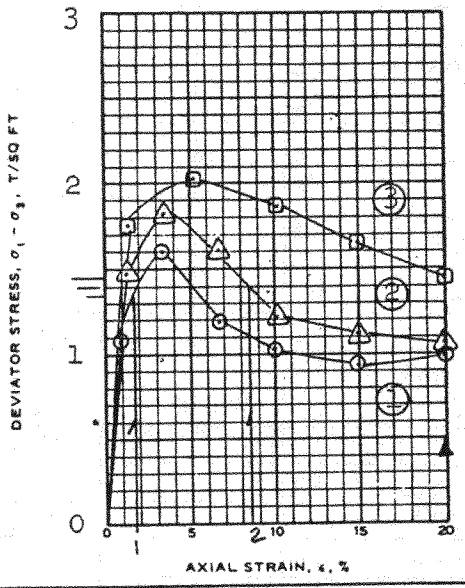
TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

(EM 1110-2-1906)





SPECIMEN NO.			1	2	3
INITIAL	WATER CONTENT, %	w_o	47.5	48.0	46.4
	DRY DENSITY LB/CU FT	γ_{d_o}	74.0	73.0	74.7
	SATURATION, %	S_o	99.7	98.4	99.2
	VOID RATIO	e_o	1.296	1.327	1.272
BEFORE SHEAR	WATER CONTENT, %	w_c	48.9	48.1	44.2
	DRY DENSITY LB/CU FT	γ_{d_c}	74.6	74.5	77.8
	SATURATION, %	S_c	100+	100+	100+
	VOID RATIO	e_c	1.277	1.279	1.182
	FINAL BACK PRESSURE, T/SQ FT	u_o	4.32	4.32	4.32
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.60	1.81	2.01
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	236	243	364
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$			
INITIAL DIAMETER, IN.		D_o	1.40	1.41	1.40
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY (CH), GRAY

LL 75 | PL 26 | PI 49 | G_s 2.72(EST) | TYPE OF SPECIMEN UNDISTURBED | TYPE OF TEST R

REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE

BORING NO. 2-IU | SAMPLE NO. 30-B

DEPTH/ELEV 117.5/-108.9

LABORATORY USAEWES | DATE 16 JUNE 1981

SHEET 1 OF 2

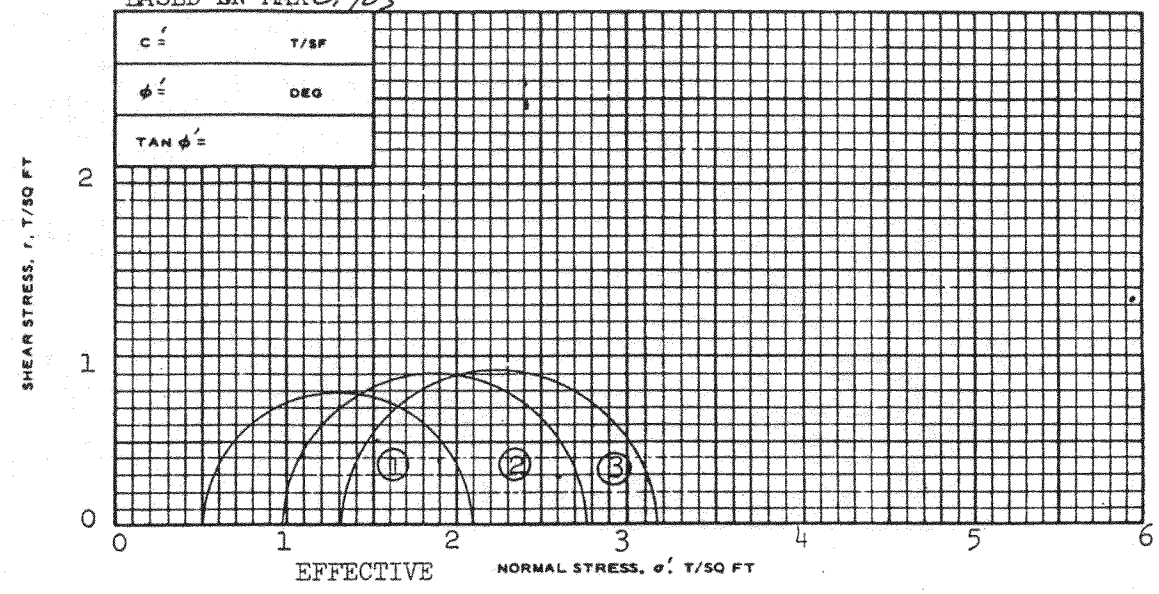
JMS TRIAXIAL COMPRESSION TEST REPORT

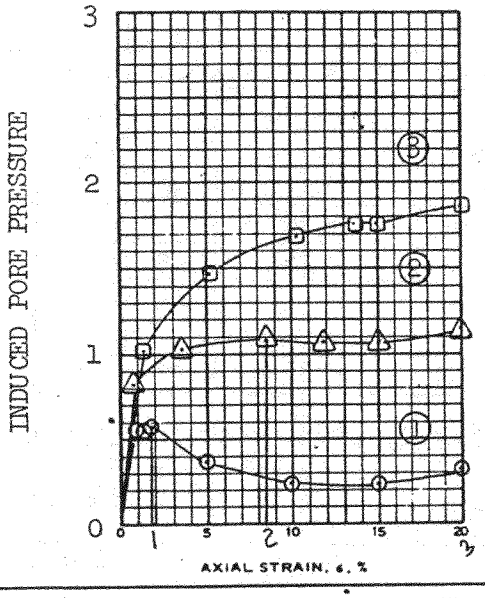
ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE

TRANSLUCENT

(EM 1110-2-1906)

BASED ON MAX σ_1'/σ_3'





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.50	0.97	1.31	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.60	1.81	1.86	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE

BORING NO. 2-IU SAMPLE NO. 30-B

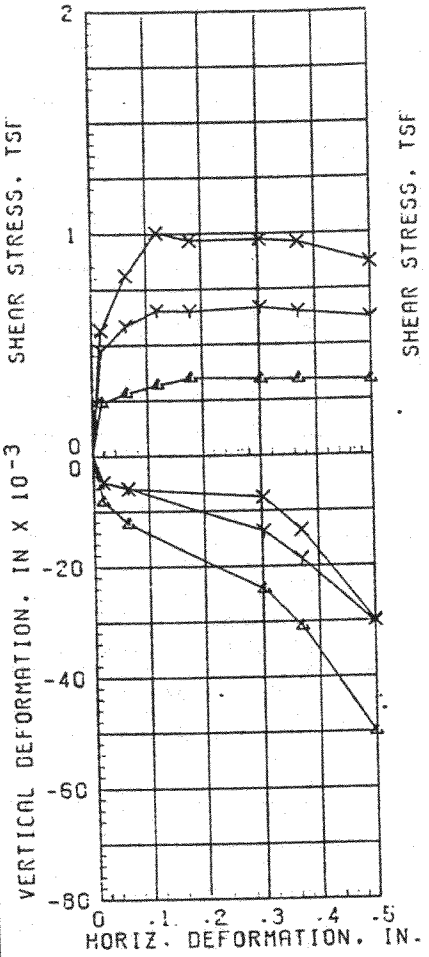
DEPTH/ELEV 117.5/-108.9

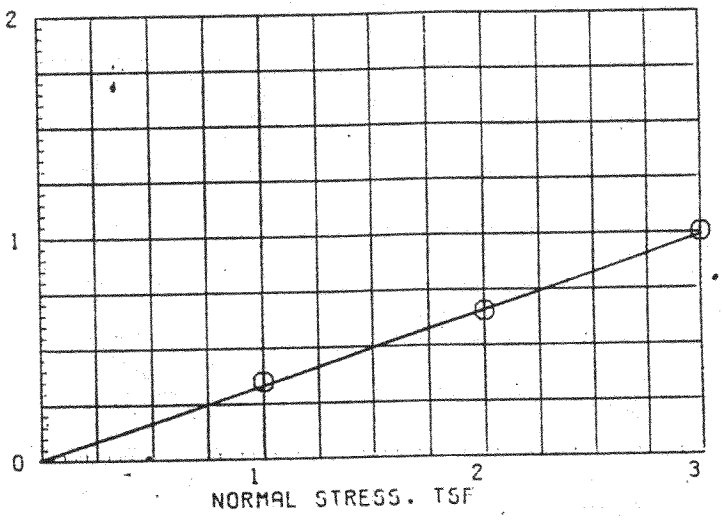
LABORATORY USAEWES DATE 16 JUNE 1981

SHEET 2 OF 2

JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)





Φ = 18.57

TAN Φ = 0.336

C = _____

TEST NO.		1 △	2 Y	3 X	
INITAL	WATER CONTENT, %	22.0	22.9	21.3	
	VOID RATIO	0.581	0.709	0.670	
	SATURATION, %	95.7	86.0	84.8	
	DRY DENSITY, PCF	98.7	97.1	99.4	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	19.3	19.2	22.2	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF		0.35	0.65	1.00	
TIME TO FAILURE, MIN		920	613	613	
RATE OF STRAIN, IN/MIN		.00020	.00020	.00020	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED | 3.00 IN. SQUARE | 0.584 IN. THICK

CLASSIFICATION SILTY SAND (SM), GRAY

LL	PL	PI		OS 2-66 (EST)

REMARKS.

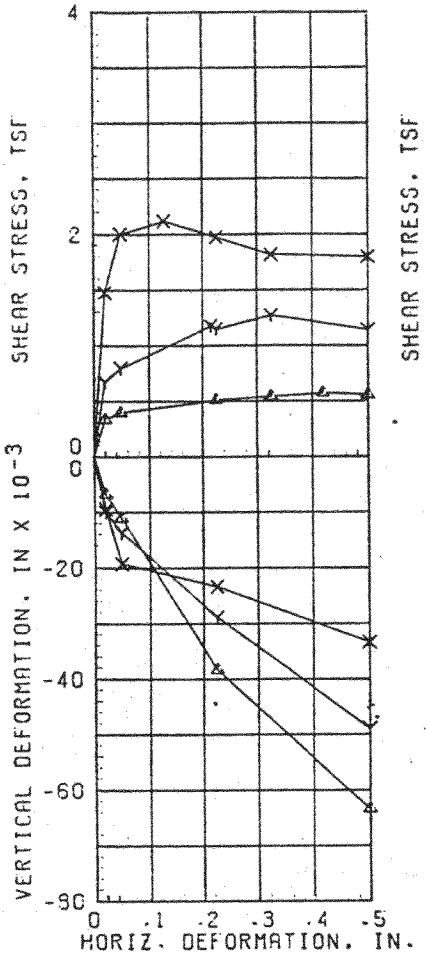
PROJECT M.R.G.O. - NEW SHIPLOCK

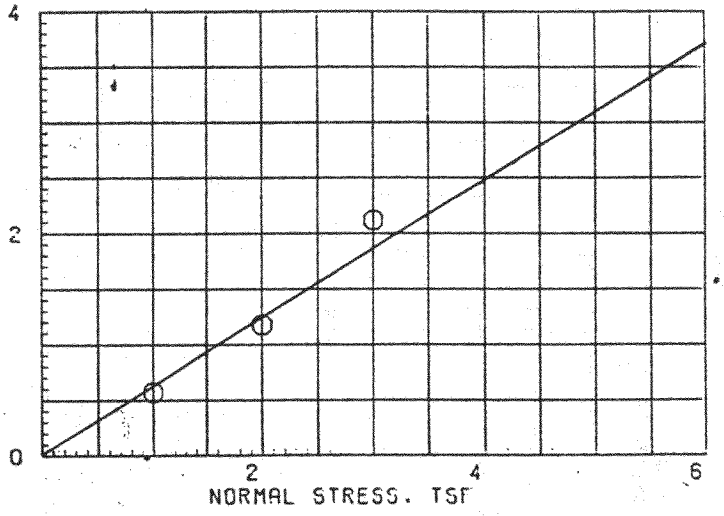
IHNC SITE

BORING NO. 2-10 | SAMPLE 10-C

DEPTH/ELEV 73.9/-65.2 | DATE 11 AUG 81

DIRECT SHEAR TEST REPORT





Φ = 31.89

TAN Φ = 0.6222

C = _____

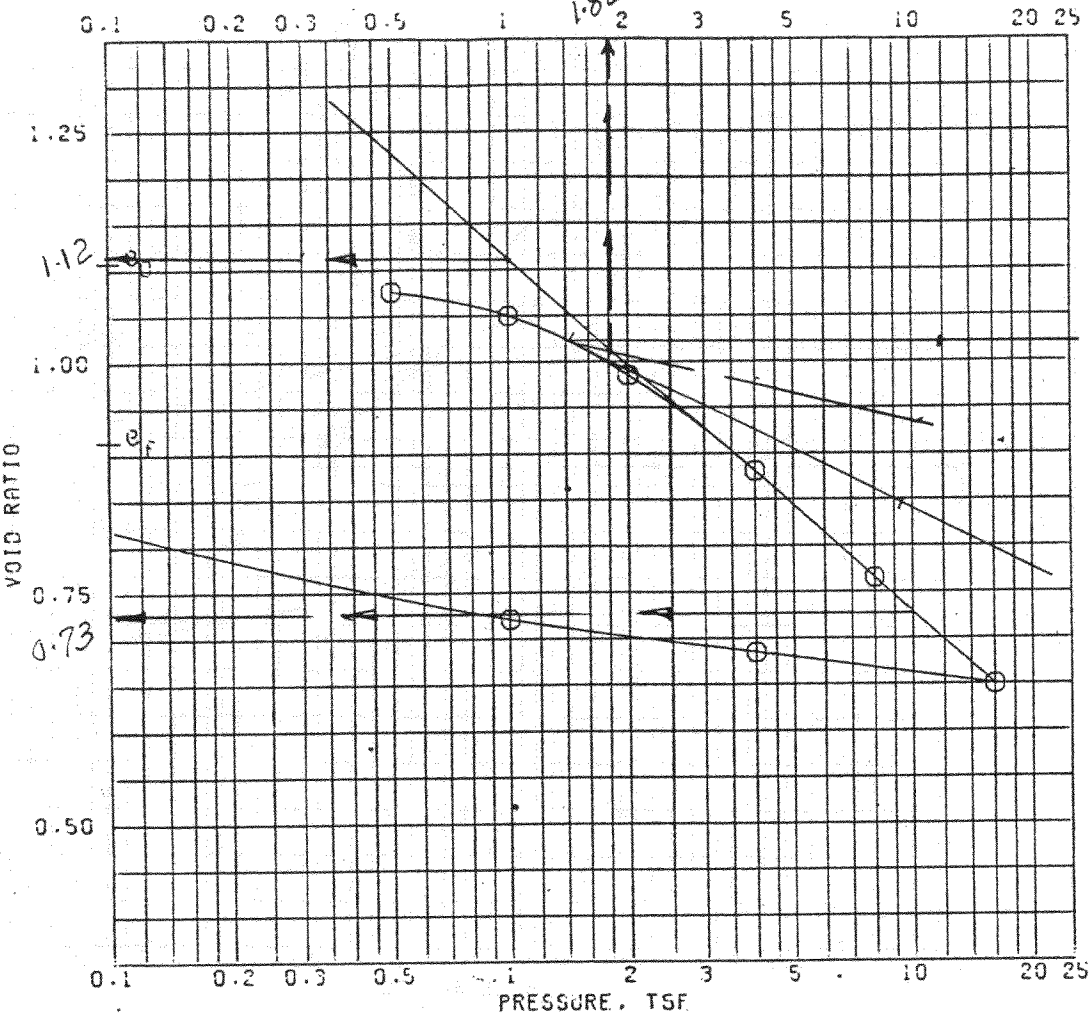
TEST NO.		1 △	2 Y	3 X	
INITAL	WATER CONTENT, %	25.1	25.1	25.4	
	VOID RATIO	0.824	0.826	0.864	
	SATURATION, %	84.7	84.6	81.9	
	DRY DENSITY, PCF	91.7	91.6	89.7	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	29.4	27.4	25.5	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF		0.57	1.18	2.12	
TIME TO FAILURE, MIN		2317	1192	706	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	0.584 IN. THICK
CLASSIFICATION SILT (ML), GRAY		

LL	PL	PI		GS 2.68 (EST)

REMARKS:	PROJECT M.R.C.O. – NEW SHIPLOCK	
	IHNC SITE	
	BORING NO. 2-1U	SAMPLE 25-C
	DEPTH/ELEV 97.7/-89.1	DATE 07 AUG 81

DIRECT SHEAR TEST REPORT

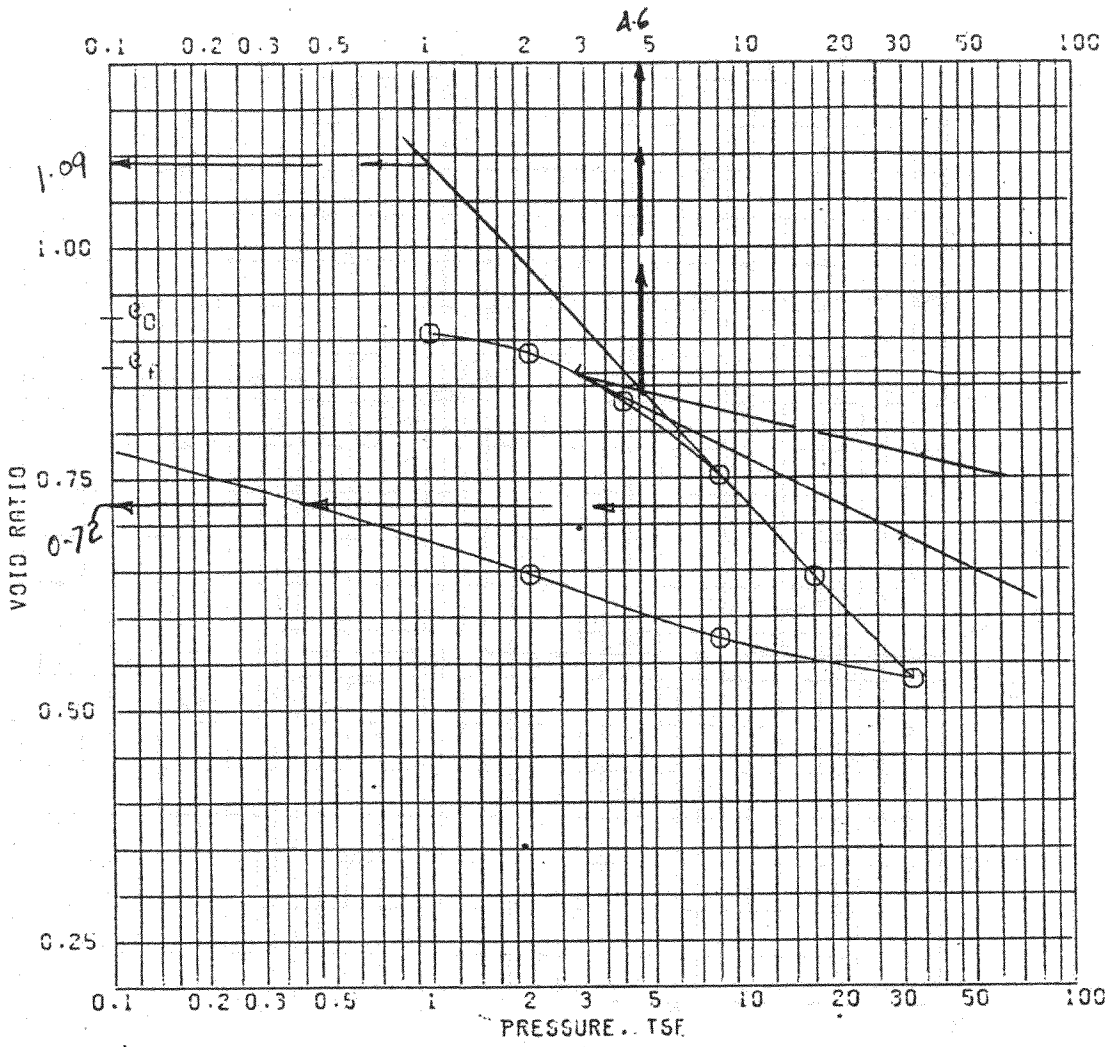


1.12 / 0.73 / .39

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	37.7	34.0
PRECONSOL. PRESSURE, TSF	1.82	DRY DENSITY, PCF	90.0	99.2
COMPRESSION INDEX	0.39	SATURATION, %	92.1	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.105	0.912
DIA. IN 4.44	HT. IN 1.119	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 61	PL 22	PI 39	PROJECT M.R.G.O. - NEW SHIPLOCK
OS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV. -18.6		BORING NO. 2-10	SAMPLE NO. 7-D
PC = 1.82		DEPTH/ELEV 27.2/-18.6	DATE 07 OCT 91
Cc = 0.39		CONSOLIDATION TEST REPORT	



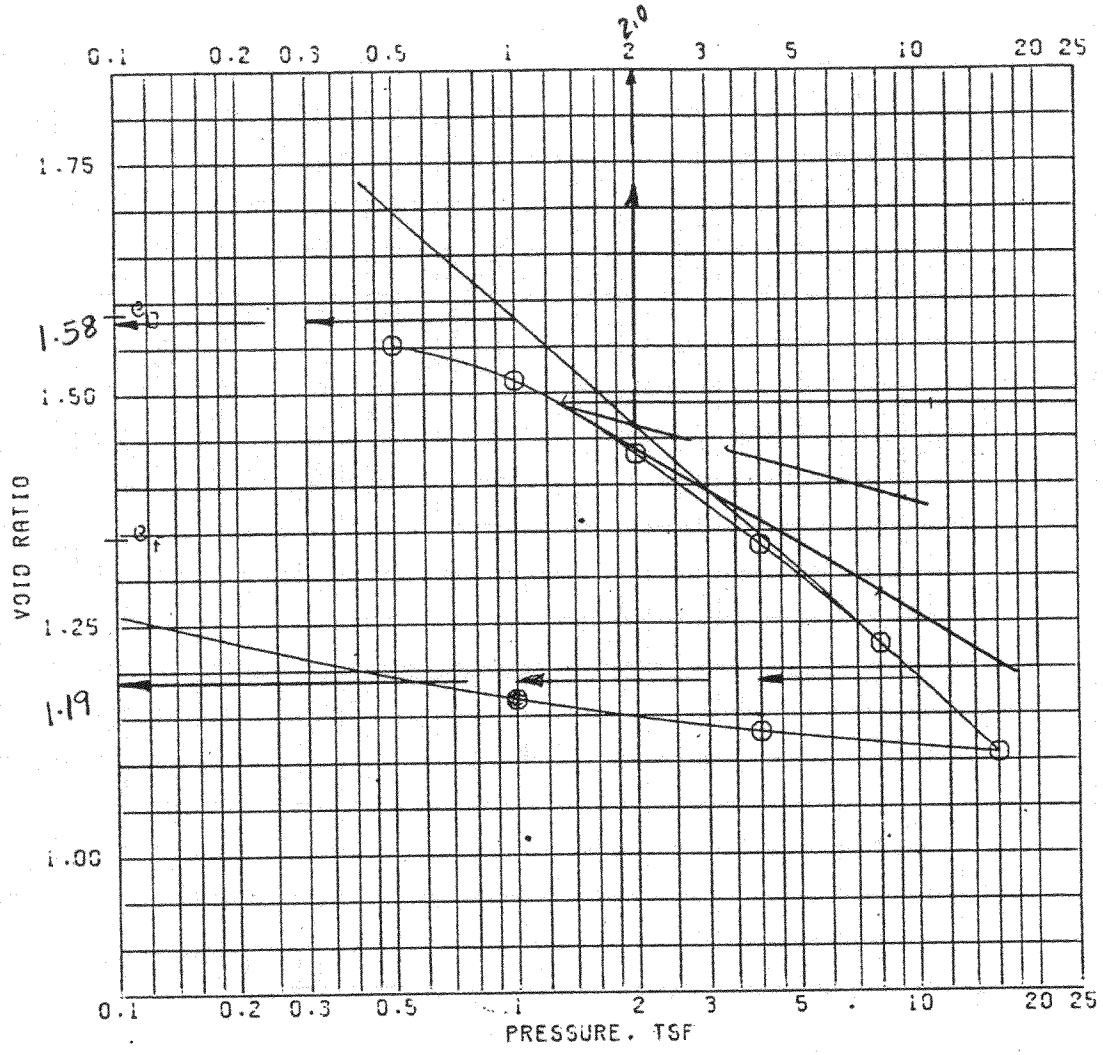
1.09
.72
0.37

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 4.6	WATER CONTENT, % 31.4	32.9
COMPRESSION INDEX 0.37	DRY DENSITY, PCF 87.6	90.2
TYPE SPECIMEN UNDISTURBED	SATURATION, % 91.6	100 +
DIA. IN 4.44 HT. IN 1.145	VOID RATIO 0.924	0.870
	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY & TAN MOTTLED; FISSURED

LL 95 PL 30 PI 65	PROJECT M.R.G.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS ELEV. -44.0	BORING NO. 2-IU / SAMPLE NO. 14-B
$\rho_c = 4.6$	DEPTH/ELEV 52.6/-44.0 / DATE 07 OCT 81
$C_c = 0.37$	CONSOLIDATION TEST REPORT

SHEET 1 OF 11



1.58
-1.19
0.39

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 2.0	WATER CONTENT, % 40.3	65.9
COMPRESSION INDEX 0.39	DRY DENSITY, PCF 65.2	71.9
TYPE SPECIMEN UNDISTURBED	SATURATION, % 98.5	100 +
DIA. IN 4.44 HT. IN 1.123	VOID RATIO 1.595	1.343
	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT SEAM

LL 56 PL 20 PI 36

GS 2.70 (EST) D_{10}

PROJECT M.R.G.D. - NEW SHIPLOCK

IHNC SITE

BORING NO. 2-IU SAMPLE NO. 22-D

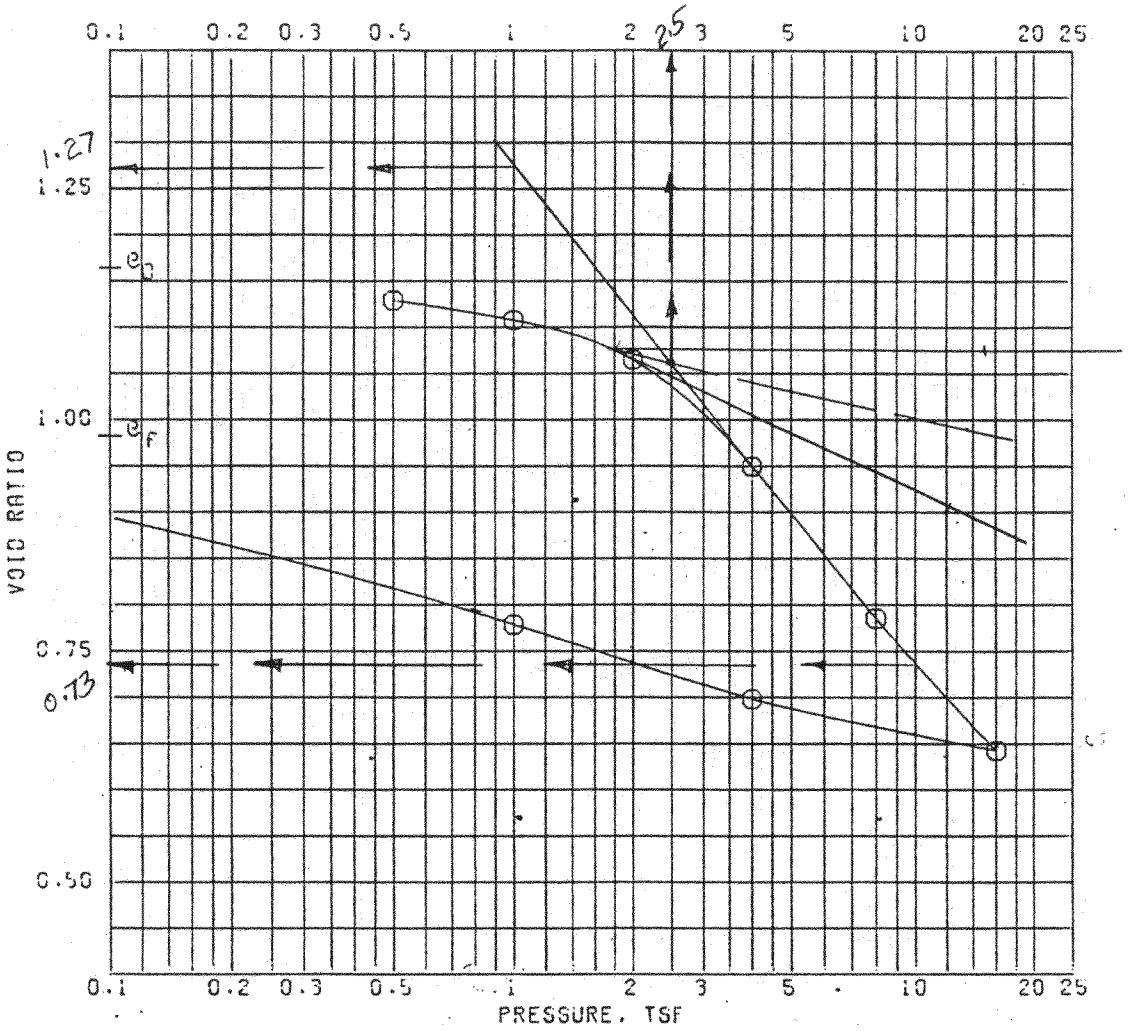
DEPTH/ELEV 85.9/-78.2 DATE 07 OCT 91

REMARKS ELEV. -78.2

pc = 2.0

Cc = 0.39

CONSOLIDATION TEST REPORT



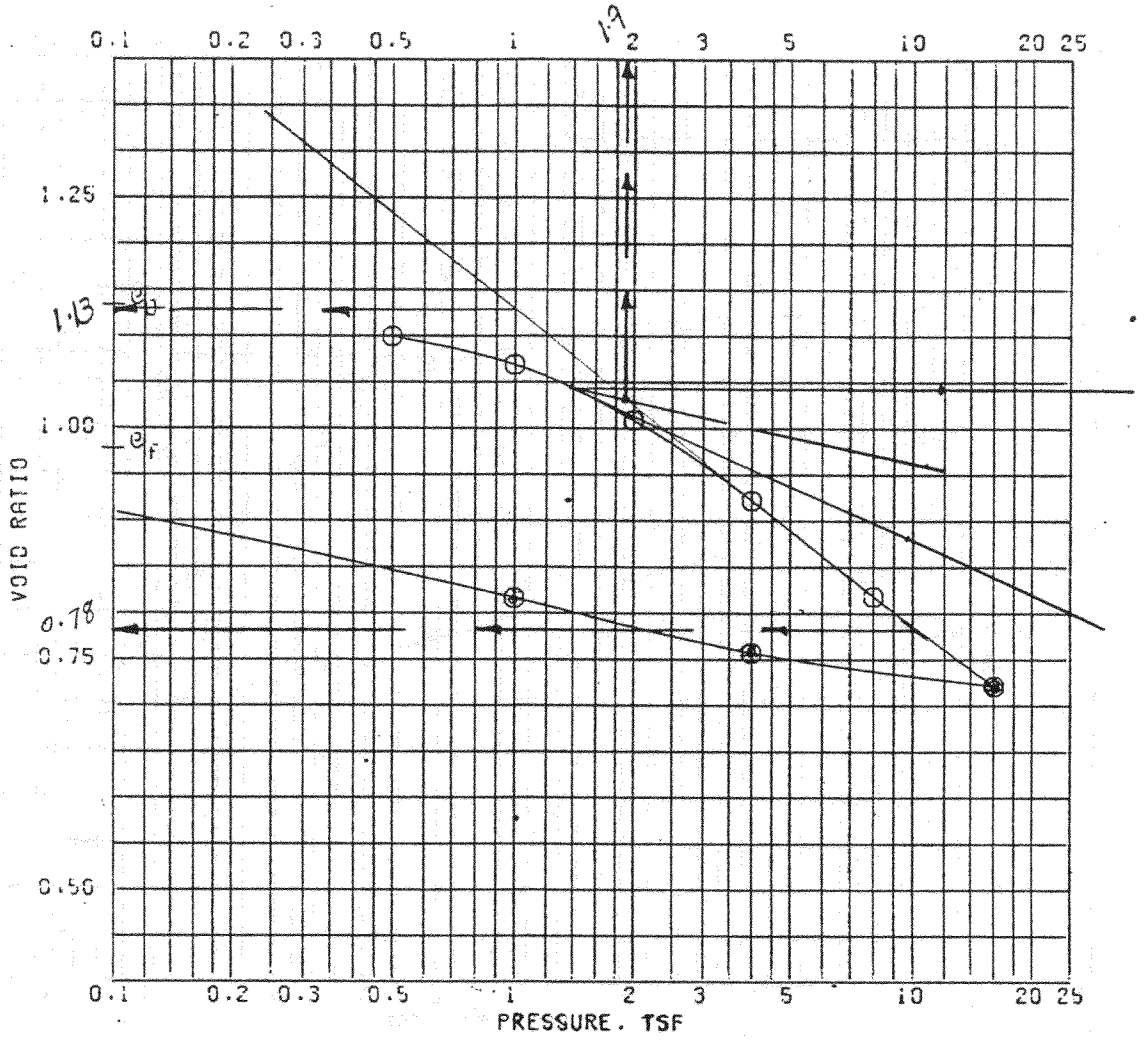
1.27
0.73
0.54

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 2.5	DRY DENSITY, PCF 77.9	85.1
COMPRESSION INDEX 0.54	SATURATION, % 99.1	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.152	0.990
DIA. IN 4.25 HT. IN 1.152	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT SEAMS

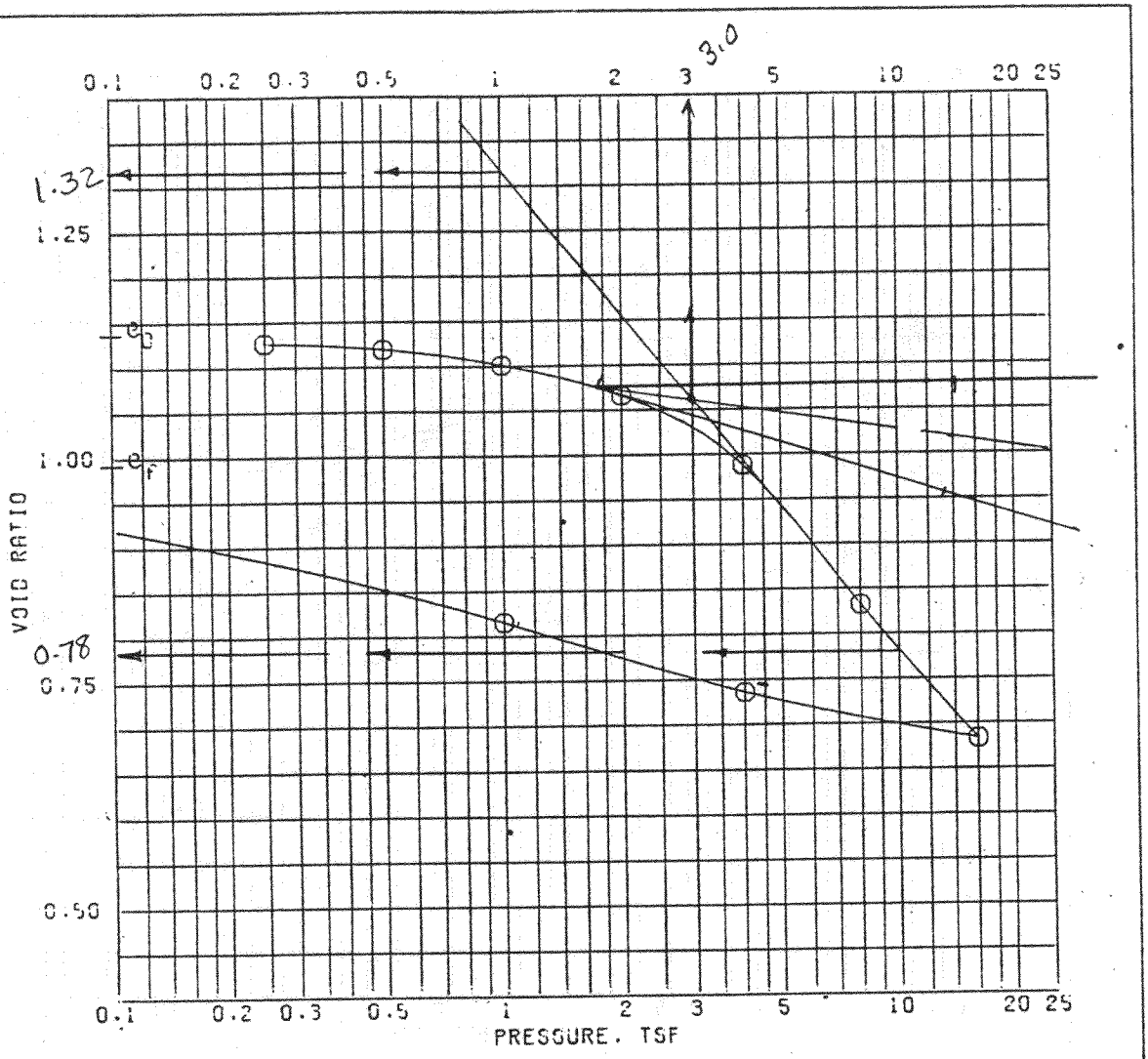
LL 65 PL 23 PI 42	PROJECT M.R.D.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS ELEV. -101.4	BORING NO. 2-IU / SAMPLE NO. 29-C
$p_c = 2.5$	DEPTH/ELEV 110.0/-101.4 / DATE 08 OCT 81
$C_c = 0.54$	CONSOLIDATION TEST REPORT

SHEET 1 OF 11



1.13 − 0.78 / 0.35

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		WATER CONTENT. %	40.1	35.7
PRECONSOL. PRESSURE. TSF	1.90	DRY DENSITY. PCF	79.1	85.3
COMPRESSION INDEX	035	SATURATION. %	95.5	98.9
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.132	0.975
DIA. IN 4.44	HT. IN 1.145	BACK PRESSURE. TSF		
CLASSIFICATION PLASTIC CLAY (CH). GRAY: SILT POCKETS				
LL / PL / PI		PROJECT M.R.C.C. - NEW SHIPLOCK		
GS 2.70 (EST)	D_{10}	IHNC SITE		
REMARKS ELEV. −112.4		BORING NO. 2-IU	SAMPLE NO. 31-B	
Pc = 1.9.		DEPTH/ELEV 121.0/-112.4	DATE 09 OCT 81	
Cc = 0.35		CONSOLIDATION TEST REPORT		

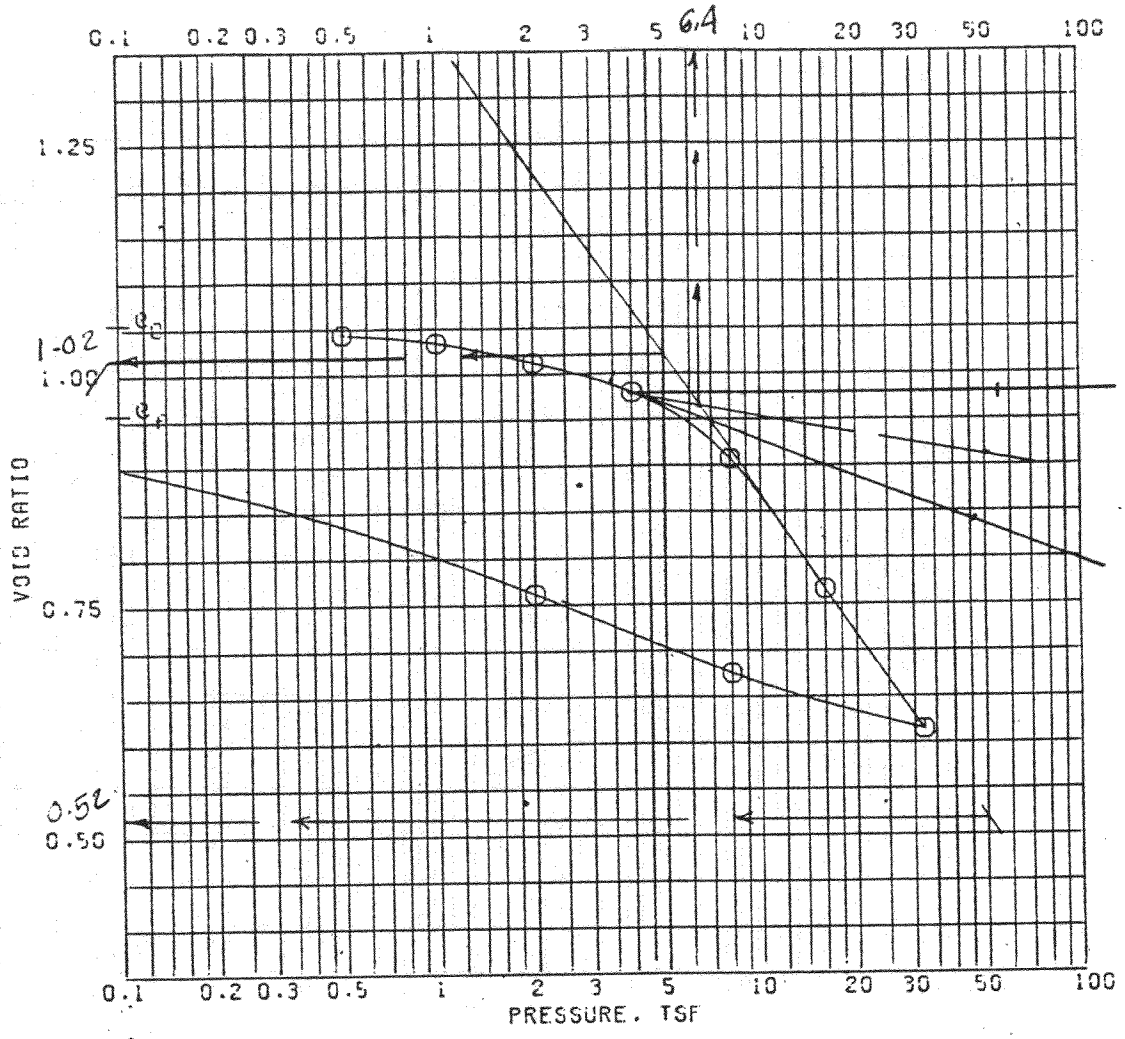


1.32
0.78
.054

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		
PRECONSOL. PRESSURE. TSF 3.0	WATER CONTENT. %	42.9	38.5
COMPRESSION INDEX 0.54	DRY DENSITY. PCF	78.9	84.7
TYPE SPECIMEN UNDISTURBED	SATURATION. %	100 +	100 +
DIA. IN 4.25 HT. IN 1.163	VOID RATIO	1.135	0.900
	BACK PRESSURE. TSF		

CLASSIFICATION PLASTIC CLAY (CH). GRAY

LL 72 PL 25 PI 47	PROJECT M.R.G.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS ELEV. -125.8	BORING NO. 2-IU / SAMPLE NO. 34-C
Pc = 3.0	DEPTH/ELEV 134.4/-125.9 / DATE 09 OCT 91
Cc = 0.54	CONSOLIDATION TEST REPORT

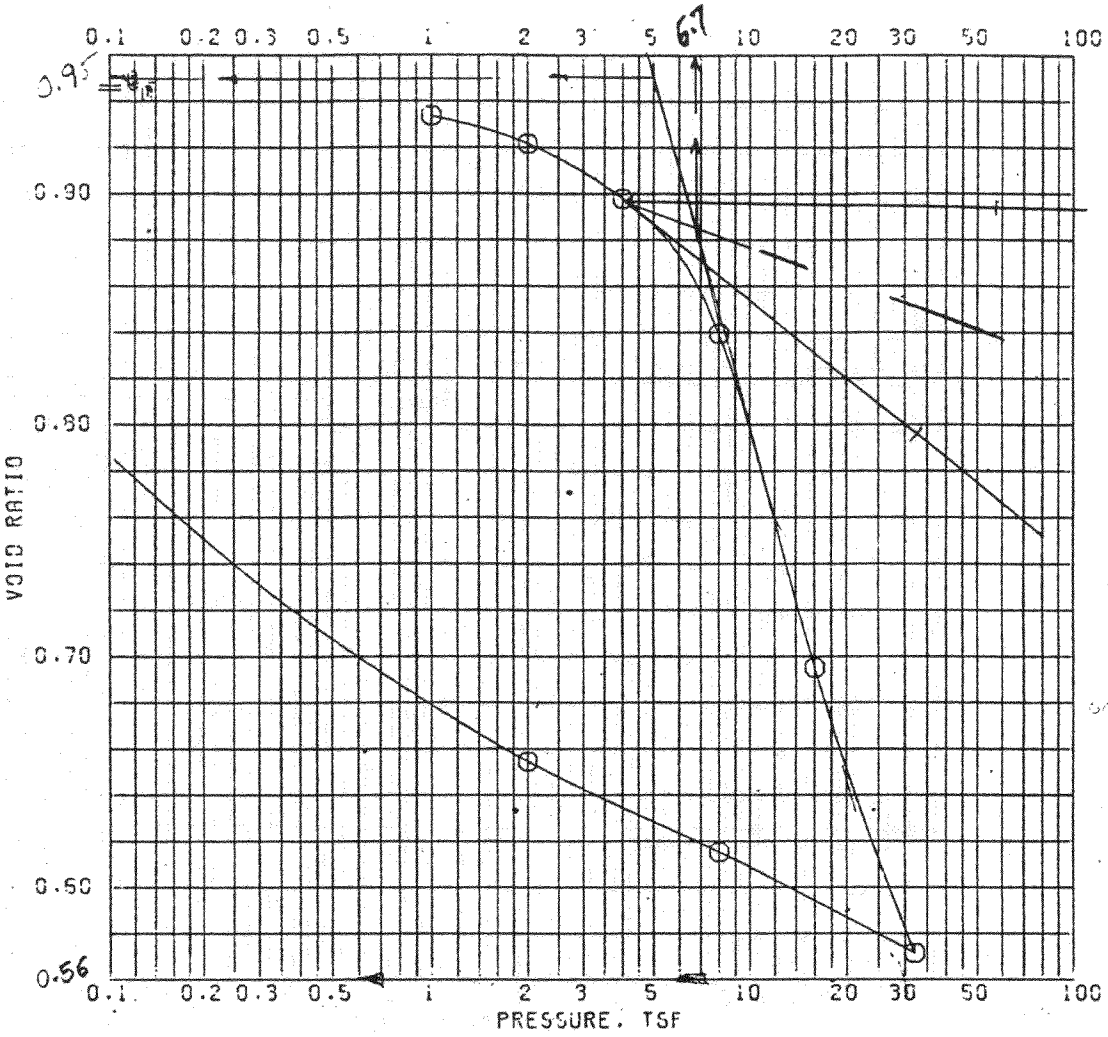


1.02
-0.52
0.50

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		
PRECONSOL. PRESSURE. TSF 6.4	DRY DENSITY. PCF	92.1 / 96.2
COMPRESSION INDEX 0.50	SATURATION. %	100 + / 100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO	1.054 / 0.956
DIA. IN 4.44 HT. IN 1.122	BACK PRESSURE. TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 65	PL 24	PI 41	PROJECT M.R.C.C. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV. -149.8			BORING NO. 2-IU / SAMPLE NO. 40-C
Pc = 6.4			DEPTH/ELEV 159.4/-143.9 / DATE 09 OCT 91
Cc = 0.50			CONSOLIDATION TEST REPORT



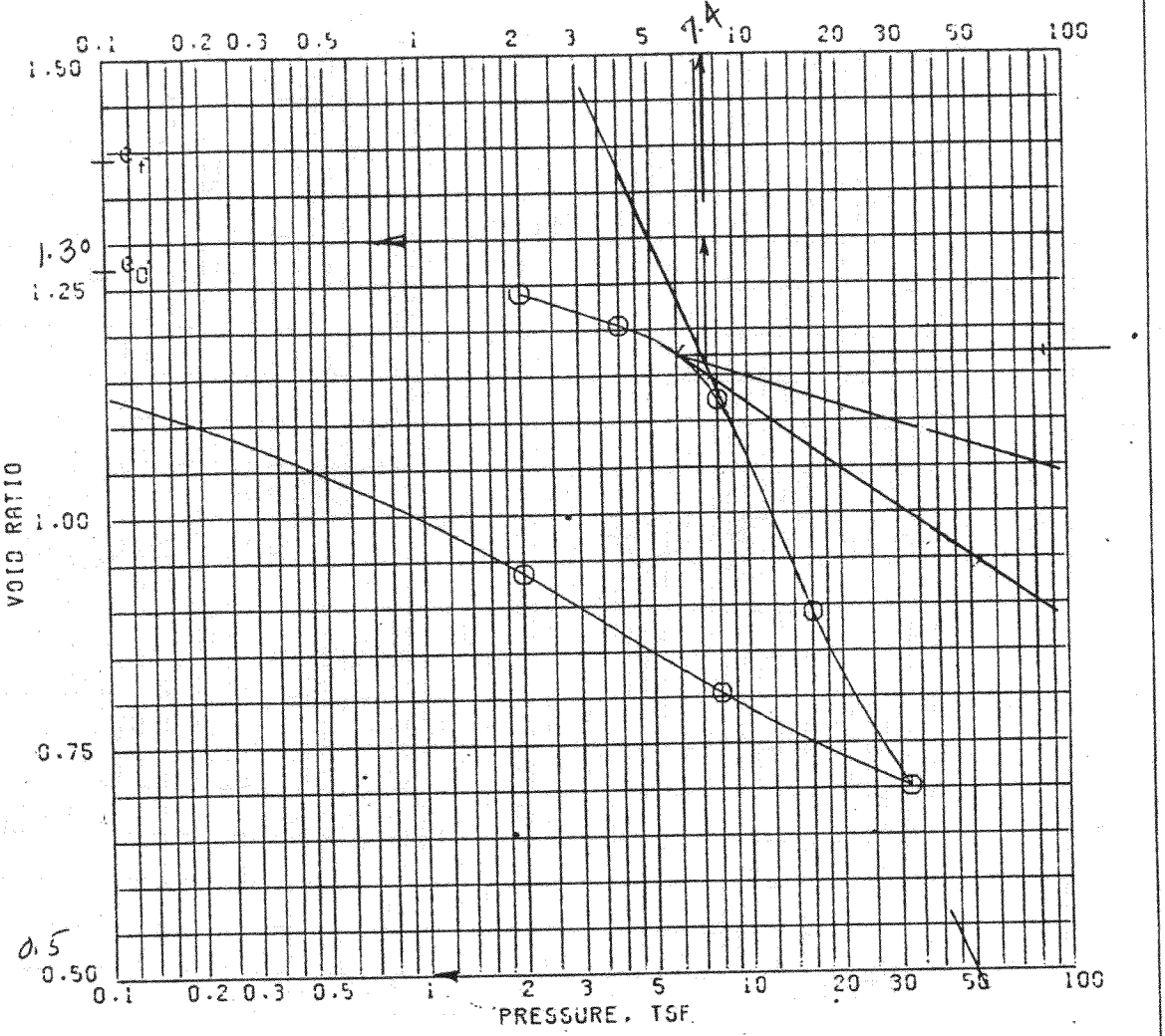
0.95 − 0.56 / log 30 − log 5 = 0.39 / 0.778 = 0.51

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		
PRECONSOL. PRESSURE. TSF 6.7	DRY DENSITY. PCF	86.7	86.6
COMPRESSION INDEX 0.51	SATURATION. %	100 +	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO	0.944	0.945
DIA. IN 4.25 HT. IN 1.159	BACK PRESSURE. TSF		

CLASSIFICATION PLASTIC CLAY (CH). GRAY

LL 68	PL 23	PI 45	PROJECT M.R.C.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV. -197.8.		BORING NO. 2-IU	SAMPLE NO. 52-C
Pc = 6.7		DEPTH/ELEV 206.4/-197.8	DATE 14 OCT 81
Cc = 0.51		CONSOLIDATION TEST REPORT	

SHEET 1 OF 11



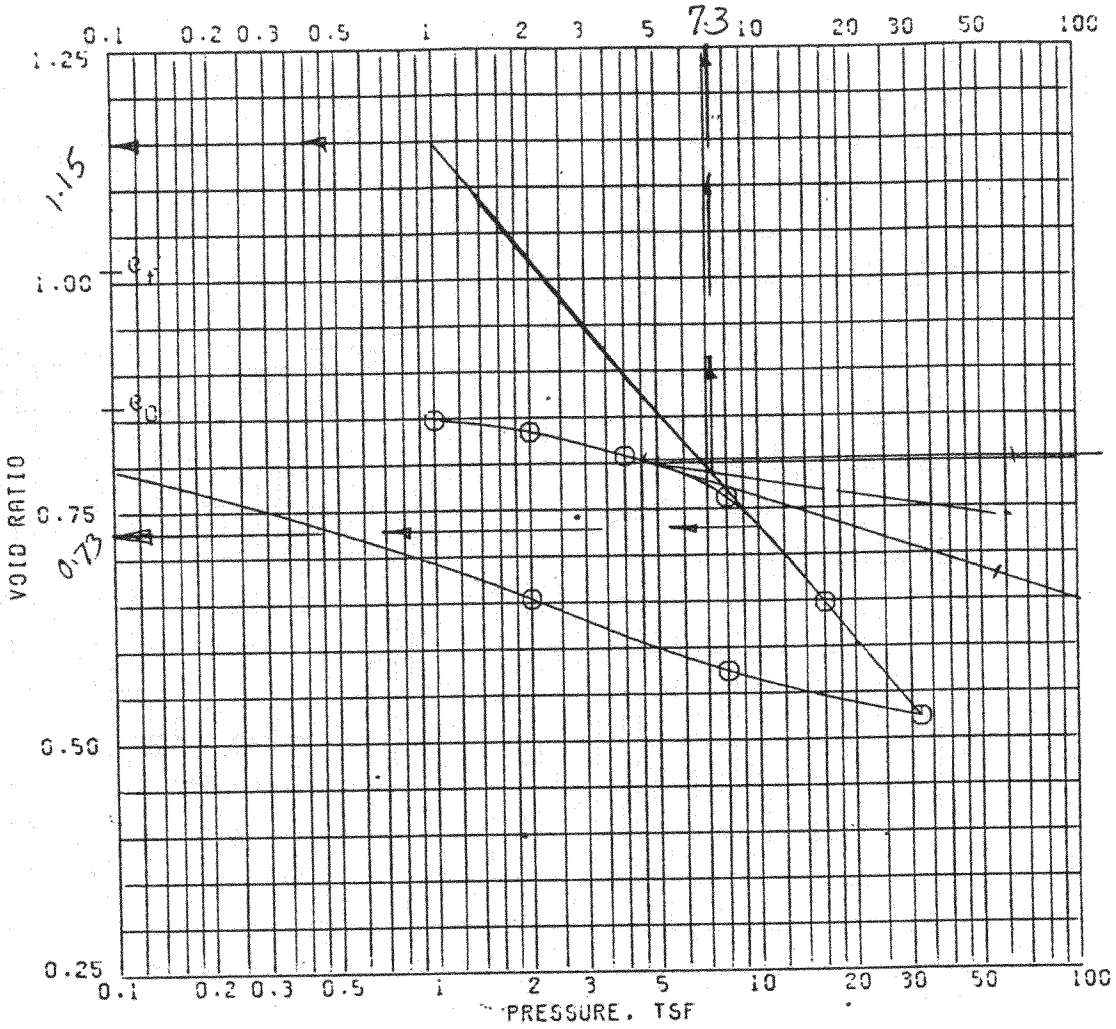
1.30
-0.50
0.80

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 7.4	WATER CONTENT, % 37.7	53.1
COMPRESSION INDEX 0.80	DRY DENSITY, PCF 74.3	70.5
TYPE SPECIMEN UNDISTURBED	SATURATION, % 90.1	100 +
DIA. IN 4.44 HT. IN 1.123	VOID RATIO 1.270	1.399
	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 79 PL 29 PI 50	PROJECT M.R.C.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS ELEV. -214.2	BORING NO. 2-10 SAMPLE NO. 55-D
Pc = 7.4	DEPTH/ELEV 222.9/-214.2 DATE 14 OCT 82
Cc = 0.80	CONSOLIDATION TEST REPORT

SHEET 1 OF 10



1.15
0.73
0.42

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 7.3	DRY DENSITY, PCF 90.5	93.9
COMPRESSION INDEX 0.42	SATURATION, % 100 +	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 0.993	1.012
DIA. IN 4.25 HT. IN 1.162	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 54	PL 20	PI 34
GS 2.70 (EST)	D_{10}	

PROJECT M.R.C.O. - NEW SHIPLOCK

IHNC SITE

REMARKS ELEV. -246.1

BORING NO. 2-IU SAMPLE NO. S4-D

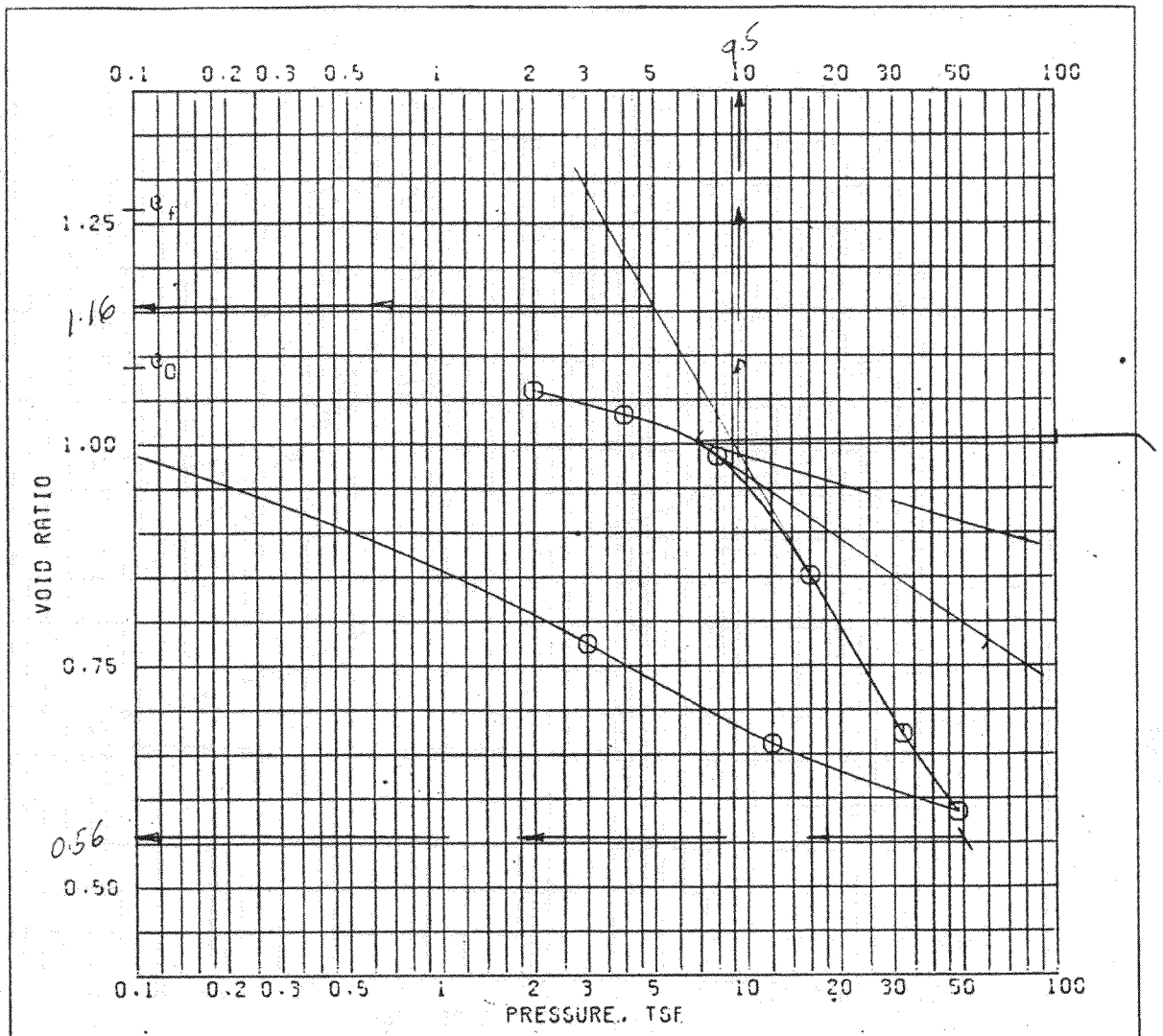
Pc = 7.3

DEPTH/ELEV 254.7/-246.1 DATE 14 OCT 82

Cc = 0.42

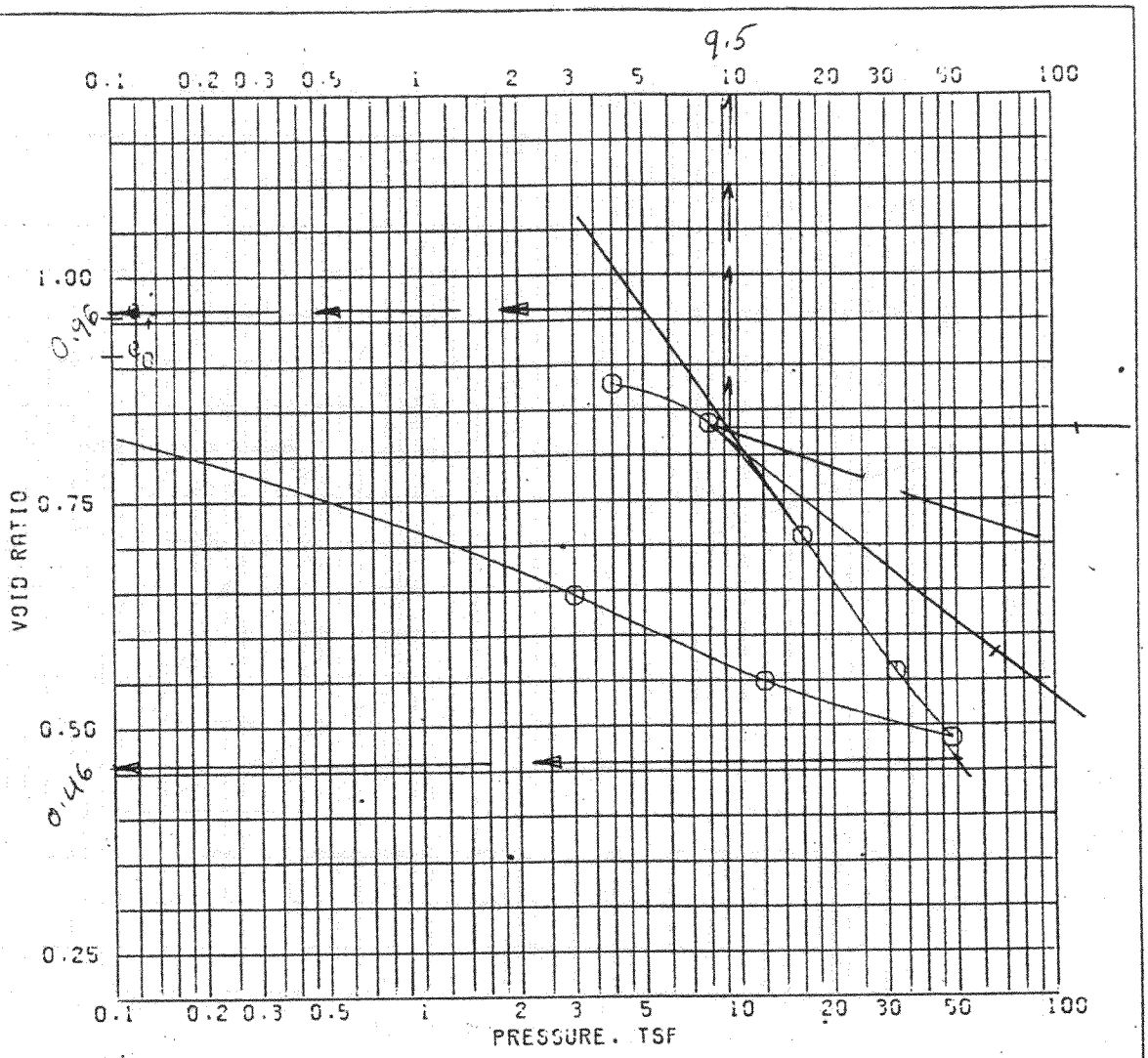
CONSOLIDATION TEST REPORT

SHEET 1 OF 11



1.16 − 0.56 / 0.60

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 9.5	DRY DENSITY, PCF	80.9	74.4
COMPRESSION INDEX 0.60	SATURATION, %	100 +	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO	1.086	1.264
DIA. IN 4.25 HT. IN 1.159	BACK PRESSURE, TSF		
CLASSIFICATION PLASTIC CLAY (CH), GRAY			
LL 75 PL 25 PI 50	PROJECT M.R.C.O. - NEW SHIPLOCK		
GS 2.70 (EST) D_{10}	IHNC SITE		
REMARKS ELEV. -264.4	BORING NO. 2-IU	SAMPLE NO. 69-B	
$p_c = 9.5$	DEPTH/ELEV 273.0/-264.4	DATE 14 OCT 91	
$C_c = 0.60$	CONSOLIDATION TEST REPORT		



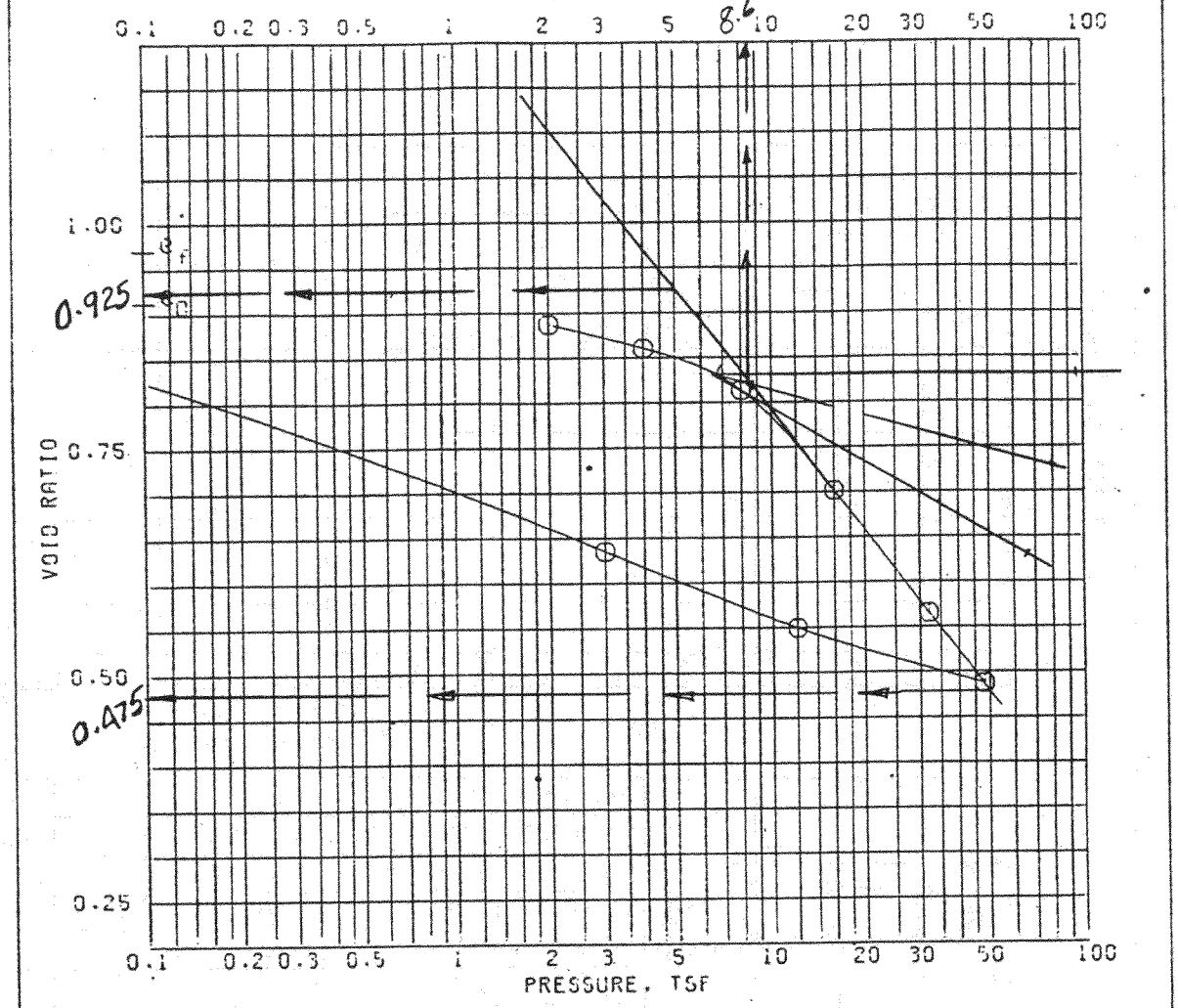
0.96 − 0.46 / 0.50

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		
PRECONSOL. PRESSURE. TSF 9.5	WATER CONTENT. %	33.4	35.1
COMPRESSION INDEX . 0.50	DRY DENSITY. PCF	99.2	98.2
TYPE SPECIMEN UNDISTURBED	SATURATION. %	98.9	100 +.
DIA. IN 4.44 HT. IN 1.122	VOID RATIO	0.912	0.954
	BACK PRESSURE. TSF		

CLASSIFICATION PLASTIC CLAY (CH). DARK GRAY

LL 52 PL 19 PI 34	PROJECT M.R.G.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS ELEV. -289.8	BORING NO. 2-IU / SAMPLE NO. 75-C
p_c = 9.5	DEPTH/ELEV 238.4/-289.8 / DATE 14 OCT 81
C_c = 0.50	CONSOLIDATION TEST REPORT

SHEET 1 OF 10

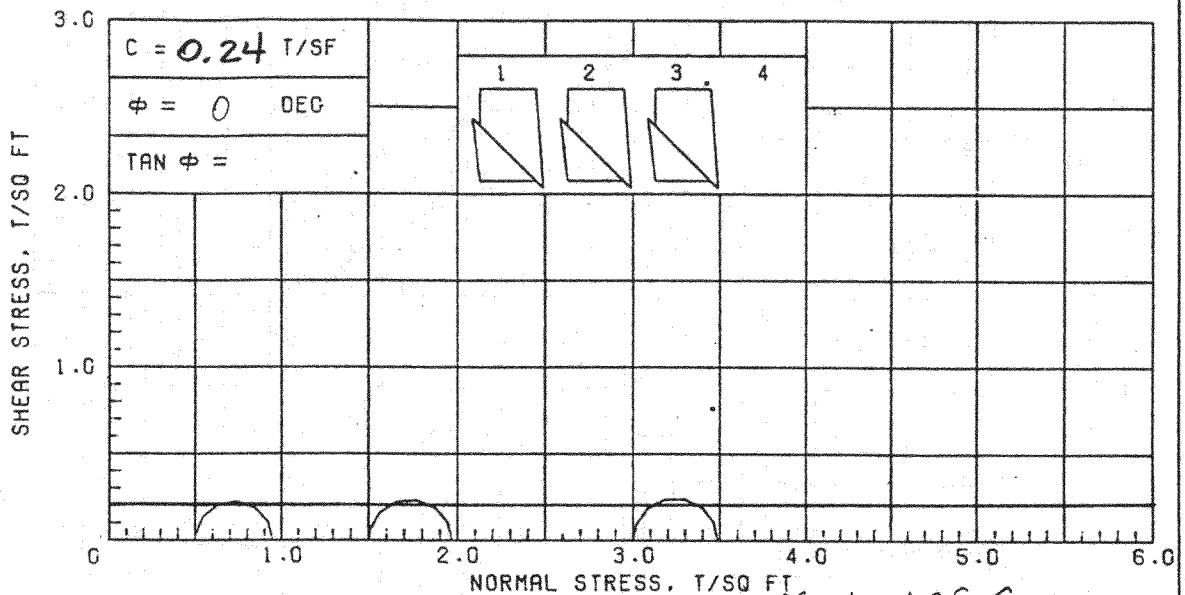


0.925
-0.475
0.450

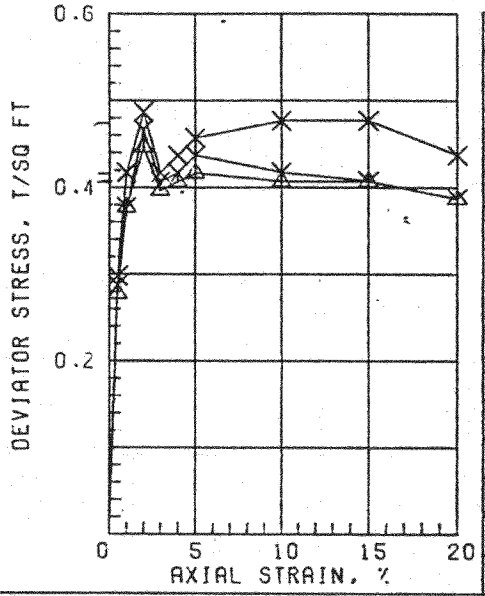
	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 8.6	DRY DENSITY, PCF	95.2	85.6
COMPRESSION INDEX 0.45	SATURATION, %	95.4	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO	0.911	0.969
DIA. IN 4.44 HT. IN 1.115	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), DARK GRAY; SILT LENSES

LL 46	PL 20	PI 25	PROJECT M.R.G.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		INNC SITE
REMARKS ELEV. -306.2			BORING NO. 2-10 / SAMPLE NO. 79-D
$P_c = 8.6$			DEPTH/ELEV 314.8/-306.2 / DATE 14 OCT 81
$C_c = 0.45$			CONSOLIDATION TEST REPORT



$\gamma_{sat} = 106.6$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	52.3	53.1	53.5	53.0
	DRY DENSITY, PCF	70.2	69.5	69.4	69.7
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.400	1.426	1.428	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.45	0.47	0.49	0.47
TIME TO FAILURE, MIN.		4	4	4	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.41	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; CONCRETIONS

LL 88	PL 25	PI 63	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

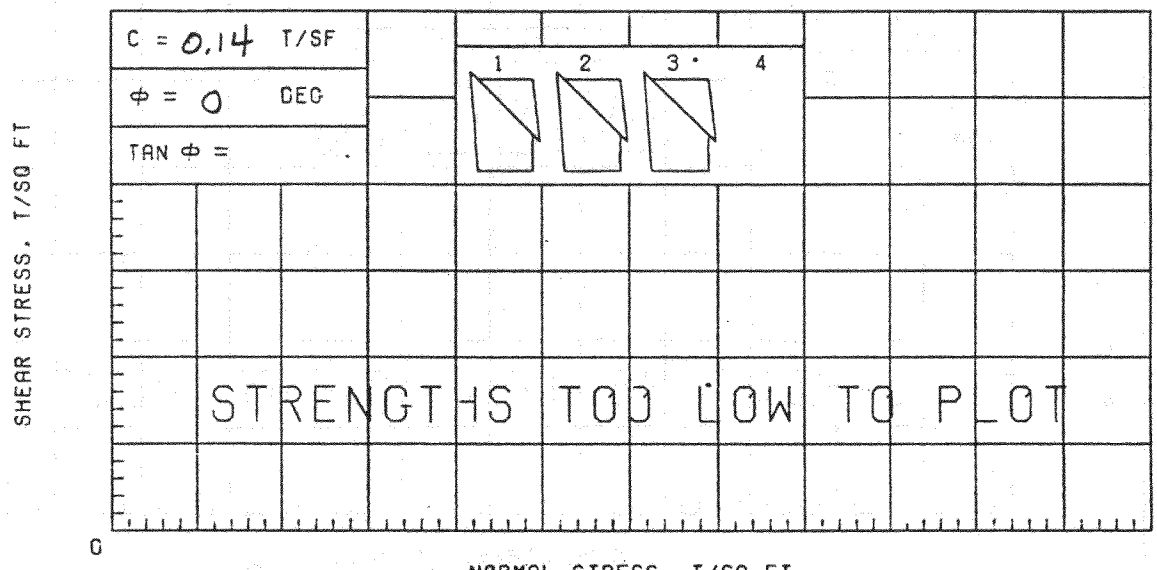
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 2-C

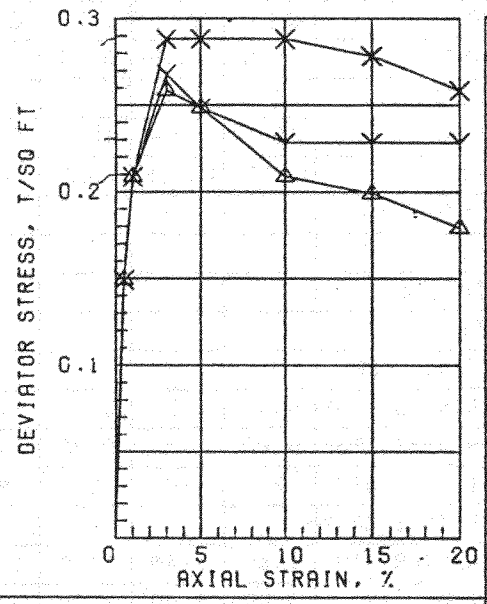
DEPTH/ELEV 5.6/-25.6 | TECH. KOC

LABORATORY USAE WES | DATE 27 AUG 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 98.6$



SPECIMEN NO.		Δ1	Y2	X3	AVG 4
INITIAL	WATER CONTENT, %	73.7	73.8	72.2	73.2
	DRY DENSITY, PCF	56.4	57.2	57.0	56.9
	SATURATION, %	100.0	100+	99.7	
	VOID RATIO	1.990	1.948	1.956	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.26	0.27	0.29	.27
TIME TO FAILURE, MIN.		6	6	6	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.40	1.41	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 82	PL 19	PI 63	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

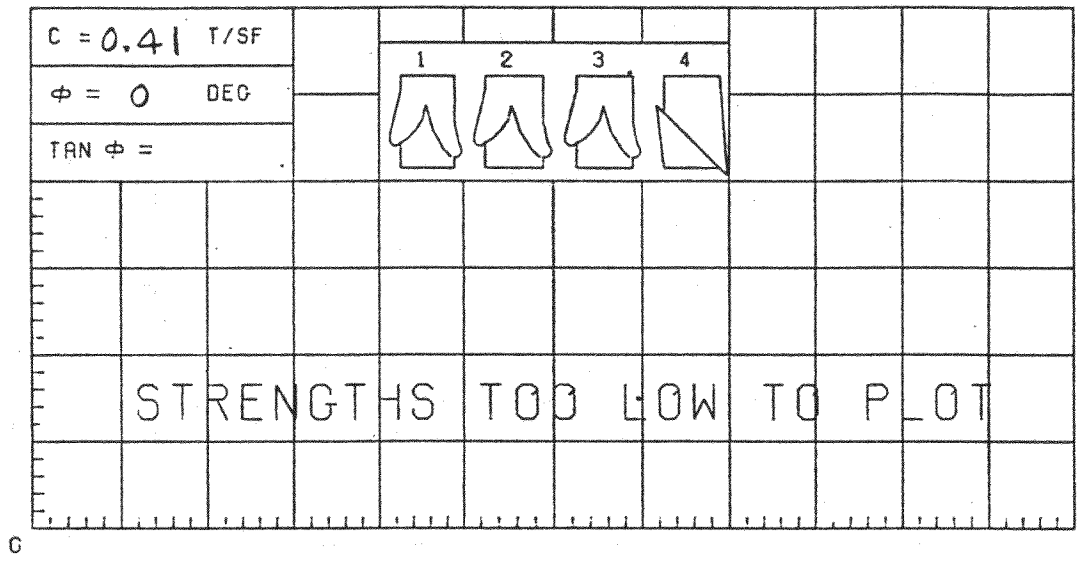
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 5-C

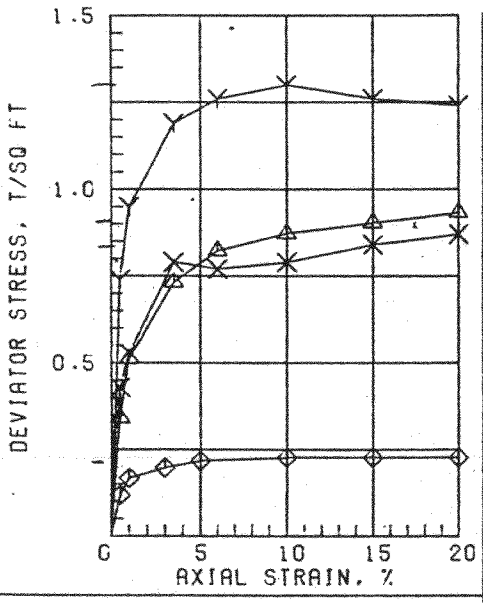
DEPTH/ELEV 18.4/-38.4 | TECH. KOC

LABORATORY USAE WES | DATE 28 AUG 81

TRIAXIAL COMPRESSION TEST REPORT



γ_{sat} = 116.7



	SPECIMEN NO.	Δ1	Y2	X3	◇4	AVG
INITIAL	WATER CONTENT, %	36.0	33.9	33.7	43.2	36.7
	DRY DENSITY, PCF	86.4	88.4	89.3	76.5	85.2
	SATURATION, %	100+	100+	100+	96.9	
	VOID RATIO	0.952	0.906	0.888	1.203	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5	
MAX. DEV. STRESS, TSF		0.90	1.30	0.79	0.23	0.81
TIME TO FAILURE, MIN.		27	18	6	20	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.40	1.40	1.40	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

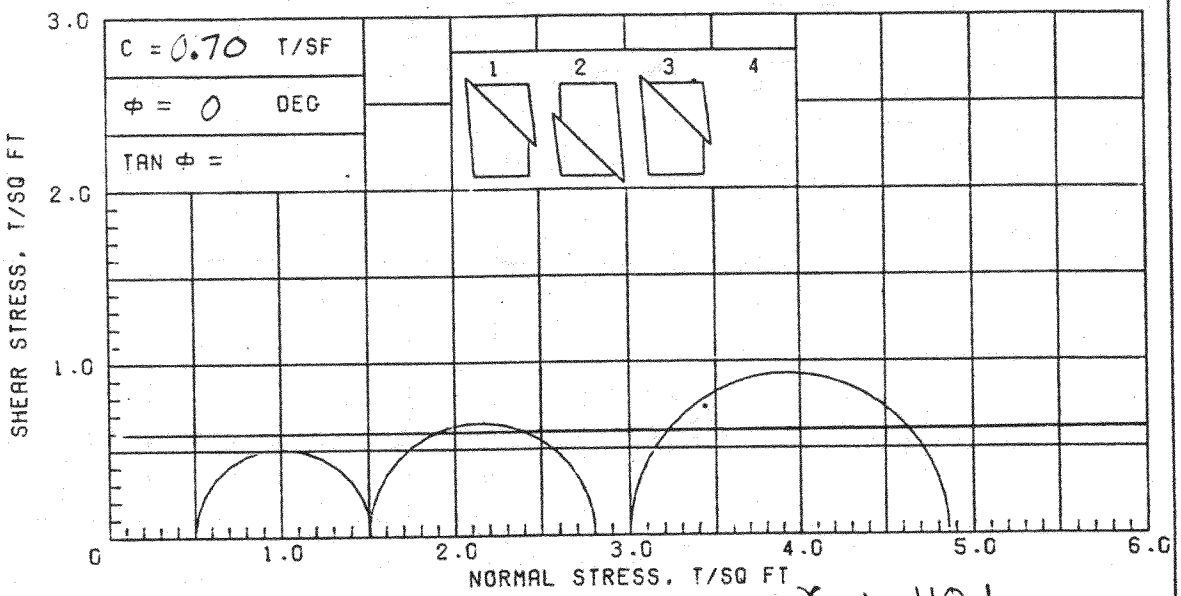
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), LIGHT GRAY

LL 57	PL 19	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

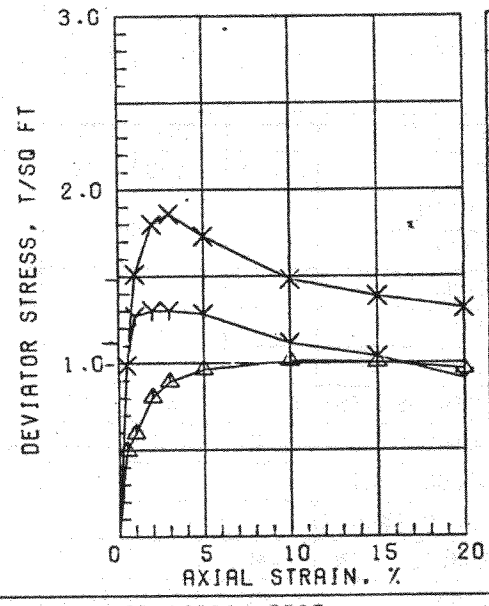
REMARKS:

PROJECT M.R.C.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 4-IU
SAMPLE NO. 12-B
DEPTH/ELEV 45.0/-65.0
TECH. PJR
LABORATORY USAE WES
DATE 23 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 110.1$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	46.2	46.4	46.7	46.4
	DRY DENSITY, PCF	74.1	75.8	75.2	75.0
	SATURATION, %	97.7	100+	100+	99.2
	VOID RATIO	1.276	1.224	1.241	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.01	1.30	1.86	1.39
TIME TO FAILURE, MIN.		20	4	6	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.40	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), LIGHT GRAY; SLICKENSIDED

LL 92	PL 22	PI 70	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.O. - NEW SHIPLOCK

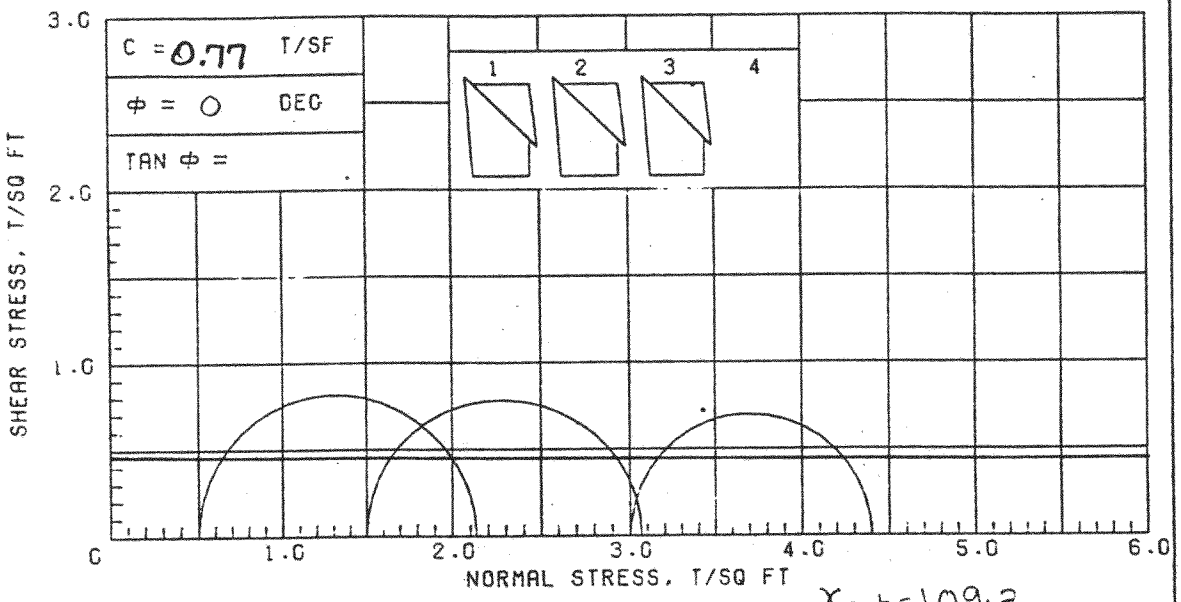
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 14-C

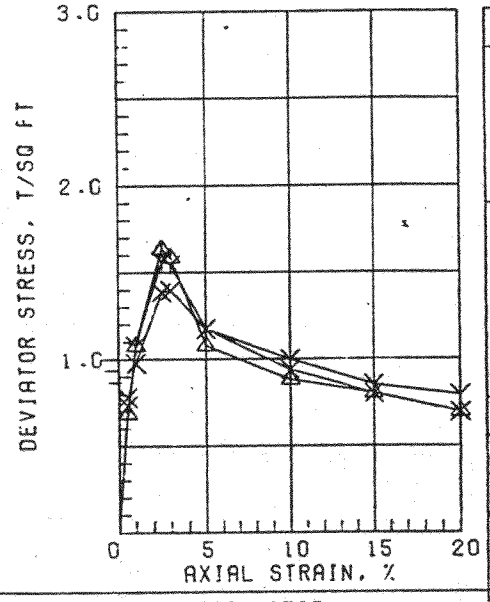
DEPTH/ELEV 54.1/-74.1 | TECH. KOC

LABORATORY USAE WES | DATE 28 AUG 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 109.2$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	48.4	48.3	48.0	48.2
	DRY DENSITY, PCF	73.6	73.6	73.9	73.7
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.291	1.290	1.281	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.63	1.56	1.40	1.53
TIME TO FAILURE, MIN.		5	15	18	
RATE OF STRAIN INCR.,%			6	6	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 71	PL 22	PI 49	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

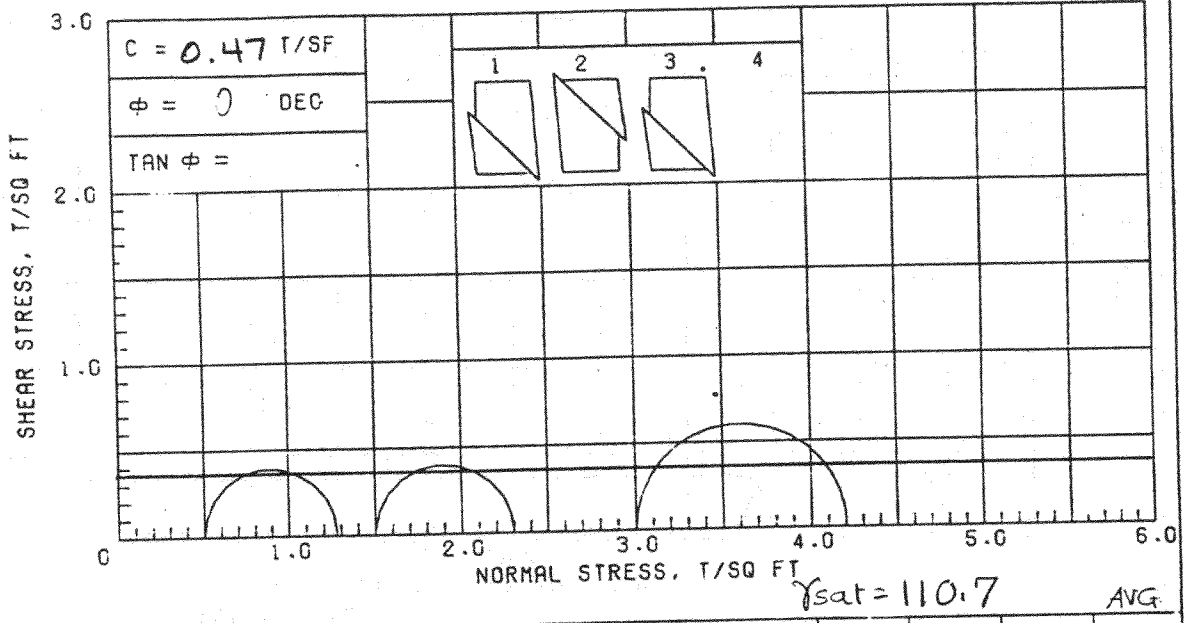
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 18-B

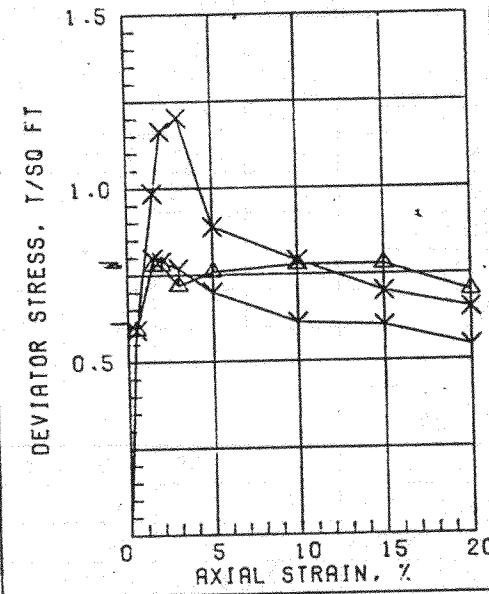
DEPTH/ELEV 68.7/-88.7 | TECH. KOC

LABORATORY USAE WES | DATE 31 AUG 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 110.7$ AVG



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	46.7	46.9	46.8	46.8
	DRY DENSITY, PCF	75.5	75.4	75.3	75.4
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.232	1.236	1.238	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.78	0.80	1.20	0.93
TIME TO FAILURE, MIN.		3	3	19	
RATE OF STRAIN INCR.%				6	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY

LL 63	PL 21	PI 42	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

INSUFFICIENT MATERIAL FOR CHECK TEST.

PROJECT M.R.C.C. - NEW SHIPLOCK

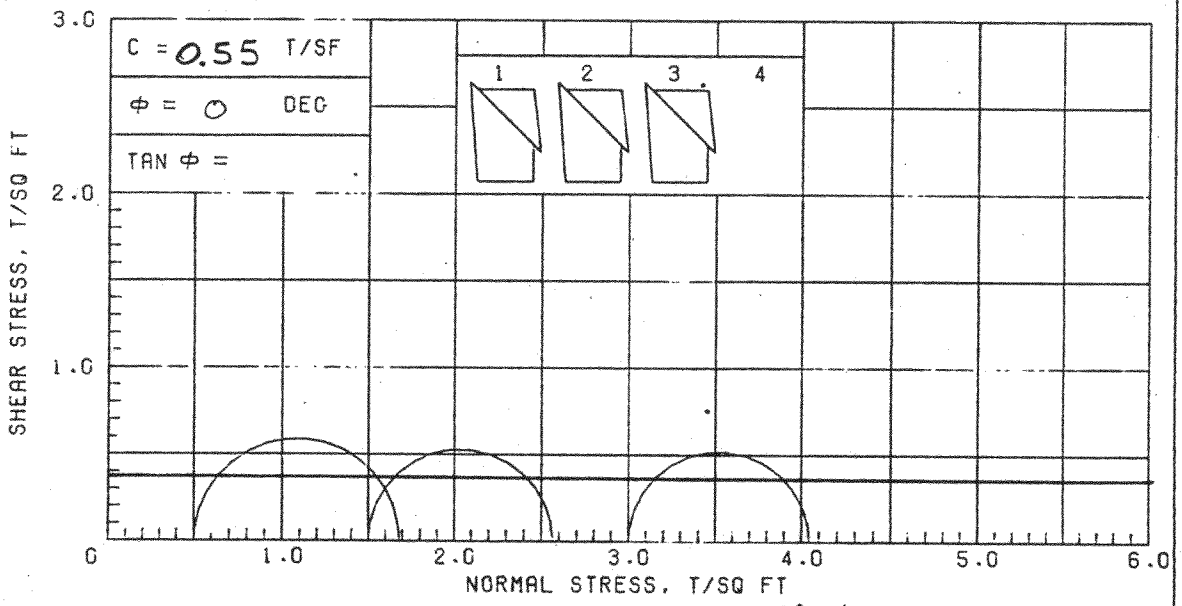
IHNC SITE

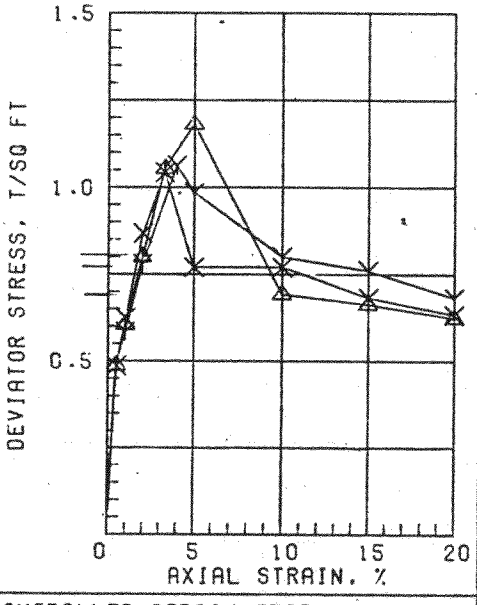
BORING NO. 4-IU | SAMPLE NO. 20-D

DEPTH/ELEV 78.8/-98.8 | TECH. KOC

LABORATORY USAE WES | DATE 31 AUG 81

TRIAXIAL COMPRESSION TEST REPORT





$\gamma_{sat} = 108.9$ AVG.

SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	48.5	48.2	48.3	48.3
	DRY DENSITY, PCF	73.2	73.4	73.7	73.4
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.301	1.295	1.287	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.18	1.06	1.04	1.09
TIME TO FAILURE, MIN.		10	25	19	
RATE OF STRAIN INCR, %			6	6	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

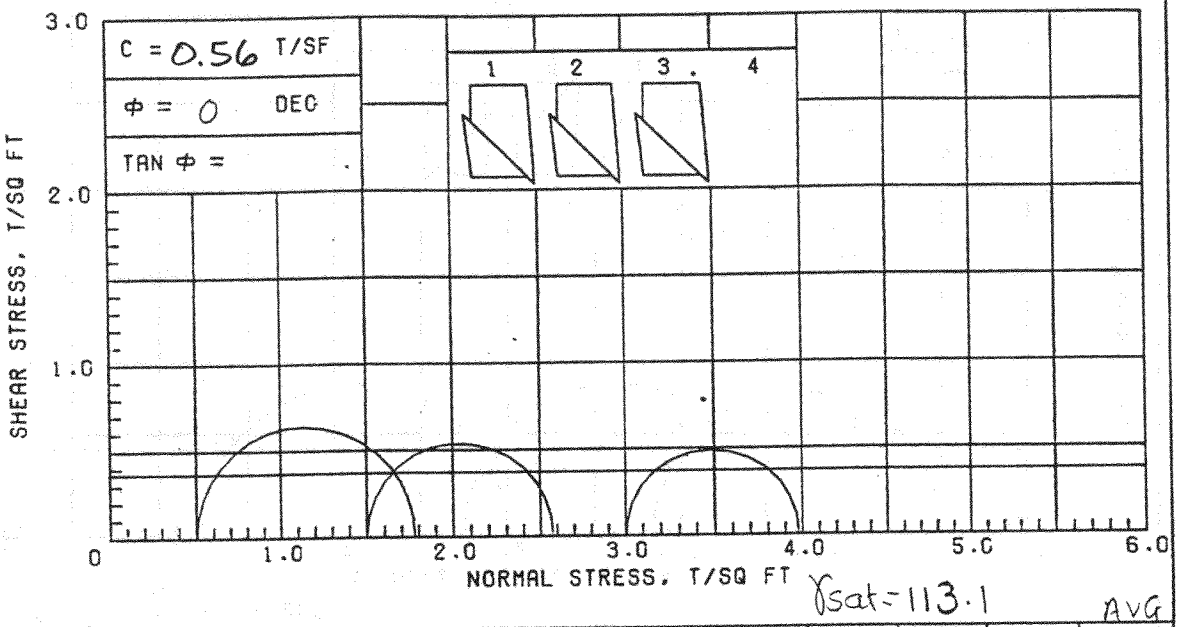
DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT LENSES

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

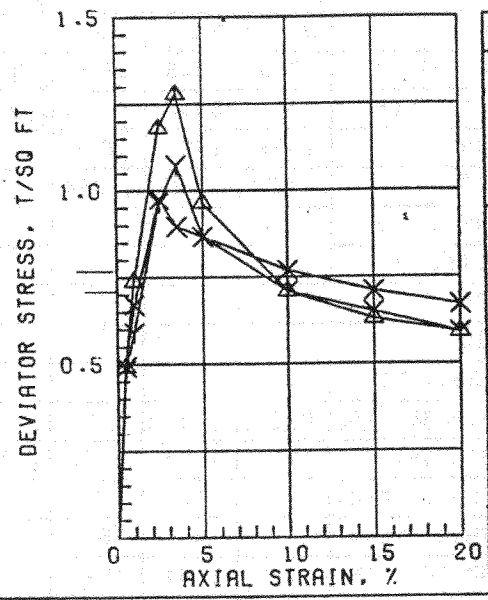
REMARKS:

PROJECT M.R.C.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 4-IU SAMPLE NO. 24-B
DEPTH/ELEV 93.2/-113.2 TECH. KOC
LABORATORY USAE WES DATE 01 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 113.1$ AVG



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	40.7	41.8	41.6	41.4
	DRY DENSITY, PCF	80.9	79.4	79.7	80.0
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.085	1.123	1.114	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.28	1.07	0.97	1.11
TIME TO FAILURE, MIN.		7	21	15	
RATE OF STRAIN INCR.%			6	6	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

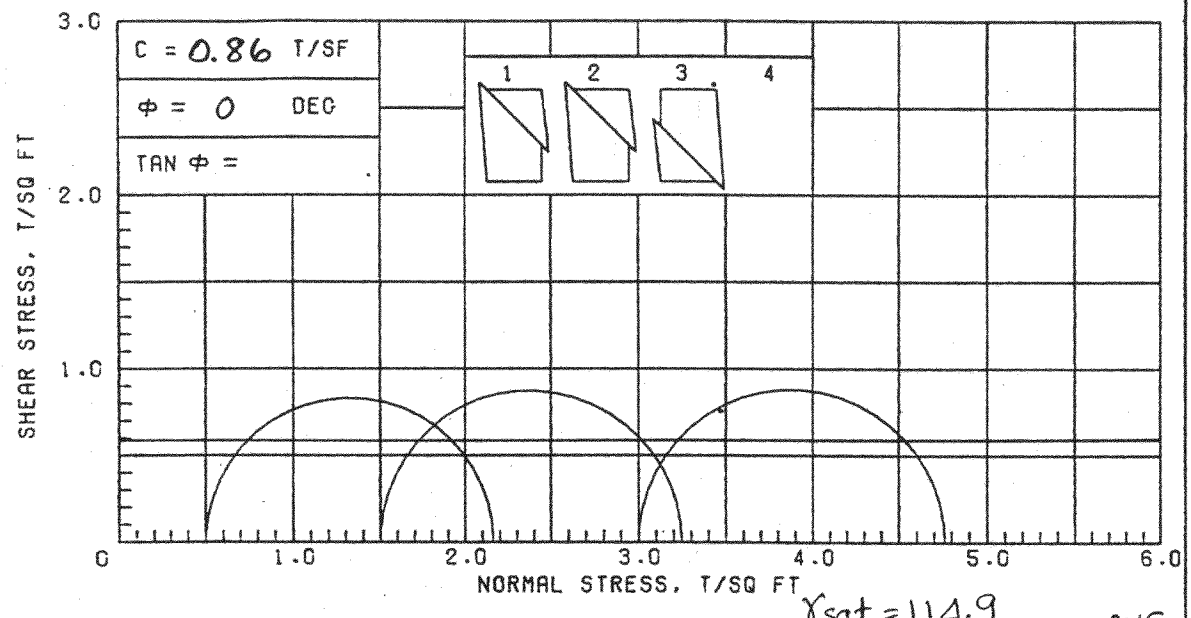
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 67	PL 17	PI 50	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

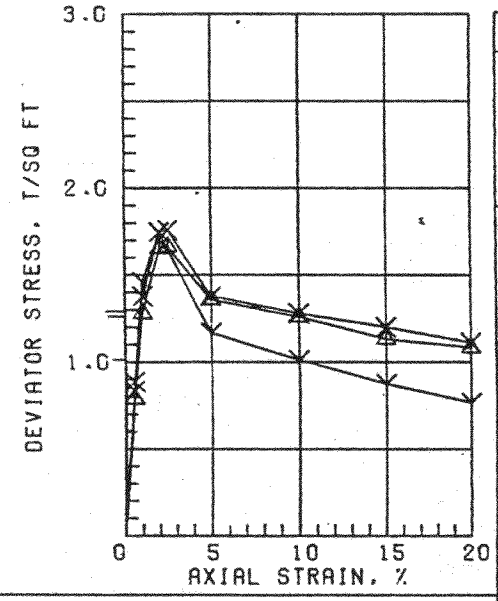
REMARKS:

PROJECT M.R.C.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 4-IU | SAMPLE NO. 26-B
DEPTH/ELEV 101.0/-121.0 | TECH. KOC
LABORATORY USAE WES | DATE 01 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 114.9$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	39.5	38.8	39.6	39.3
	DRY DENSITY, PCF	82.2	83.2	82.0	82.5
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.052	1.026	1.054	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.66	1.74	1.76	1.72
TIME TO FAILURE, MIN.		5	12	15	
RATE OF STRAIN INCR.%			6	6	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 56	PL 16	PI 40	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

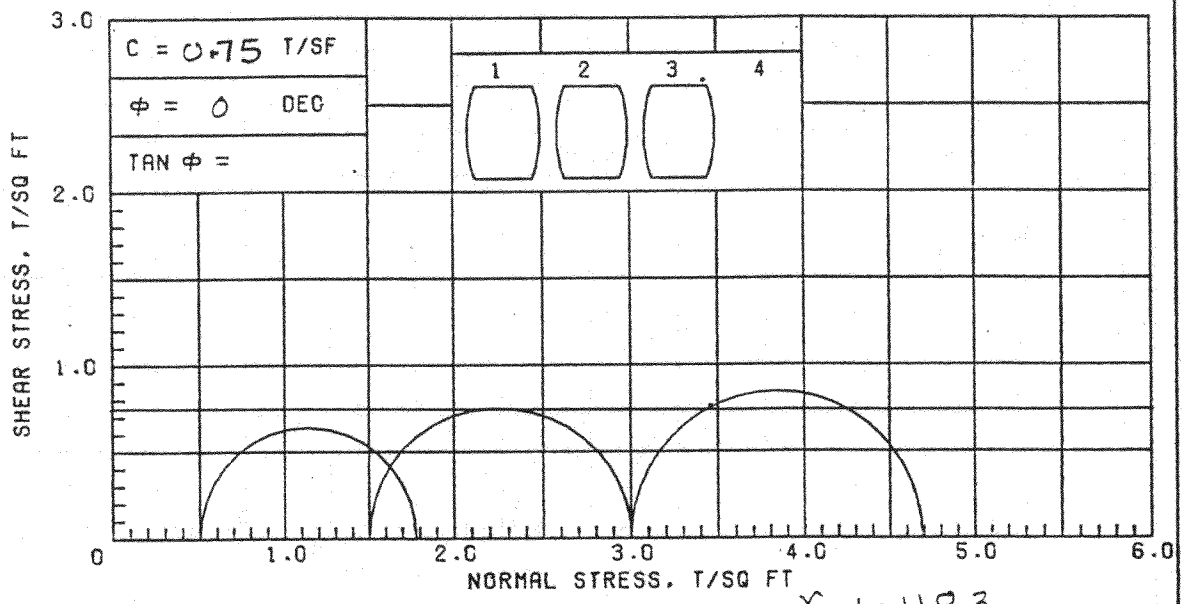
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 28-B

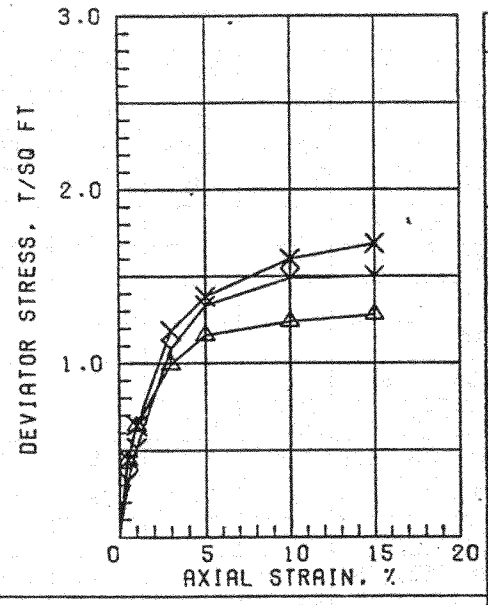
DEPTH/ELEV 109.0/-129.0 | TECH. KOC

LABORATORY USAE WES | DATE 22 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 118.3$ AVG



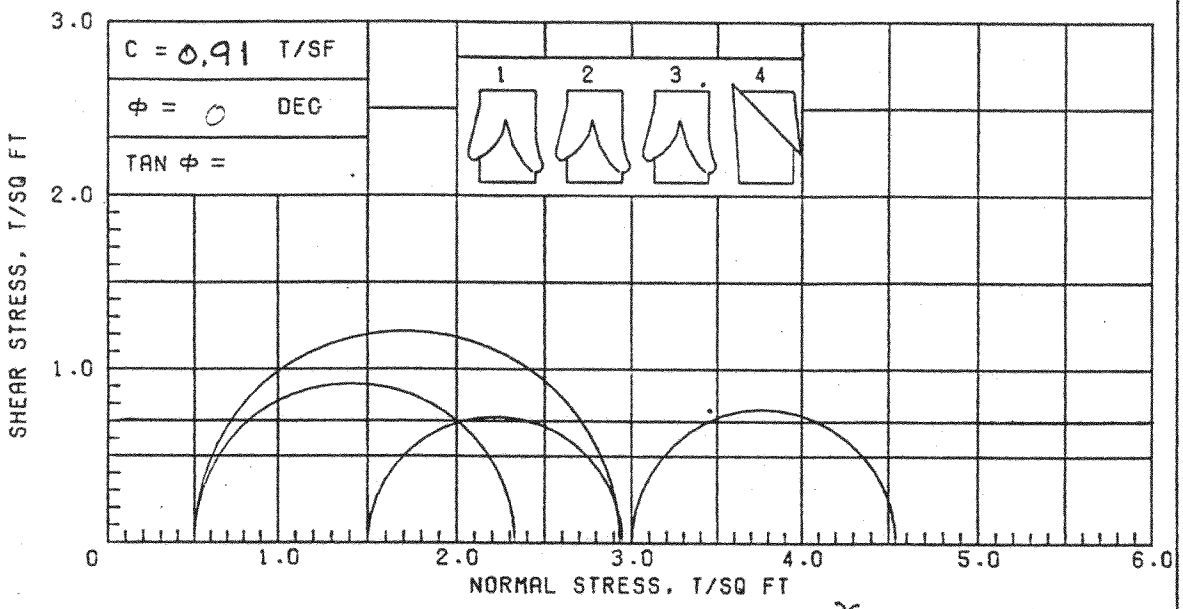
SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	31.8	33.9	32.6	32.8
	DRY DENSITY, PCF	90.1	87.9	87.8	88.6
	SATURATION, %	98.5	99.7	95.7	98.0
	VOID RATIO	0.872	0.918	0.920	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.28	1.50	1.69	1.49
TIME TO FAILURE, MIN.		30	30	30	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

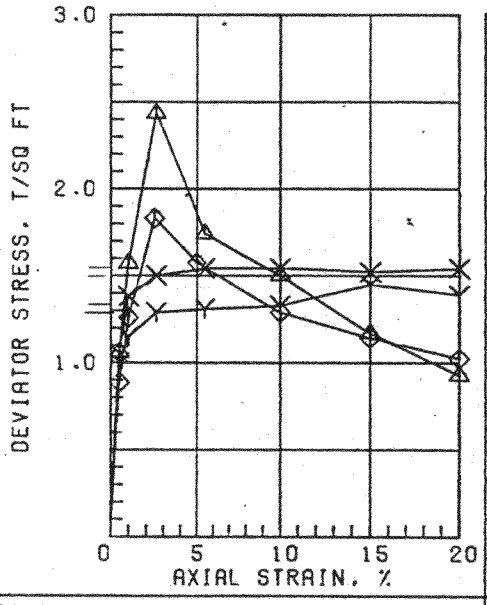
DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT LENSES

LL 44	PL 14	PI 30	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT M.R.C.O. - NEW SHIPLOCK	
LIMITS ON MIXTURE OF MATERIAL.	IHNC SITE	
	BORING NO. 4-IU	SAMPLE NO. 32-D
	DEPTH/ELEV 126.8/-146.8	TECH. KOC
	LABORATORY USAE WES	DATE 22 SEP 81
	TRIAXIAL COMPRESSION TEST REPORT	



$\gamma_{sat} = 114.3$



	SPECIMEN NO.	Δ1	Y2	X3	◇4	AVG
INITIAL	WATER CONTENT, %	40.7	39.8	38.4	39.2	39.3
	DRY DENSITY, PCF	80.7	81.9	82.8	82.0	81.9
	SATURATION, %	100+	100+	100+	100+	
	VOID RATIO	1.088	1.059	1.035	1.056	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		2.43	1.45	1.54	1.83	1.81
TIME TO FAILURE, MIN.		5	67	25	5	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.40	1.40	1.40	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

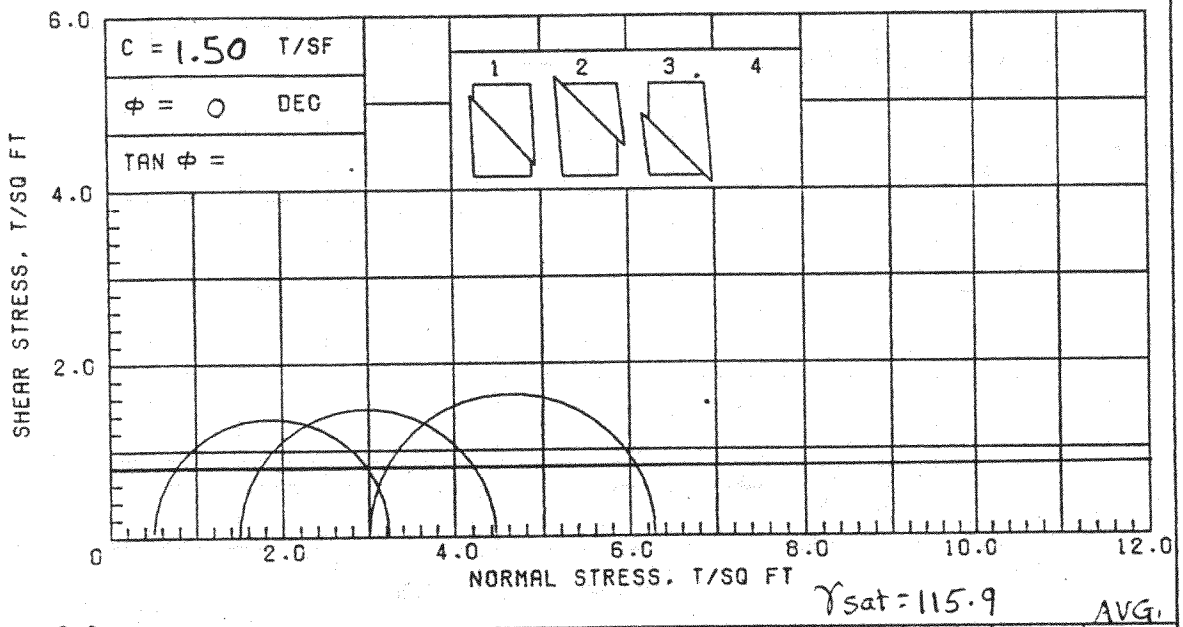
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), LIGHT GRAY; SILT LENSES

LL 57	PL 21	PI 36	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

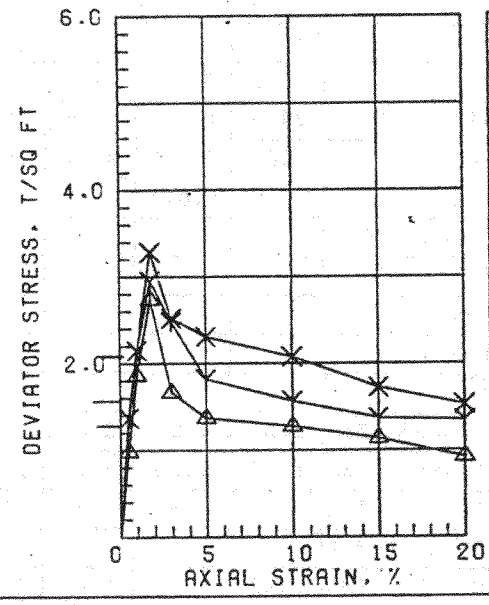
REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 4-IU | SAMPLE NO. 45-C
DEPTH/ELEV 178.3/-198.3 | TECH. PJR
LABORATORY USAE WES | DATE 24 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 115.9$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	38.0	36.6	36.6	37.1
	DRY DENSITY, PCF	83.7	84.6	85.2	84.5
	SATURATION, %	100+	99.6	100+	99.9
	VOID RATIO	1.014	0.992	0.978	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.73	2.95	3.28	2.99
TIME TO FAILURE, MIN.		4	11	11	
RATE OF STRAIN INCR.%			6	6	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 63	PL 22	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

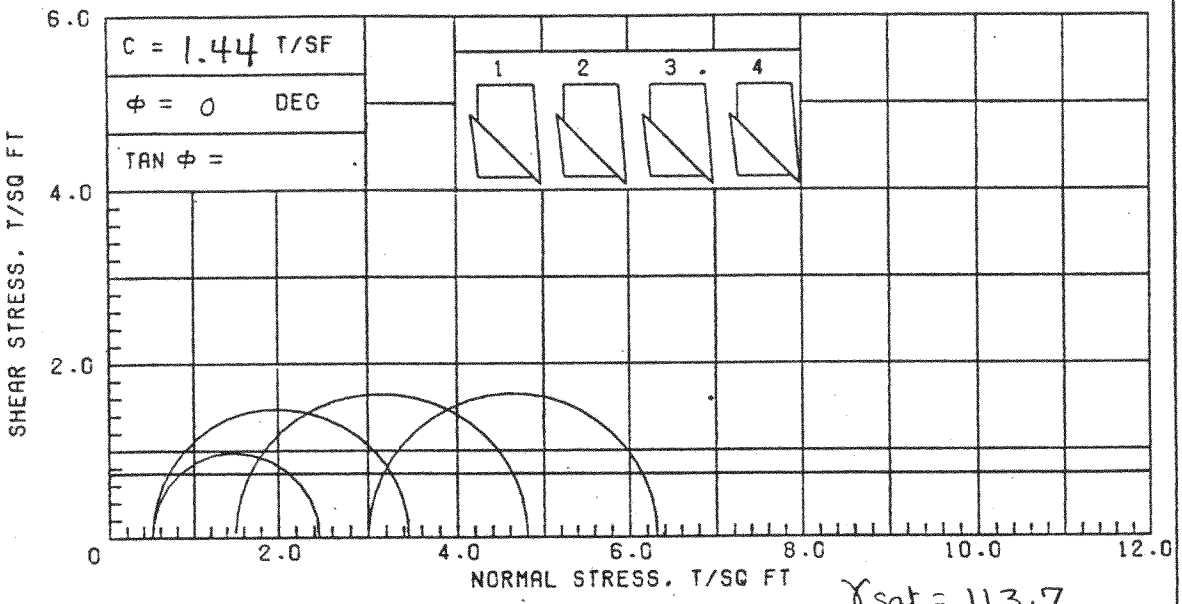
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 48-B

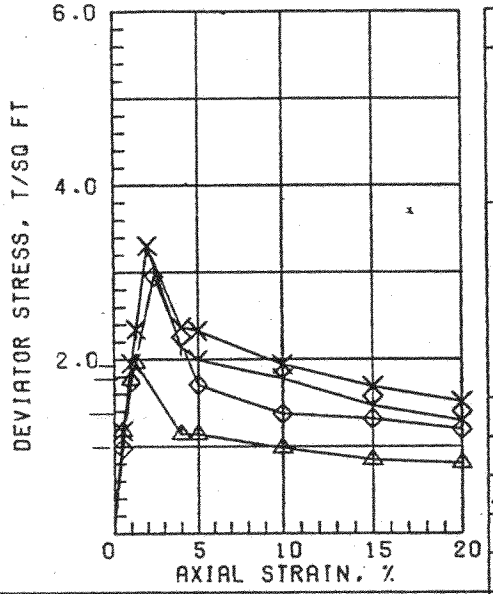
DEPTH/ELEV 189.0/-209.0 | TECH. PJR

LABORATORY USAE WES | DATE 23 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



γ_{sat} = 113.7



SPECIMEN NO.		△1	Y2	X3	◇4	AVG
INITIAL	WATER CONTENT, %	41.5	36.3	37.3	42.2	39.3
	DRY DENSITY, PCF	79.5	83.8	82.1	79.2	81.2
	SATURATION, %	100+	97.0	95.7	100+	98.2
	VOID RATIO	1.120	1.011	1.053	1.129	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		1.96	3.30	3.31	2.96	2.88
TIME TO FAILURE, MIN.		3	18	18	14	
RATE OF STRAIN INCR.%			4	4	4	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES & POCKETS

LL 76	PL 24	PI 52	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

LIMITS ON MIXTURE OF MATERIAL.

PROJECT M.R.C.O. - NEW SHIPLOCK

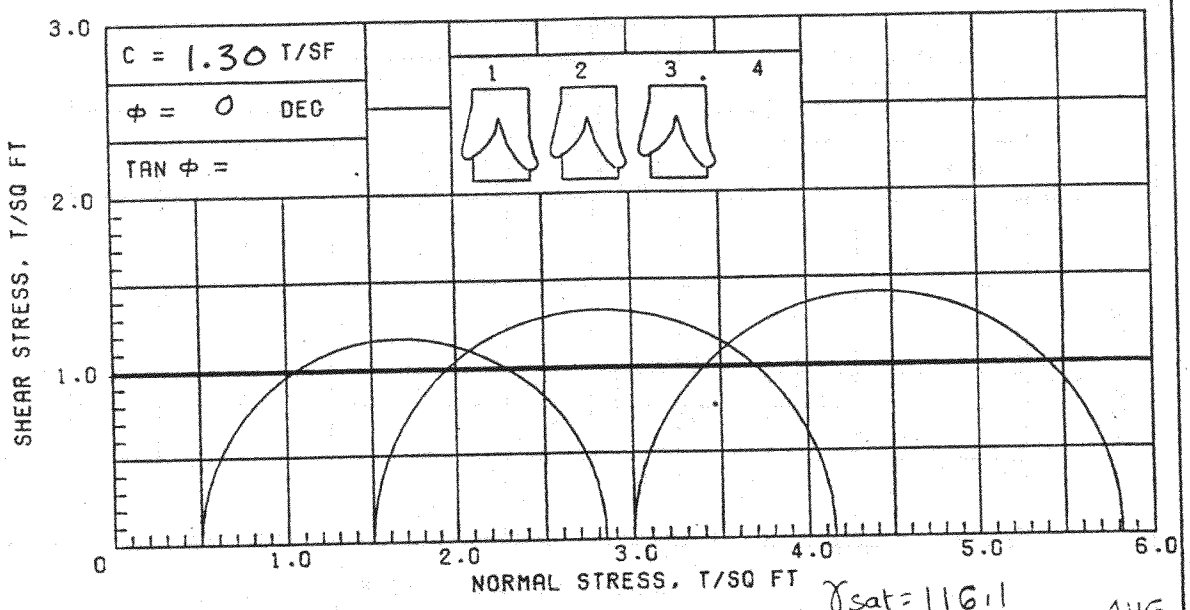
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 52-B

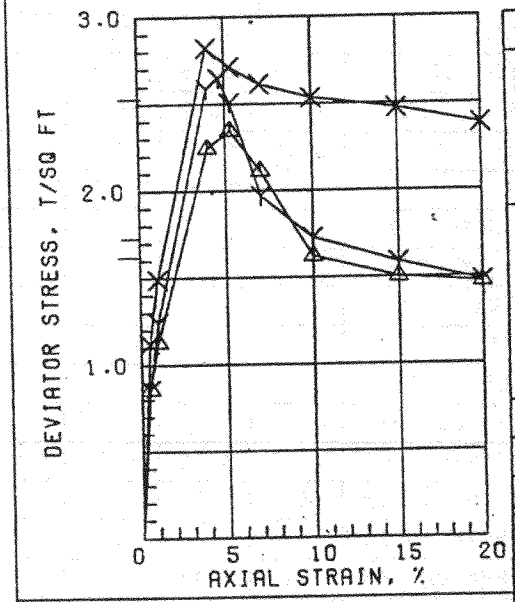
DEPTH/ELEV 205.0/-225.0 | TECH. KOC

LABORATORY USAE WES | DATE 23 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 116.1$ AVG.



SPECIMEN NO.		△1	Y2	X3	4
INITIAL	WATER CONTENT, %	33.4	31.6	32.4	32.5
	DRY DENSITY, PCF	85.0	85.6	84.9	85.2
	SATURATION, %	91.7	88.1	88.8	89.5
	VOID RATIO	0.984	0.968	0.986	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		2.34	2.65	2.82	2.60
TIME TO FAILURE, MIN.		10	8	7	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.40	1.39	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

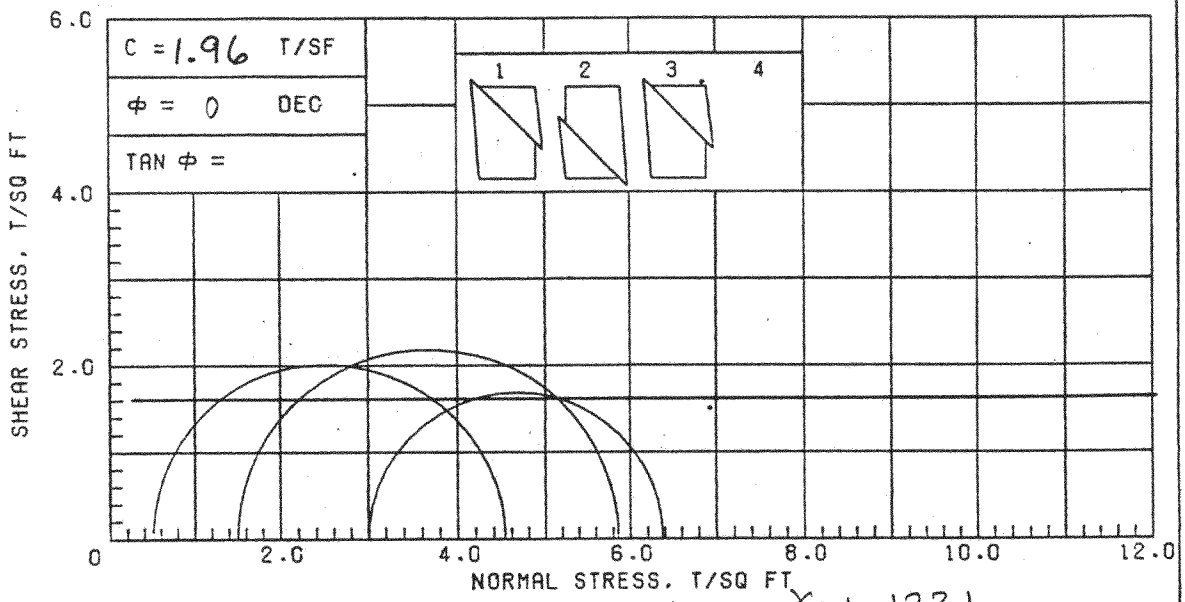
DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 60	PL 19	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

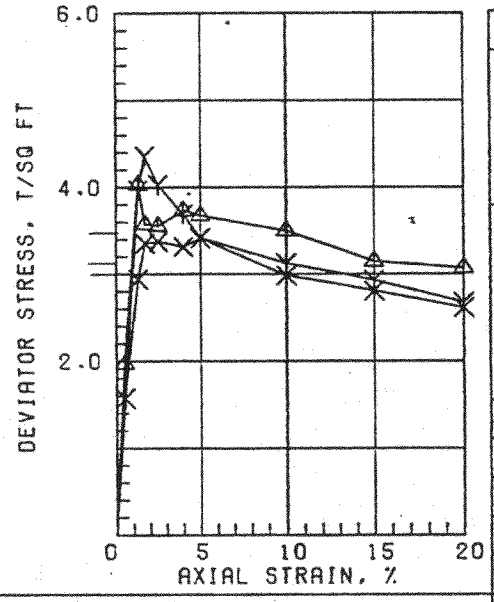
REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 4-IU | SAMPLE NO. 58-B
DEPTH/ELEV 230.0/-250.0 | TECH. PJR
LABORATORY USAE WES | DATE 24 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 123.1$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	27.4	27.8	28.2	27.8
	DRY DENSITY, PCF	96.8	96.2	95.8	96.3
	SATURATION, %	99.8	99.8	100+	
	VOID RATIO	0.741	0.752	0.760	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		4.02	4.36	3.37	3.92
TIME TO FAILURE, MIN.		3	15	21	
RATE OF STRAIN INCR.%			4	4	
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 50	PL 17	PI 33	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS;

PROJECT M.R.C.O. - NEW SHIPLOCK

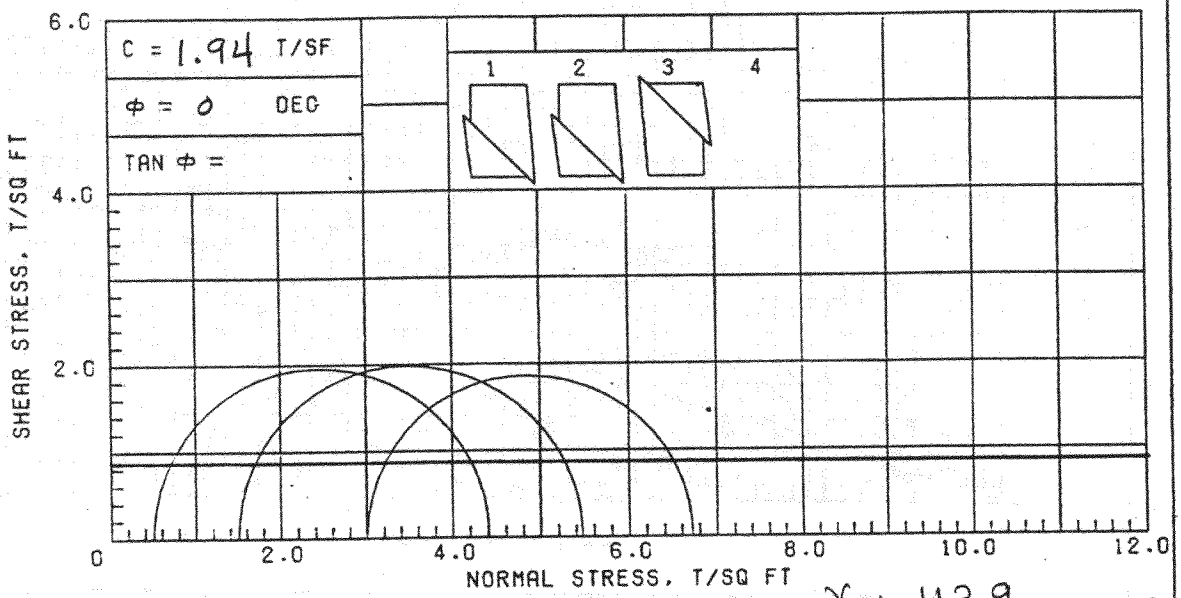
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 60-D

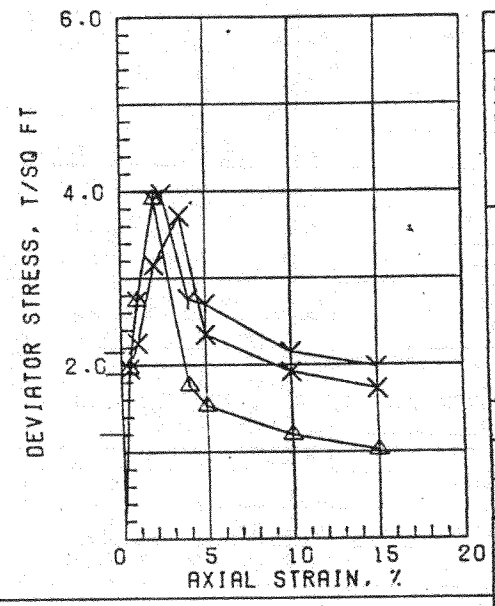
DEPTH/ELEV 239.3/-259.3 | TECH. KOC

LABORATORY USAE WES | DATE 24 SEP 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 112.9$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	42.8	41.3	42.0	42.0
	DRY DENSITY, PCF	79.0	80.1	79.3	79.5
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.134	1.104	1.127	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		3.92	3.97	3.72	3.87
TIME TO FAILURE, MIN.		4	26	31	
RATE OF STRAIN INCR.%			4	4	
INITIAL DIAMETER, IN.		1.42	1.42	1.42	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH), GRAY

LL 82	PL 20	PI 62	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.C. - NEW SHIPLOCK

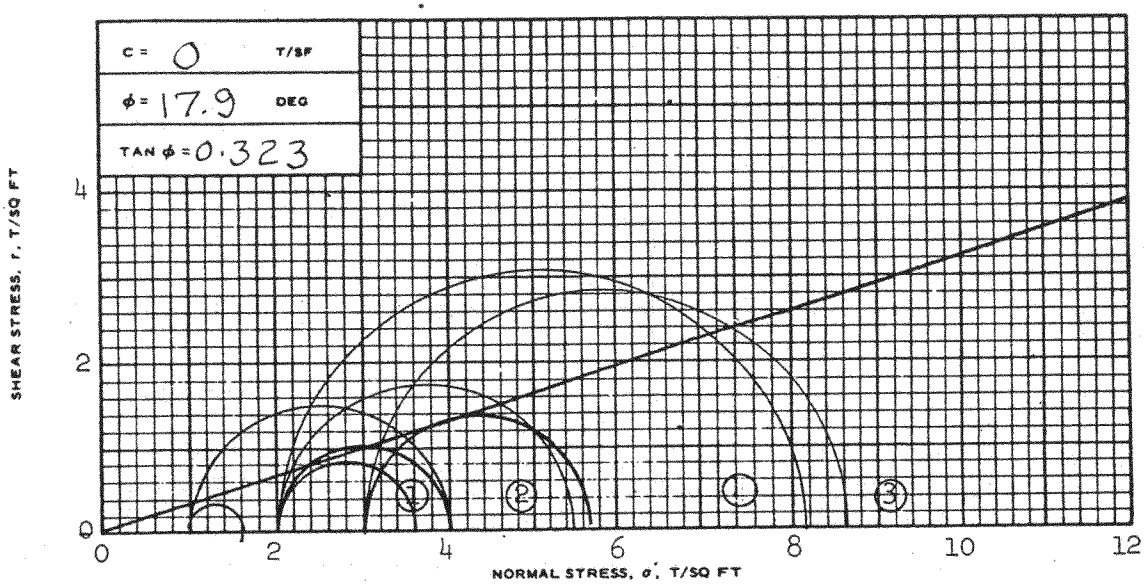
IHNC SITE

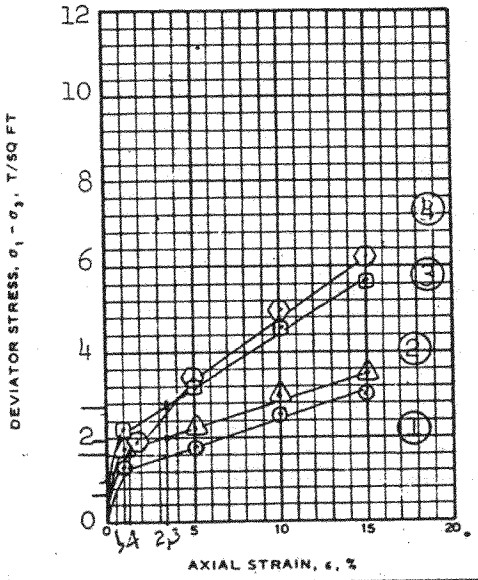
BORING NO. 4-IU | SAMPLE NO. 64-B

DEPTH/ELEV 253.0/-273.0 | TECH. KOC

LABORATORY USAE WES | DATE 24 SEP 81

TRIAXIAL COMPRESSION TEST REPORT





SPECIMEN NO.			1	2	3	4	
INITIAL	WATER CONTENT, %	w_o	24.3	24.4	23.1	23.0	23.
	DRY DENSITY LB/CU FT	γ_{d_o}	100.8	101.3	102.6	102.8	101.
	SATURATION, %	S_o	98.2	99.9	97.7	97.6	98.
	VOID RATIO	e_o	0.666	0.657	0.636	0.634	
BEFORE SHEAR	WATER CONTENT, %	w_c	22.4	20.8	20.1	21.1	
	DRY DENSITY LB/CU FT	γ_{d_c}	104.5	110.9	101.3	109.0	
	SATURATION, %	S_c	99.3	100+	100+	100+	
	VOID RATIO	e_c	0.607	0.515	0.534	0.541	
	FINAL BACK PRESSURE, T/SQ FT	u_o	5.04	5.04	5.04	5.04	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	2.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	3.02	3.50	5.65	6.16	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	1071	1071	1071	224	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$					
INITIAL DIAMETER, IN.		D_o	1.38	1.38	1.38	1.39	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS CLAYEY SILT (ML), GRAY

LL	PL	PI	G_s	TYPE OF SPECIMEN	TYPE OF TEST
			2.69(EST)	UNDISTURBED	R

REMARKS:

PROJECT MRGO - NEW SHIPLOCK
IHNC SITE

BORING NO. 4-IU SAMPLE NO. 19-C

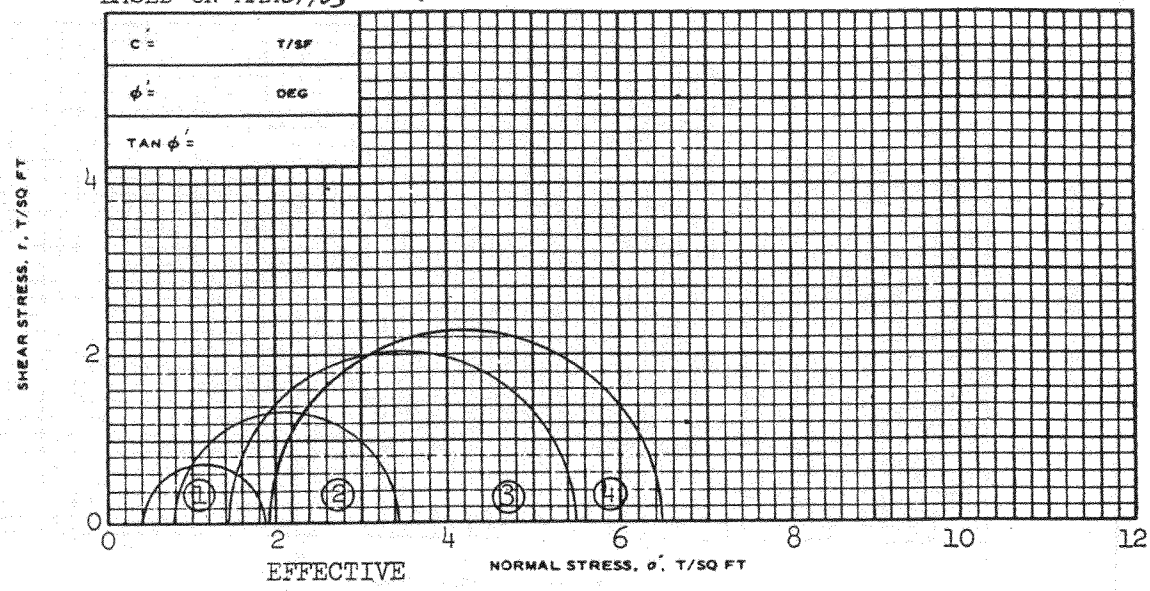
DEPTH/ELEV 73.5/-93.5

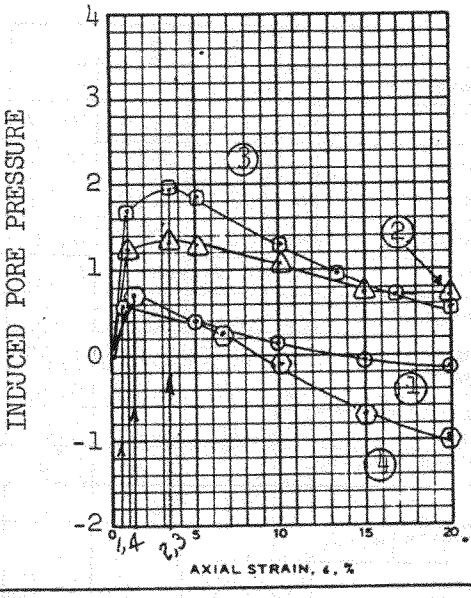
LABORATORY USAEWES DATE 13 OCT 81

SHEET 1 OF 2 JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

BASED ON MAX σ_1/σ_3





SPECIMEN NO.			1	2	3	4
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.42	0.78	1.42	1.93
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.44	2.66	4.06	4.54
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

PROJECT MRGO - NEW SHIPLOCK
IHNC SITE

BORING NO. 4-IU SAMPLE NO. 19-C

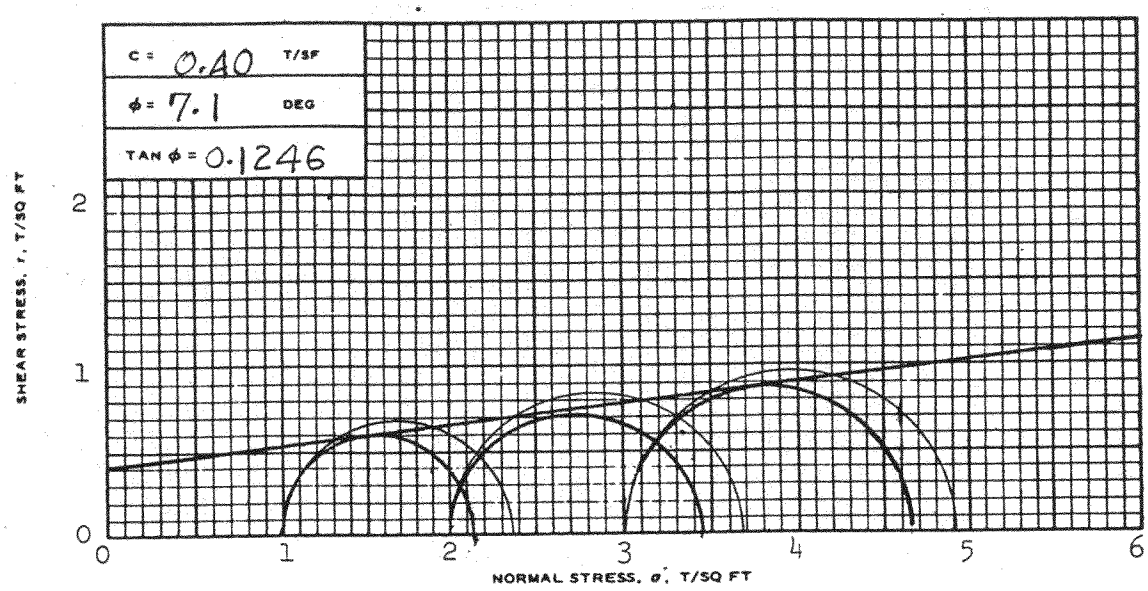
DEPTH/ELEV 73.5/-93.5

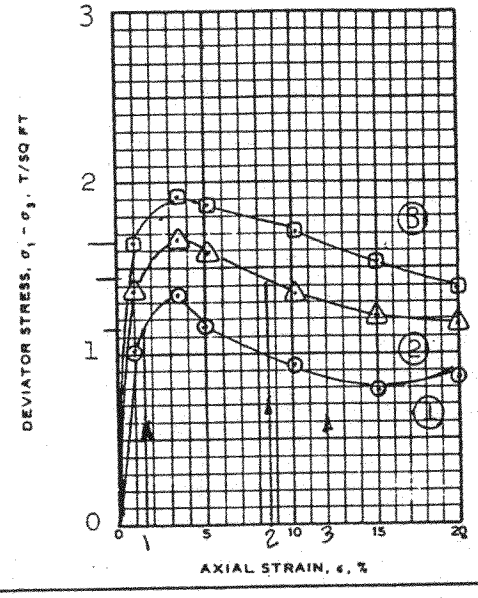
LABORATORY USAEWES DATE 13 OCT 81

SHEET 2 OF 2

JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o	46.0	42.3	43.5	43.9
	DRY DENSITY LB/ CU FT	γ_{d_o}	74.0	77.5	76.7	76.1
	SATURATION, %	S_o	96.6	96.5	97.4	96.8
	VOID RATIO	e_o	1.296	1.192	1.215	
BEFORE SHEAR	WATER CONTENT, %	w_c	48.0	42.2	41.6	
	DRY DENSITY LB/CU FT	γ_{d_c}	74.8	81.0	81.0	
	SATURATION, %	S_c	100+	100+	100+	
	VOID RATIO	e_c	1.272	1.096	1.096	
	FINAL BACK PRESSURE, T/SQ FT	u_b	5.76	5.76	5.76	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{MAX}$		1.36	1.67	1.91	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	243	243	243	
ULTIMATE DEVIATOR STRESS, T/SQ FT	$(\sigma_1 - \sigma_3)_{ULT}$					
INITIAL DIAMETER, IN.		D_o	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL 66 | PL 16 | PI 50 | Gs 2.70 (ESTD) | TYPE OF SPECIMEN UNDISTURBED | TYPE OF TEST R

REMARKS:

PROJECT MRGO - NEW SHIPLOCK
IHNC SITE

BORING NO. 4-IU | SAMPLE NO. 24-D

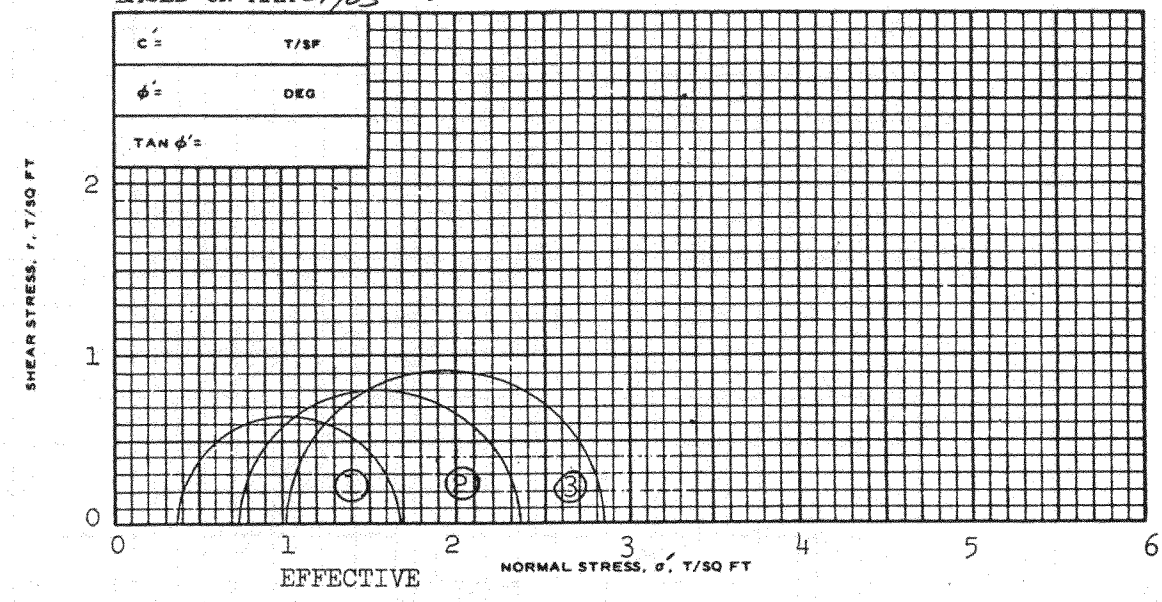
DEPTH/ELEV 94.6/-114.6

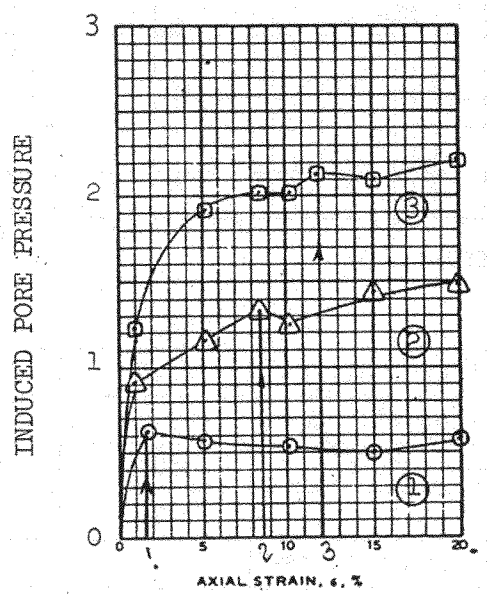
LABORATORY USAEWES | DATE 13 OCT 81

SHEET 1 OF 2 | JMS | TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

BASED ON MAX σ_1'/σ_3'





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_b				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.37	0.74	1.02	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	1.32	1.59	1.82	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	Gs	TYPE OF SPECIMEN	TYPE OF TEST

REMARKS:

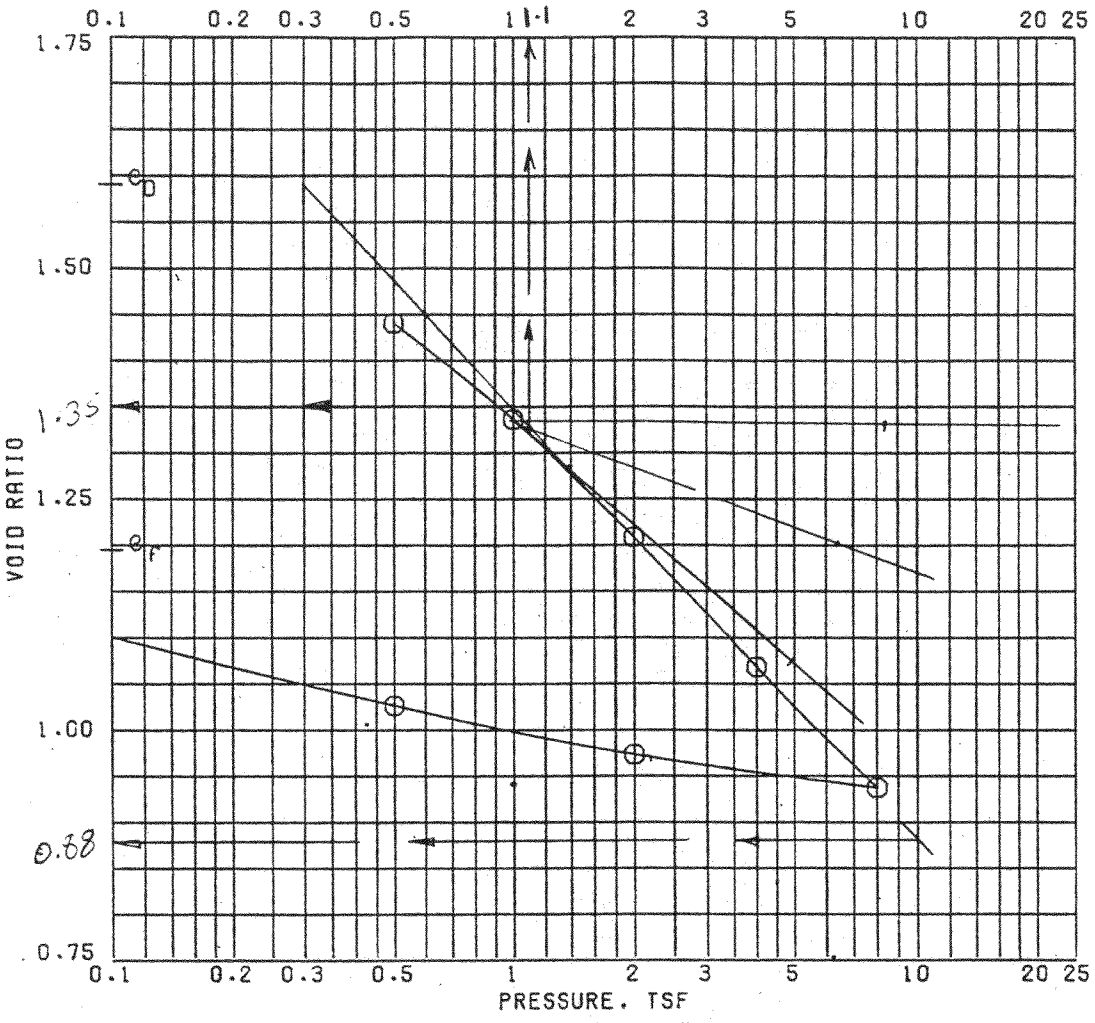
PROJECT MRGO - NEW SHIPLOCK
IHNC SITE

BORING NO. 4-IU SAMPLE NO. 24-D

DEPTH/ELEV 94.6/-114.6

LABORATORY USAEWES DATE 13 OCT 81

SHEET 2 OF 2 JMS TRIAXIAL COMPRESSION TEST REPORT

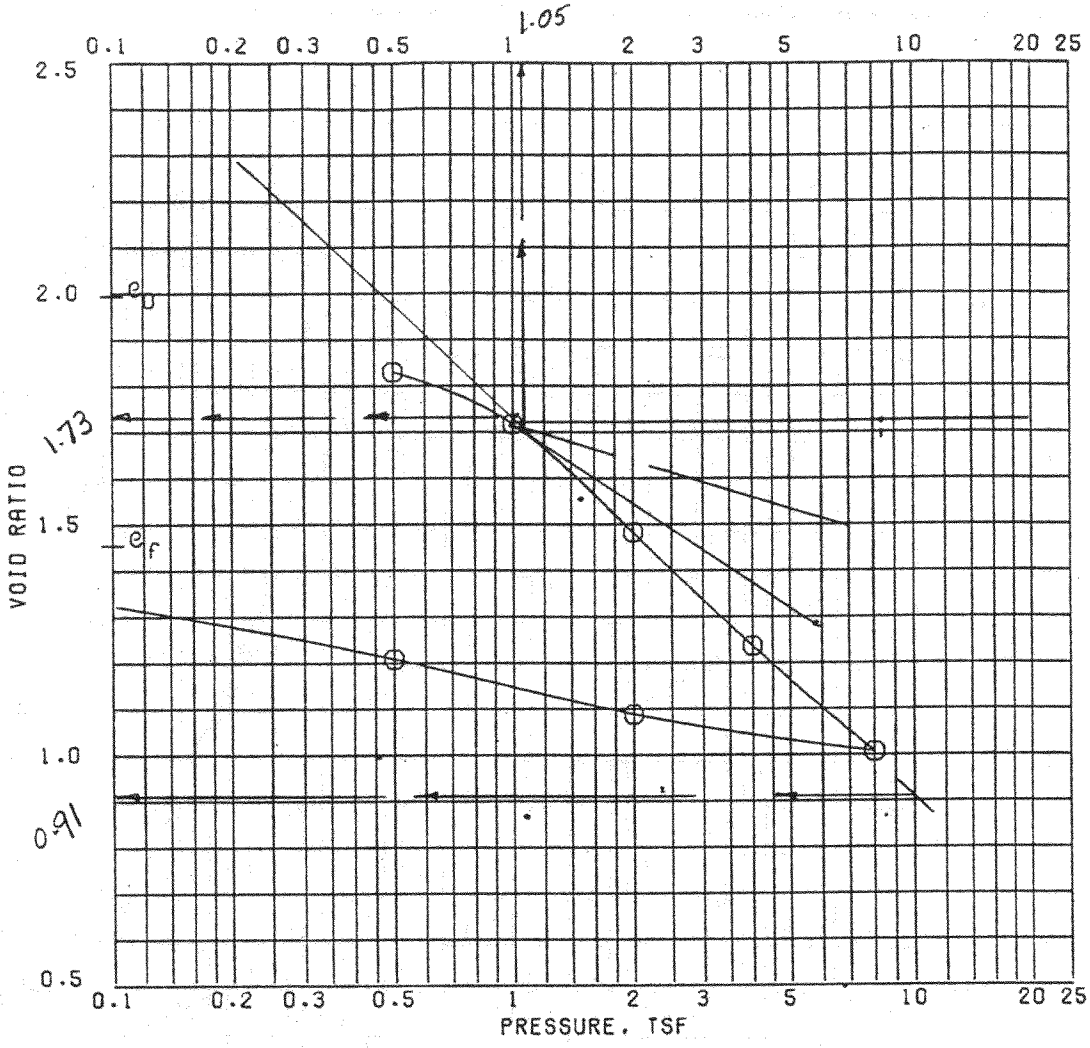


			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		WATER CONTENT. %	86.2	41.4
PRECONSOL. PRESSURE. TSF	1.10	DRY DENSITY. PCF	65.1	76.9
COMPRESSION INDEX	0.47	SATURATION. %	100 +	93.8
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.589	1.193
DIA. IN 4.44	HT. IN 1.138	BACK PRESSURE. TSF		

CLASSIFICATION PLASTIC CLAY (CH). GRAY; ROOTS TO 1/2"

LL 113	PL 34	PI 79	PROJECT M.R.C.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV.-27.0 .		BORING NO. 4-IU	SAMPLE NO. 2-D
Pc = 1.10		DEPTH/ELEV 7.0-27.0	DATE 10 NOV 81
Ce = 0.47		CONSOLIDATION TEST REPORT	

SHEET 1 OF 10



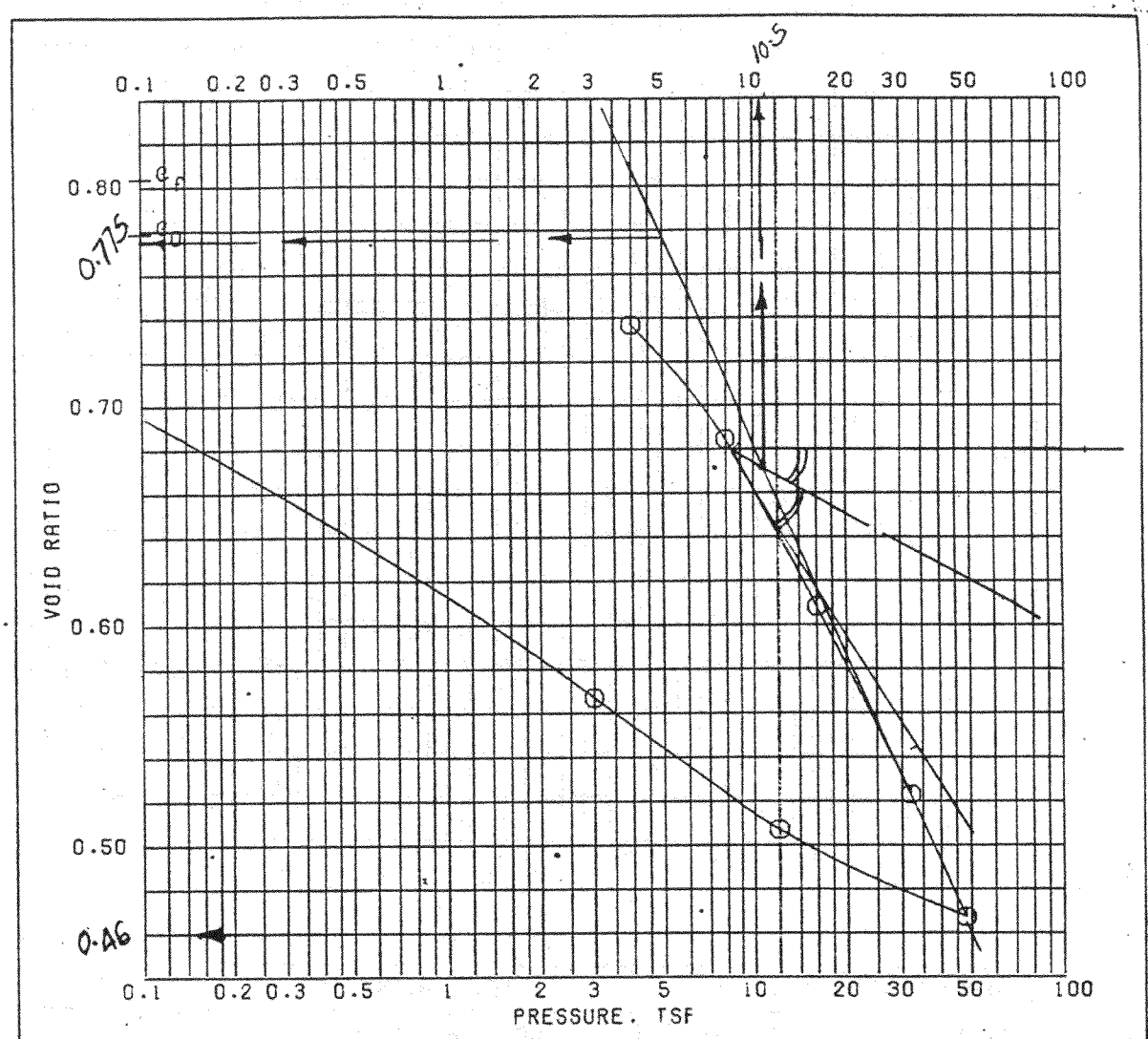
1.73 − 0.91 / 0.82

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 1.05	WATER CONTENT, %	71.5	59.0
COMPRESSION INDEX 0.82	DRY DENSITY, PCF	56.4	68.8
TYPE SPECIMEN UNDISTURBED	SATURATION, %	96.9	100 +
DIA. IN 4.44 HT. IN 1.125	VOID RATIO	1.991	1.451
	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SHELLS

LL 86	PL 26	PI 60	PROJECT M.R.C.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV. -37.0			BORING NO. 4-IU / SAMPLE NO. 5-B
p_c = 1.05			DEPTH/ELEV 17.0/-37.0 / DATE 12 NOV 81
C_c = 0.82			CONSOLIDATION TEST REPORT

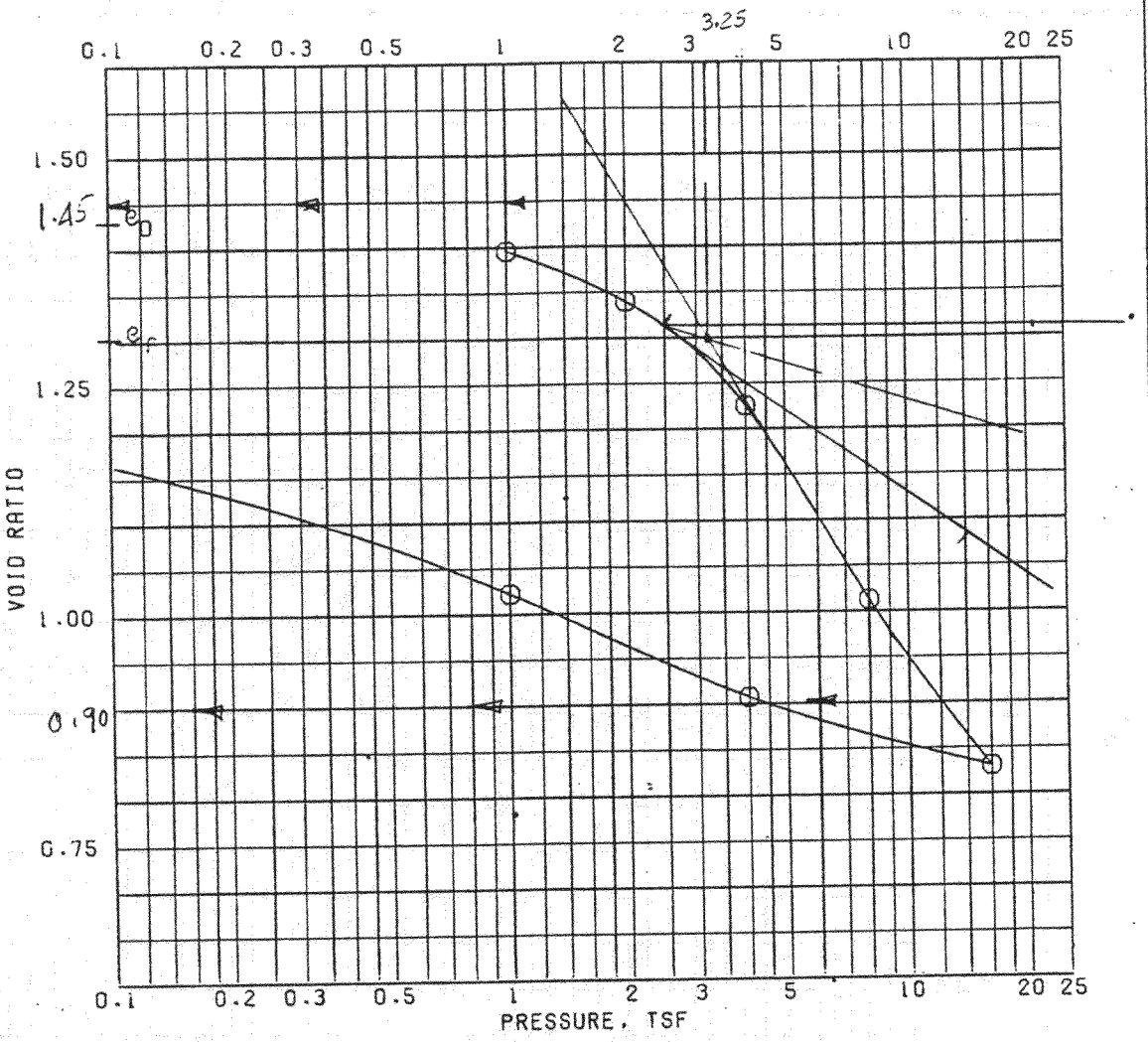
SHEET 1 OF 10



0.775 - 0.46 = 0.315 / 1 = 0.32

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE. TSF		
PRECONSOL. PRESSURE. TSF 10.5	DRY DENSITY. PCF 94.8	93.5
COMPRESSION INDEX 0.32	SATURATION. % 77.9	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 0.778	0.803
DIA. IN 4.44 HT. IN 1.128	BACK PRESSURE. TSF	
CLASSIFICATION CLAY (CL). GRAY		
LL 46 PL 14 PI 32	PROJECT M.R.C.C. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV. -66.4	BORING NO. 4-IU	SAMPLE NO. 12-C
P_c = 10.5	DEPTH/ELEV 46.4/-66.4	DATE 13 NOV 81
C_c = 0.32	CONSOLIDATION TEST REPORT	

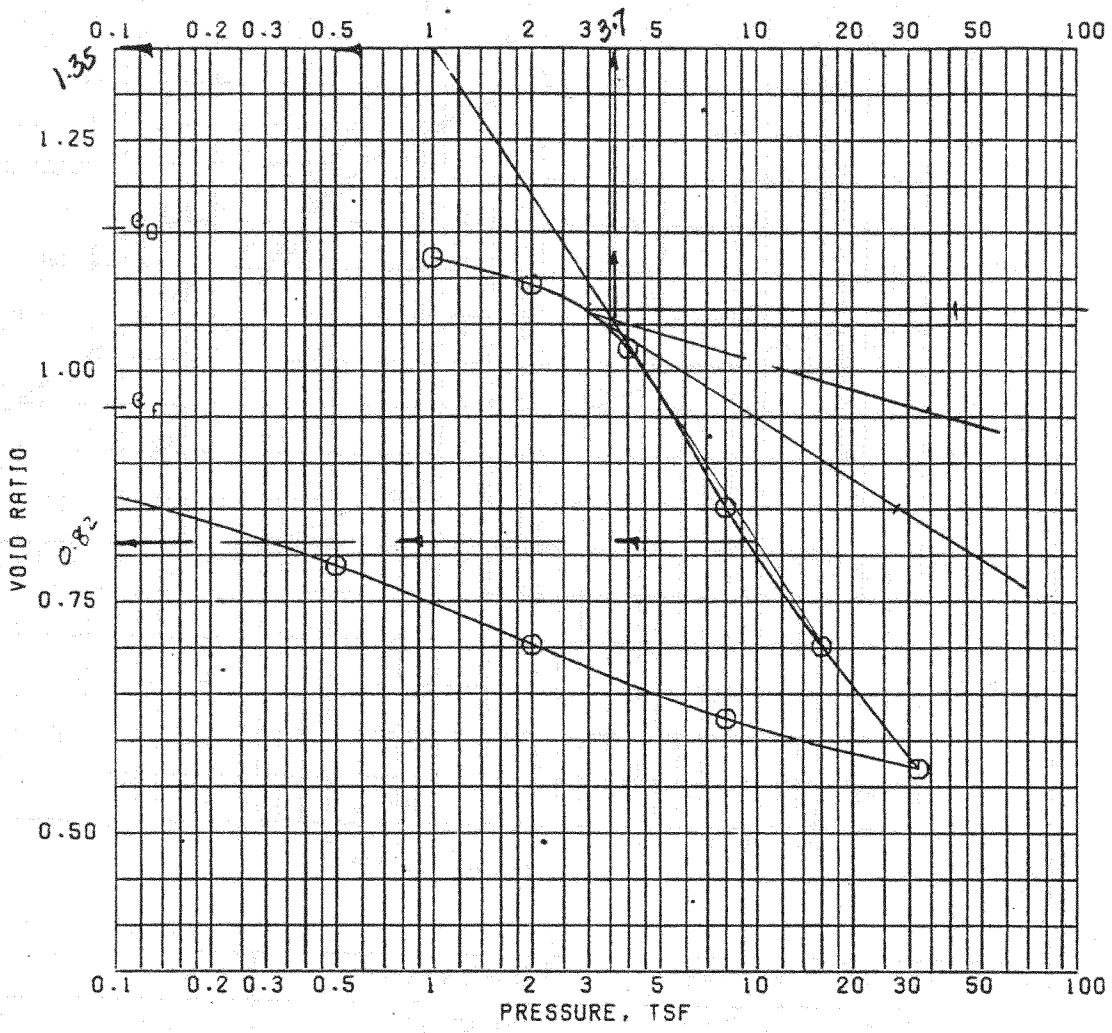
SHEET 1 OF 10



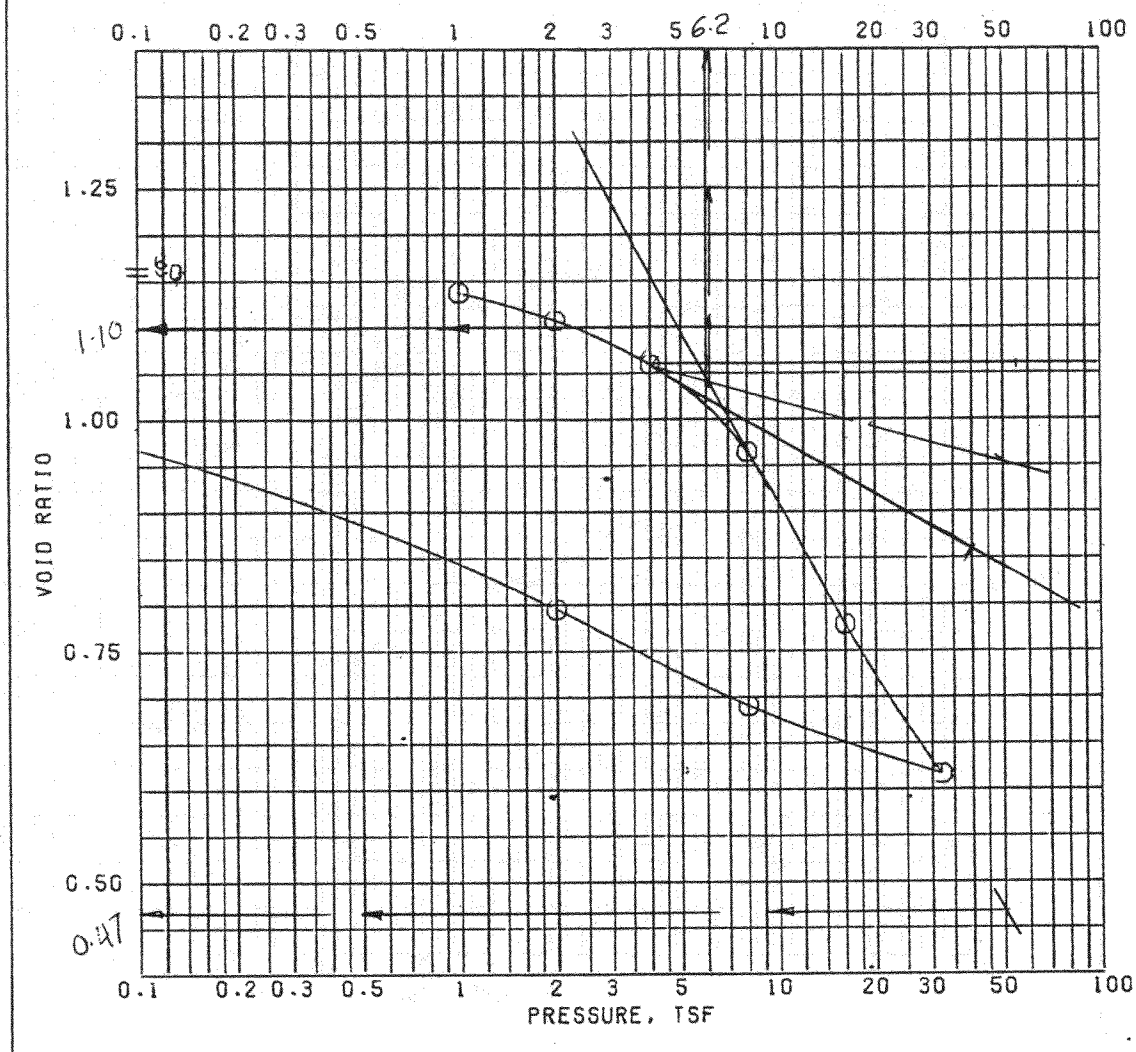
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	53.0	46.6
PRECONSOL. PRESSURE, TSF	3.25	DRY DENSITY, PCF	69.4	73.3
COMPRESSION INDEX	0.71	SATURATION, %	100 +	96.7
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.428	1.301
DIA. IN 4.44	HT. IN 1.115	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), GRAY; SILT POCKETS

LL 43	PL 16	PI 27	PROJECT M.R.C.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS ELEV. -112.8		BORING NO. 4-IU	SAMPLE NO. 24-B
$P_c = 3.25$		DEPTH/ELEV 92.8/-112.8	DATE 18 NOV 82
$C_c = 0.71$		CONSOLIDATION TEST REPORT	

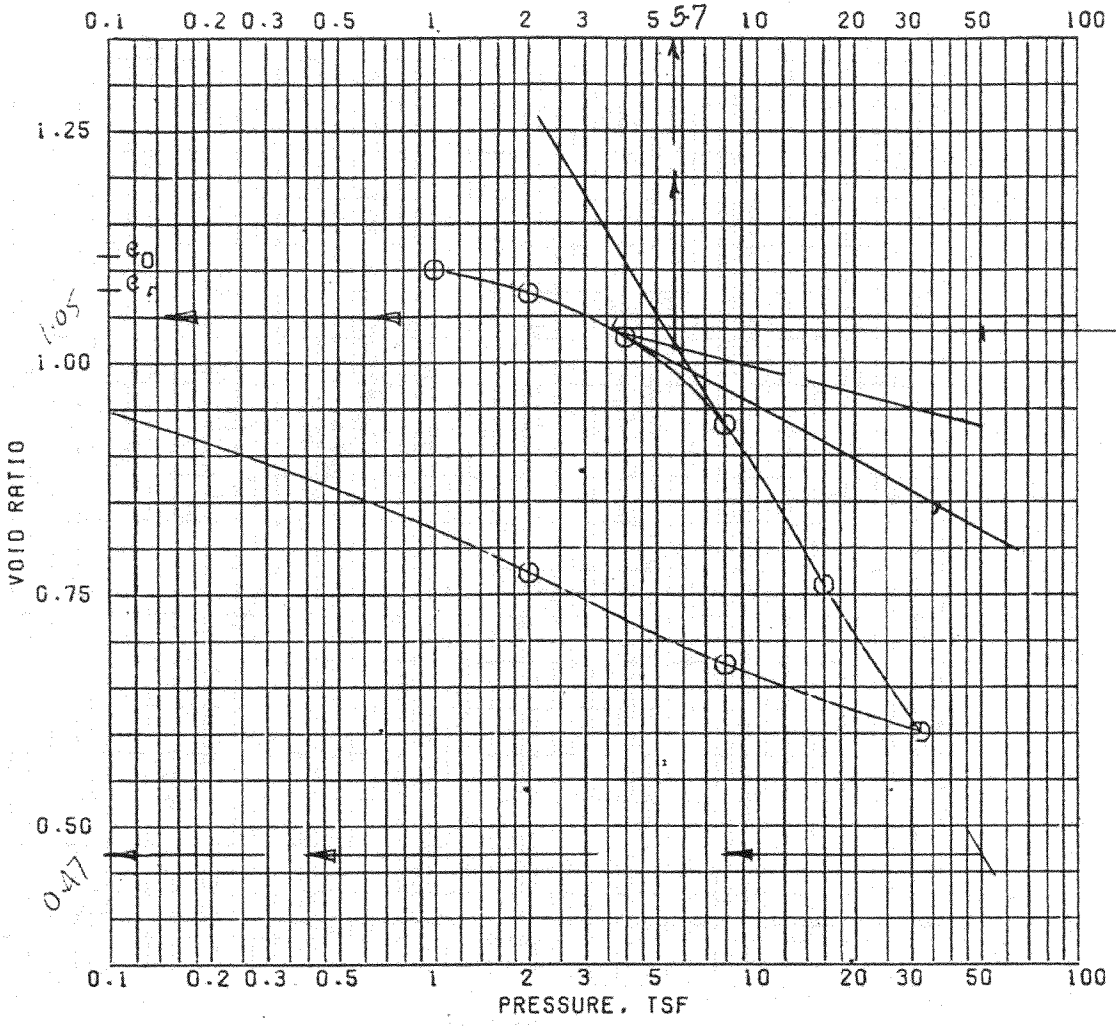


	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 3.7	DRY DENSITY, PCF 78.3	86.1
COMPRESSION INDEX 0.53	SATURATION, % 100 +	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.153	0.958
DIA. IN 4.44 HT. IN 1.121	BACK PRESSURE, TSF	
CLASSIFICATION CLAY (CL), GRAY; SILT POCKETS		
LL 45 PL 19 PI 26	PROJECT M.R.C.O. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV. -129.9	BORING NO. 4-IU	SAMPLE NO. 28-C
Pc = 3.7	DEPTH/ELEV 109.9/-129.9	DATE 19 NOV 81
Cc = 0.53	CONSOLIDATION TEST REPORT	



1.10
0.47
.63

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 6.2	DRY DENSITY, PCF 77.9	78.2
COMPRESSION INDEX 0.63	SATURATION, % 98.7	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.163	1.155
DIA. IN 4.44 HT. IN 1.115	BACK PRESSURE, TSF	
CLASSIFICATION PLASTIC CLAY (CH), GRAY		
LL 71 PL 22 PI 49	PROJECT M.R.C.O. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV. -197.0.	BORING NO. 4-IU	SAMPLE NO. 45-B
$P_c = 6.2$	DEPTH/ELEV 177.0/-197.0	DATE 20 NOV 82
$C_c = 0.63$	CONSOLIDATION TEST REPORT	



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	38.1	45.1
PRECONSOL. PRESSURE, TSF	5.7	DRY DENSITY, PCF	79.8	81.2
COMPRESSION INDEX	0.58	SATURATION, %	92.4	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.114	1.077
DIA. IN 4.44	HT. IN 1.124	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 79	PL 25	PI 54	PROJECT M.R.C.C. - NEW SHIPLOCK	
GS 2.70 (EST)	D_{10}		IHNC SITE	
REMARKS ELEV. -212.8			BORING NO. 4-IU	SAMPLE NO. 49-B
			DEPTH/ELEV 192.8/-212.8	DATE 20 NOV 82

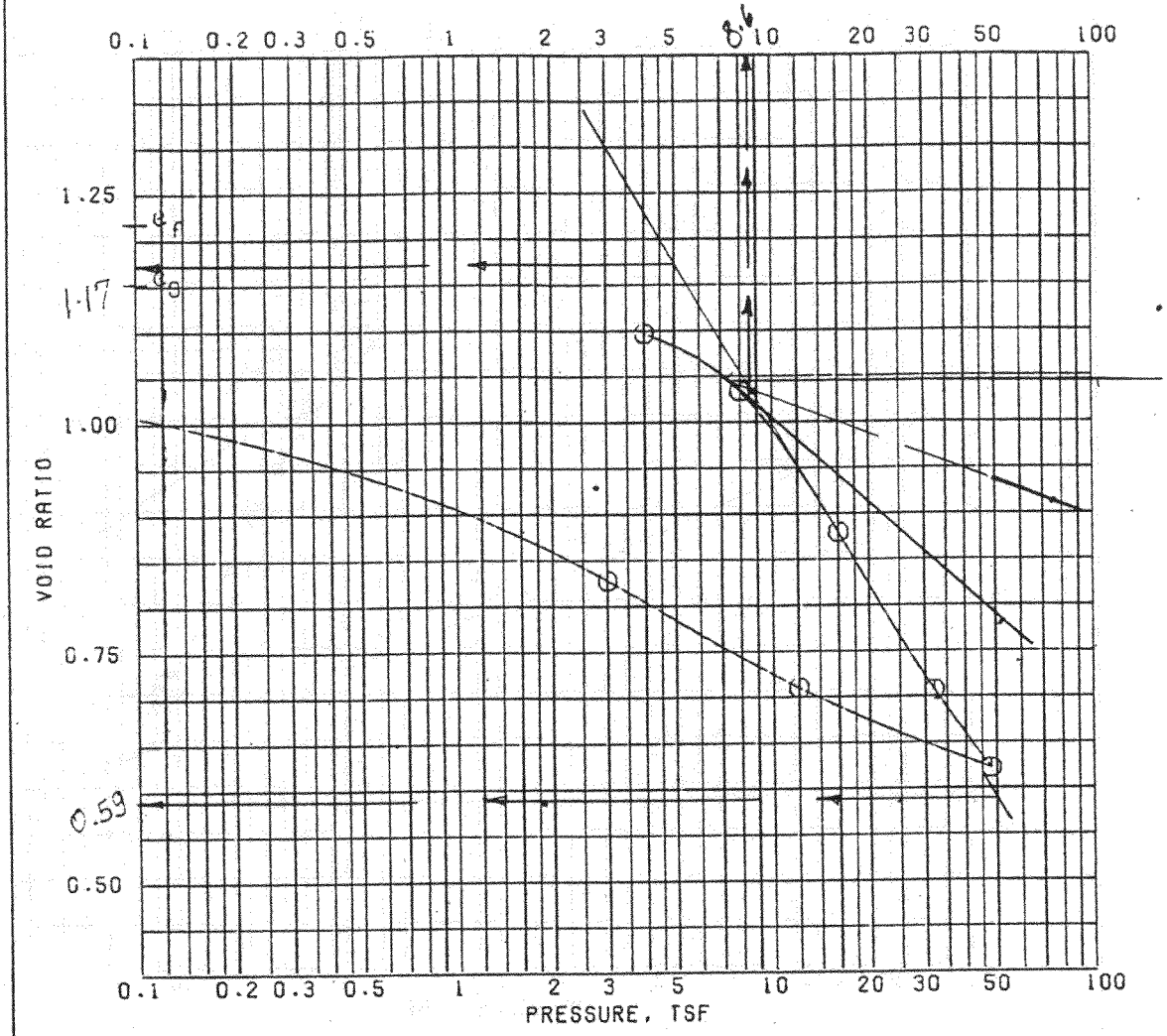
$P_c = 5.7$

$C_c = 0.58$

CONSOLIDATION TEST REPORT

SHEET 1 OF 11

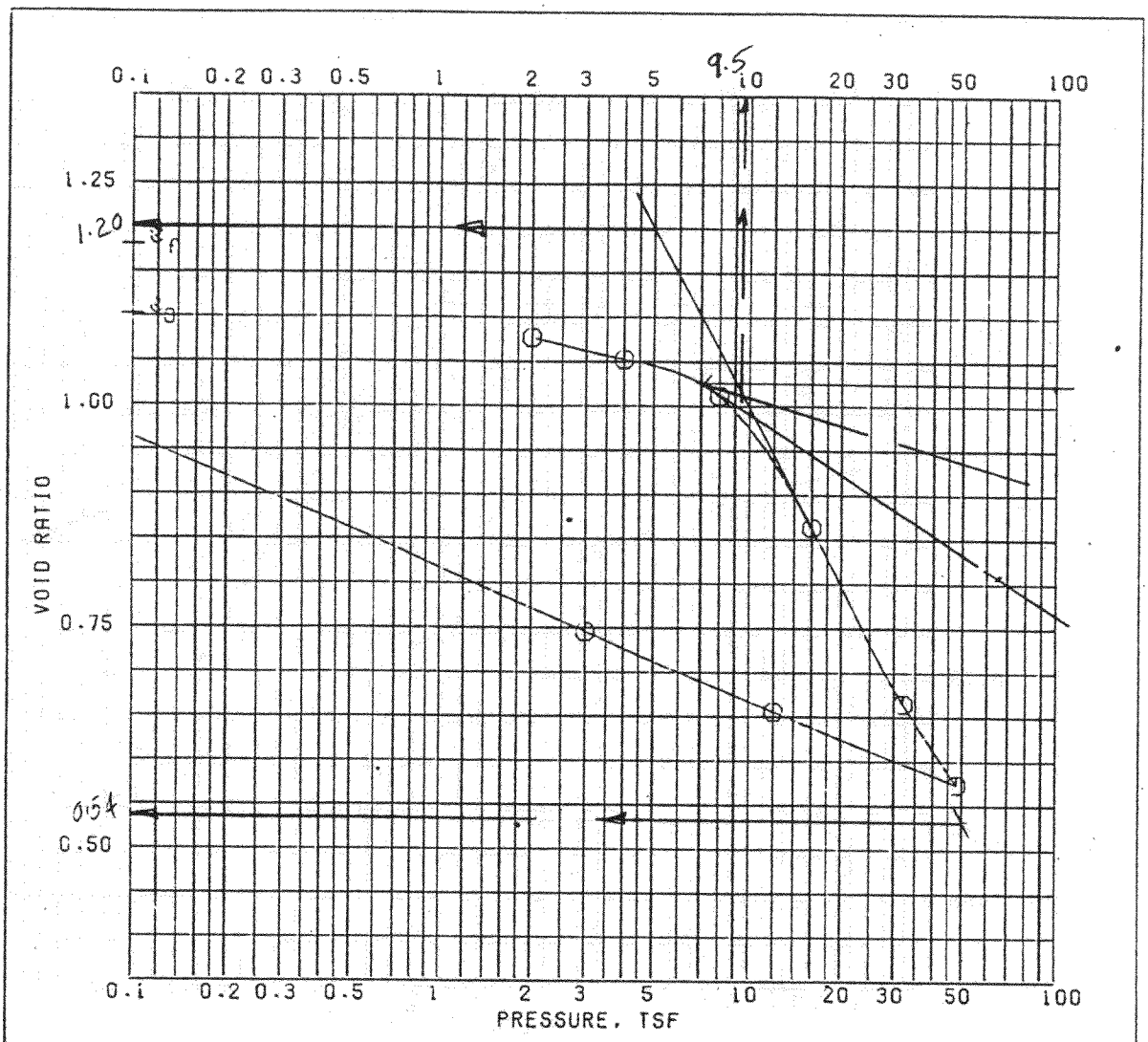
$\frac{1.05 - 0.47}{\log 5.7 - \log 1.05} = 0.58$



$$\frac{1.17 - 0.59}{\log 50 - \log 8.6} = \frac{0.58}{1} = 0.58$$

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 8.6	DRY DENSITY, PCF 78.4	76.1
COMPRESSION INDEX 0.58	SATURATION, % 96.1	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.151	1.216
DIA. IN 4.44 HT. IN 1.127	BACK PRESSURE, TSF	
CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT POCKETS		
LL 62 PL 22 PI 40	PROJECT M.R.C.C. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV. -257.5	BORING NO. 4-10	SAMPLE NO. 60-B
PC = 8.6	DEPTH/ELEV 237.5/-257.5	DATE 20 NOV 81
C_c = 0.58	CONSOLIDATION TEST REPORT	

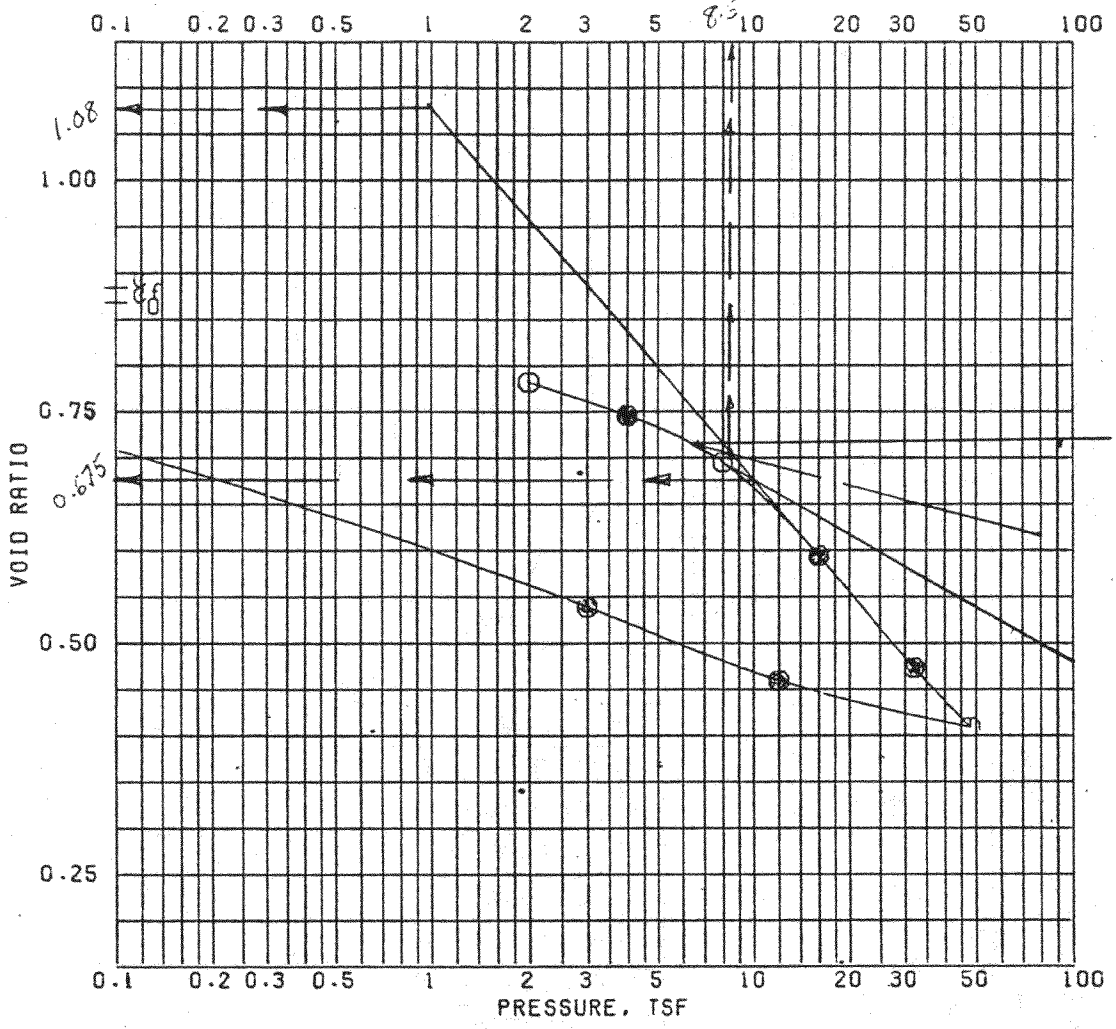
SHEET 1 OF 10



1.20 - 0.54 = 0.66
log 50 - log 5

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 9.5	DRY DENSITY, PCF 80.2	77.3
COMPRESSION INDEX 0.66	SATURATION, % 98.2	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.101	1.179
DIA. IN 4.44 HT. IN 1.124	BACK PRESSURE, TSF	
CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT POCKETS; SLICKENSIDED		
LL 60 PL 21 PI 39	PROJECT M.R.G.C. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV. -278.8	BORING NO. 4-IU	SAMPLE NO. 65-D
Pc = 9.5	DEPTH/ELEV 258.8/-278.8	DATE 24 NOV 81
Cc = 0.66	CONSOLIDATION TEST REPORT	

SHEET 1 OF 11



1.08 − 0.675 / 0.405

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 8.5	WATER CONTENT, % 30.6	35.1
COMPRESSION INDEX 0.41	DRY DENSITY, PCF 90.3	89.5
TYPE SPECIMEN UNDISTURBED	SATURATION, % 95.4	100 +
DIA. IN 4.44 HT. IN 1.137	VOID RATIO 0.867	0.883
	BACK PRESSURE, TSF	

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 56 PL 16 PI 40

CS 2.70 (EST) D_{10}

REMARKS ELEV. -309.6.

$P_c = 8.5$

$C_c = 0.41$

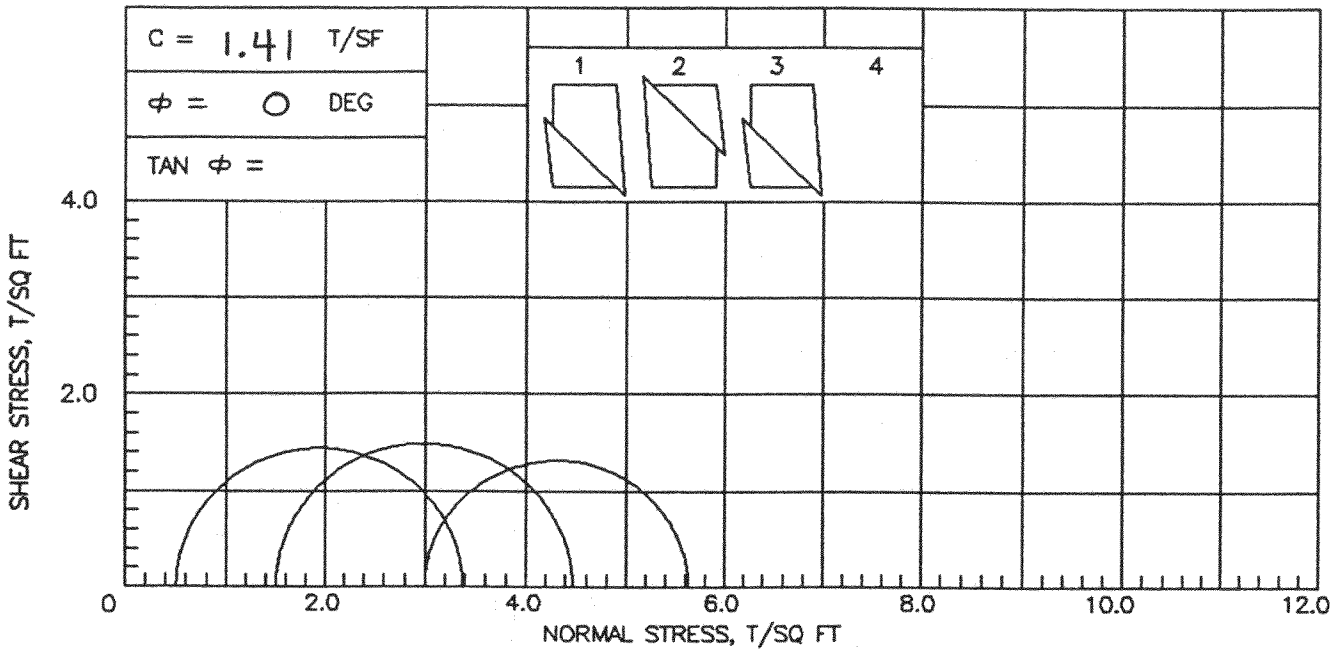
PROJECT M.R.G.O. - NEW SHIPLOCK

IHNC SITE

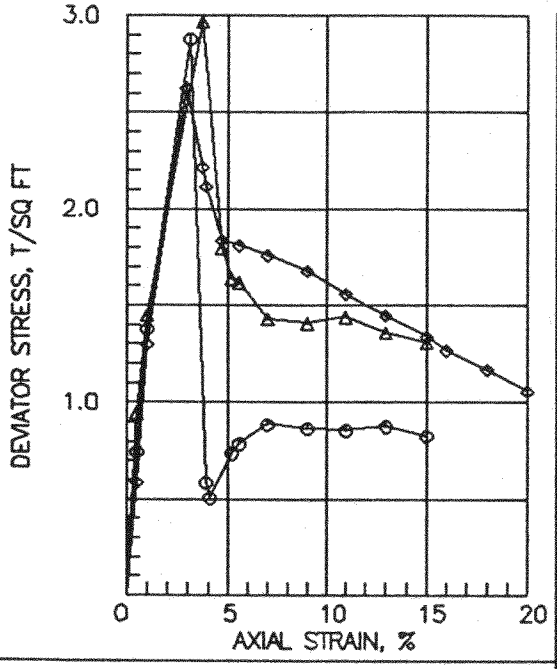
BORING NO. 4-IU SAMPLE NO. 73-C

DEPTH/ELEV 289.6/-309.6 DATE 24 NOV 81

CONSOLIDATION TEST REPORT



γ_w = 109.8 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	46.4	45.8	45.9	
	DRY DENSITY, PCF	75.0	75.5	75.0	
	SATURATION, %	100+	100+	99.5	
	VOID RATIO	1.248	1.234	1.246	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		2.88	2.97	2.63	
TIME TO FAILURE, MIN.		6	21	16	
STRAIN RATE INCR., %			5	5	
INITIAL DIAMETER, IN.		1.37	1.37	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 81	PL 20	PI 61	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

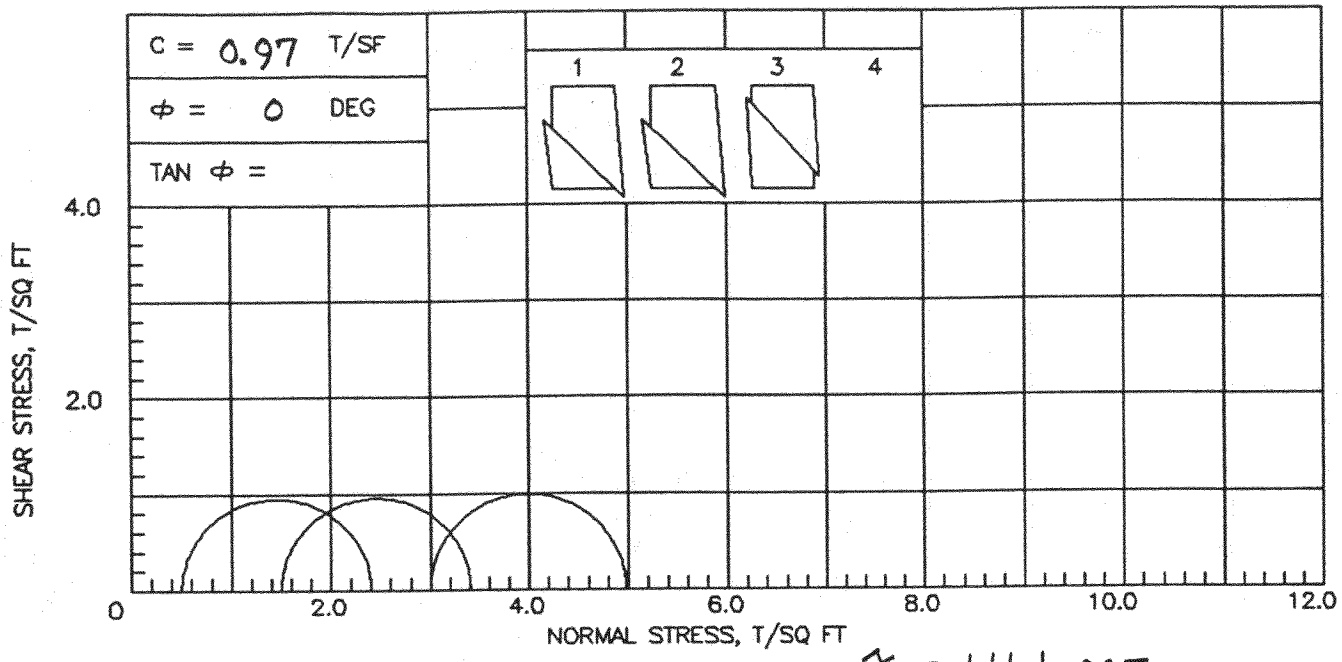
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 46C

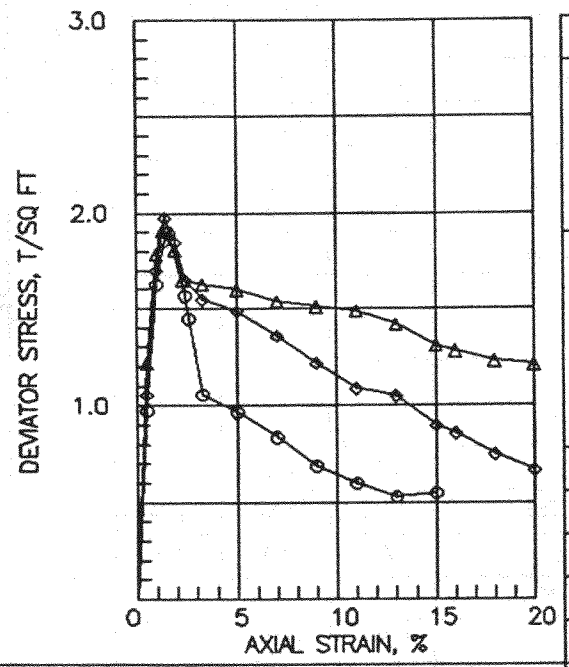
DEPTH/ELEV 195.0/-227.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 02 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 111.1 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	44.2	44.2	44.7	
	DRY DENSITY, PCF	77.4	77.5	76.1	
	SATURATION, %	100+	100+	99.2	
	VOID RATIO	1.178	1.174	1.216	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.90	1.91	1.98	
TIME TO FAILURE, MIN.		3	13	14	
STRAIN RATE INCR., %			3	1	
INITIAL DIAMETER, IN.		1.37	1.37	1.38	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY

LL 76	PL 20	PI 56	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

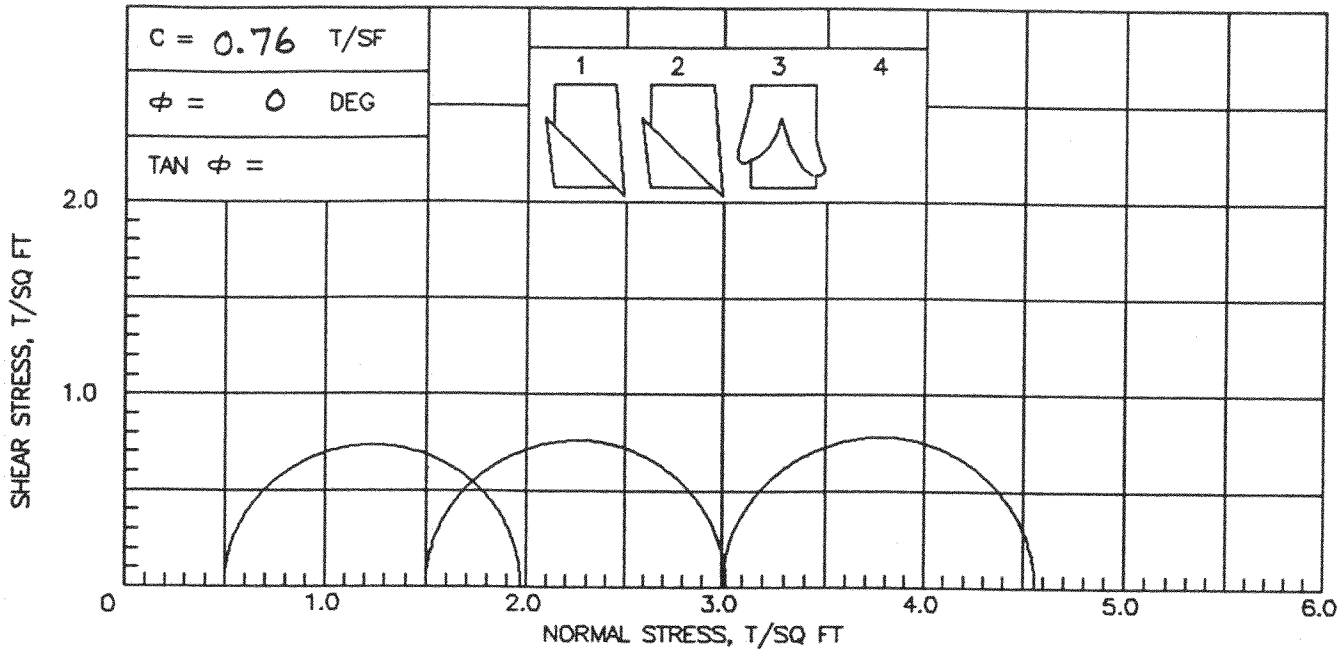
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 42C

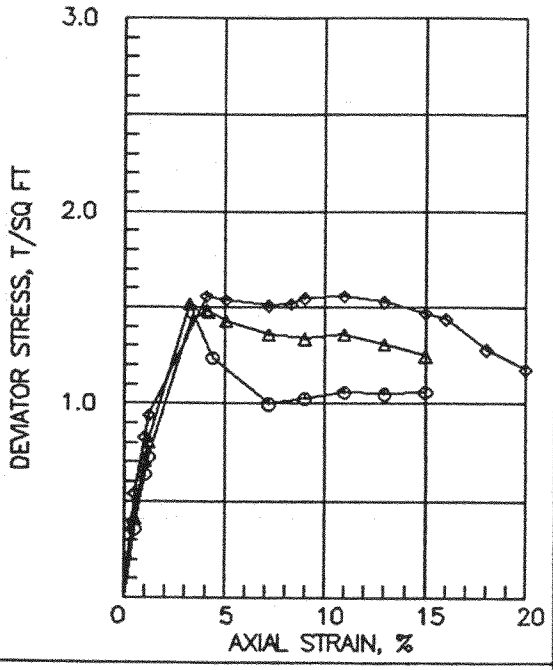
DEPTH/ELEV 179.3/-211.8 TECH. JH

LABORATORY USAE WES - STF/GL DATE 02 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 114.9 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	37.8	34.0	35.8	
	DRY DENSITY, PCF	83.1	86.1	84.6	
	SATURATION, %	99.1	95.9	97.3	
	VOID RATIO	1.030	.958	.994	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.47	1.52	1.56	
TIME TO FAILURE, MIN.		7	19	24	
STRAIN RATE INCR., %			7	8	
INITIAL DIAMETER, IN.		1.36	1.39	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; 1/2" FINE SAND LAYER

LL 59	PL 18	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

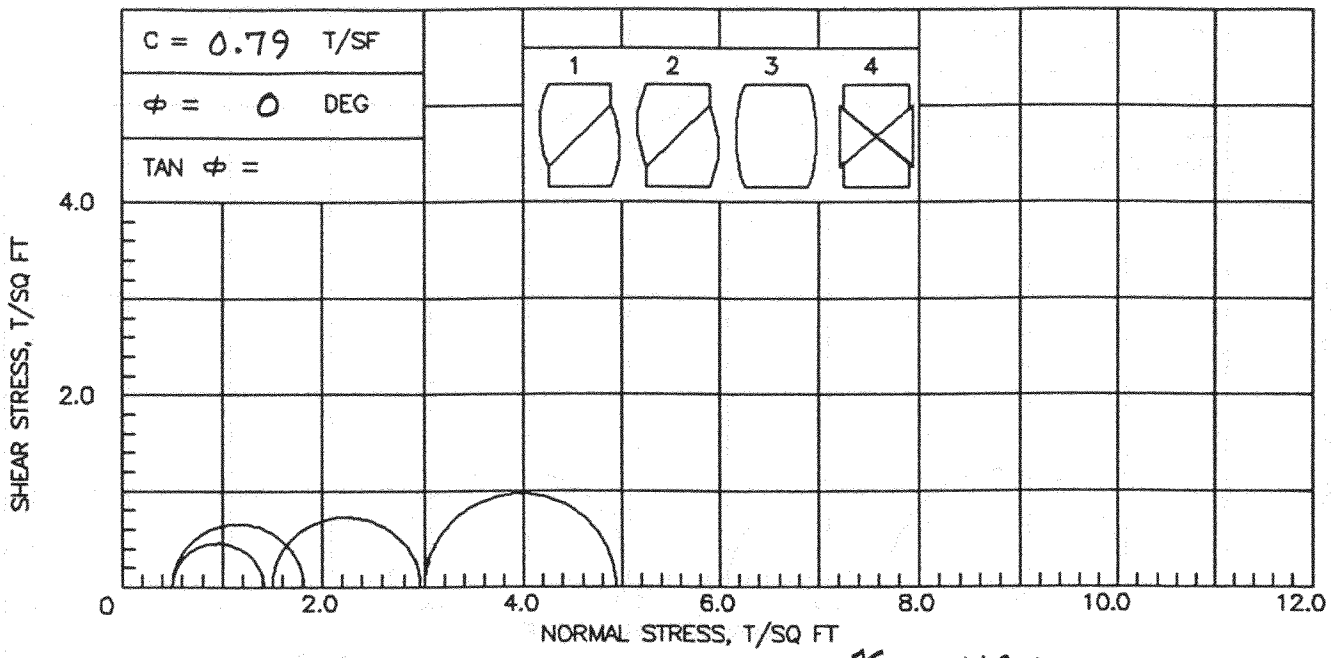
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 39C

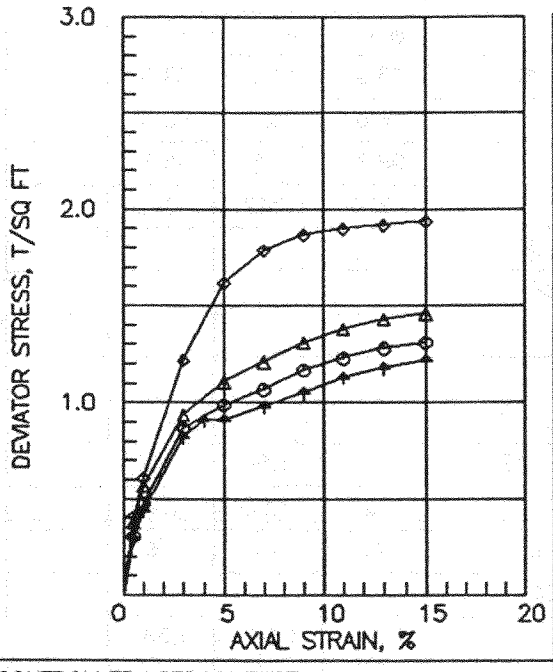
DEPTH/ELEV 167.2/-199.7 TECH. JH

LABORATORY USAE WES - STF/GL DATE 01 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 119.0 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	29.2	30.0	27.0	29.2
	DRY DENSITY, PCF	92.3	89.8	95.2	90.3
	SATURATION, %	95.4	92.6	94.6	91.0
	VOID RATIO	.825	.876	.770	.866
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		1.31	1.46	1.94	.91
TIME TO FAILURE, MIN.		29	29	29	8
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.35	1.37	1.37	1.38
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL 48	PL 18	PI 30	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

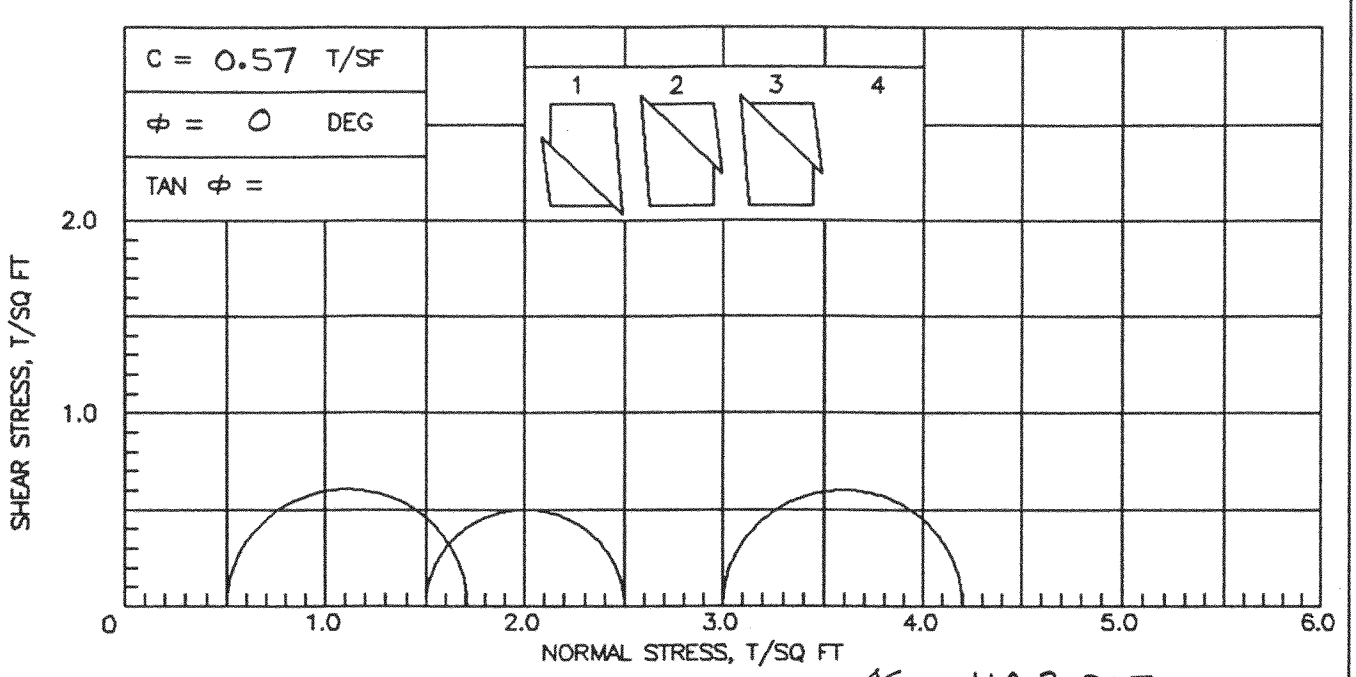
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 32B

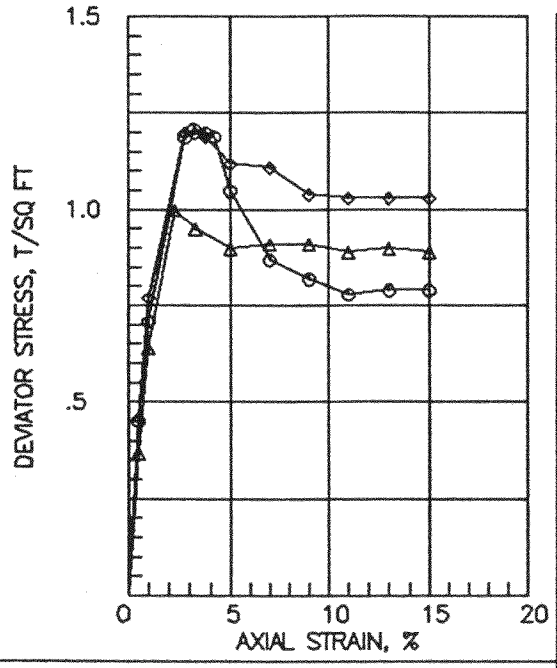
DEPTH/ELEV 138/-170.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 01 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 110.2 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	43.9	44.1	39.0	
	DRY DENSITY, PCF	76.6	75.0	80.6	
	SATURATION, %	98.7	95.5	96.5	
	VOID RATIO	1.200	1.247	1.092	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.21	1.00	1.20	
TIME TO FAILURE, MIN.		7	13	16	
STRAIN RATE INCR., %				5	
INITIAL DIAMETER, IN.		1.36	1.36	1.38	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; ORGANIC MATERIAL

LL 65	PL 16	PI 49	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

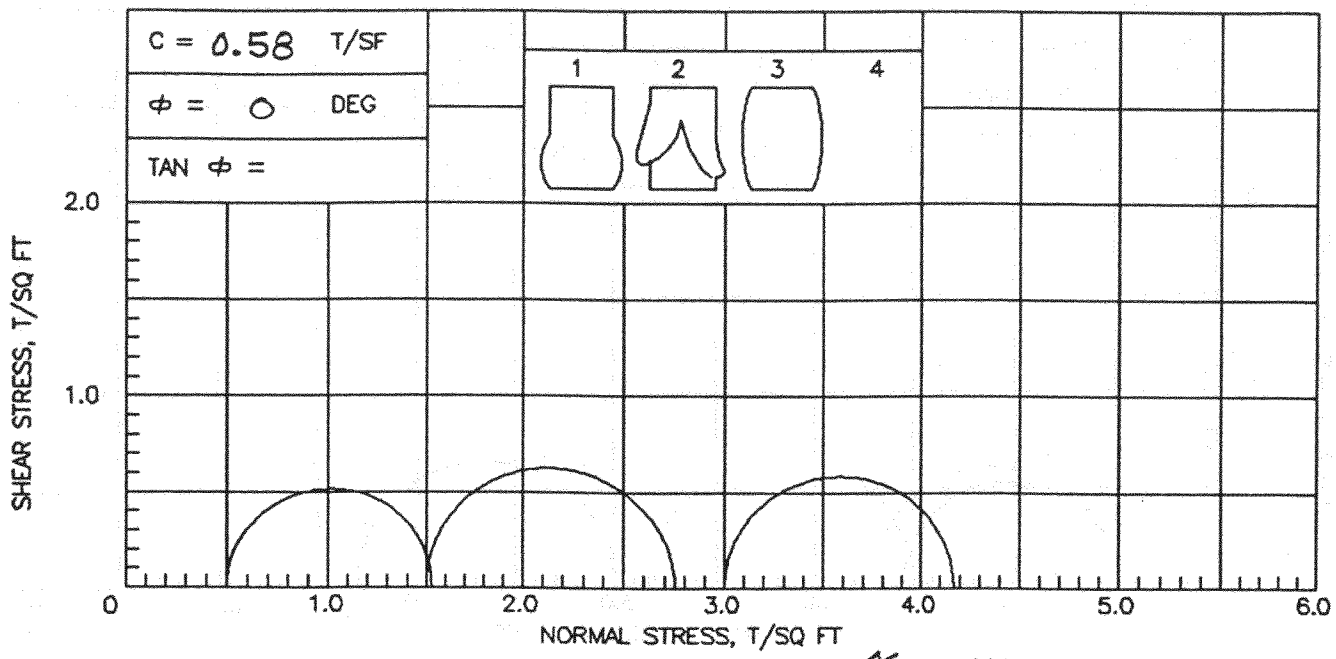
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 27B

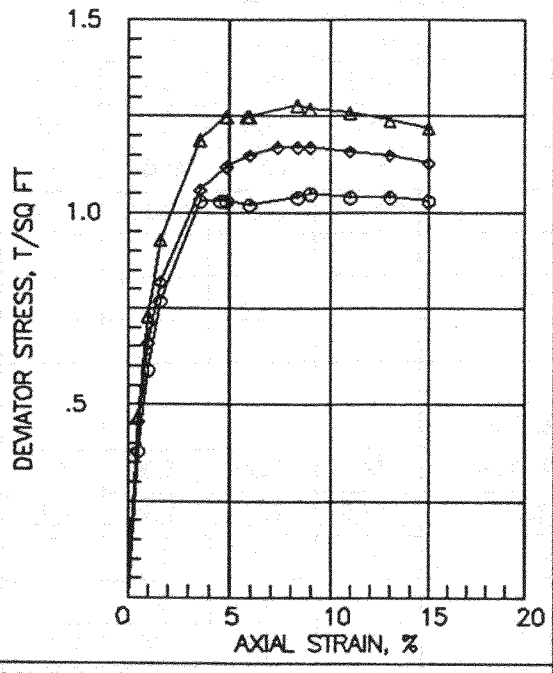
DEPTH/ELEV 118.4/-150.9 TECH. JH

LABORATORY USAE WES - STF/GL DATE 30 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_w = 116.0$ PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	34.2	34.5	34.4	
	DRY DENSITY, PCF	86.3	86.5	86.3	
	SATURATION, %	96.7	98.2	97.2	
	VOID RATIO	.954	.948	.954	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.03	1.25	1.17	
TIME TO FAILURE, MIN.		7	26	41	
STRAIN RATE INCR., %			6		
INITIAL DIAMETER, IN.		1.37	1.36	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; FINE SAND LENSES; SILT SEAMS

LL 53	PL 19	PI 34	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

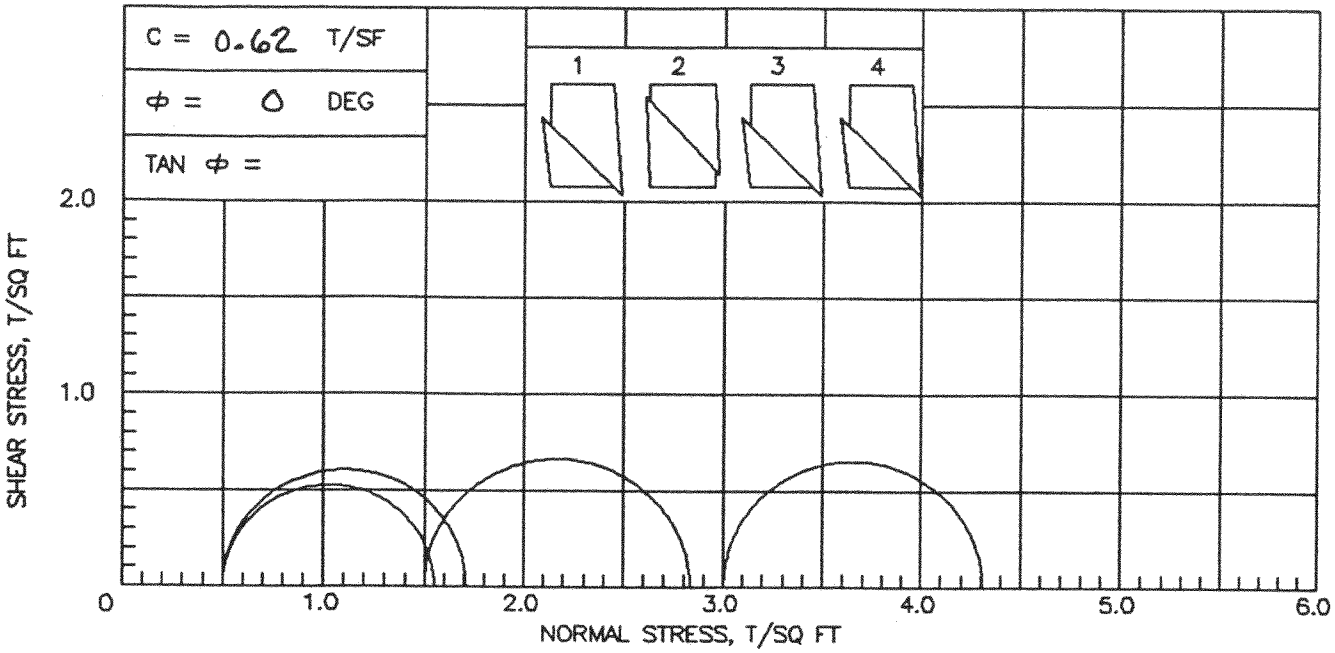
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 23B

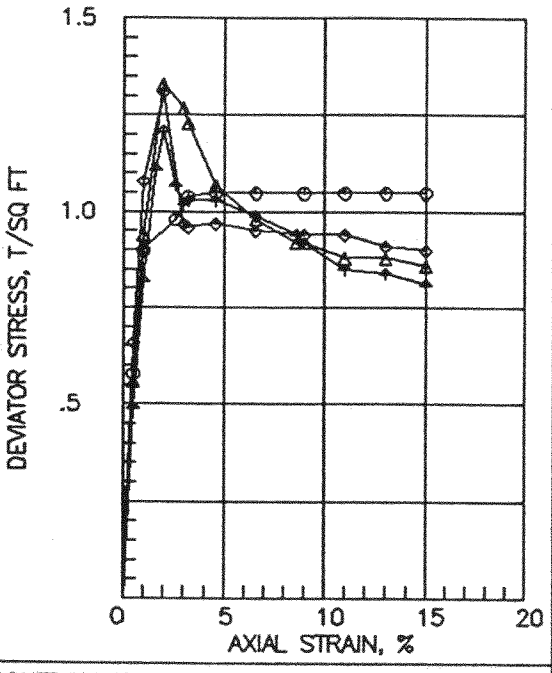
DEPTH/ELEV 102/-134.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 30 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_w = 112.1$ PCF



SPECIMEN NO.		⊙ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	42.3	42.2	43.4	42.5
	DRY DENSITY, PCF	78.3	79.4	78.0	78.5
	SATURATION, %	99.2	100+	100+	100+
	VOID RATIO	1.153	1.123	1.162	1.148
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		1.05	1.33	1.31	1.21
TIME TO FAILURE, MIN.		9	15	16	14
STRAIN RATE INCR., %			8	3	5
INITIAL DIAMETER, IN.		1.37	1.36	1.36	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT LENSES

LL 69	PL 18	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

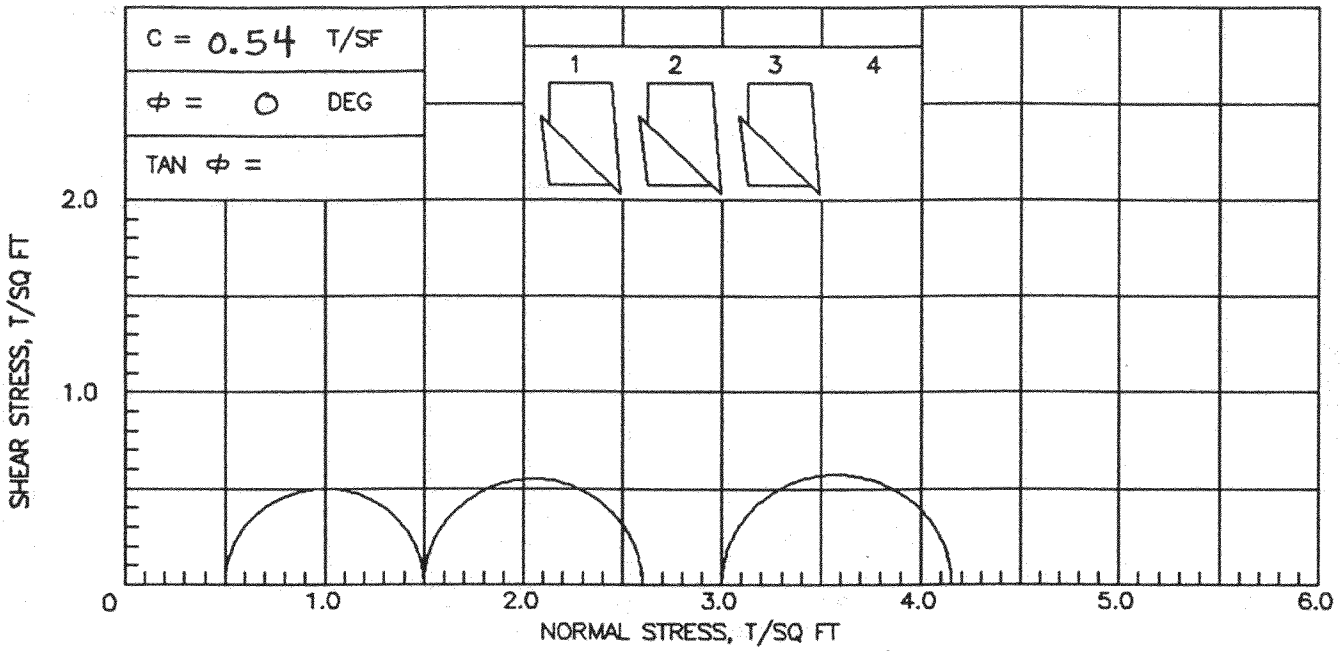
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 19C

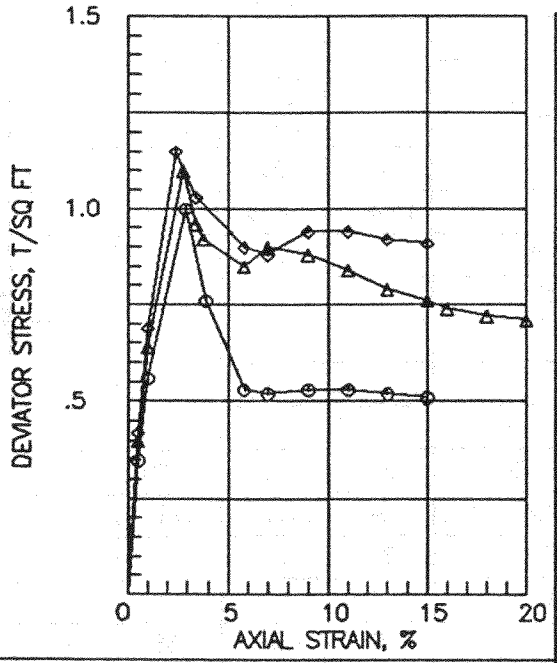
DEPTH/ELEV 87.0/-119.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 25 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 111.8 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	45.1	44.1	41.2	
	DRY DENSITY, PCF	76.4	77.4	79.9	
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.208	1.177	1.110	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.00	1.10	1.15	
TIME TO FAILURE, MIN.		5	14	12	
STRAIN RATE INCR., %			5	7	
INITIAL DIAMETER, IN.		1.36	1.37	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 56	PL 18	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

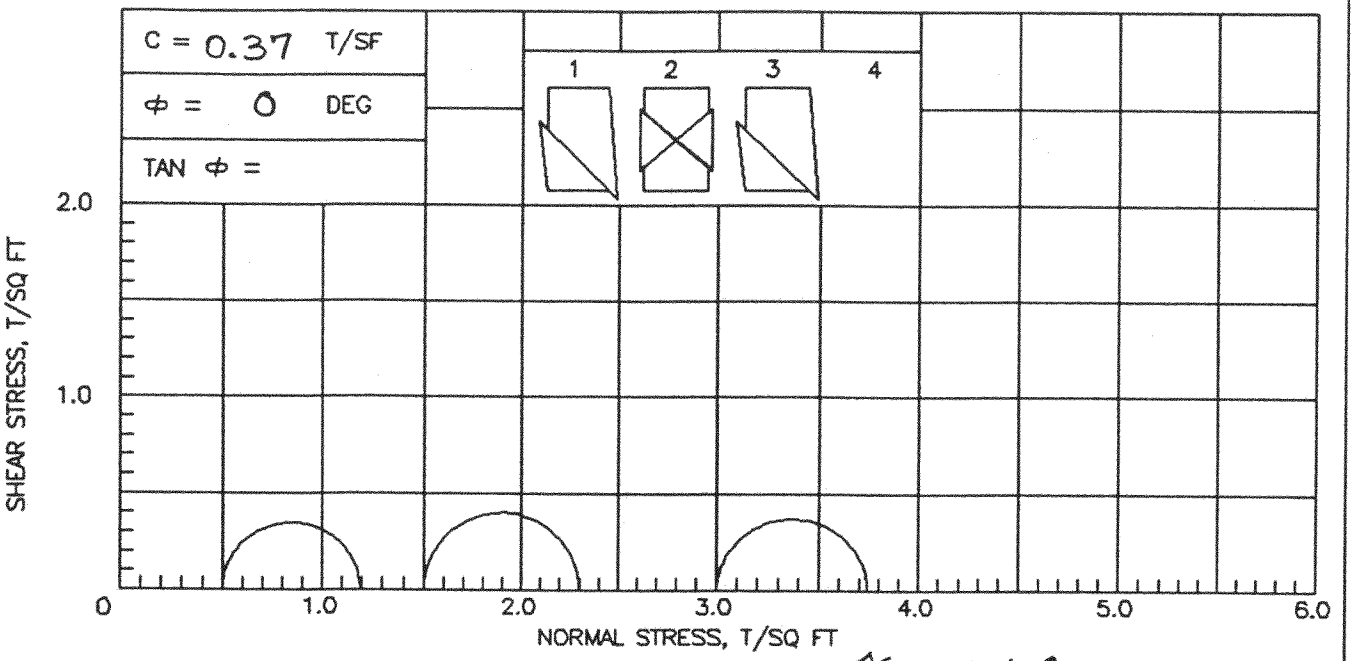
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 16C

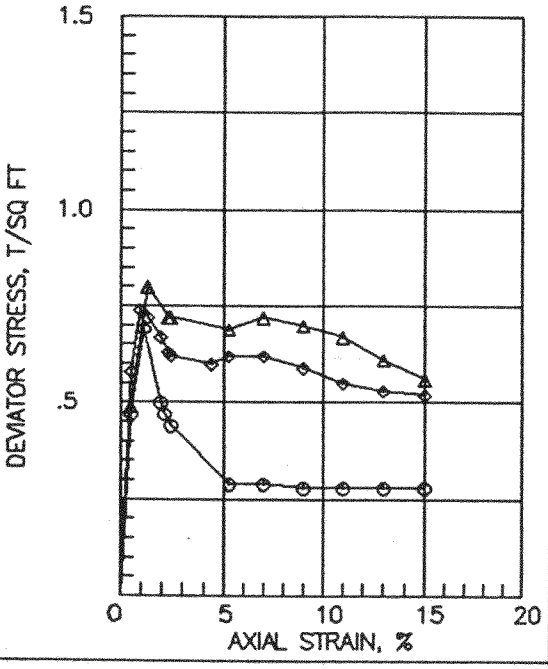
DEPTH/ELEV 75.0/-107.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 24 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 106.8 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	54.3	53.6	53.2	
	DRY DENSITY, PCF	69.1	69.4	69.9	
	SATURATION, %	100+	100+	100+	
	VOID RATIO	1.440	1.428	1.412	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.69	.80	.74	
TIME TO FAILURE, MIN.		2	7	5	
STRAIN RATE INCR., %			5	4	
INITIAL DIAMETER, IN.		1.37	1.37	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 47	PL 19	PI 28	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

LIMITS ON MIXTURE OF MATERIALS

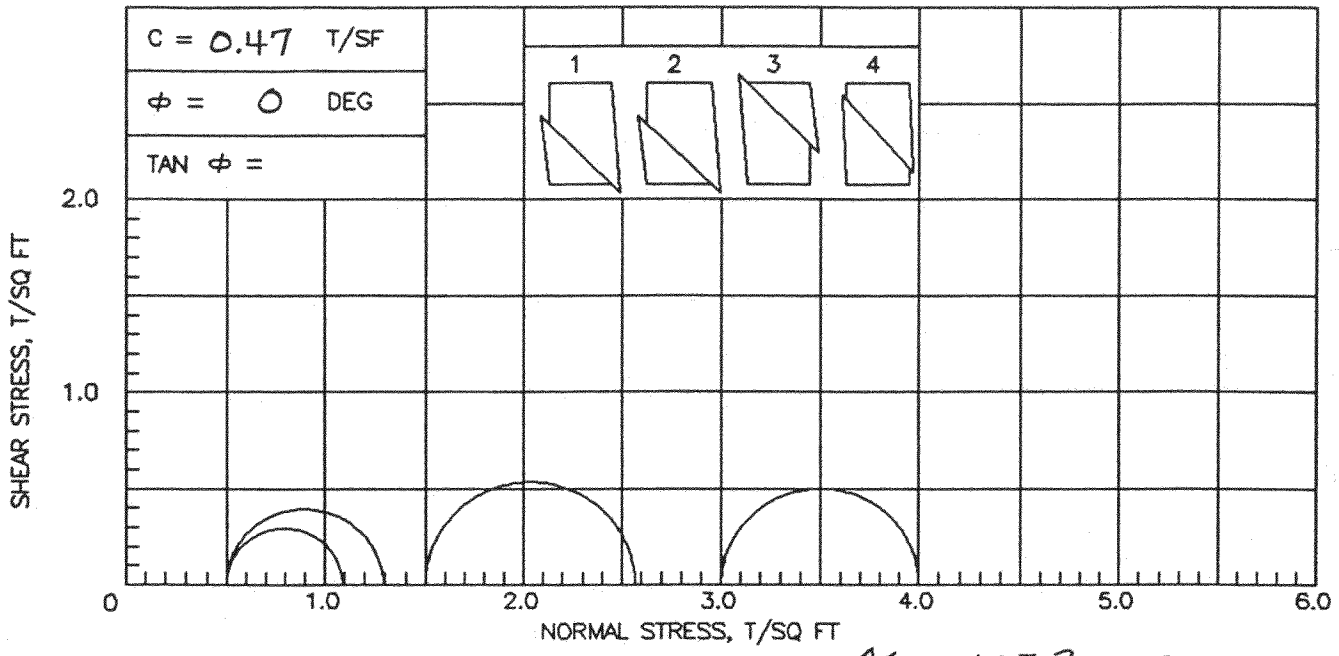
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 10C

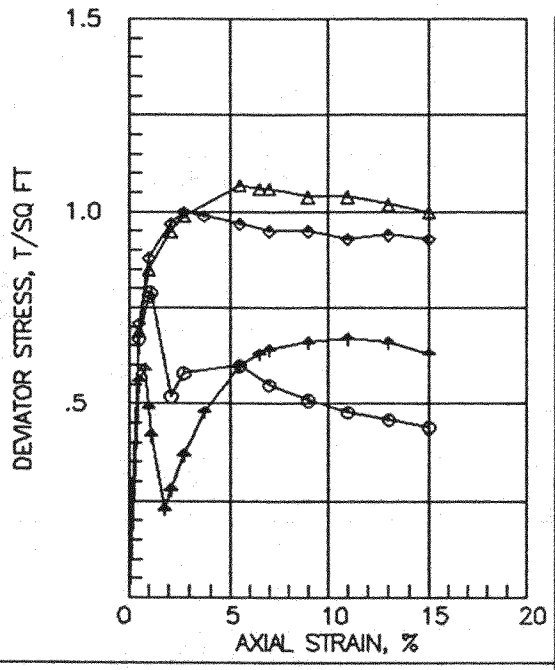
DEPTH/ELEV 51.3/-83.8 TECH. JH

LABORATORY USAE WES - STF/GL DATE 23 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 107.3 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	54.3	51.7	52.4	53.0
	DRY DENSITY, PCF	69.6	70.6	70.5	69.3
	SATURATION, %	100+	100+	100+	99.7
	VOID RATIO	1.423	1.387	1.390	1.434
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		.79	1.07	1.00	.59
TIME TO FAILURE, MIN.		2	29	14	6
STRAIN RATE INCR., %					3
INITIAL DIAMETER, IN.		1.37	1.37	1.36	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY

LL 98	PL 22	PI 76	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

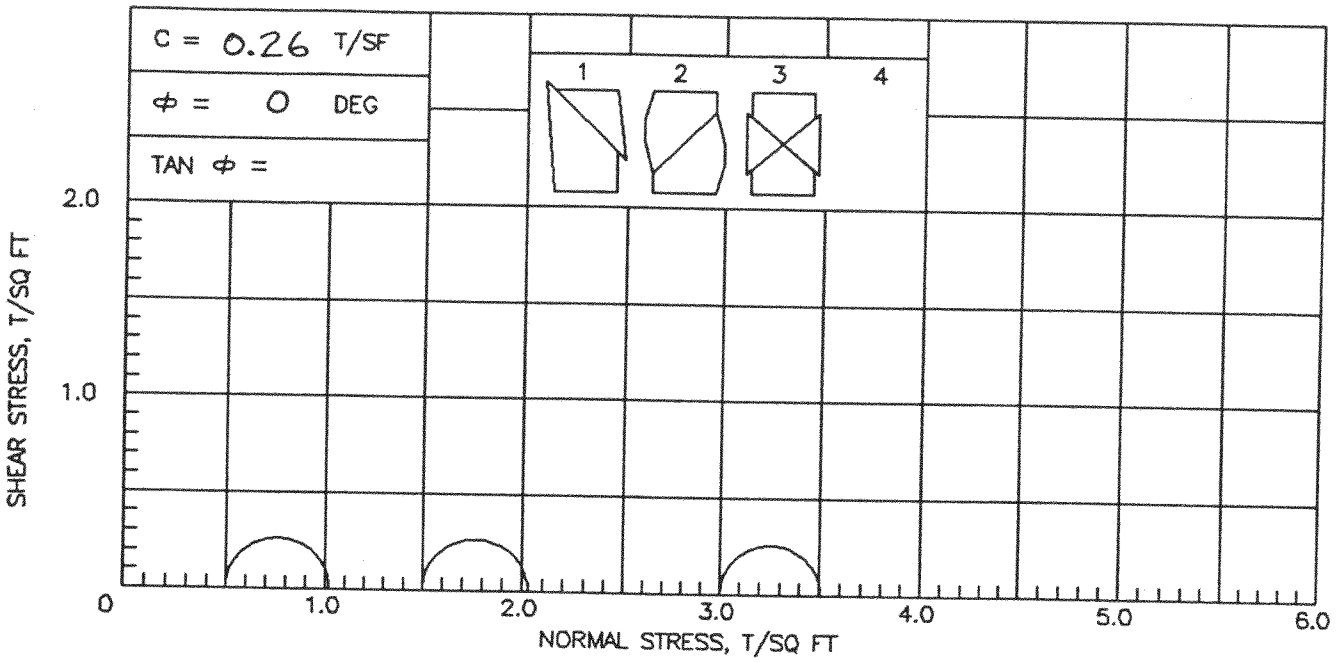
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 8C

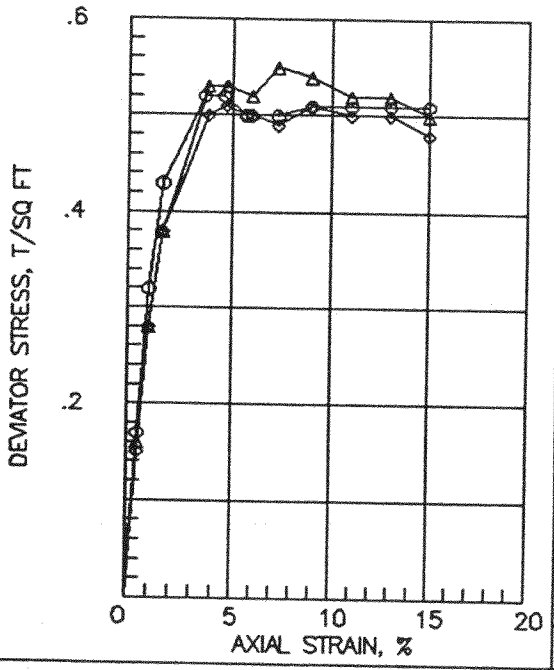
DEPTH/ELEV 43.3/-75.8 TECH. JH

LABORATORY USAE WES - STF/GL DATE 09 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_w = 115.0$ PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	38.3	33.6	36.5	
	DRY DENSITY, PCF	82.5	87.2	83.8	
	SATURATION, %	99.0	97.3	97.6	
	VOID RATIO	1.044	.933	1.010	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.52	.53	.51	
TIME TO FAILURE, MIN.		7	21	27	
STRAIN RATE INCR., %			6	7	
INITIAL DIAMETER, IN.		1.35	1.36	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; FINE SAND LENSES

LL 36	PL 15	PI 21	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

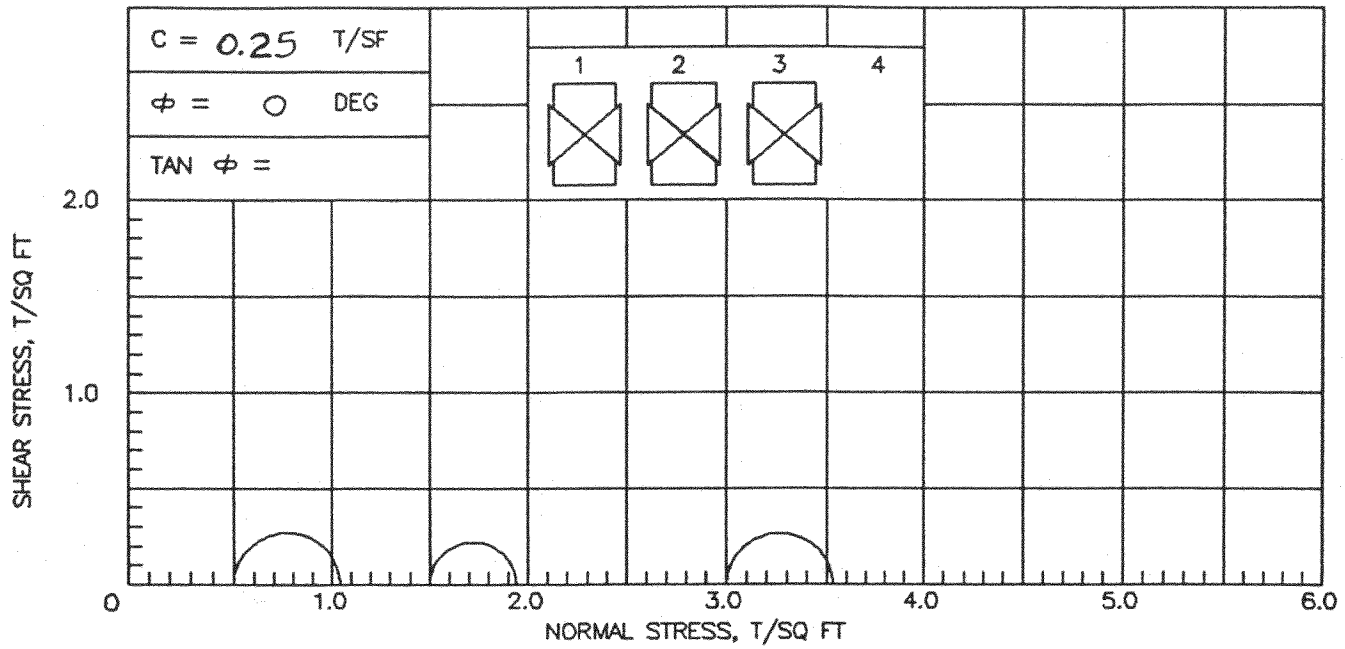
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 4C

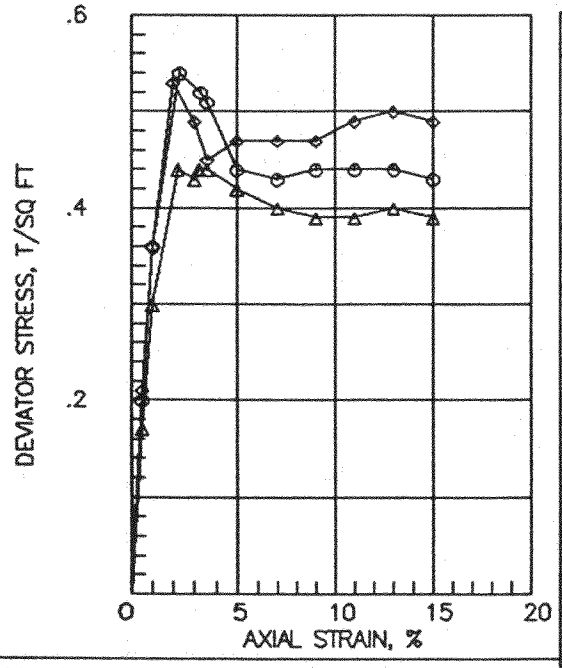
DEPTH/ELEV 27.0/-59.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 08 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 106.2 PCF



SPECIMEN NO.		◇ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	48.6	52.8	50.6	
	DRY DENSITY, PCF	72.3	68.7	70.6	
	SATURATION, %	98.5	98.0	98.3	
	VOID RATIO	1.331	1.455	1.389	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.54	.44	.53	
TIME TO FAILURE, MIN.		4	12	12	
STRAIN RATE INCR., %				3	
INITIAL DIAMETER, IN.		1.36	1.36	1.35	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT LENSES

LL 51	PL 16	PI 35	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

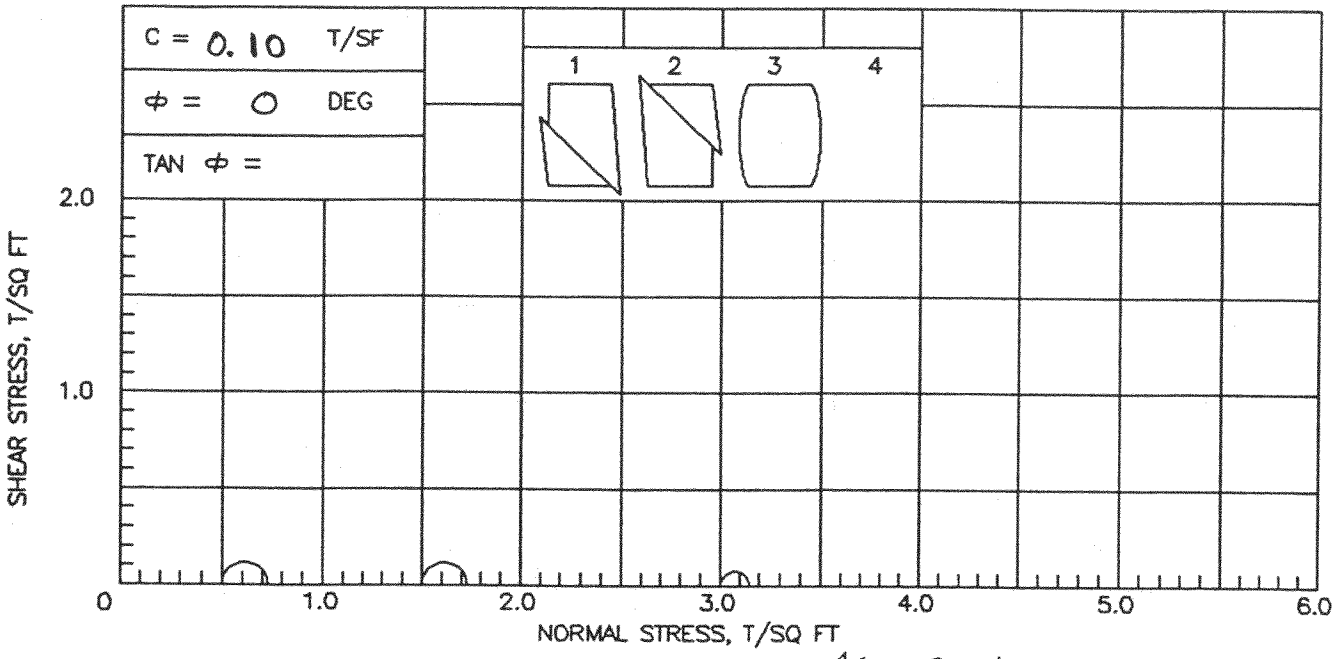
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-1U SAMPLE NO. 3B

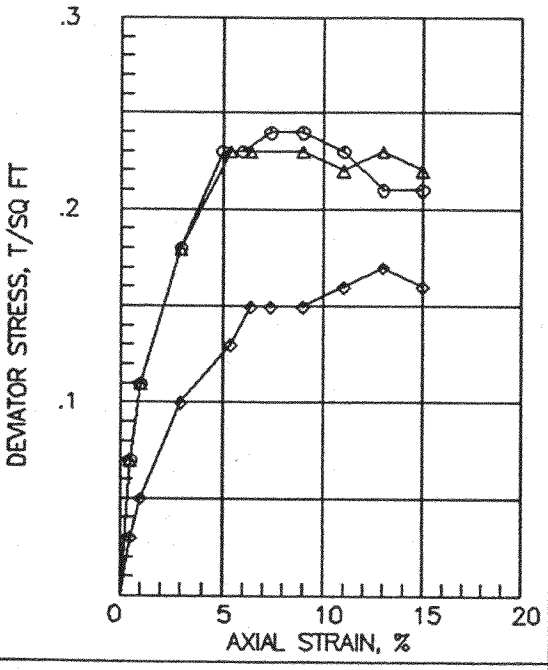
DEPTH/ELEV 22.0/-54.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 05 JUN 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 95.4 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	82.8	83.3	81.8	
	DRY DENSITY, PCF	52.4	52.1	52.2	
	SATURATION, %	100+	100+	99.1	
	VOID RATIO	2.217	2.236	2.227	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.23	.23	.15	
TIME TO FAILURE, MIN.		10	24	26	
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.36	1.36	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY

LL 95	PL 23	PI 72	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

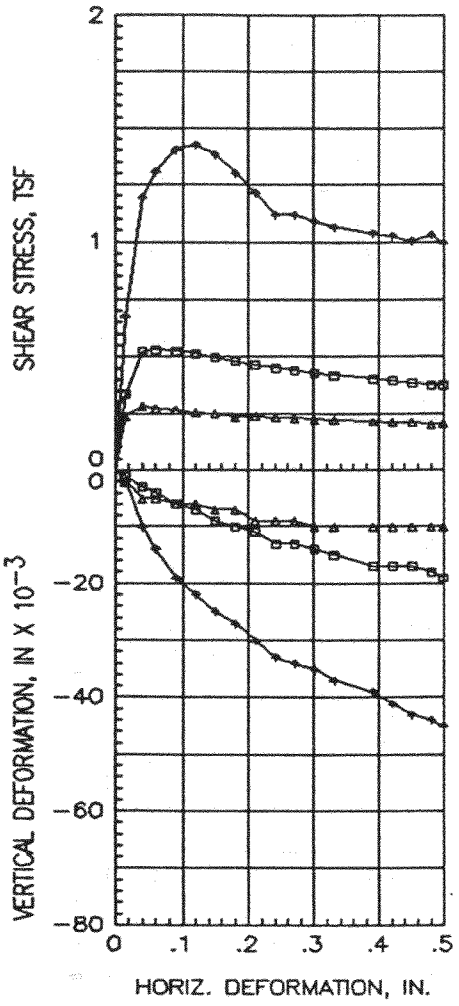
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

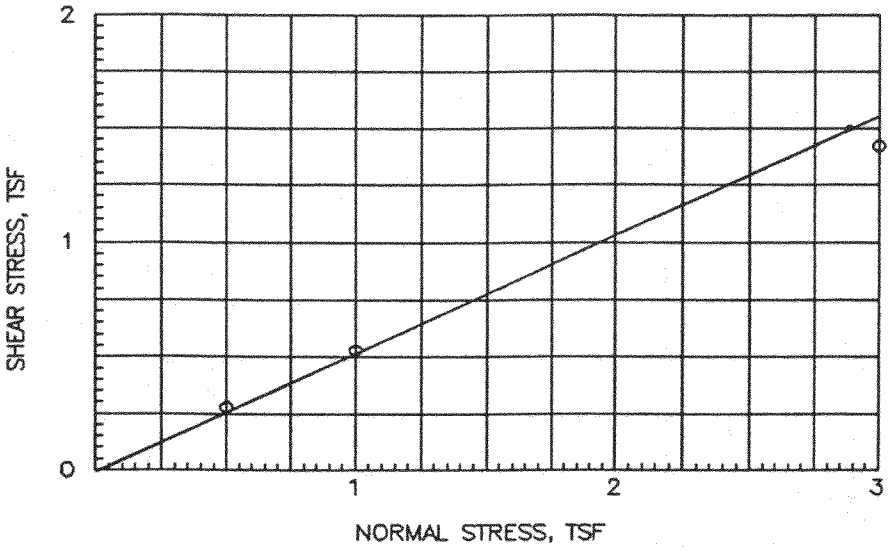
BORING NO. NC-1U SAMPLE NO. 1C

DEPTH/ELEV 15.0/-47.5 TECH. JH

LABORATORY USAE WES - STF/GL DATE 04 JUN 92

TRIAXIAL COMPRESSION TEST REPORT





ϕ = 27.5 DEG

TAN ϕ = 0.521

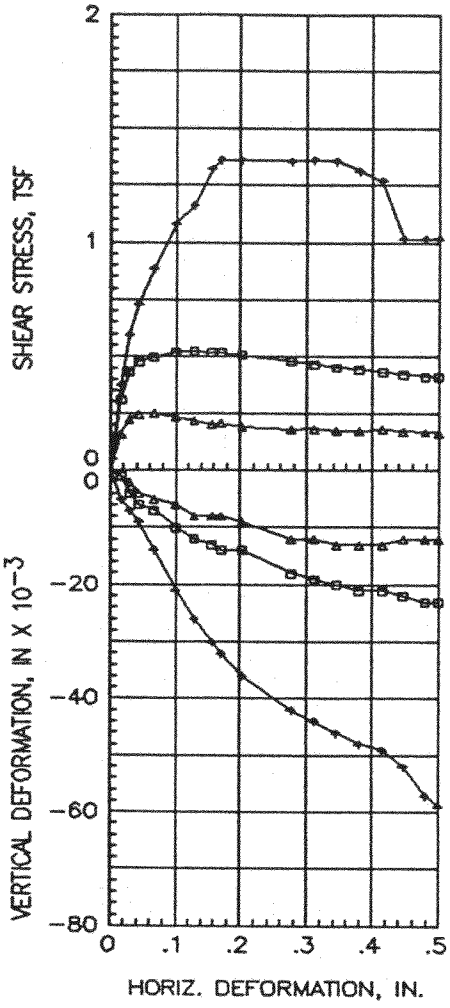
C = 0 T/SF

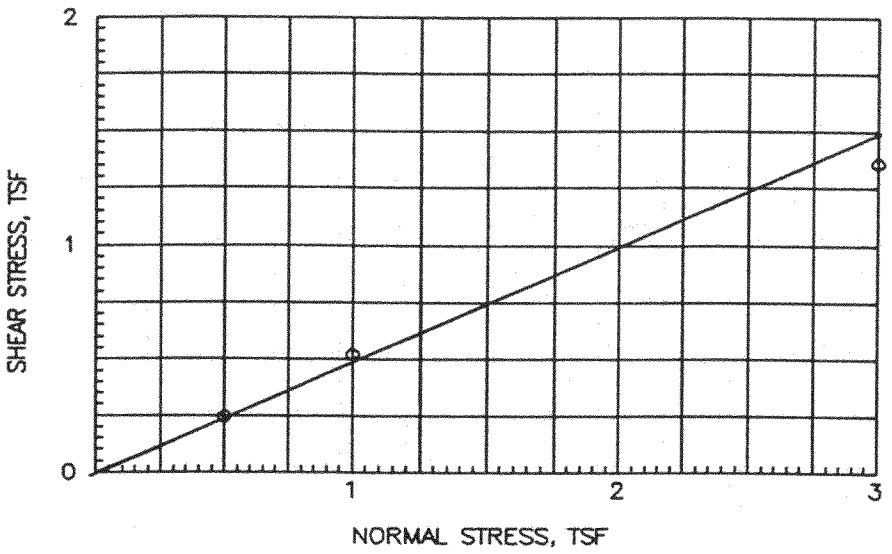
TEST NO.		1 ▲	2 □	3 ✦	
INITAL	WATER CONTENT, %	45.5	38.1	33.2	
	VOID RATIO	1.216	1.052	.903	
	SATURATION, %	100+	97.7	99.2	
	DRY DENSITY, PCF	76.0	82.1	88.5	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	44.0	40.5	32.7	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		.50	1.00	3.00	
MAXIMUM SHEAR STRESS, TSF		.28	.53	1.42	
TIME TO FAILURE, MIN		221	332	664	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	.552 IN. THICK
CLASSIFICATION CLAY (CH), GRAY; SLICKENSIDED; SHELL PARTICLES		

LL 61	PL 17	PI 44		GS 2.70 (EST)

REMARKS;	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF	
	CLAIBORNE, NEW ORLEANS	
	BORING NO. NC-1U	SAMPLE 9C
	DEPTH/ELEV 47.0/-79.5	TECH. US
	LABORATORY USAE WES - STF/GL	DATE 06 AUG 92
	DIRECT SHEAR TEST REPORT	





Φ = 26.3 DEG

TAN Φ = 0.494

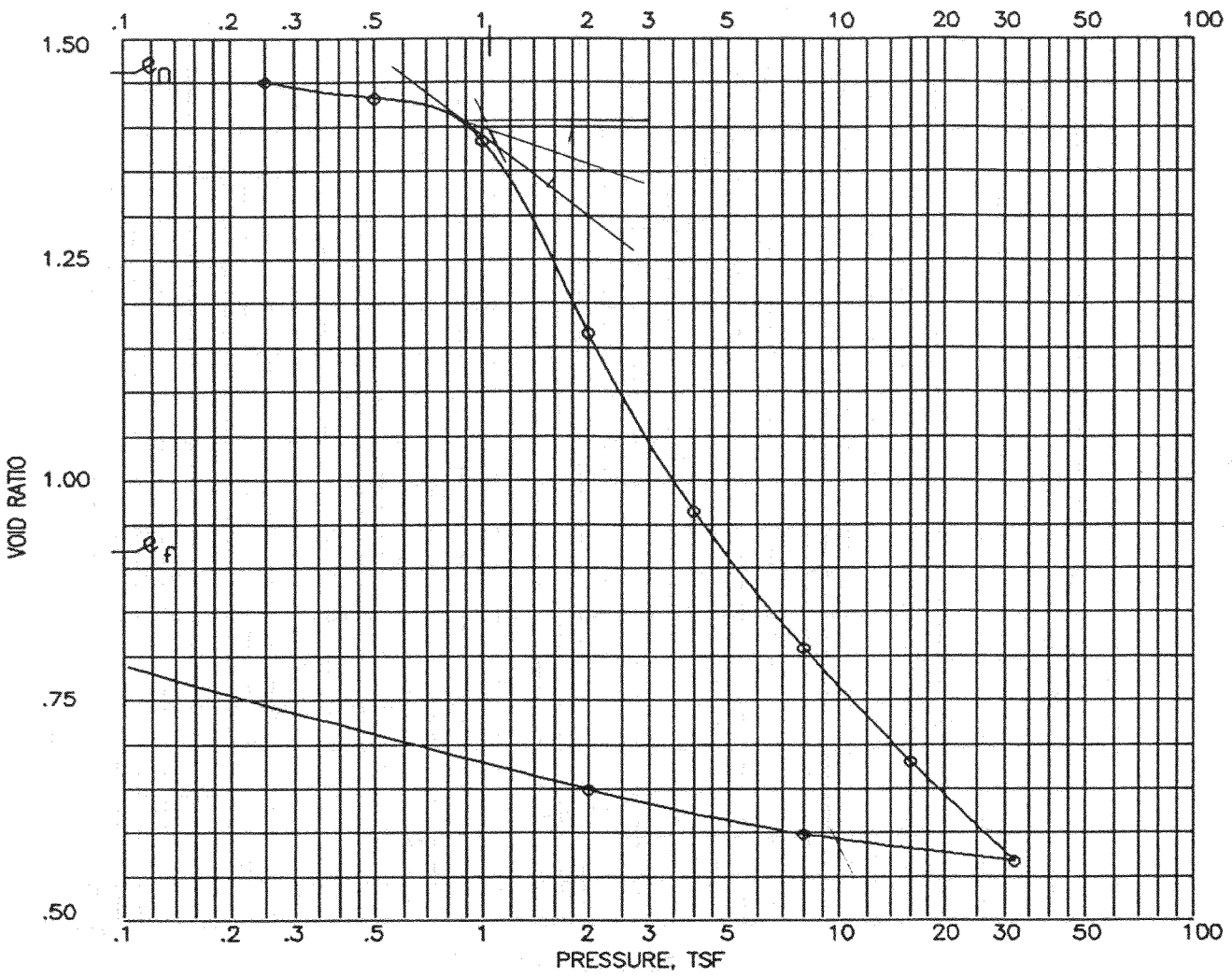
C = 0 T/SF

	TEST NO.	1 ▲	2 □	3 ◆	
INITIAL	WATER CONTENT, %	41.9	33.4	45.2	
	VOID RATIO	1.200	.978	1.272	
	SATURATION, %	94.3	92.1	96.0	
	DRY DENSITY, PCF	76.6	85.2	74.1	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	51.2	37.1	37.2	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		.50	1.00	3.00	
MAXIMUM SHEAR STRESS, TSF		.25	.53	1.36	
TIME TO FAILURE, MIN		365	714	946	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	.552 IN. THICK
CLASSIFICATION CLAY (CH), GRAY; SILT SEAMS		

LL 53	PL 18	PI 35		GS 2.70 (EST)

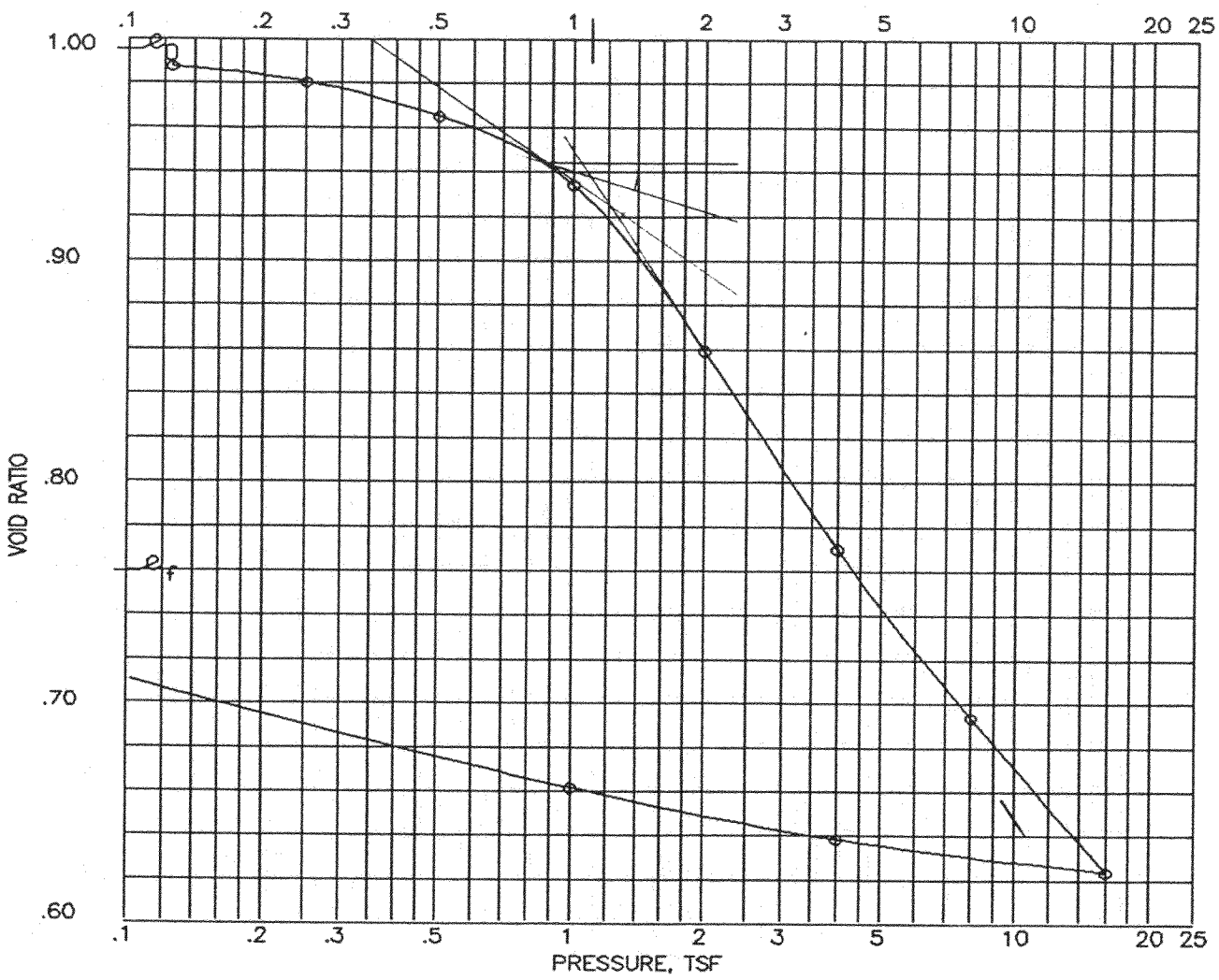
REMARKS;	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF	
	CLAIBORNE, NEW ORLEANS	
	BORING NO. NC-1U	SAMPLE 22D
	DEPTH/ELEV 99.9/-132.4	TECH. US
	LABORATORY USAE WES - STF/GL	DATE 10 AUG 92
	DIRECT SHEAR TEST REPORT	



γ_w = 104.33 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	52.3	33.7
PRECONSOL. PRESSURE, TSF	1.05	DRY DENSITY, PCF	68.5	87.9
COMPRESSION INDEX	0.83	SATURATION, %	96.6	99.2
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.461	.918
DIA. IN 4.44	HT. IN 1.120	BACK PRESSURE, TSF		

CLASSIFICATION	CLAY (CH), GRAY; FINE SAND LENSES		
LL 58	PL 15	PI 43	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:			BORING NO. NC-1U / SAMPLE NO. 3C
			DEPTH/ELEV 23.2/-55.7 / TECH. US
			LABORATORY USAE WES - STF/GL / DATE 03 AUG 92
			CONSOLIDATION TEST REPORT



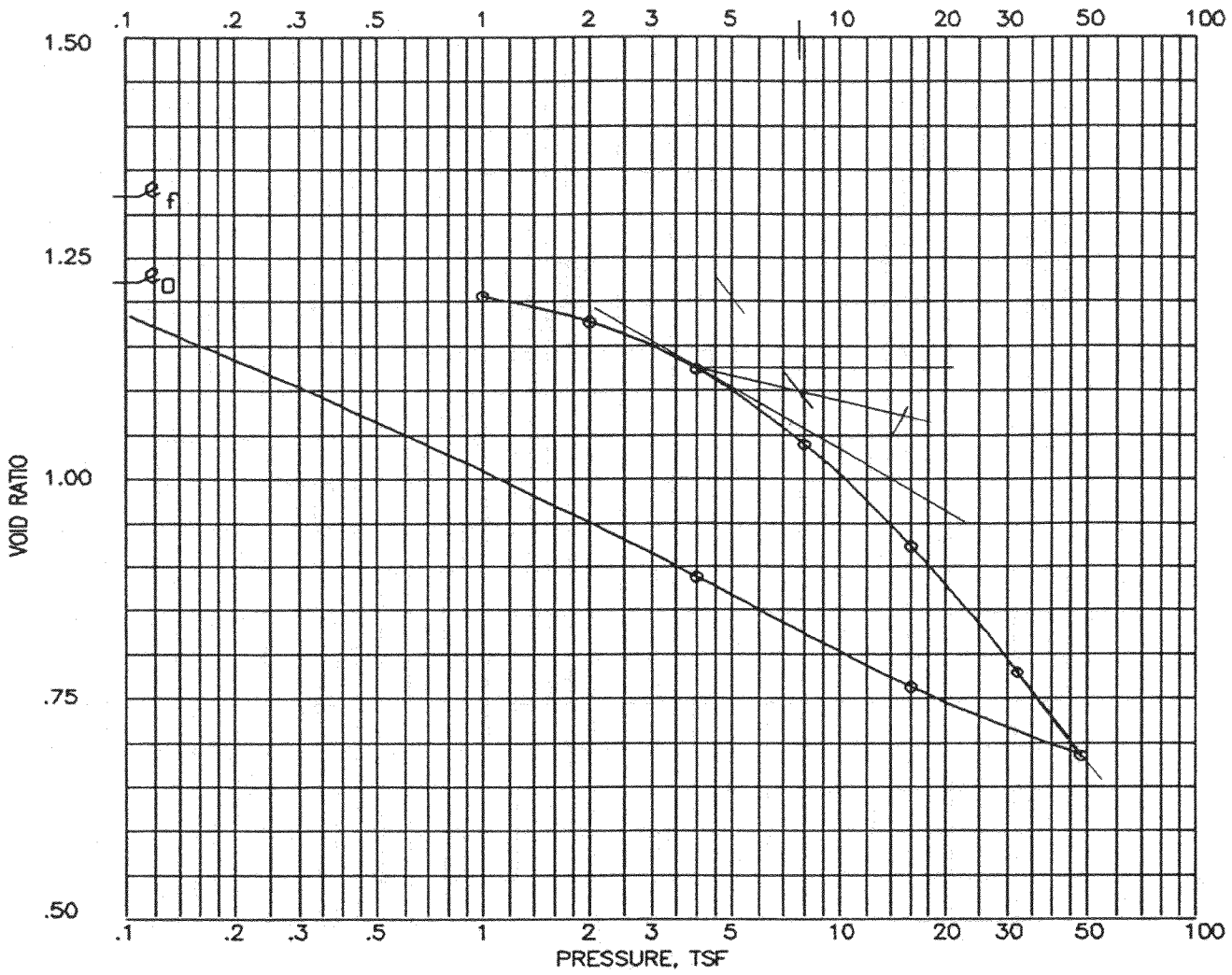
wet γ = 113.6 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	34.4	26.5
PRECONSOL. PRESSURE, TSF	1.1	DRY DENSITY, PCF	84.5	95.9
COMPRESSION INDEX	0.30	SATURATION, %	93.5	94.5
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	.994	.759
DIA. IN 4.44	HT. IN 1.157	BACK PRESSURE, TSF		

CLASSIFICATION: CLAY (CL), GRAY; FINE SAND POCKETS

LL 34	PL 13	PI 21	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 4D
		DEPTH/ELEV 28.0/-60.5	TECH. US
		LABORATORY USAE WES - STF/GL	DATE 03 AUG 92

CONSOLIDATION TEST REPORT

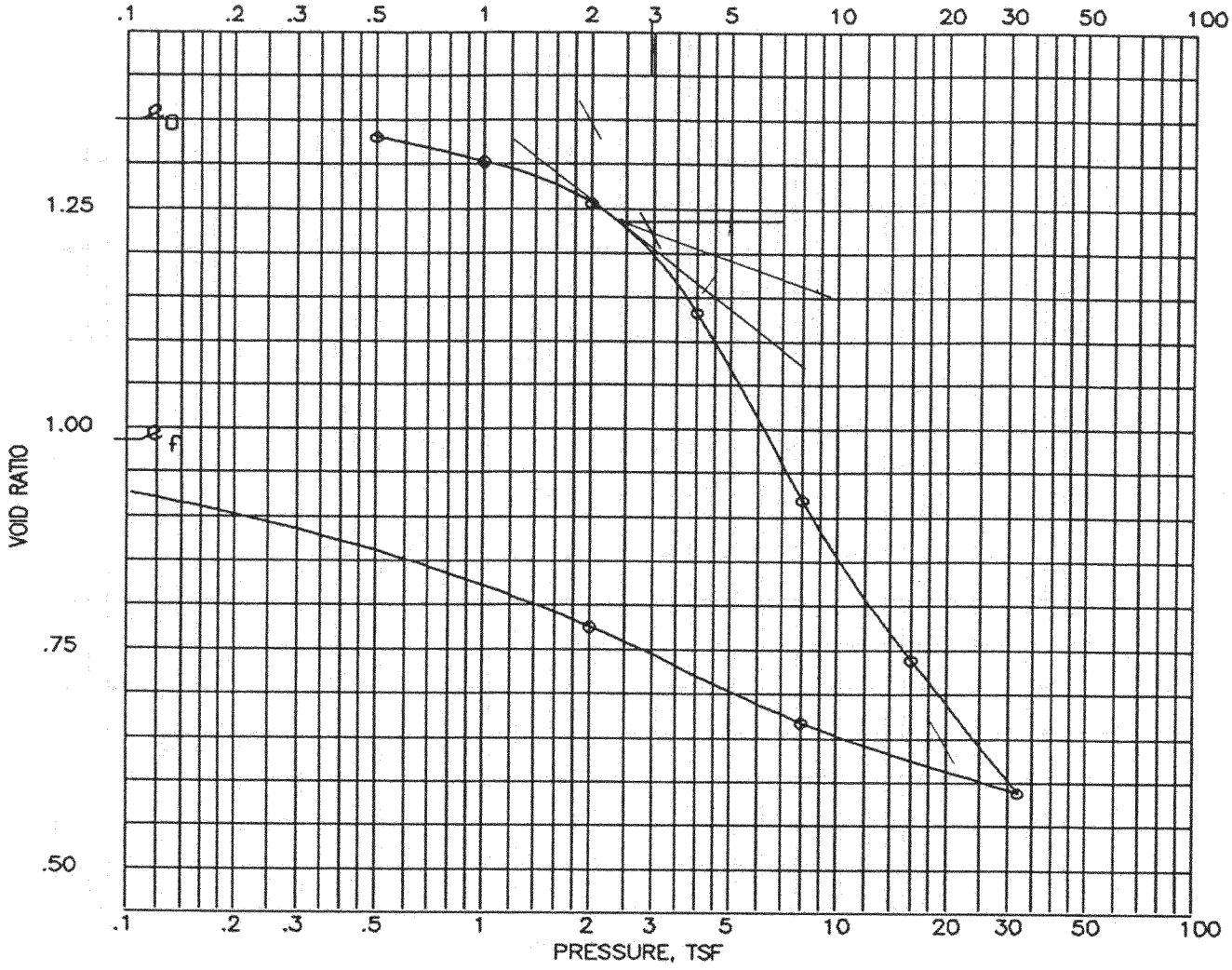


γ_w = 111.0 pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.2	51.3
PRECONSOL. PRESSURE, TSF	7.7	DRY DENSITY, PCF	75.9	72.7
COMPRESSION INDEX	0.52	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.221	1.318
DIA. IN 4.44	HT. IN 1.121	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 89	PL 23	PI 66	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 8B
		DEPTH/ELEV 42.0/-74.5	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 31 AUG 92
		CONSOLIDATION TEST REPORT	

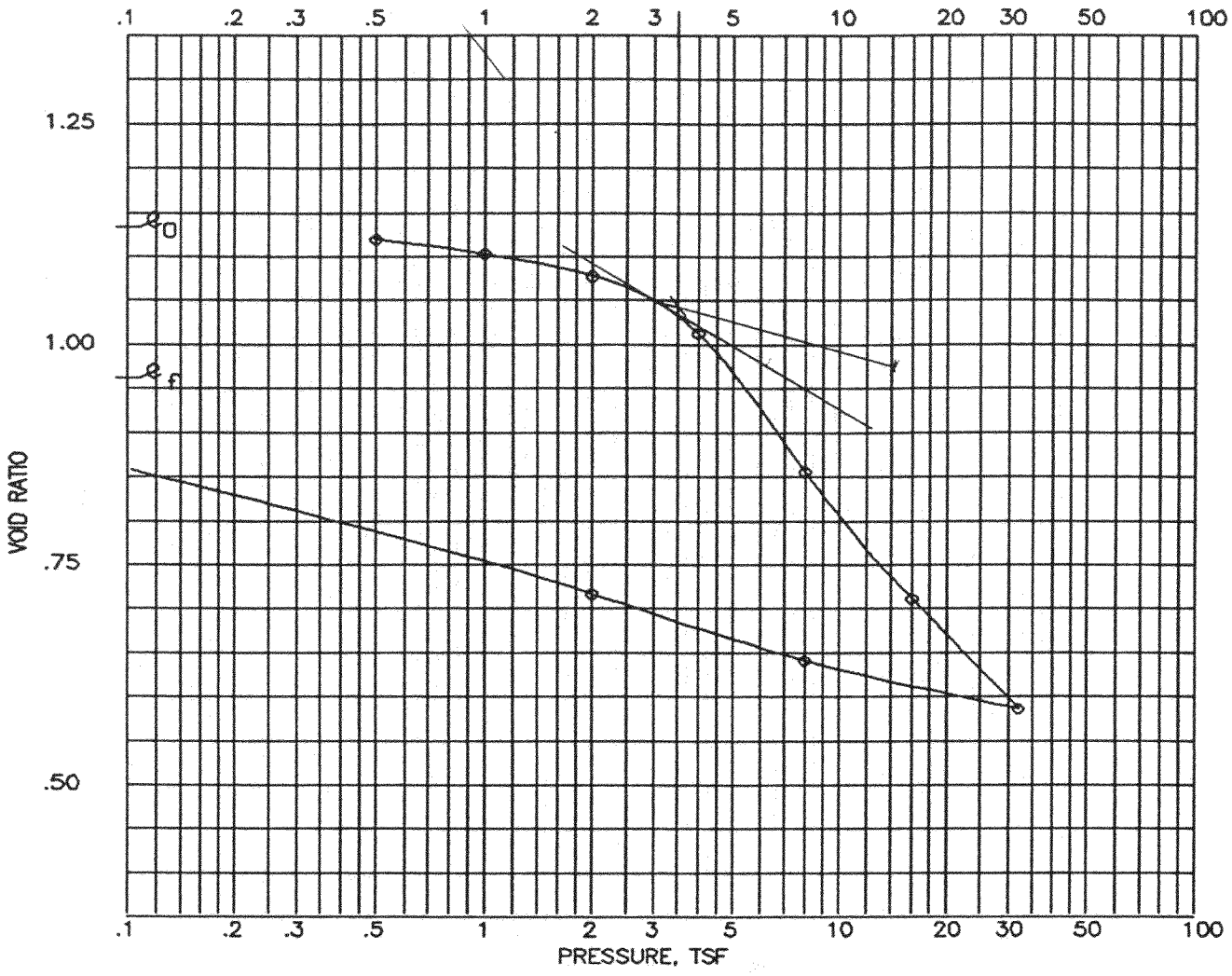


γ_w= 107.5 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	49.7	37.8
PRECONSOL. PRESSURE, TSF	2.9	DRY DENSITY, PCF	71.8	85.0
COMPRESSION INDEX	0.71	SATURATION, %	99.5	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.348	.983
DIA. IN 4.44	HT. IN 1.123	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 73	PL 21	PI 52	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 15C
		DEPTH/ELEV 71.3/-103.8	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 03 AUG 92
		CONSOLIDATION TEST REPORT	

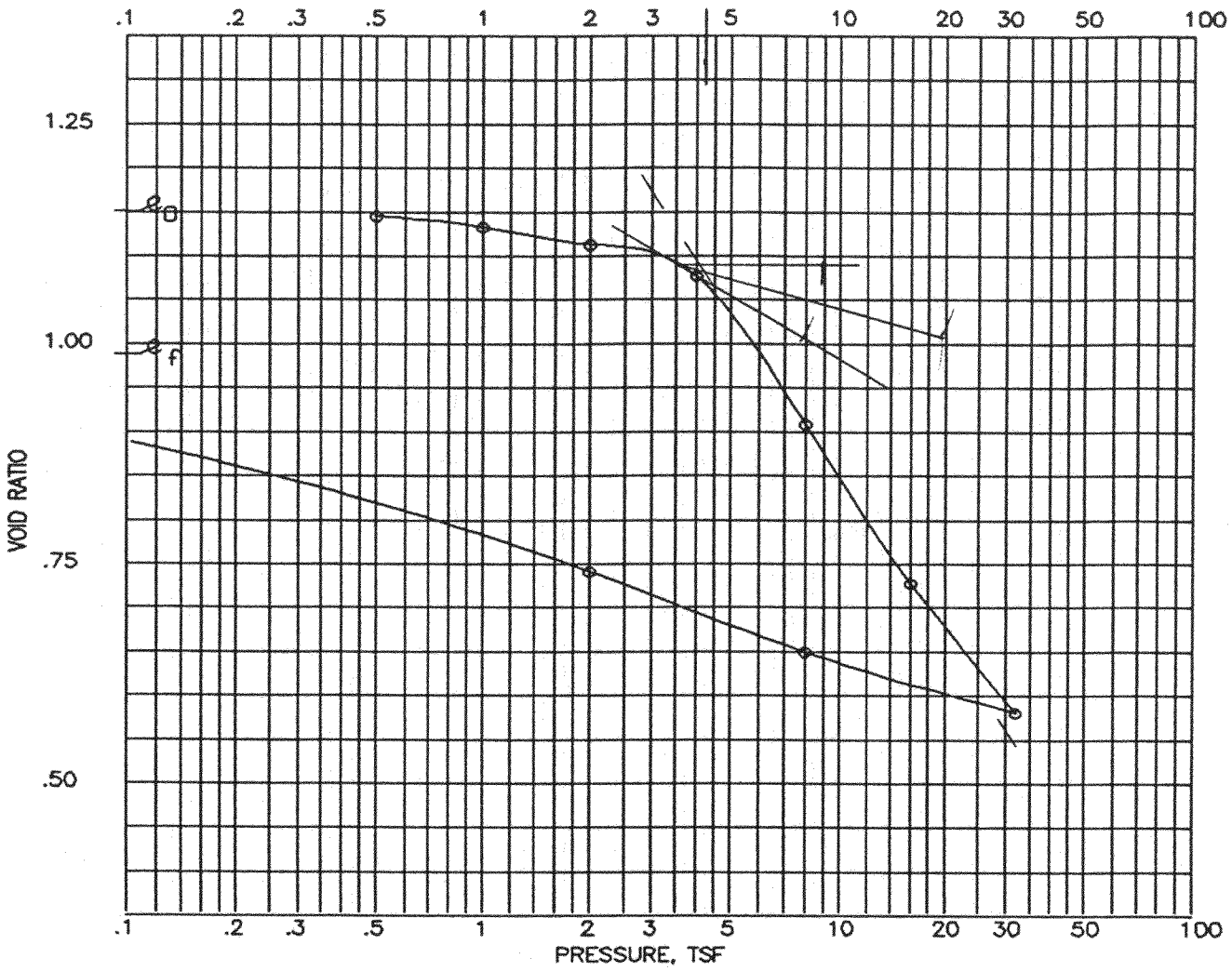


γ_w = 112.3 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	42.0	36.8
PRECONSOL. PRESSURE, TSF	3.5	DRY DENSITY, PCF	79.1	86.0
COMPRESSION INDEX	0.52	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.132	.960
DIA. IN 4.44	HT. IN 1.109	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 69	PL 17	PI 52	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 21B
		DEPTH/ELEV 94.0/-126.5	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 03 AUG 92
		CONSOLIDATION TEST REPORT	

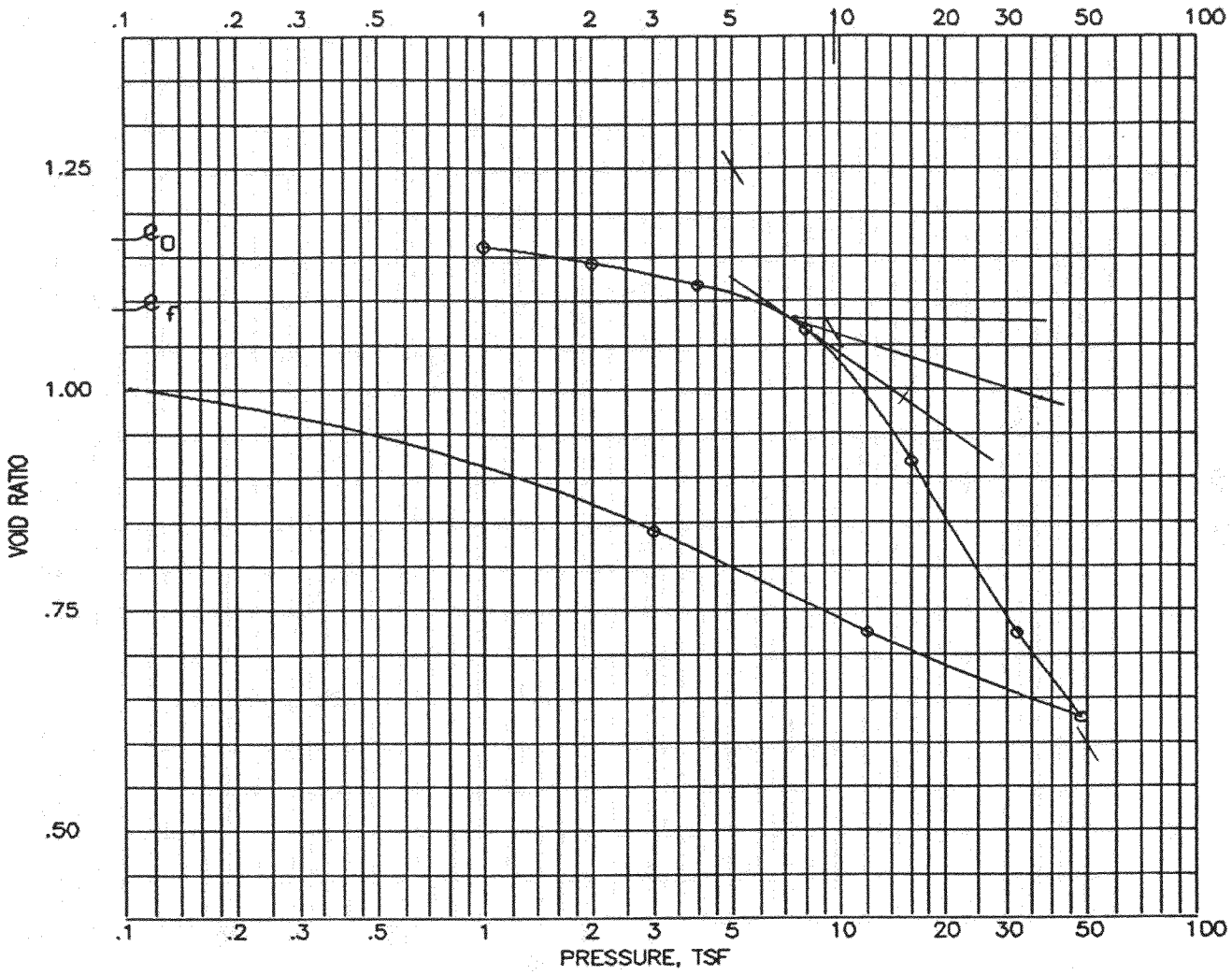


γ_w = 111.5 pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	42.2	37.7
PRECONSOL. PRESSURE, TSF	4.2	DRY DENSITY, PCF	78.4	84.9
COMPRESSION INDEX	0.61	SATURATION, %	99.2	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.149	.986
DIA. IN 4.44	HT. IN 1.112	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 66	PL 18	PI 48	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 26C
		DEPTH/ELEV 115.3/-147.8	TECH. US
		LABORATORY USAE WES - STF/GL	DATE 03 AUG 92
		CONSOLIDATION TEST REPORT	



γ_w = 111.5 pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	43.5	42.2
PRECONSOL. PRESSURE, TSF	9.6	DRY DENSITY, PCF	77.7	80.7
COMPRESSION INDEX	0.65	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.169	1.090
DIA. IN 4.44	HT. IN 1.108	BACK PRESSURE, TSF		

CLASSIFICATION: CLAY (CH), GRAY; IRON OXIDE PARTICLES

LL 78	PL 17	PI 61
GS 2.70 (EST)	D_{10}	

PROJECT: I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

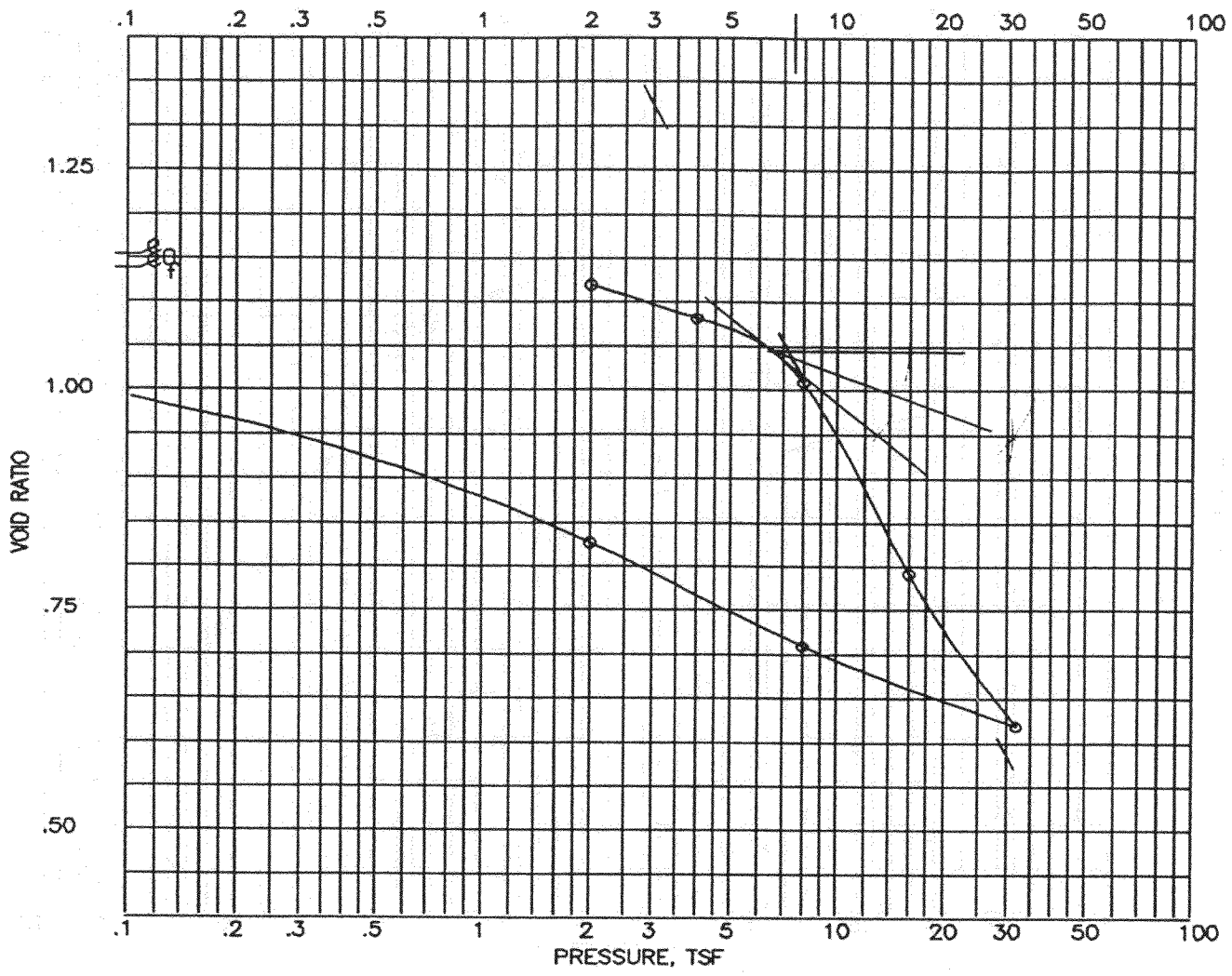
REMARKS:

BORING NO. NC–1U | SAMPLE NO. 33C

DEPTH/ELEV 143.0/–175.5 | TECH. US

LABORATORY USAE WES – STF/GL | DATE 03 AUG 92

CONSOLIDATION TEST REPORT



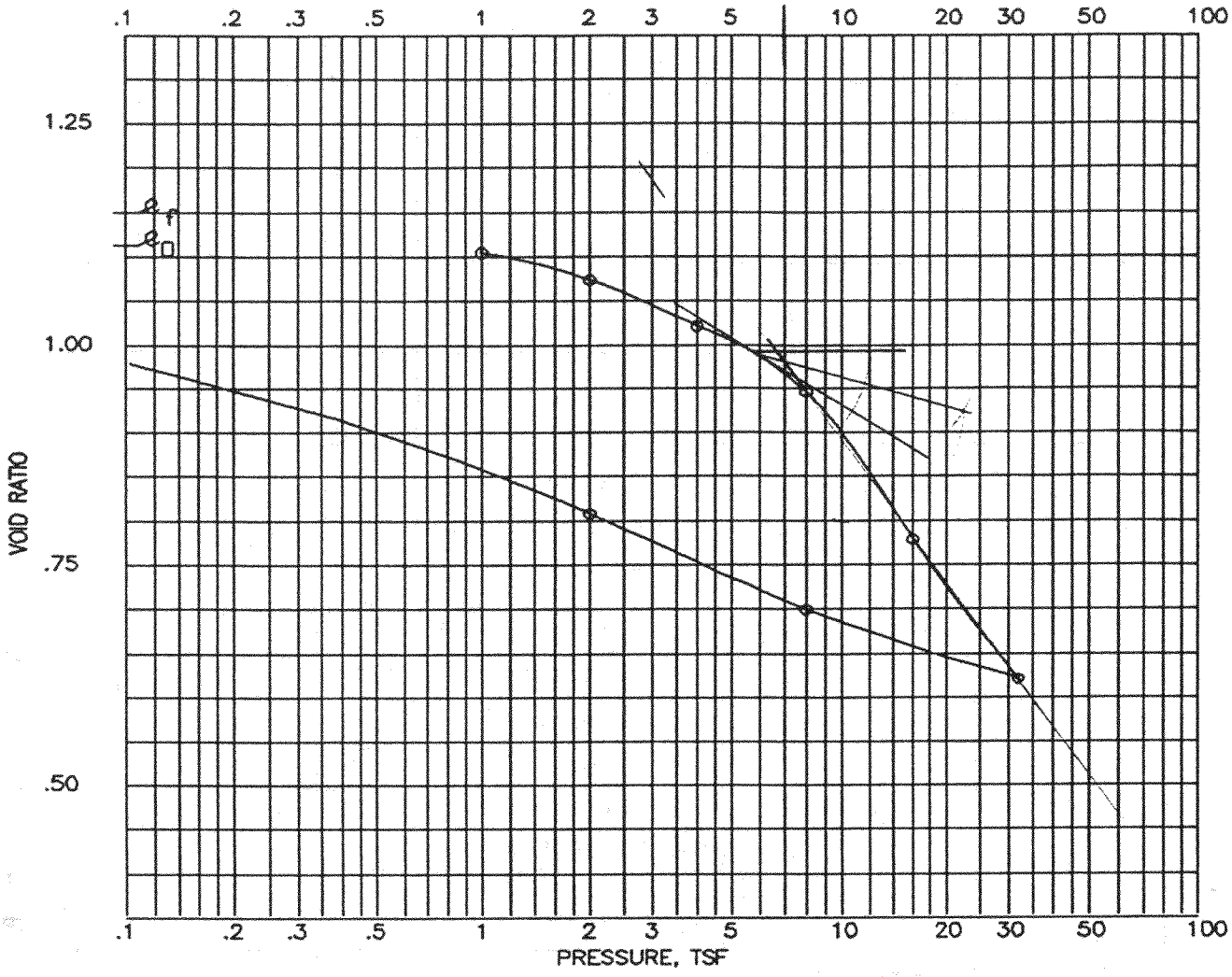
γ_w = 112.8 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	43.9	44.9
PRECONSOL. PRESSURE, TSF	7.4	DRY DENSITY, PCF	78.4	78.9
COMPRESSION INDEX	0.74	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.151	1.136
DIA. IN 4.44	HT. IN 1.113	BACK PRESSURE, TSF		

CLASSIFICATION: CLAY (CH), GRAY; SILT SEAMS

LL 72	PL 19	PI 53	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-1U	SAMPLE NO. 40C
		DEPTH/ELEV 171.0/-203.5	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 03 AUG 92

CONSOLIDATION TEST REPORT



γ_w = 111.8 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	40.1	42.9
PRECONSOL. PRESSURE, TSF	7.0	DRY DENSITY, PCF	79.8	78.5
COMPRESSION INDEX	0.54	SATURATION, %	97.5	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.111	1.147
DIA. IN 4.44	HT. IN 1.114	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 74 PL 19 PI 55

GS 2.70 (EST) D_{10}

PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

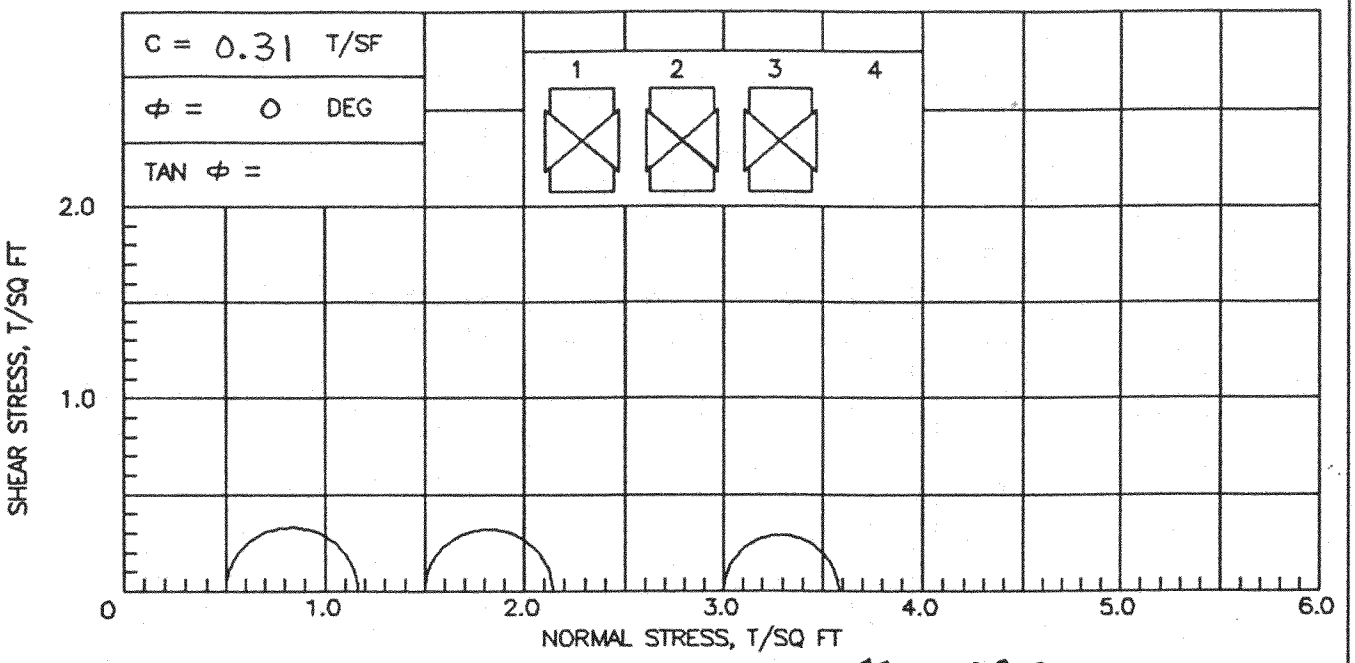
REMARKS:

BORING NO. NC-1U SAMPLE NO. 47C

DEPTH/ELEV 198.8/-231.3 TECH. US

LABORATORY USAE WES - STF/GL DATE 18 AUG 92

CONSOLIDATION TEST REPORT



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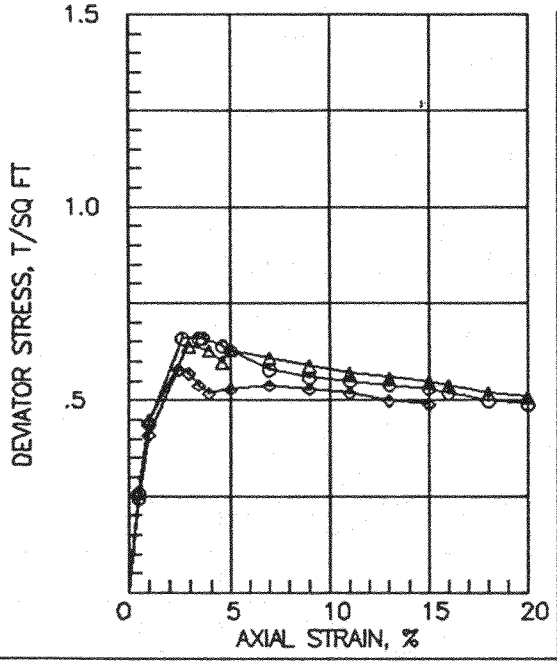


SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	44.3	45.0	47.6	
	DRY DENSITY, PCF	76.3	75.0	73.1	
	SATURATION, %	99.1	97.3	98.4	
	VOID RATIO	1.209	1.248	1.306	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.66	.64	.58	
TIME TO FAILURE, MIN.		5	24	18	
STRAIN RATE INCR., %			4		
INITIAL DIAMETER, IN.		1.36	1.36	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 52	PL 18	PI 34	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

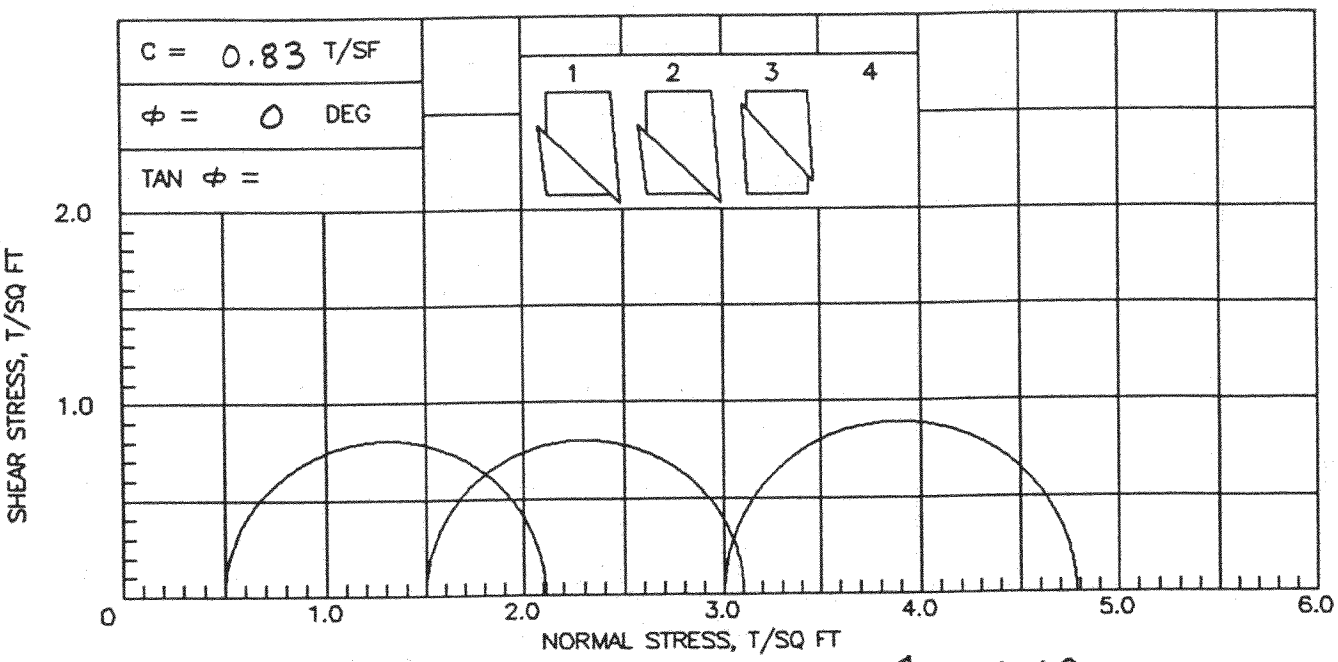
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 3B

DEPTH/ELEV 22.5/-55.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 06 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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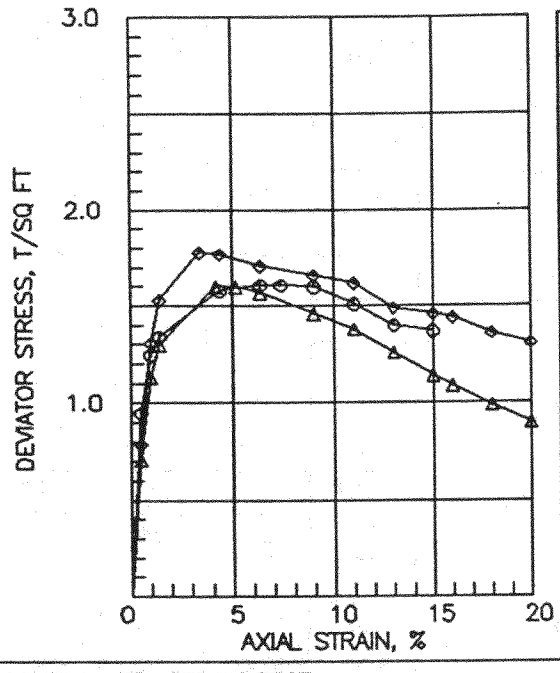


SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	35.5	39.0	37.7	
	DRY DENSITY, PCF	83.7	78.4	82.2	
	SATURATION, %	94.6	91.7	96.9	
	VOID RATIO	1.014	1.149	1.051	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.61	1.60	1.78	
TIME TO FAILURE, MIN.		13	14	16	
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.37	1.38	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SLICKENSIDED; CRUMBLY

LL 70	PL 19	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

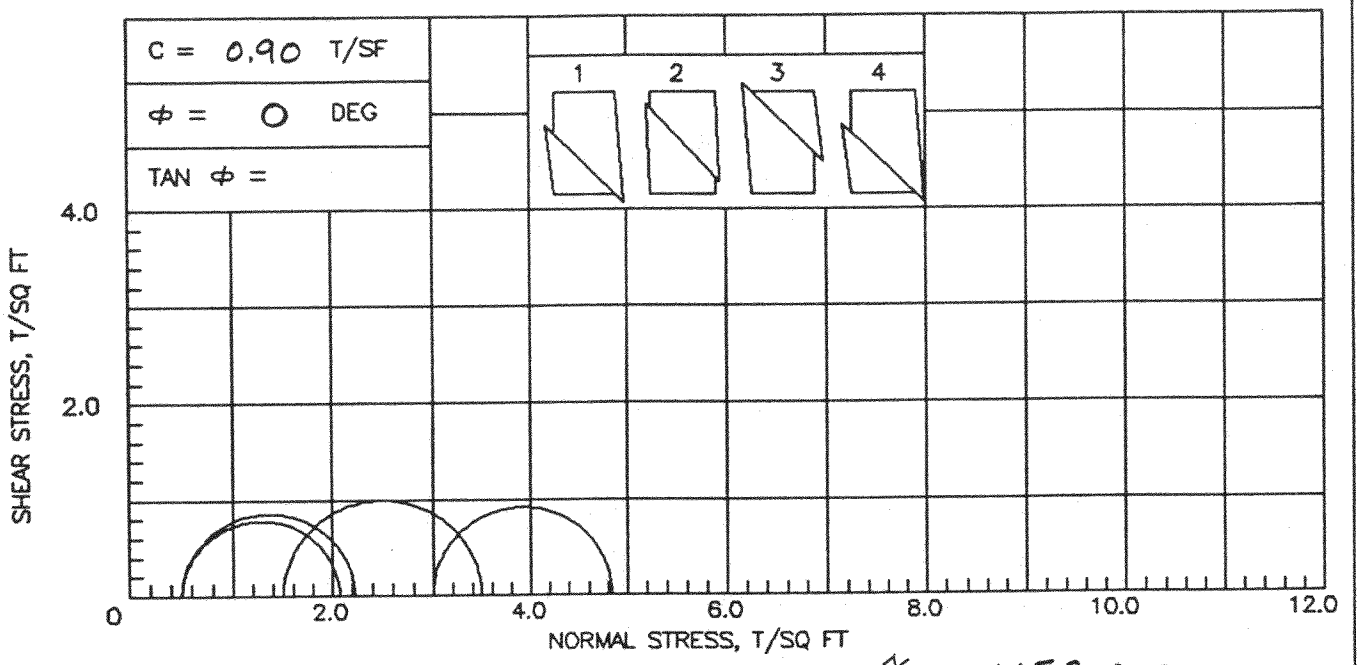
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 7C

DEPTH/ELEV 39.5/-72.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 21 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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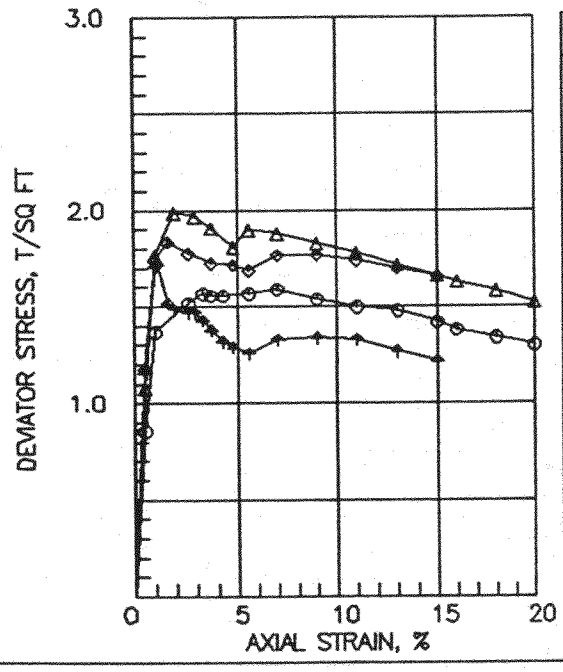


SPECIMEN NO.		⊙ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	33.8	35.7	35.5	34.6
	DRY DENSITY, PCF	86.3	85.0	84.9	86.0
	SATURATION, %	95.6	98.0	97.3	97.2
	VOID RATIO	.953	.983	.984	.961
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		1.57	1.99	1.84	1.72
TIME TO FAILURE, MIN.		7	28	24	7
STRAIN RATE INCR., %			4	5	6
INITIAL DIAMETER, IN.		1.37	1.33	1.33	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SLICKENSIDED

LL 60	PL 19	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

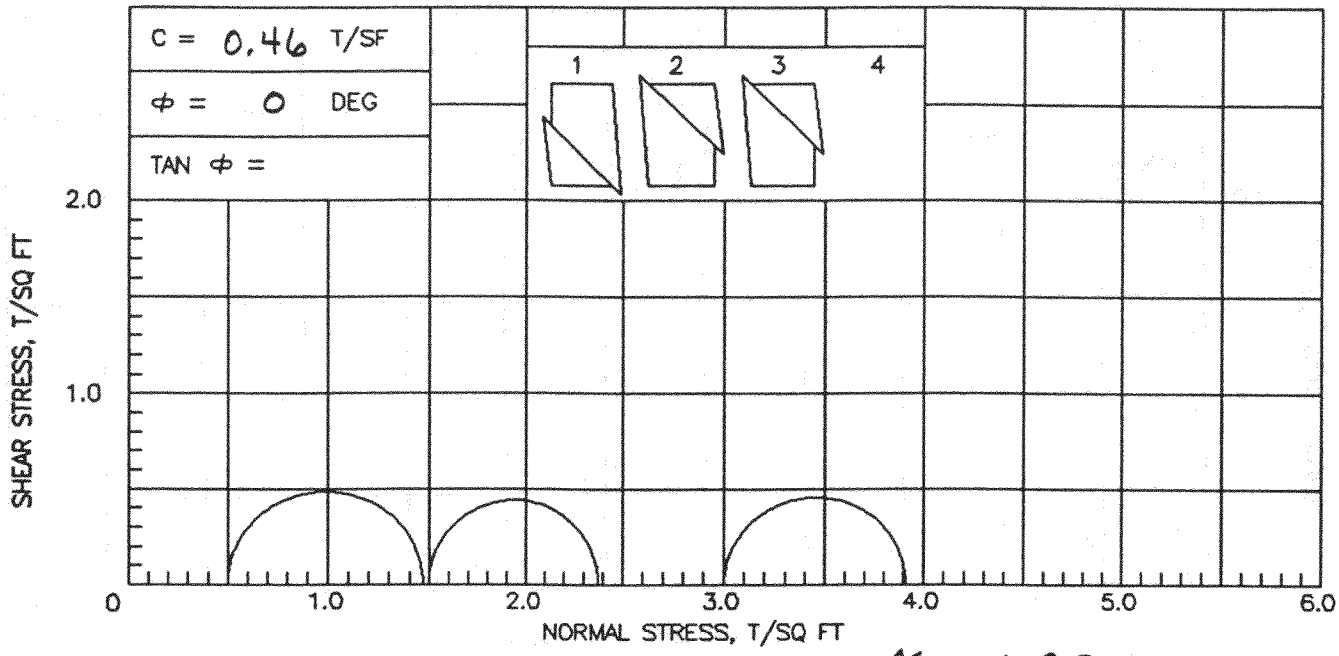
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 10C

DEPTH/ELEV 51.5/-84.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 07 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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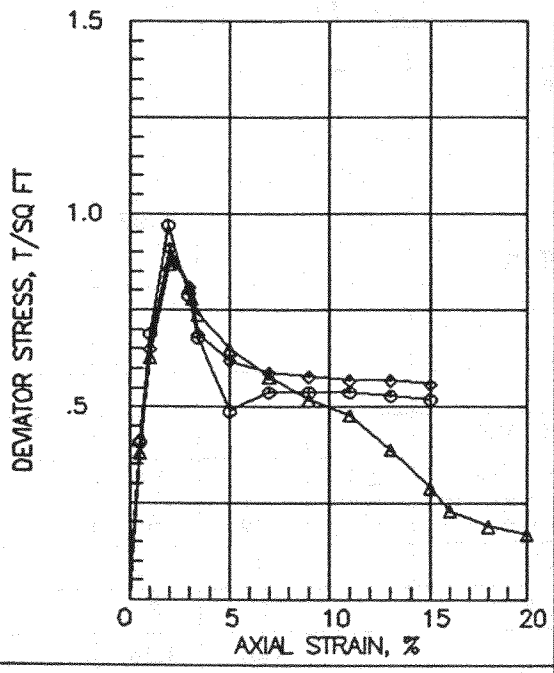


SPECIMEN NO.		◇ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	46.4	46.4	48.1	
	DRY DENSITY, PCF	74.5	75.0	73.6	
	SATURATION, %	99.3	100+	100+	
	VOID RATIO	1.263	1.248	1.291	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.97	.88	.91	
TIME TO FAILURE, MIN.		4	15	15	
STRAIN RATE INCR., %				3	
INITIAL DIAMETER, IN.		1.37	1.36	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 65	PL 19	PI 46	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

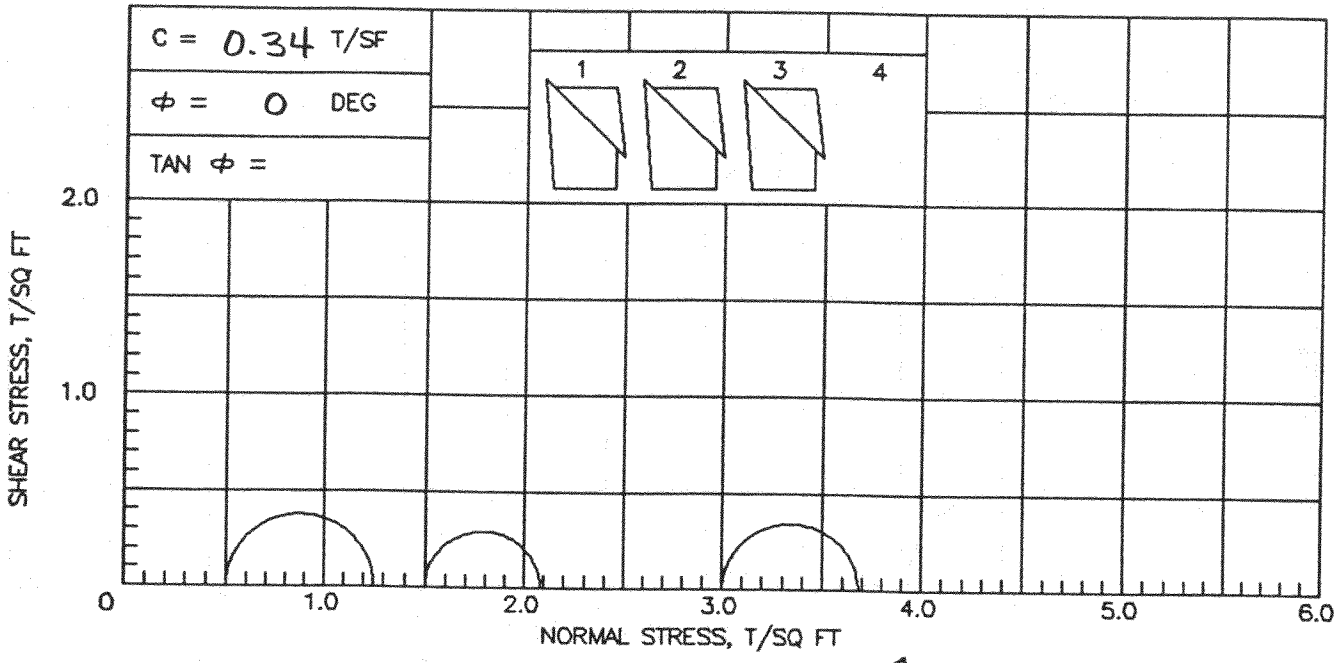
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 12B

DEPTH/ELEV 58.5/-91.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 09 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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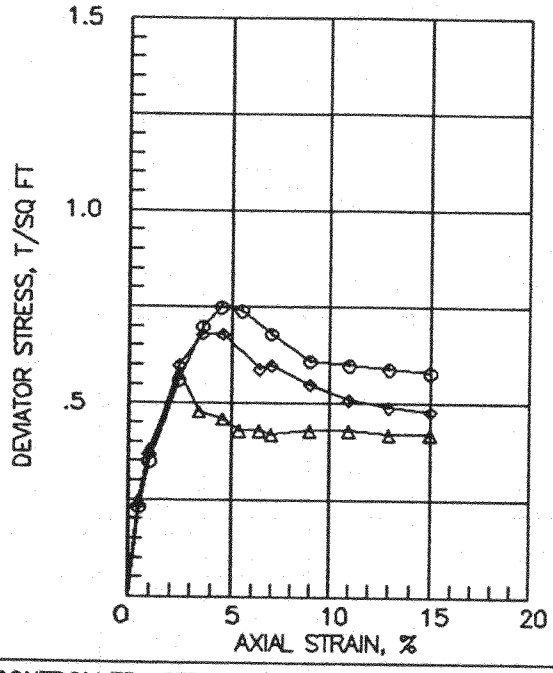


SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	38.1	42.7	43.8	
	DRY DENSITY, PCF	83.0	78.0	76.7	
	SATURATION, %	99.9	99.2	98.9	
	VOID RATIO	1.031	1.161	1.197	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.75	.58	.68	
TIME TO FAILURE, MIN.		9	12	19	
STRAIN RATE INCR., %			5	6	
INITIAL DIAMETER, IN.		1.36	1.37	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED–STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 47	PL 18	PI 29	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

LIMITS ON MIXTURE OF MATERIALS

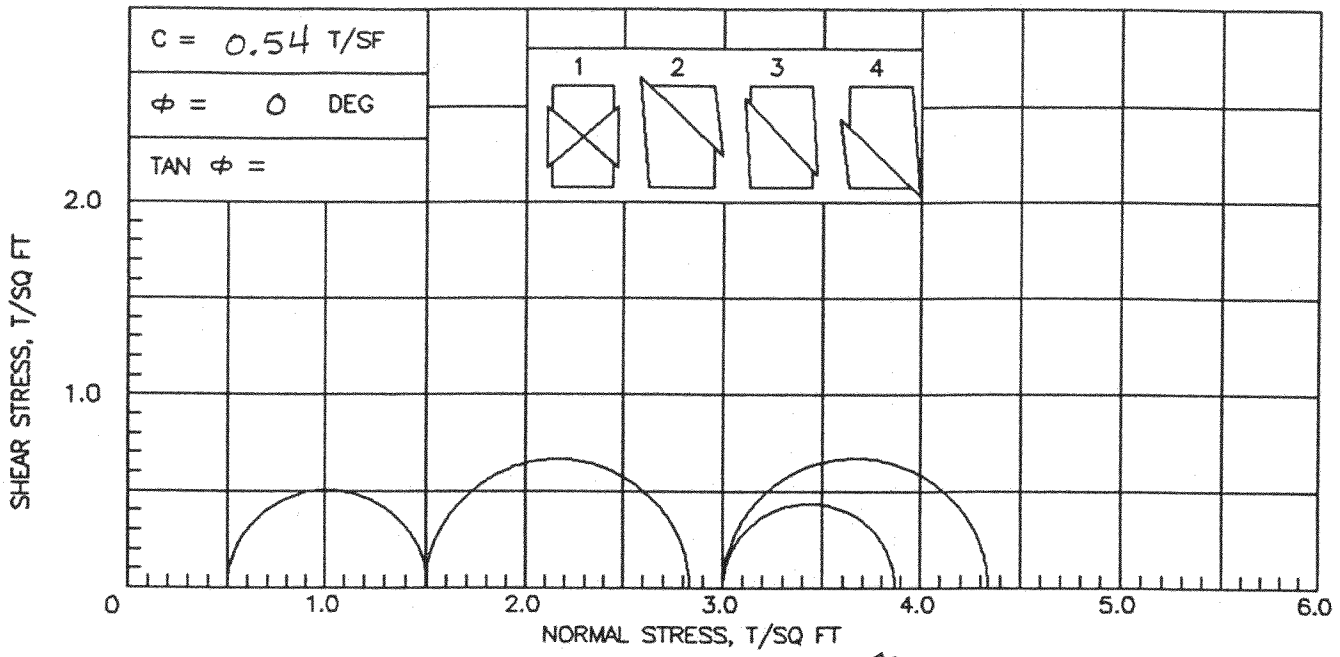
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC–2U SAMPLE NO. 14B

DEPTH/ELEV 66.8/–99.3 TECH. JH

LABORATORY USAE WES – STF/GL DATE 10 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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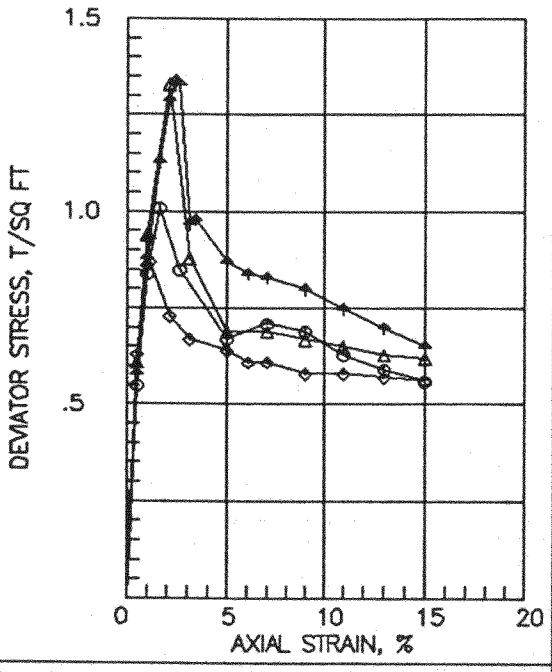


SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	51.9	51.6	51.3	51.3
	DRY DENSITY, PCF	70.3	70.3	70.8	70.4
	SATURATION, %	100+	99.7	100+	99.4
	VOID RATIO	1.397	1.397	1.382	1.394
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	3.00
MAX. DEV. STRESS, TSF		1.01	1.33	.87	1.34
TIME TO FAILURE, MIN.		3	13	9	19
STRAIN RATE INCR., %			5	6	3
INITIAL DIAMETER, IN.		1.37	1.37	1.37	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 76	PL 20	PI 56	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

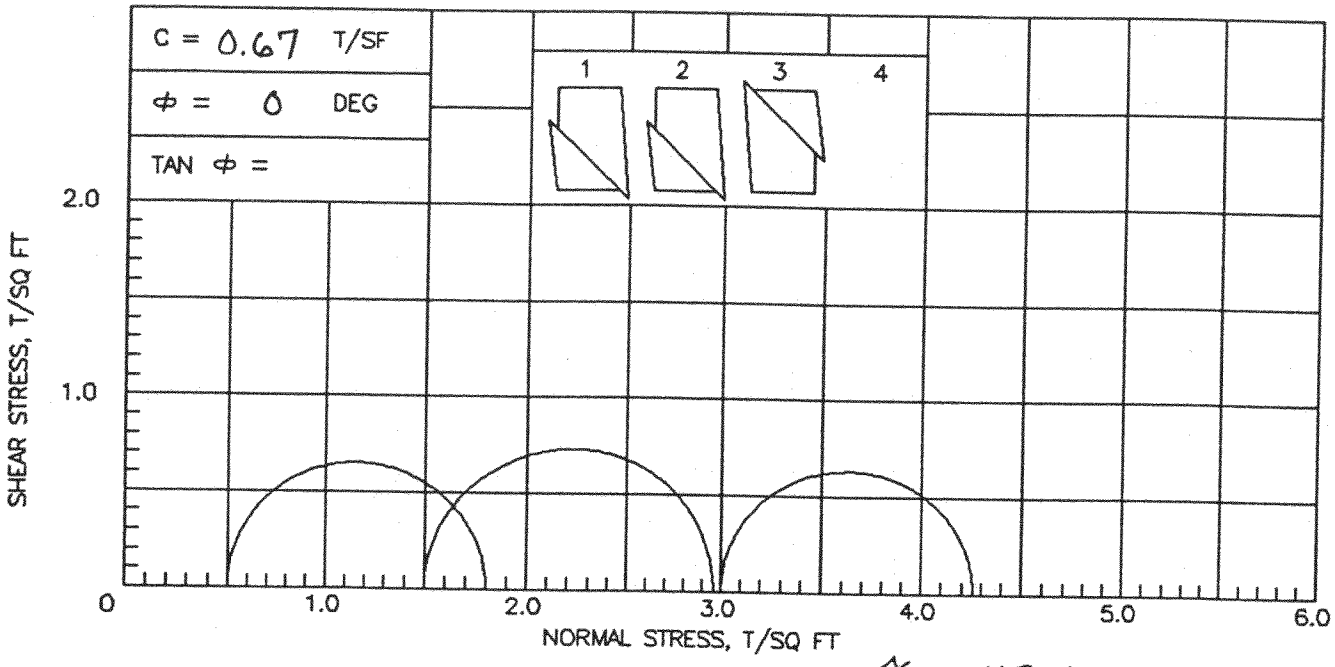
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 17B

DEPTH/ELEV 78.5/-111.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 10 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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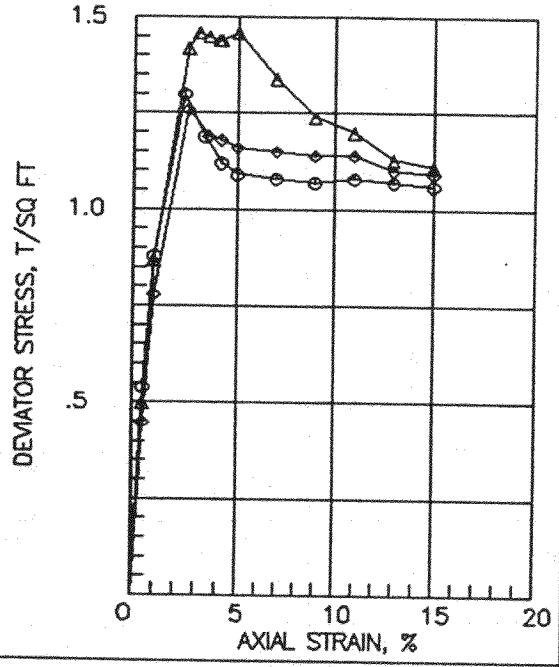


SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	36.8	36.1	38.6	
	DRY DENSITY, PCF	83.4	83.5	81.2	
	SATURATION, %	97.2	95.8	97.0	
	VOID RATIO	1.021	1.018	1.075	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		1.30	1.46	1.26	
TIME TO FAILURE, MIN.		5	33	19	
STRAIN RATE INCR., %			4		
INITIAL DIAMETER, IN.		1.37	1.38	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 55	PL 21	PI 34	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

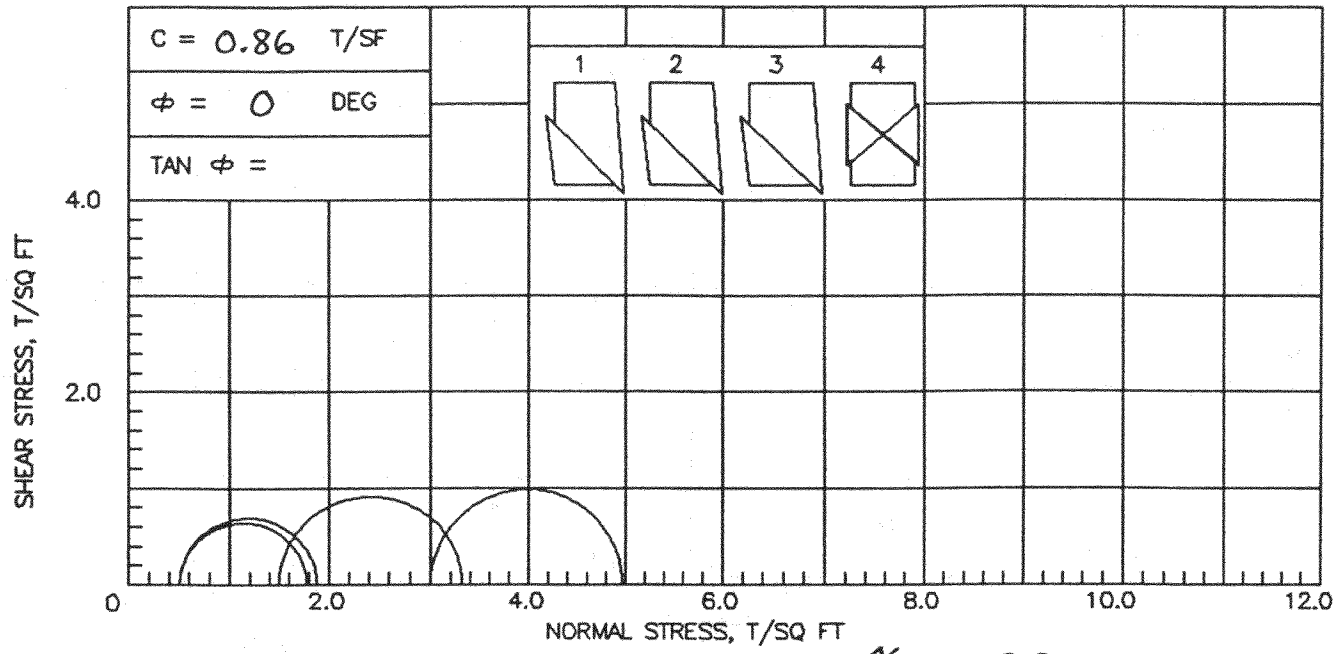
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 21B

DEPTH/ELEV 94.7/-127.2 TECH. JH

LABORATORY USAE WES - STF/GL DATE 13 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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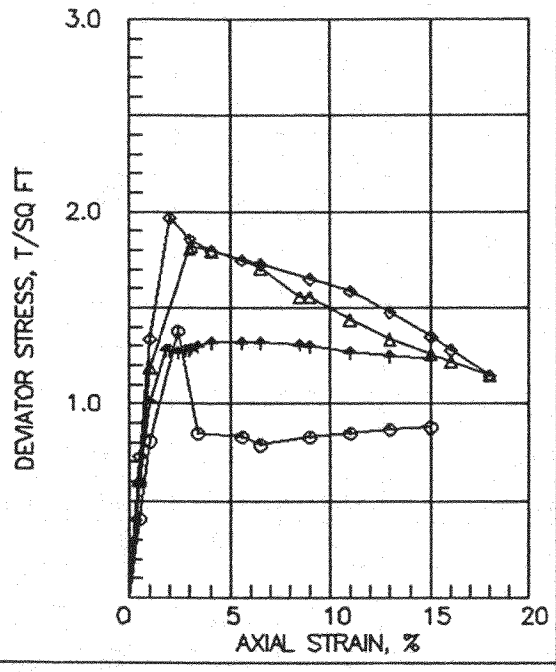


SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	35.5	36.2	36.4	36.6
	DRY DENSITY, PCF	84.1	83.5	83.7	82.8
	SATURATION, %	95.5	95.8	96.9	95.4
	VOID RATIO	1.004	1.020	1.014	1.037
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		1.38	1.82	1.97	1.28
TIME TO FAILURE, MIN.		5	24	15	13
STRAIN RATE INCR., %			8	5	
INITIAL DIAMETER, IN.		1.37	1.37	1.37	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS & LENSES

LL 50	PL 17	PI 33	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

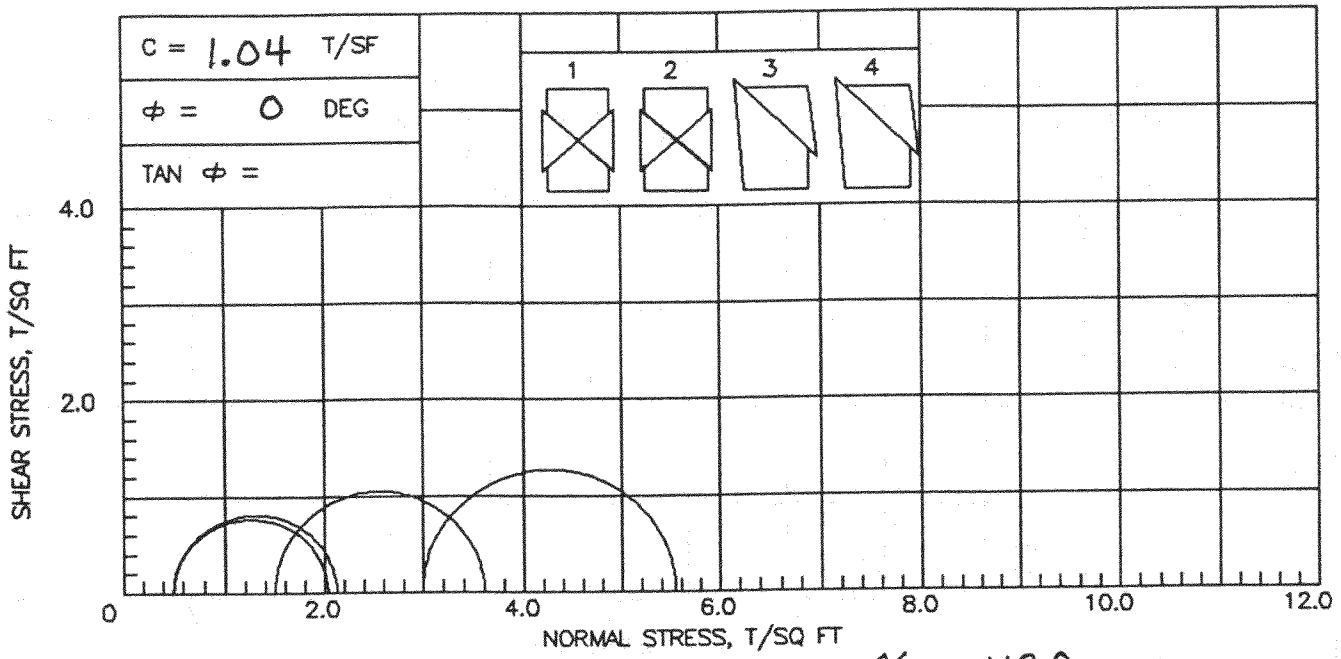
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 26C

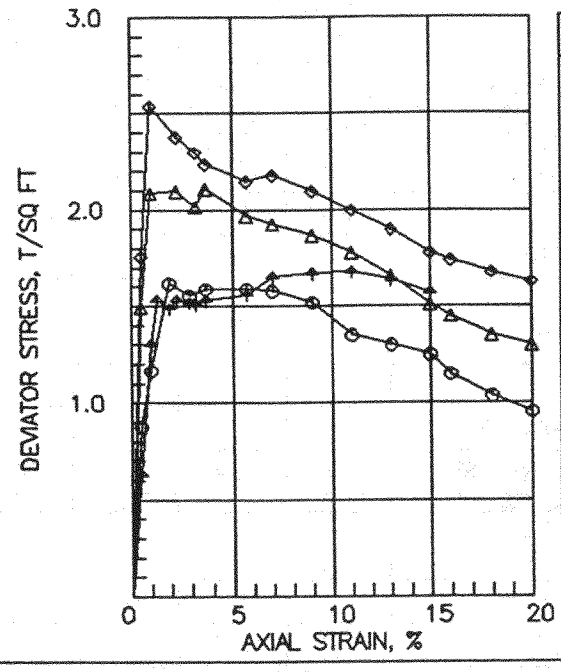
DEPTH/ELEV 115.5/-148.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 14 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 112.9 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	39.0	39.6	38.8	38.1
	DRY DENSITY, PCF	81.2	81.0	81.3	80.8
	SATURATION, %	98.0	98.8	97.6	94.5
	VOID RATIO	1.075	1.081	1.073	1.087
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		1.62	2.10	2.54	1.53
TIME TO FAILURE, MIN.		4	18	8	10
STRAIN RATE INCR., %			3	5	5
INITIAL DIAMETER, IN.		1.36	1.36	1.37	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SLICKENSIDED

LL 76	PL 19	PI 57	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

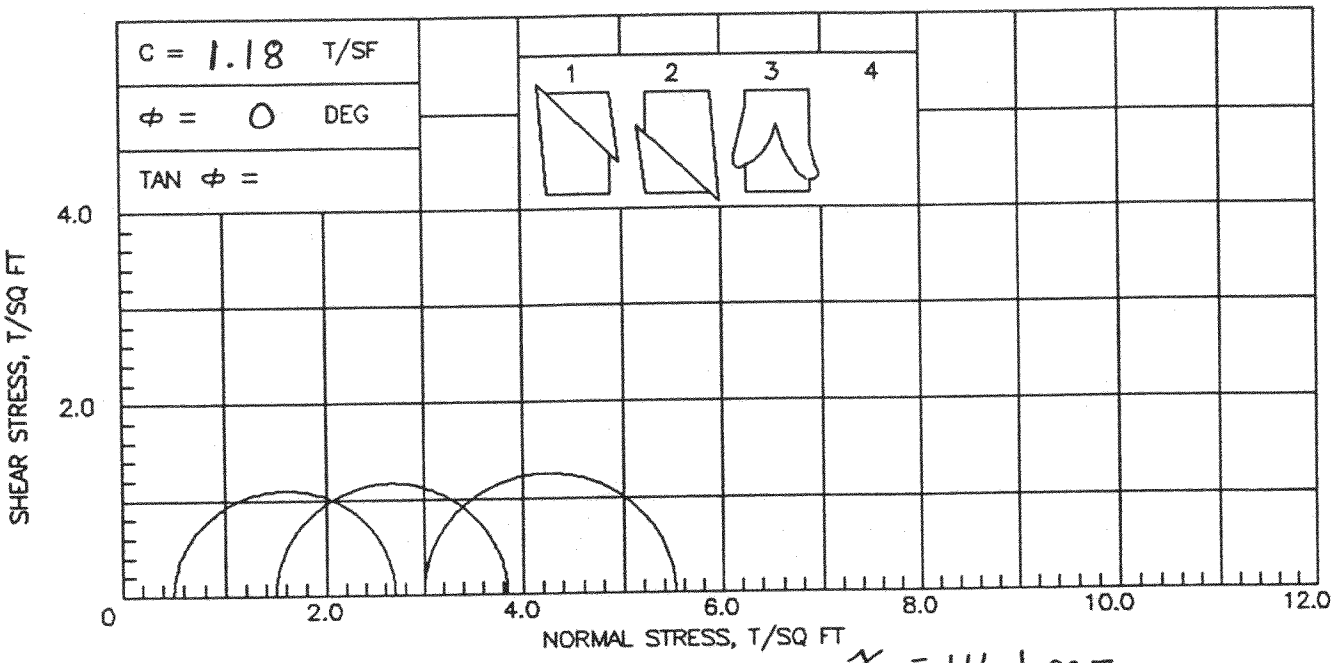
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 33C

DEPTH/ELEV 143.5/-176.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 14 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



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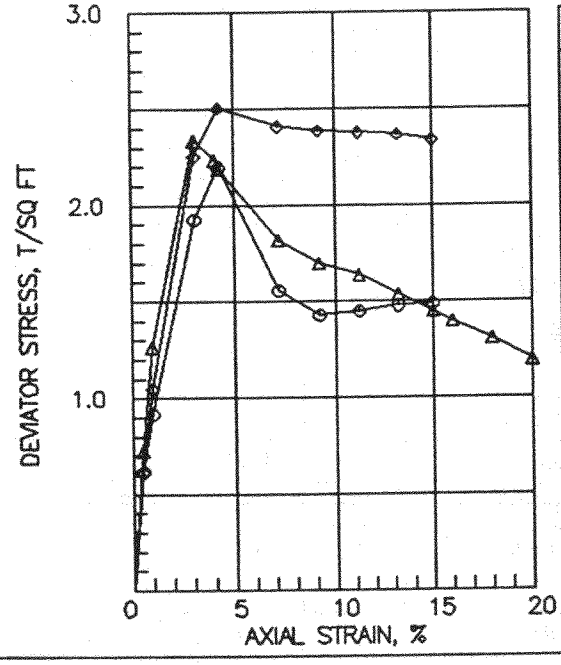


SPECIMEN NO.		◇ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	32.6	33.8	31.9	
	DRY DENSITY, PCF	87.3	87.3	87.8	
	SATURATION, %	94.6	97.9	93.5	
	VOID RATIO	.931	.931	.921	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		2.20	2.34	2.51	
TIME TO FAILURE, MIN.		8	13	29	
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.36	1.37	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT LENSES

LL 59	PL 19	PI 40	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

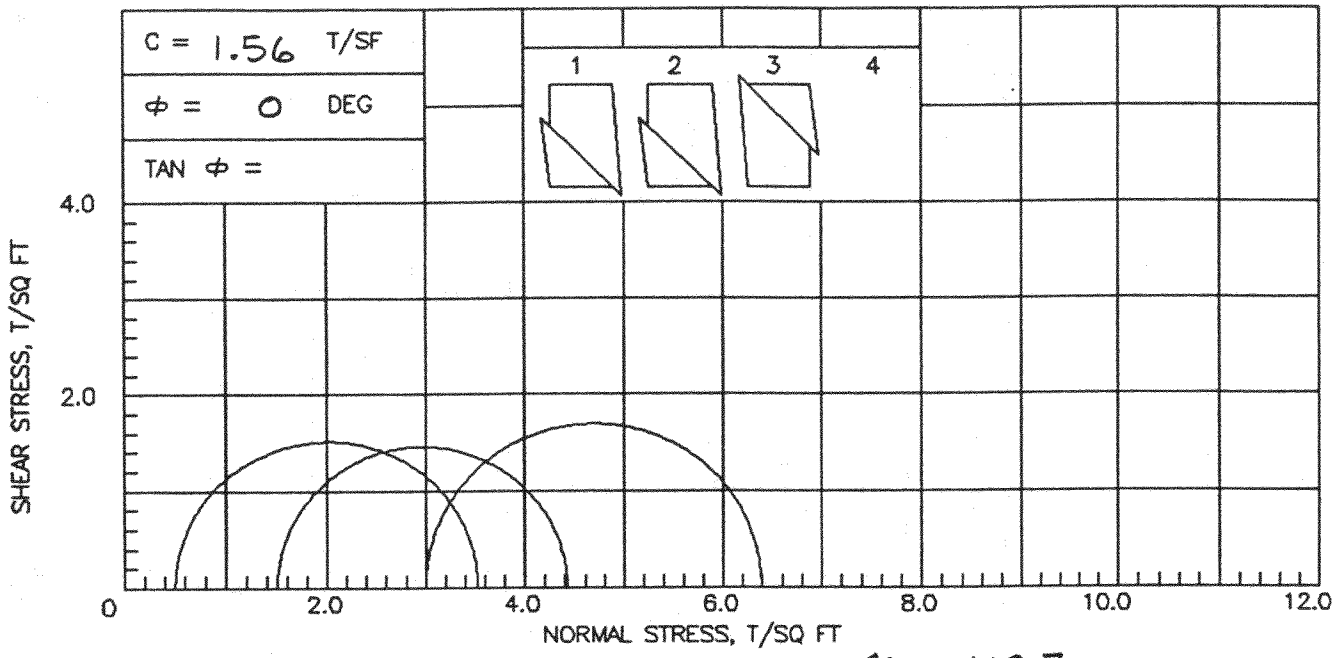
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 38C

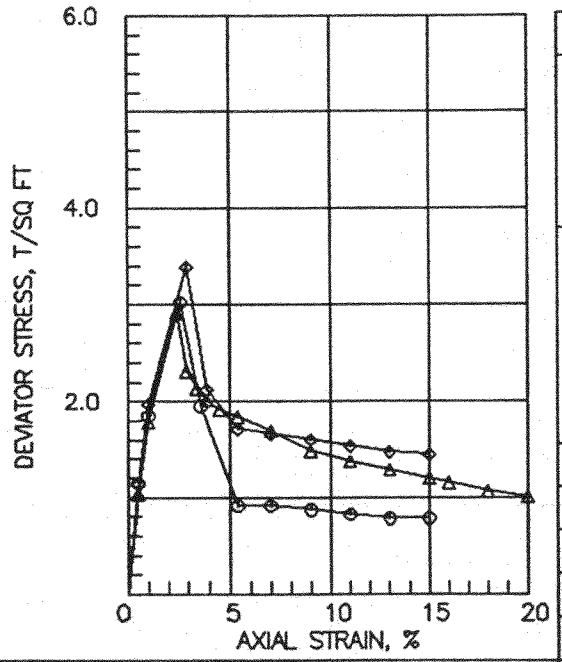
DEPTH/ELEV 163.6/-196.1 TECH. JH

LABORATORY USAE WES - STF/GL DATE 15 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 112.7 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	42.6	40.5	40.3	
	DRY DENSITY, PCF	78.4	80.3	80.7	
	SATURATION, %	100+	99.7	100+	
	VOID RATIO	1.149	1.098	1.088	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		3.03	2.92	3.39	
TIME TO FAILURE, MIN.		5	14	23	
STRAIN RATE INCR., %			4	5	
INITIAL DIAMETER, IN.		1.37	1.37	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT LENSES

LL 73	PL 20	PI 53	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

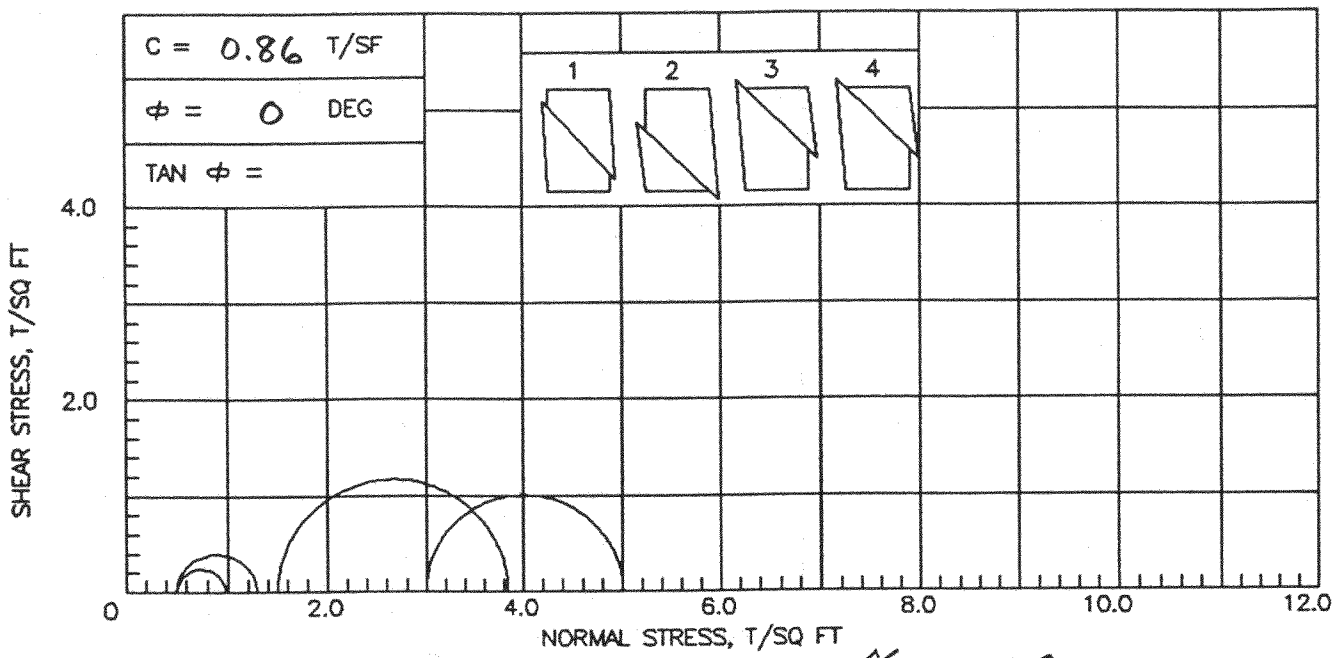
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 42C

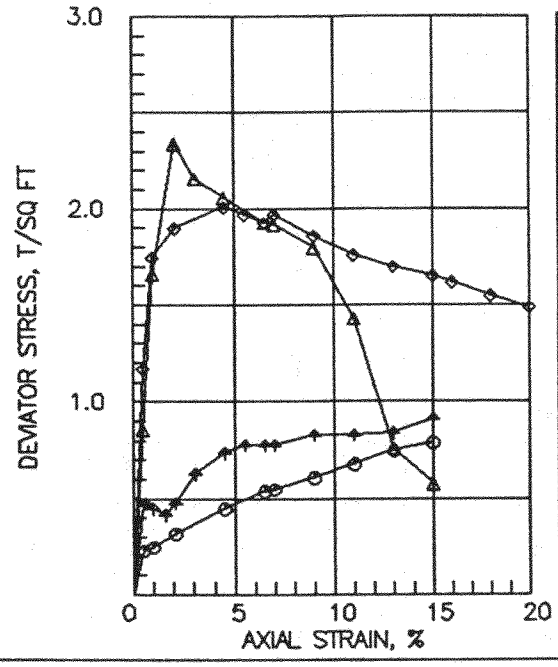
DEPTH/ELEV 179.8/-212.3 TECH. JH

LABORATORY USAE WES - STF/GL DATE 16 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 110.2 PCF



SPECIMEN NO.		◇ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	45.6	44.9	44.6	44.7
	DRY DENSITY, PCF	75.4	76.2	76.2	76.2
	SATURATION, %	99.8	100+	99.5	99.7
	VOID RATIO	1.235	1.213	1.212	1.211
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		.79	2.34	2.01	.48
TIME TO FAILURE, MIN.		30	4	37	5
STRAIN RATE INCR., %				6	
INITIAL DIAMETER, IN.		1.37	1.37	1.37	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SLICKENSIDED

LL 80	PL 20	PI 60	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

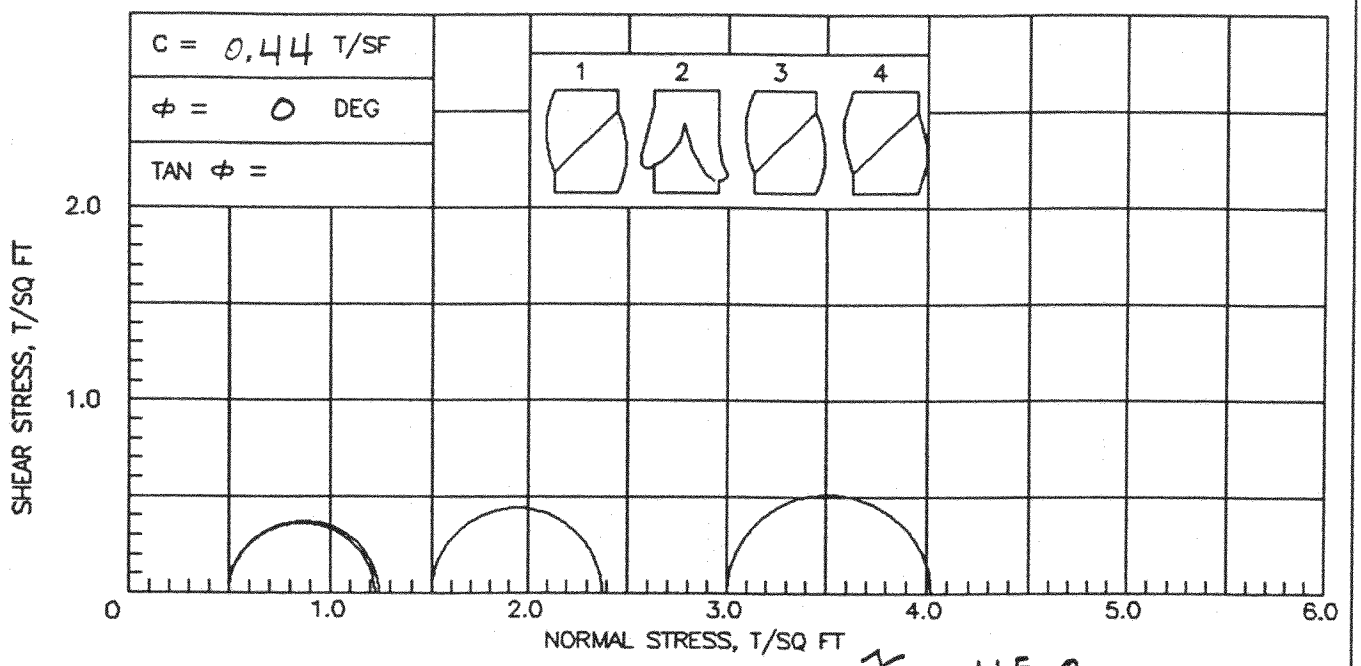
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-2U SAMPLE NO. 45B

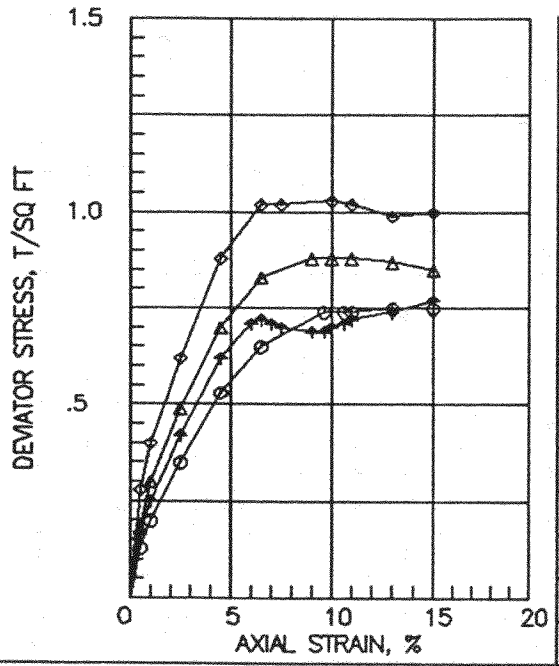
DEPTH/ELEV 190.8/-223.3 TECH. JH

LABORATORY USAE WES - STF/GL DATE 16 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 115.0 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	30.6	31.7	31.3	29.8
	DRY DENSITY, PCF	88.3	88.0	86.6	89.4
	SATURATION, %	90.9	93.6	89.1	91.1
	VOID RATIO	.908	.915	.947	.885
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	.50
MAX. DEV. STRESS, TSF		.74	.88	1.02	.72
TIME TO FAILURE, MIN.		19	18	13	23
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.39	1.37	1.39	1.38
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; FINE SAND POCKETS

LL 34	PL 16	PI 18	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

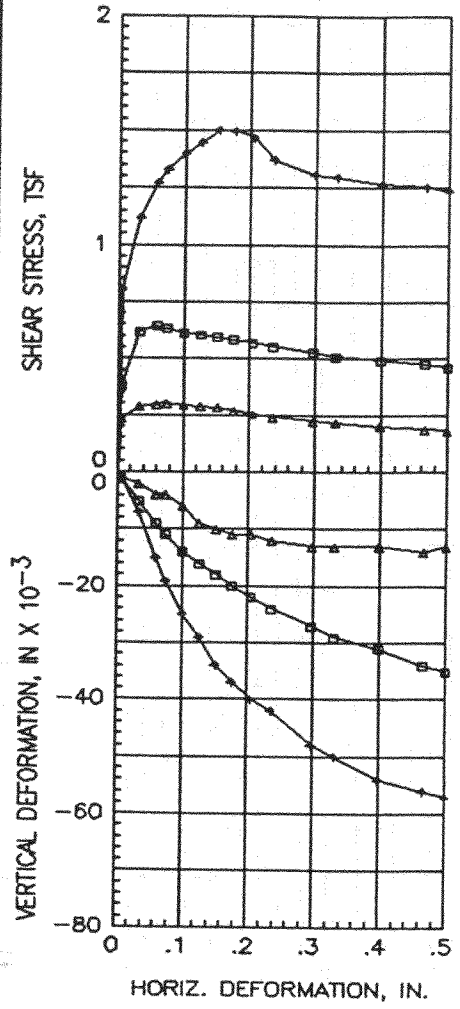
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

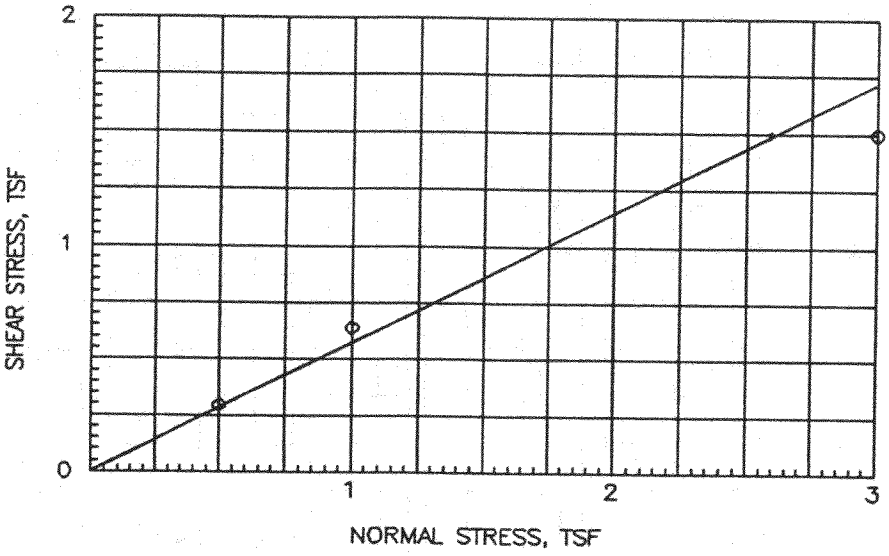
BORING NO. NC-2U SAMPLE NO. 49C

DEPTH/ELEV 207.5/-240.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 17 JUL 92

TRIAXIAL COMPRESSION TEST REPORT





Φ = 30.1 DEG

TAN Φ = 0.580

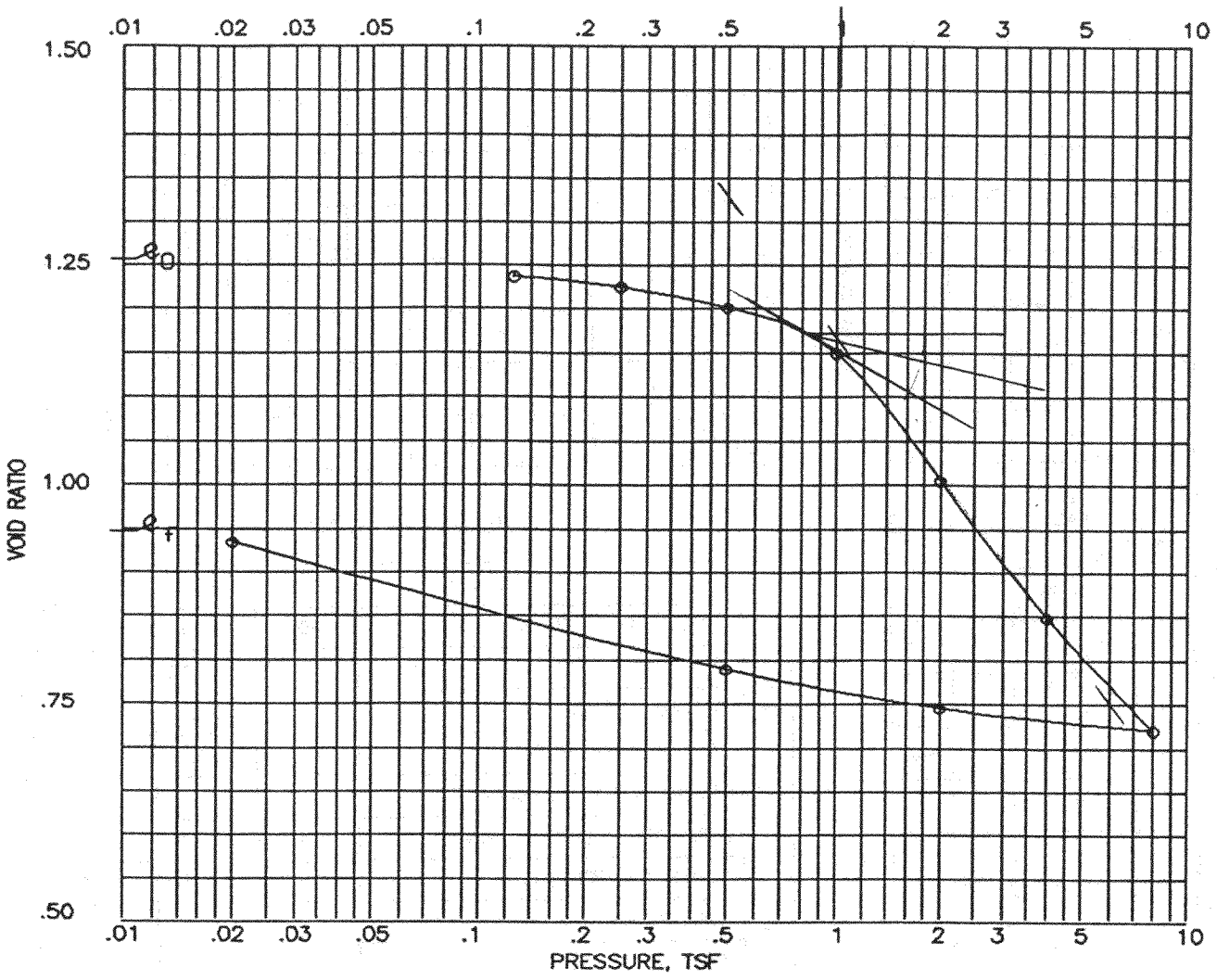
C = 0 T/SF

TEST NO.		1 ▲	2 □	3 ◆	
INITAL	WATER CONTENT, %	40.8	46.6	46.8	
	VOID RATIO	1.152	1.282	1.327	
	SATURATION, %	95.6	98.1	95.3	
	DRY DENSITY, PCF	78.3	73.8	72.4	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	46.2	50.8	45.1	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		.50	1.00	3.00	
MAXIMUM SHEAR STRESS, TSF		.30	.64	1.50	
TIME TO FAILURE, MIN		414	331	834	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED	3.00 IN. SQUARE	.552 IN. THICK
CLASSIFICATION CLAY (CH), GRAY		

LL 70	PL 19	PI 51		GS 2.70 (EST)

REMARKS;	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF	
	CLAIBORNE, NEW ORLEANS	
	BORING NO. NC-2U	SAMPLE 20B
	DEPTH/ELEV 91.0/-123.5	TECH. US
	LABORATORY USAE WES - STF/GL	DATE 11 AUG 92
	DIRECT SHEAR TEST REPORT	



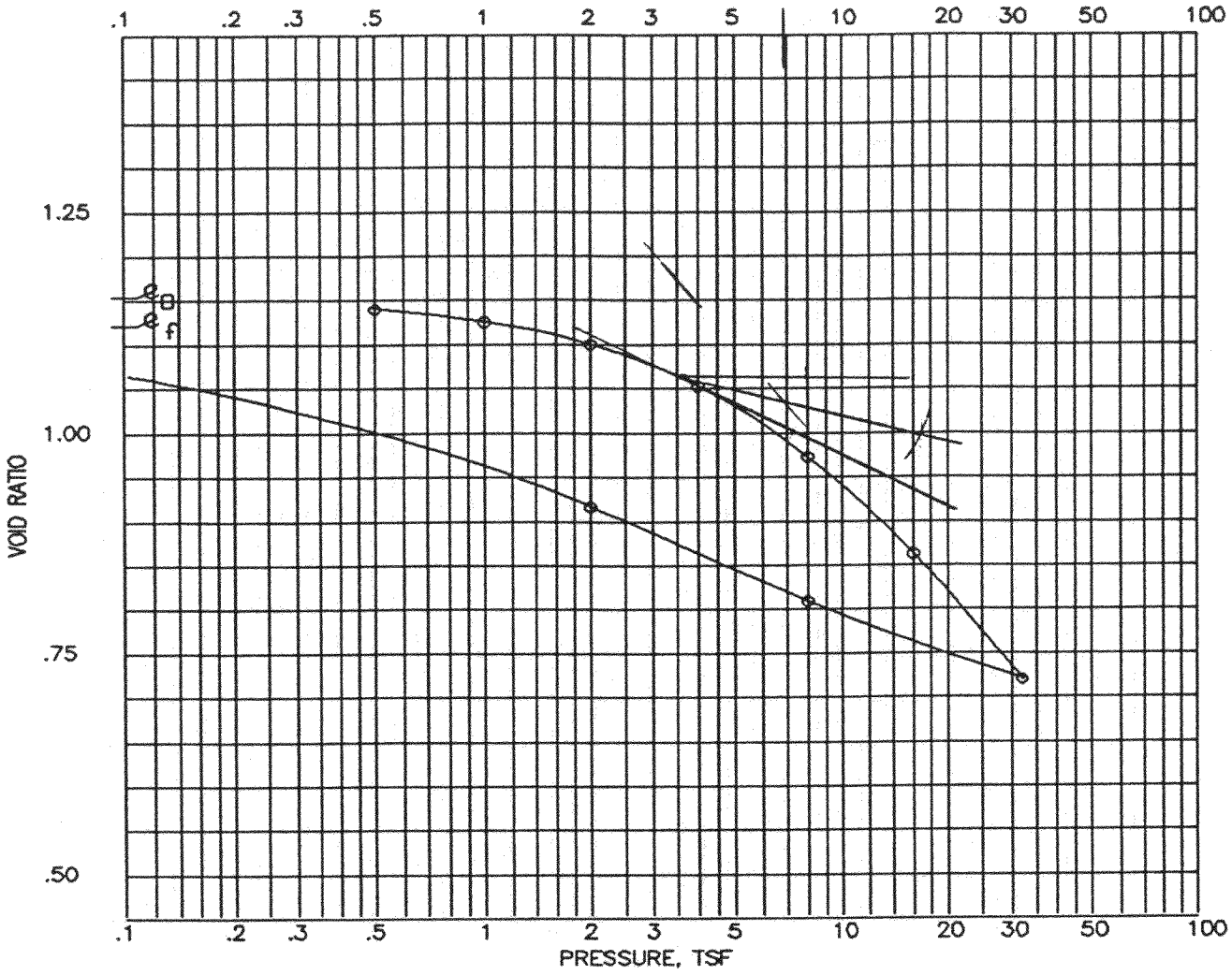
γ_w = 101.1 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	35.3	34.9
PRECONSOL. PRESSURE, TSF	1.0	DRY DENSITY, PCF	74.7	86.7
COMPRESSION INDEX	0.58	SATURATION, %	75.9	99.8
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.255	.945
DIA. IN 4.44	HT. IN 1.124	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), GRAY; FINE SAND POCKETS

LL 46	PL 18	PI 28	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-2U	SAMPLE NO. 2B
		DEPTH/ELEV 19.0/-51.5	TECH. US
		LABORATORY USAE WES - STF/GL	DATE 18 AUG 92

CONSOLIDATION TEST REPORT

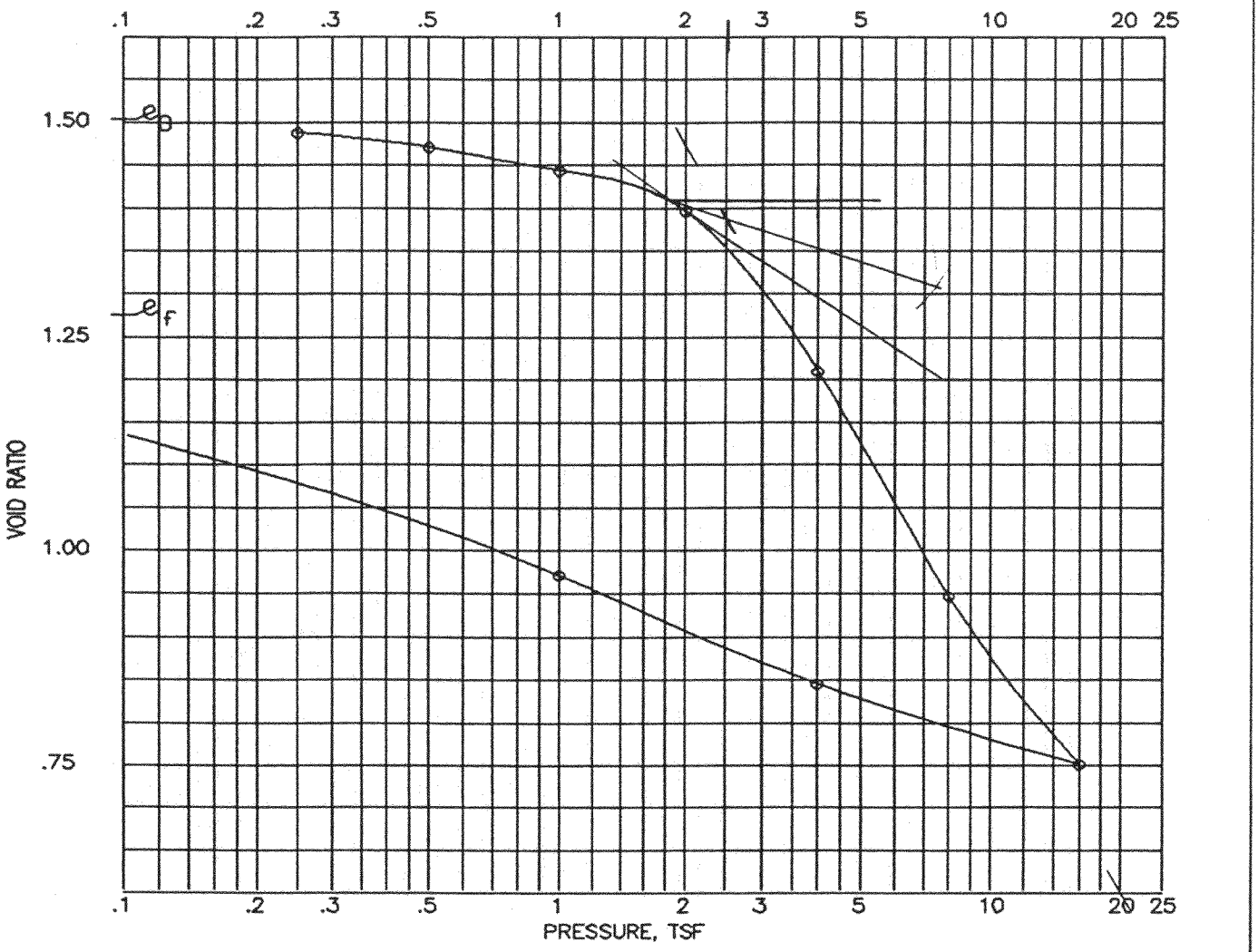


γ_w = 111.4 pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	42.3	43.2
PRECONSOL. PRESSURE, TSF	5.9	DRY DENSITY, PCF	78.3	79.5
COMPRESSION INDEX	0.44	SATURATION, %	99.1	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.153	1.119
DIA. IN 4.44	HT. IN 1.124	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 82	PL 16	PI 66	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-2U	SAMPLE NO. 8B
		DEPTH/ELEV 42.8/-75.3	TECH. US
		LABORATORY USAE WES - STF/GL	DATE 18 AUG 92
		CONSOLIDATION TEST REPORT	



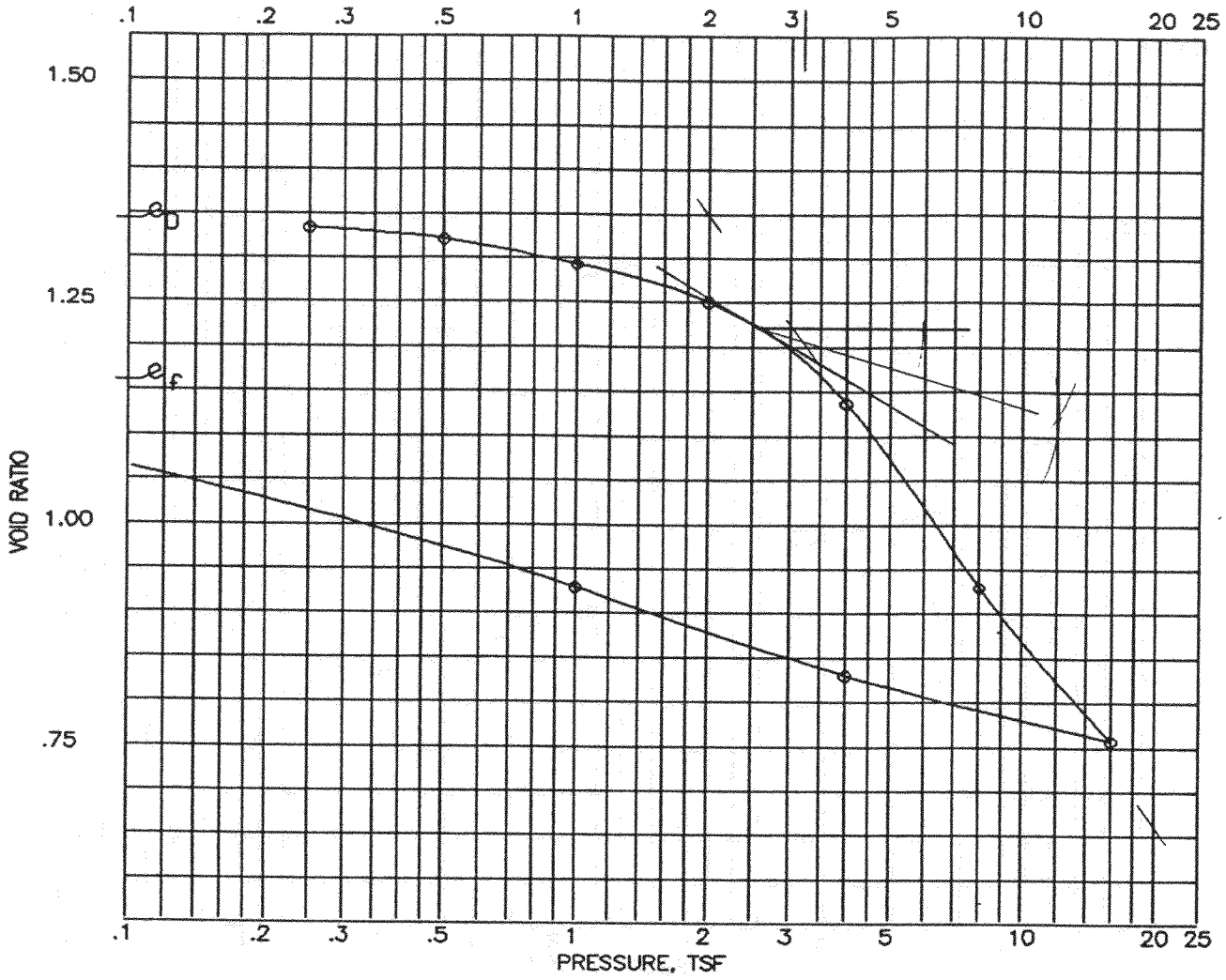
$\gamma_w = 105.2$ PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	56.1	49.8
PRECONSOL. PRESSURE, TSF	2.5	DRY DENSITY, PCF	67.4	74.1
COMPRESSION INDEX	0.87	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.501	1.274
DIA. IN 4.44	HT. IN 1.122	BACK PRESSURE, TSF		

CLASSIFICATION: CLAY (CH), GRAY; FINE SAND LENSES

LL 75	PL 19	PI 56	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC–2U	SAMPLE NO. 11C
		DEPTH/ELEV 55.6/–88.1	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 26 AUG 92

CONSOLIDATION TEST REPORT

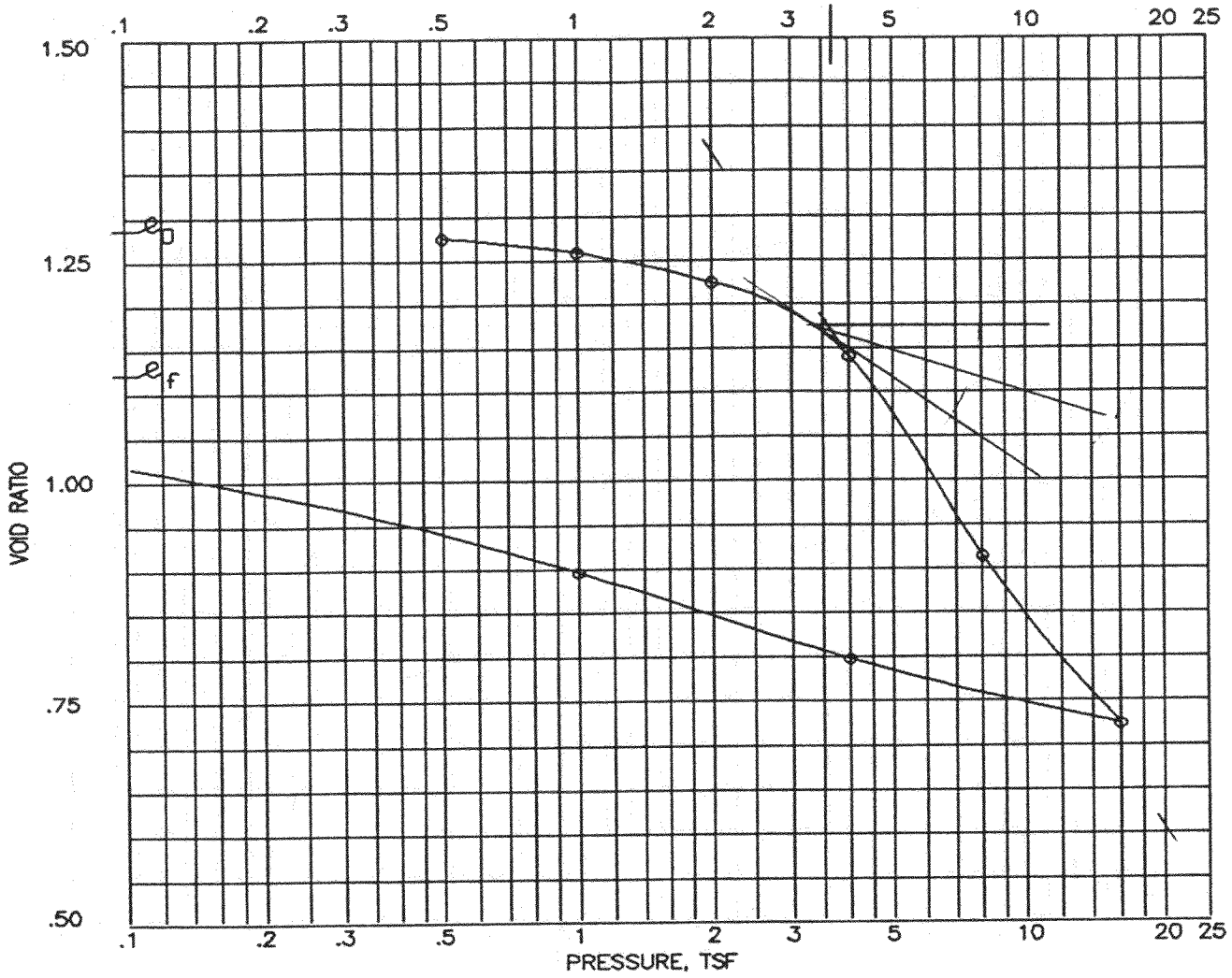


$\gamma_w = 108.1$ PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	50.2	44.3
PRECONSOL. PRESSURE, TSF	3.2	DRY DENSITY, PCF	72.0	78.1
COMPRESSION INDEX	0.69	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.340	1.158
DIA. IN 4.44	HT. IN 1.117	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 50	PL 18	PI 32	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-2U	SAMPLE NO. 168
		DEPTH/ELEV 74.9/-107.4	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 26 AUG 92
		CONSOLIDATION TEST REPORT	

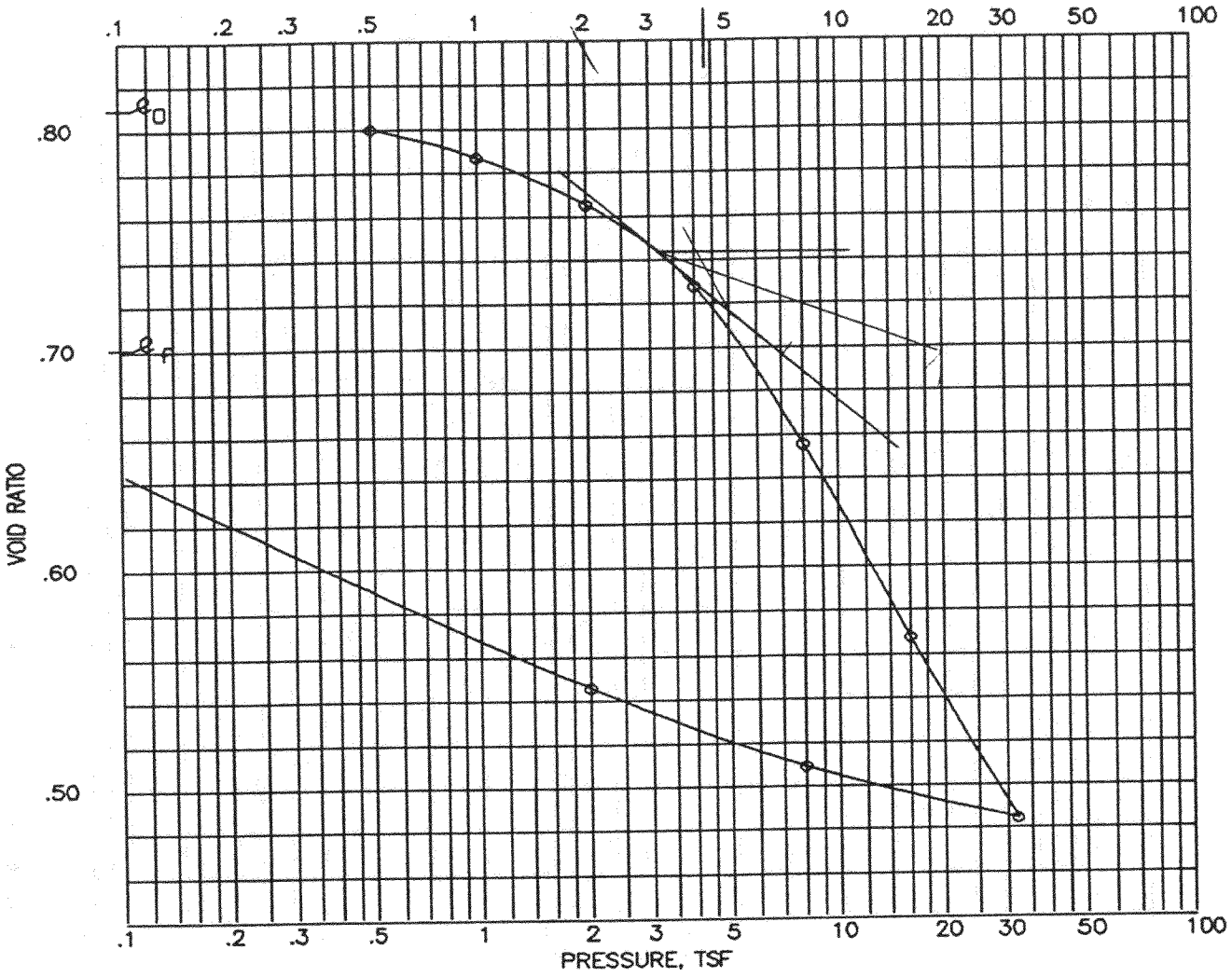


$\gamma_w = 108.0$ pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.3	42.7
PRECONSOL. PRESSURE, TSF	3.7	DRY DENSITY, PCF	73.8	79.5
COMPRESSION INDEX	0.77	SATURATION, %	97.2	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.285	1.121
DIA. IN 4.44	HT. IN 1.118	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 64	PL 19	PI 45	PROJECT	I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}			CLAIBORNE, NEW ORLEANS
REMARKS:			BORING NO. NC-2U	SAMPLE NO. 22C
			DEPTH/ELEV 99.5/-132.0	TECH. US
			LABORATORY USAE WES - STF/GL	DATE 01 SEP 92
			CONSOLIDATION TEST REPORT	

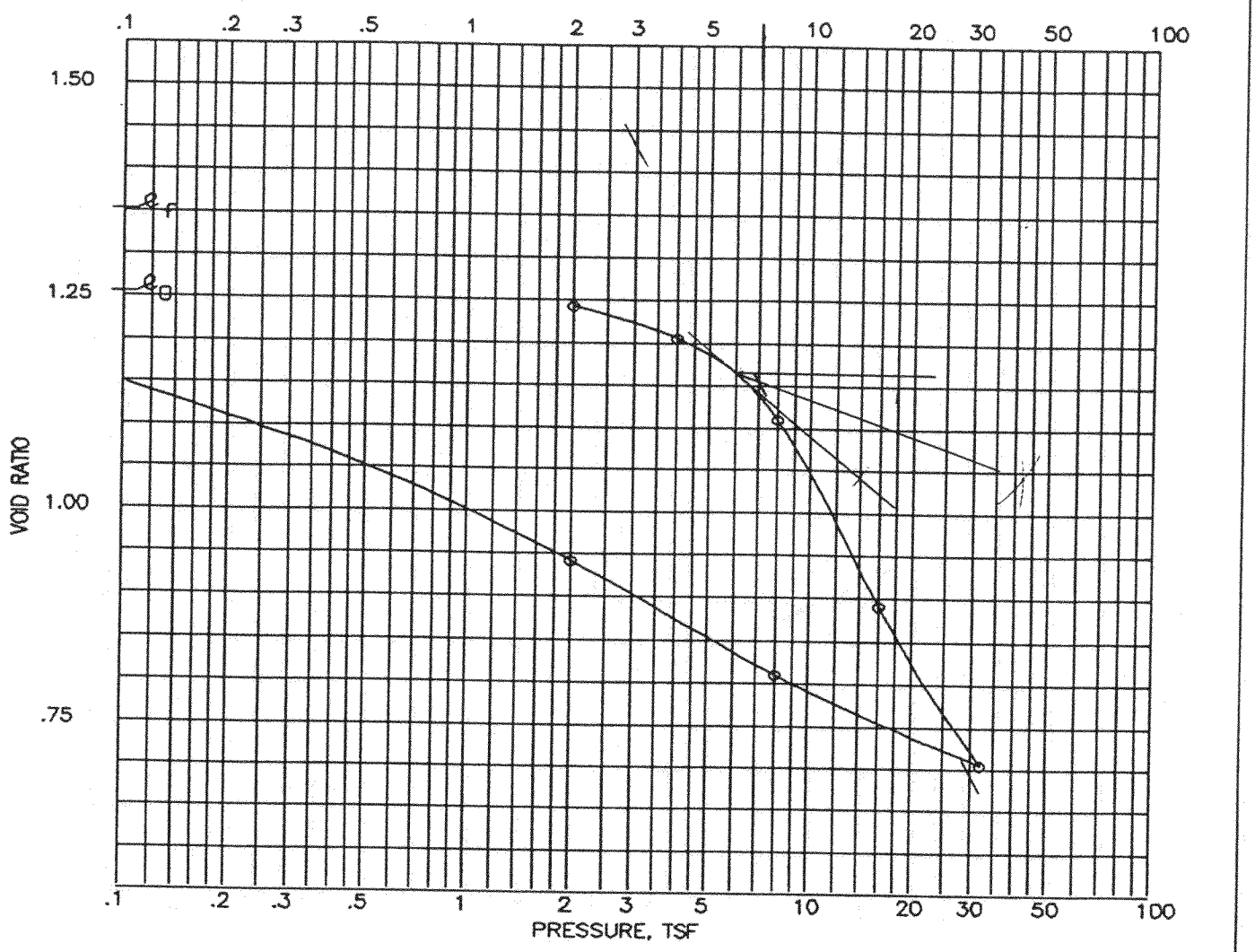


$\gamma_w = 120.0$ pcf

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	28.8	26.2
PRECONSOL. PRESSURE, TSF	4.3	DRY DENSITY, PCF	93.2	99.1
COMPRESSION INDEX	0.30	SATURATION, %	96.2	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	.809	.700
DIA. IN 4.44	HT. IN 1.111	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), GRAY

LL 39	PL 17	PI 22	PROJECT	I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}			CLAIBORNE, NEW ORLEANS
REMARKS:			BORING NO. NC–2U	SAMPLE NO. 28B
			DEPTH/ELEV 122.1/–154.6	TECH. US
			LABORATORY USAE WES – STF/GL	DATE 18 AUG 92
			CONSOLIDATION TEST REPORT	



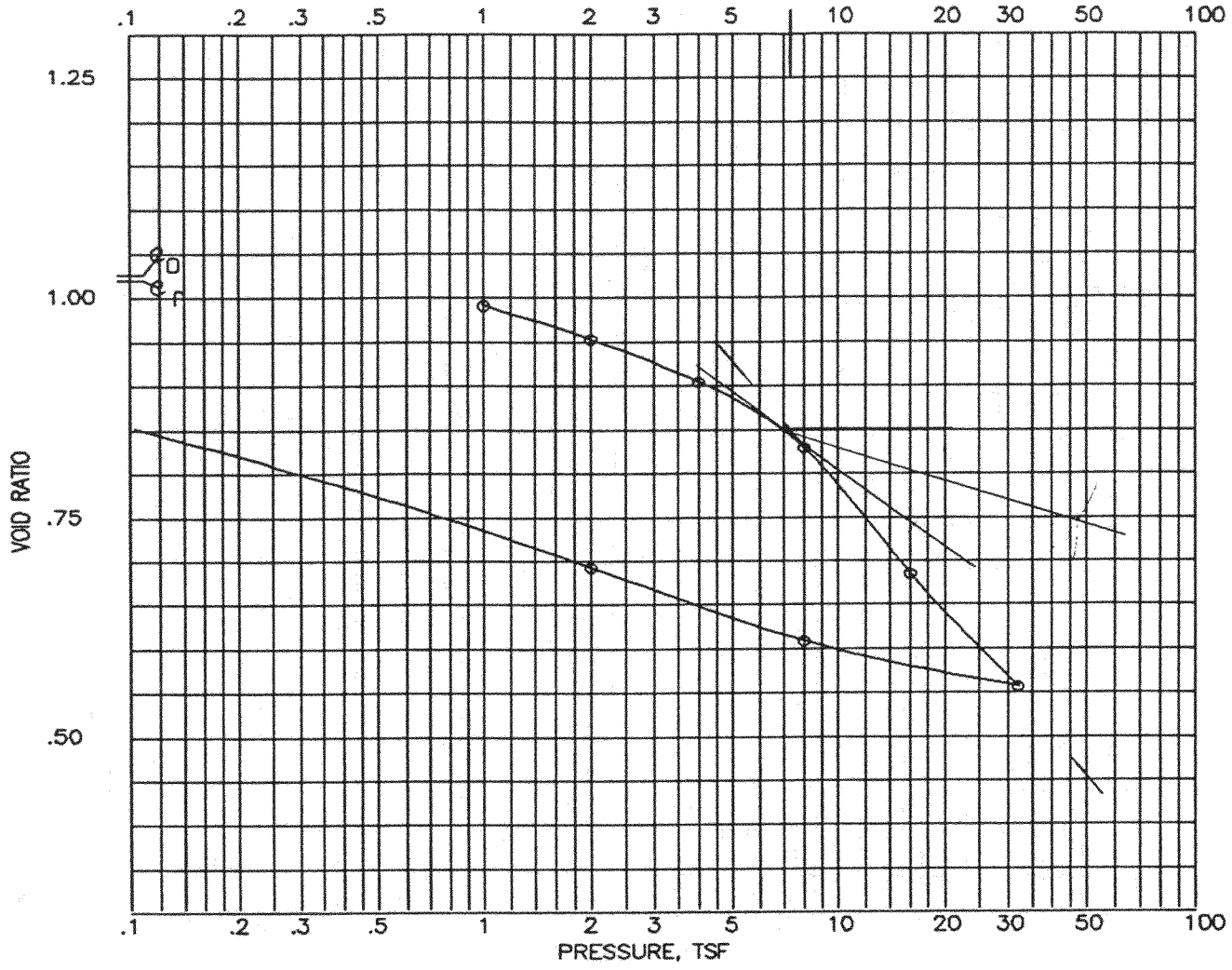
γ_w = 109.2 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.0	50.9
PRECONSOL. PRESSURE, TSF	7.0	DRY DENSITY, PCF	74.8	71.7
COMPRESSION INDEX	0.74	SATURATION, %	99.1	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.254	1.350
DIA. IN 4.44	HT. IN 1.123	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY

LL 79	PL 19	PI 60	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-2U	SAMPLE NO. 44C
		DEPTH/ELEV 187.5/-220.0	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 01 SEP 92

CONSOLIDATION TEST REPORT

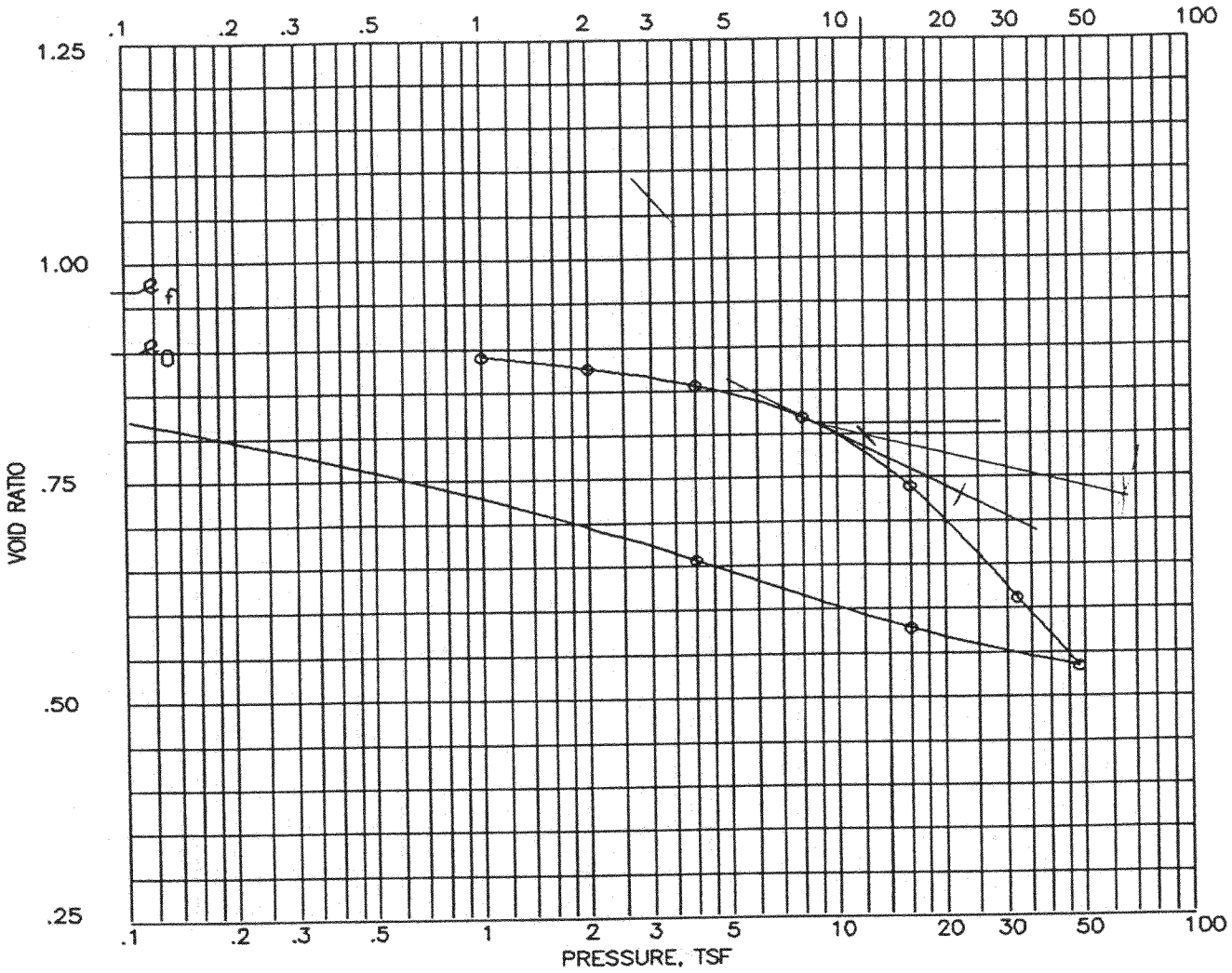


γ_w = 114.1 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	37.0	37.9
PRECONSOL. PRESSURE, TSF	7.2	DRY DENSITY, PCF	83.3	83.5
COMPRESSION INDEX	0.48	SATURATION, %	97.7	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.024	1.018
DIA. IN 4.44	HT. IN 1.111	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY; SILT LENSES

LL 56	PL 16	PI 40	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-2U	SAMPLE NO. 50B
		DEPTH/ELEV 210.8/-243.3	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 18 AUG 92
		CONSOLIDATION TEST REPORT	

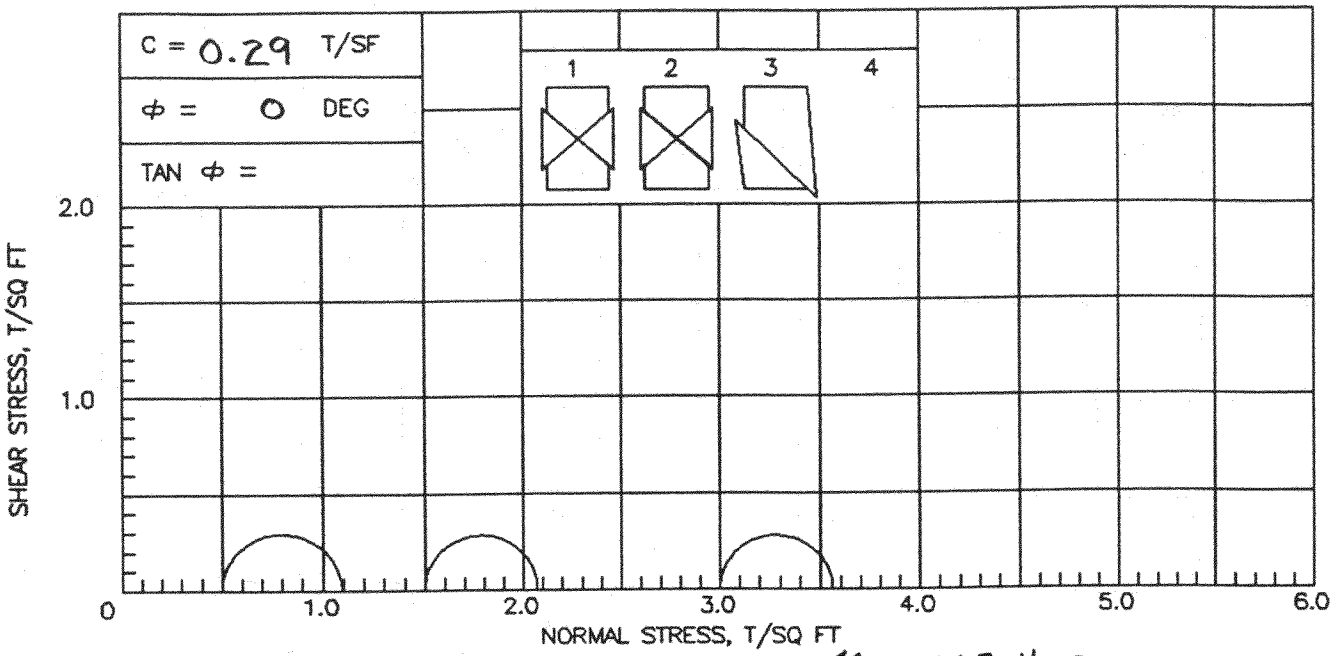


$\gamma_w = 118.9$

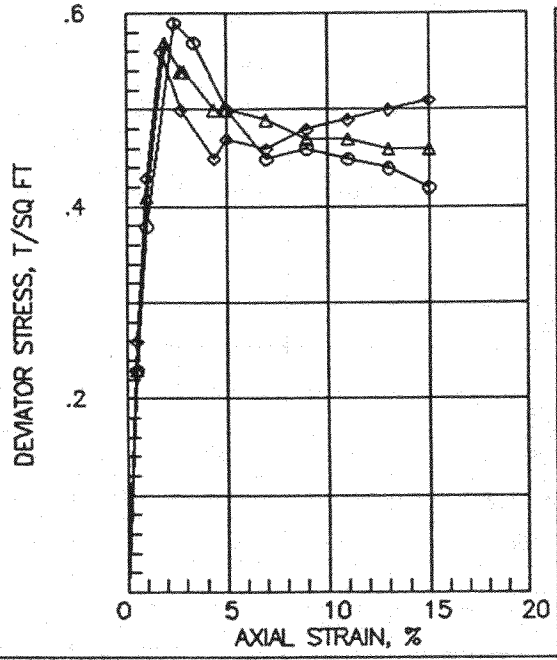
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	33.9	37.1
PRECONSOL. PRESSURE, TSF	12.0	DRY DENSITY, PCF	88.8	85.7
COMPRESSION INDEX	0.48	SATURATION, %	100 +	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	.897	.967
DIA. IN 4.44	HT. IN 1.122	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CH), GRAY; FRIABLE

LL 64	PL 20	PI 44	PROJECT	I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS	
REMARKS:			BORING NO. NC-2U	SAMPLE NO. 338
			DEPTH/ELEV 142.7/-175.2	TECH. US
			LABORATORY USAE WES – STF/GL	DATE 31 AUG 92
			CONSOLIDATION TEST REPORT	



γ_w = 105.4 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	4
INITIAL	WATER CONTENT, %	52.3	51.7	51.0	
	DRY DENSITY, PCF	68.7	69.7	70.1	
	SATURATION, %	97.2	98.4	98.0	
	VOID RATIO	1.453	1.419	1.406	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	
MAX. DEV. STRESS, TSF		.59	.57	.56	
TIME TO FAILURE, MIN.		5	11	16	
STRAIN RATE INCR., %				4	
INITIAL DIAMETER, IN.		1.38	1.36	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CH), GRAY; SILT SEAMS

LL 57	PL 17	PI 40	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

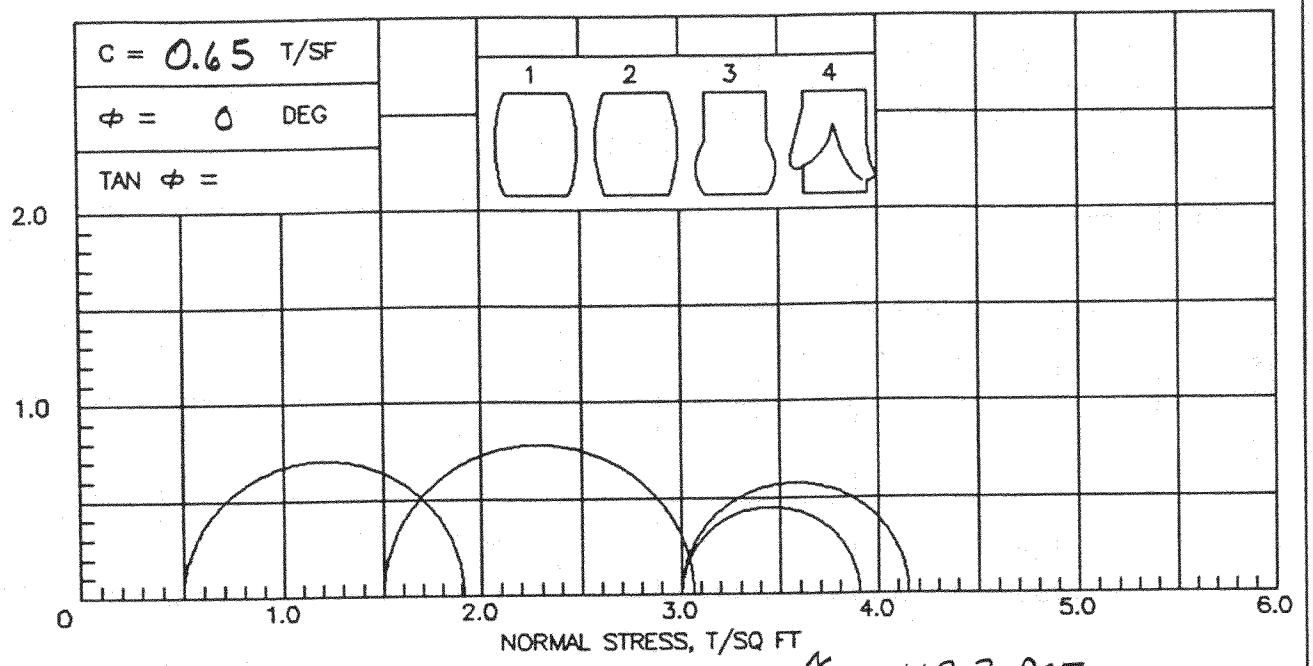
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-3U SAMPLE NO. 4B

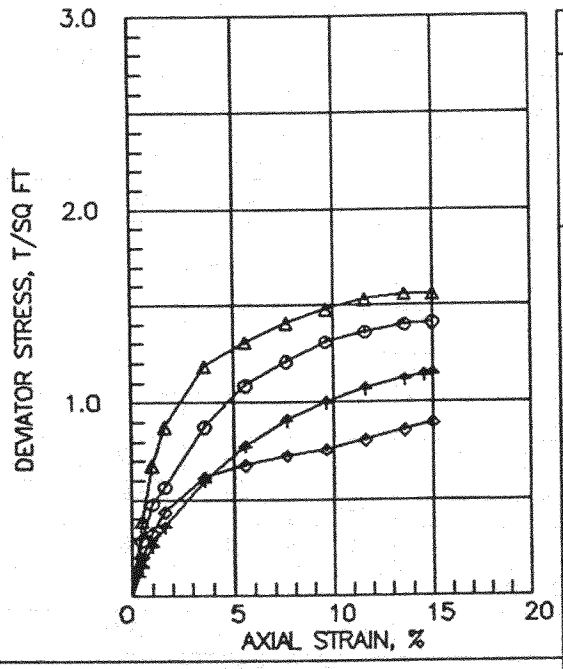
DEPTH/ELEV 23.0/-54.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 20 JUL 92

TRIAXIAL COMPRESSION TEST REPORT



γ_w = 119.3 PCF



SPECIMEN NO.		○ 1	△ 2	◇ 3	+ 4
INITIAL	WATER CONTENT, %	27.8	28.0	28.5	27.6
	DRY DENSITY, PCF	93.9	92.4	93.0	95.2
	SATURATION, %	94.6	91.7	94.7	96.8
	VOID RATIO	.794	.825	.812	.770
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESSURE, TSF				
CHAMBER PRESSURE, TSF		.50	1.50	3.00	3.00
MAX. DEV. STRESS, TSF		1.41	1.56	.90	1.15
TIME TO FAILURE, MIN.		30	27	30	60
STRAIN RATE INCR., %					
INITIAL DIAMETER, IN.		1.38	1.38	1.36	1.37
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL 31	PL 14	PI 17	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

CHECK TEST TAKEN FROM DIFFERENT LIFT

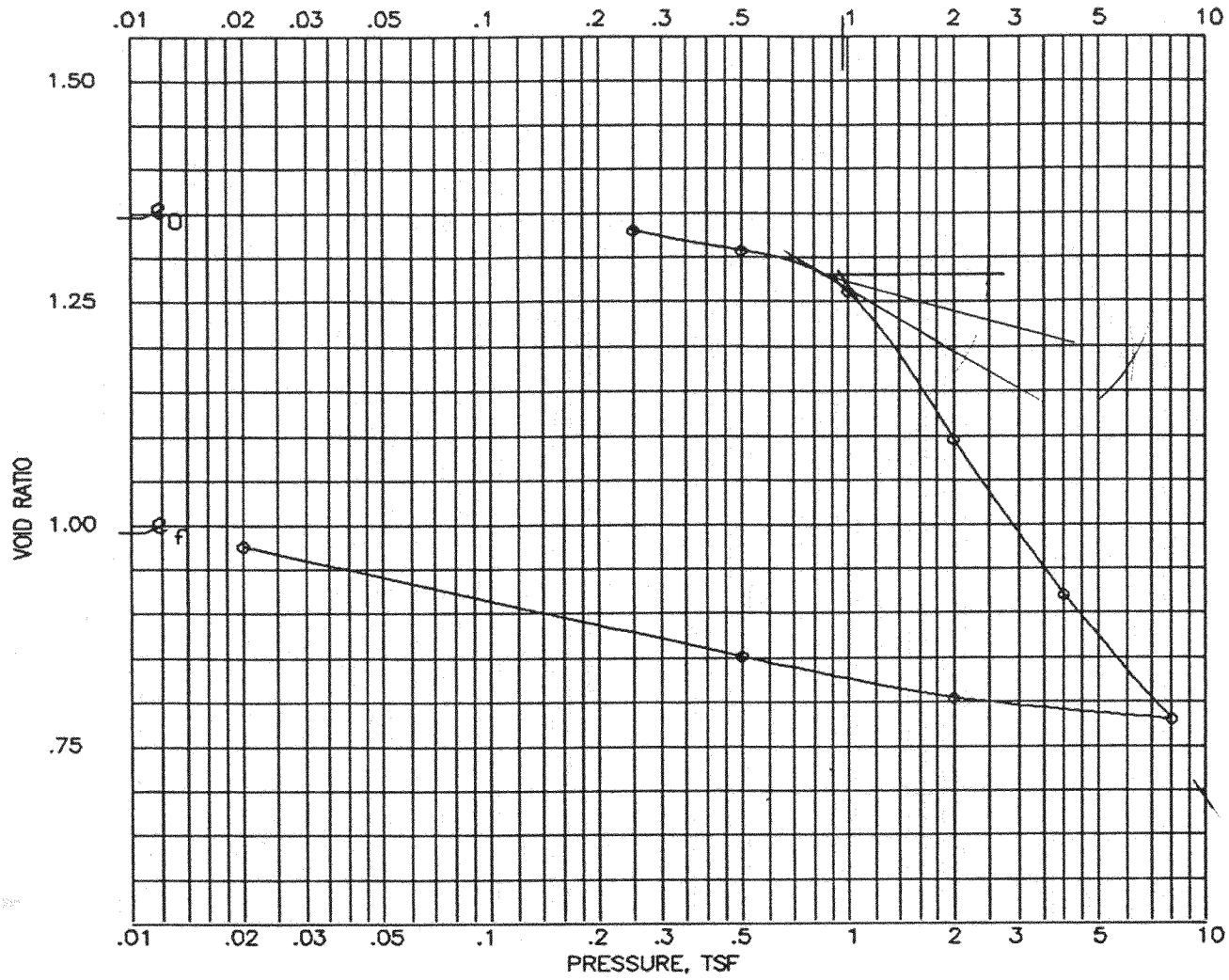
PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS

BORING NO. NC-3U SAMPLE NO. 7C

DEPTH/ELEV 36.0/-67.0 TECH. JH

LABORATORY USAE WES - STF/GL DATE 21 JUL 92

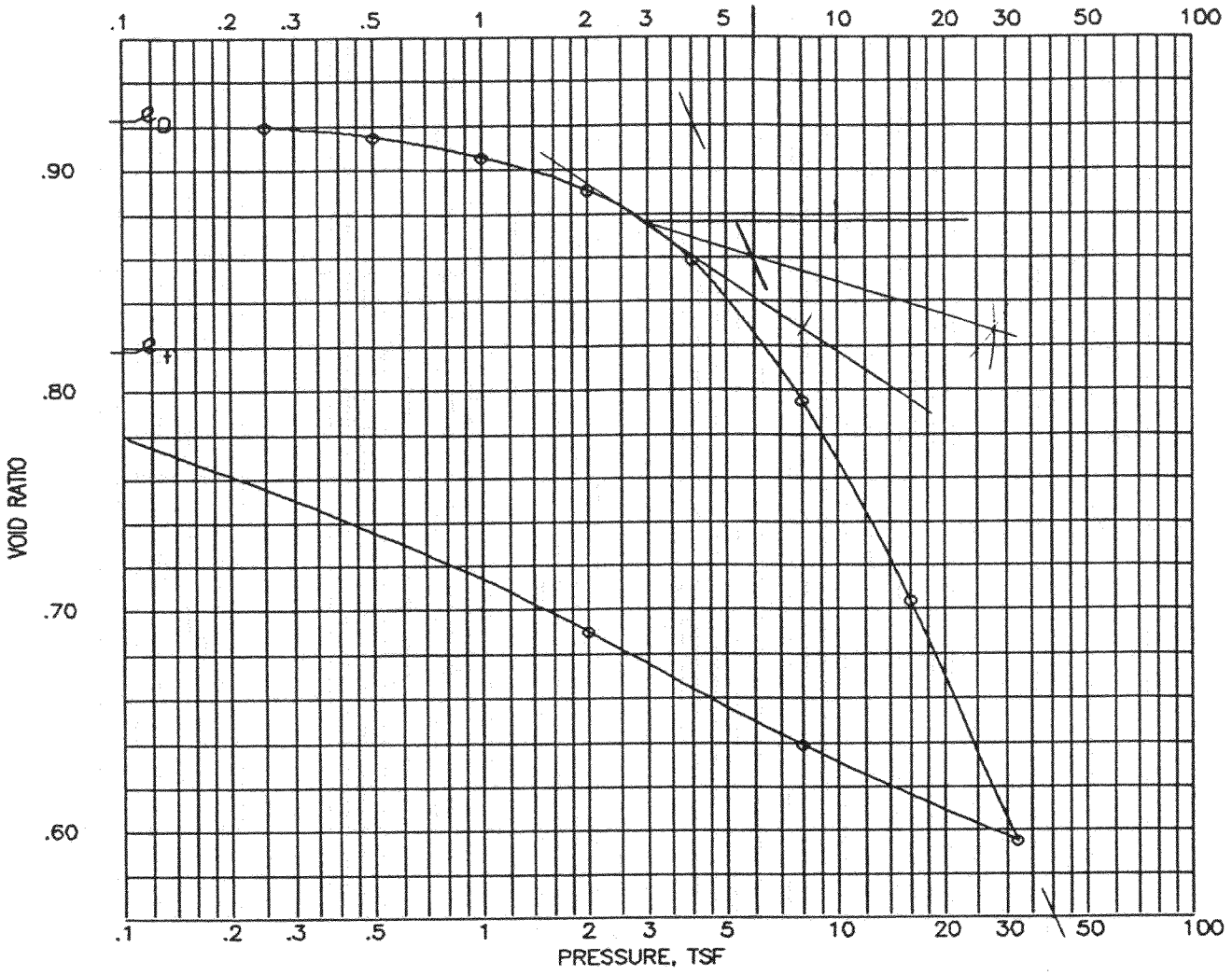
TRIAXIAL COMPRESSION TEST REPORT



γ_w = 107.3 PCF

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	49.3	36.1
PRECONSOL. PRESSURE, TSF	0.97	DRY DENSITY, PCF	71.9	84.7
COMPRESSION INDEX	0.57	SATURATION, %	99.1	98.4
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.344	.990
DIA. IN 4.44	HT. IN 1.108	BACK PRESSURE, TSF		

CLASSIFICATION	CLAY (CH), GRAY; SILT POCKETS		
LL 53	PL 17	PI 36	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF
GS 2.70 (EST)	D_{10}		CLAIBORNE, NEW ORLEANS
REMARKS:		BORING NO. NC-3U	SAMPLE NO. 3C
		DEPTH/ELEV 20.0/-51.0	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 04 SEP 92
		CONSOLIDATION TEST REPORT	



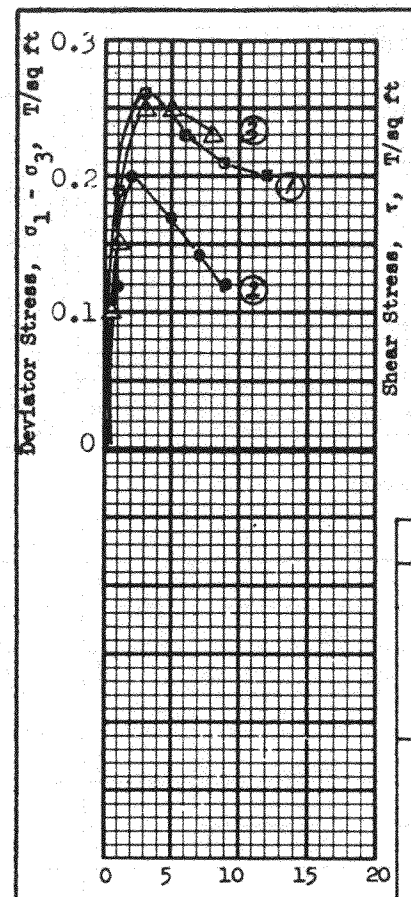
γ_w = 117.6 PCF

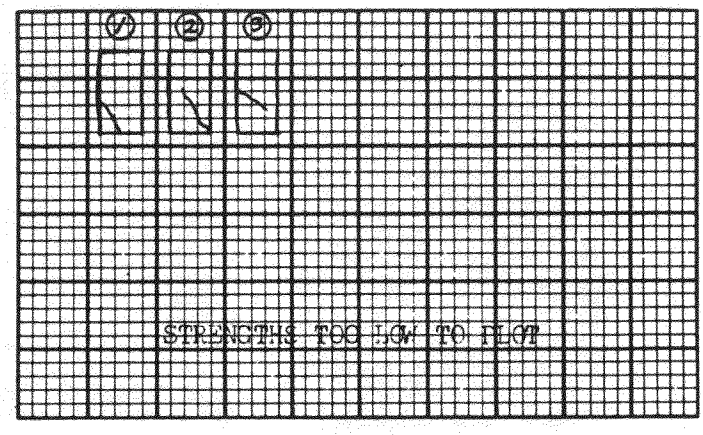
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	34.0	31.3
PRECONSOL. PRESSURE, TSF	6.0	DRY DENSITY, PCF	87.7	92.7
COMPRESSION INDEX	0.36	SATURATION, %	99.7	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	.922	.817
DIA. IN 4.44	HT. IN 1.111	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), GRAY; FRIABLE

LL 48	PL 17	PI 31	PROJECT I.H.N.C. NEW SHIPLOCK NORTH OF CLAIBORNE, NEW ORLEANS
GS 2.70 (EST)	D_{10}		
REMARKS:		BORING NO. NC-3U	SAMPLE NO. 8C
		DEPTH/ELEV 40.0/-71.0	TECH. US
		LABORATORY USAE WES – STF/GL	DATE 19 AUG 92

CONSOLIDATION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.12 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

			Test No.	1	2	3	
Initial	Water content	w_o	82.0 %	80.9%	94.3%	%
	Void ratio	e_o	2.17	2.11	2.50	
	Saturation	S_o	100+ %	100+%	100+%	%
	Dry density, lb/cu ft	γ_d	52.4	53.4	47.5	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.26	0.20	0.25	
Time to failure, min		t_f	7	11	38	
Rate of strain, percent/min			0.43	0.18	0.08	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains organic matter and *

LL 109 | PL 35 | PI 74 | G_s 2.66

Remarks *decayed root 1/4" in diameter

Specimen 3 contained excessive amount of organic matter

Project MISS. RIVER - GULF OUTLET - GDM

1968 - NEW SHIP LOCK

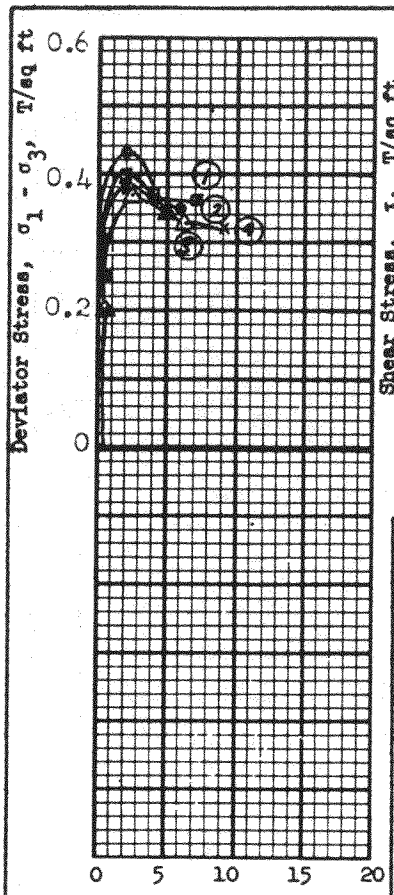
Area

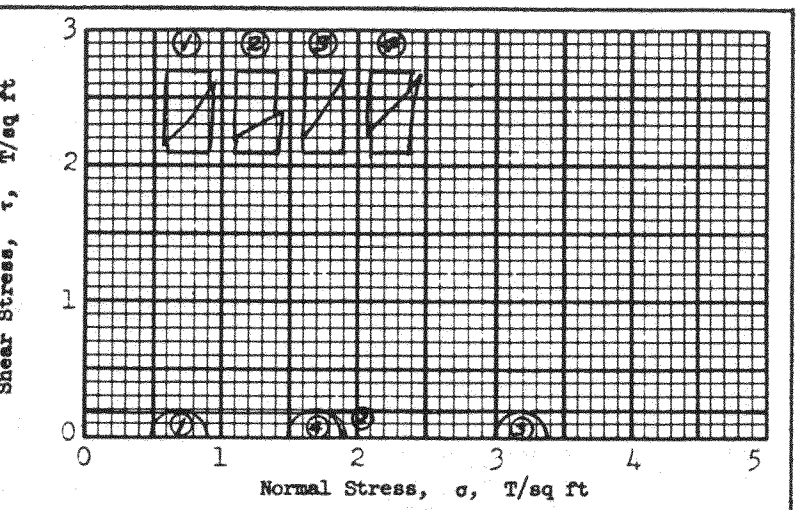
Boring No. 2-UL | Sample No. 7-D

Depth 15.0 | Date 7 AUGUST 1968

EAK

TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	4
Initial	Water content	w_o	67.3 %	69.3 %	66.9 %	67.4%
	Void ratio	e_o	1.83	1.86	1.84	1.84
	Saturation	S_o	99.7 %	100+ %	98.5 %	99.3%
	Dry density, lb/cu ft	γ_d	59.8	59.1	59.6	59.5
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	1.5
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.40	0.43	0.37	0.38
Time to failure, min		t_f	10	14	31	20
Rate of strain, percent/min			0.19	0.14	0.08	0.10
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	1.40
Initial height, in.		H_o	3.00	3.00	3.00	3.00

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.19 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray

LL 79 | PL 26 | PI 53 | | G_s 2.71

Remarks _____

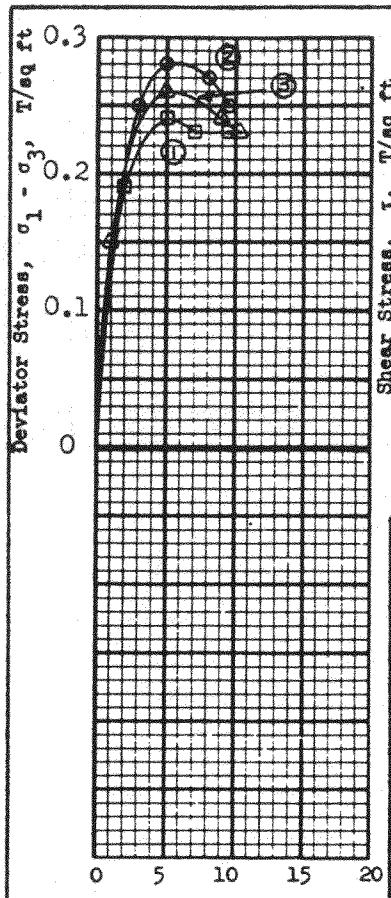
Project MISS. RIVER - GULF OUTLET - GDM
1968 - NEW SHIP LOCK

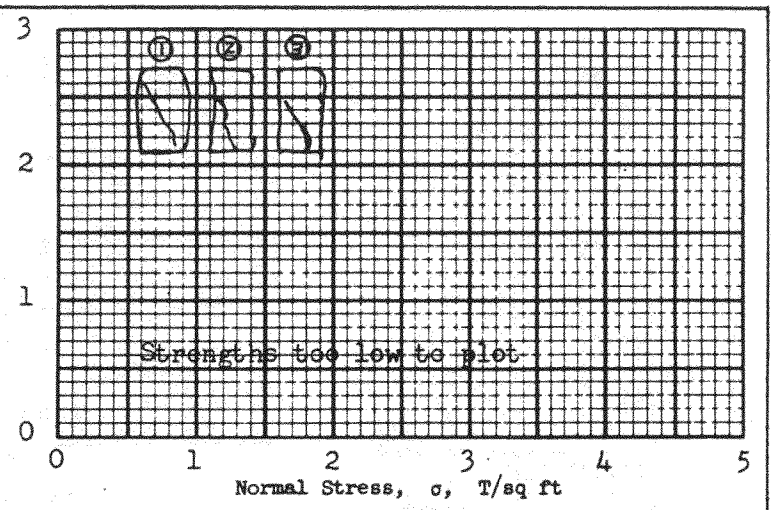
Area

Boring No. 2-UL | Sample No. 10-B

Depth 25.1 | Date 8 AUGUST 1968

GDA TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	68.1 %	68.0 %	68.0 %	%
	Void ratio	e_o	1.88	1.89	1.84	
	Saturation	S_o	98.2 %	97.5 %	100+ %	%
	Dry density, lb/cu ft	γ_d	58.8	58.6	59.5	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.24	0.28	0.26	
Time to failure, min		t_f	33	38	36	
Rate of strain, percent/min			0.15	0.13	0.14	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.40	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.13 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, fissured

LL 91 | PL 25 | PI 66 | | G_s 2.71

Remarks _____

Project MISS. RIVER - GULF OUTLET -GDM

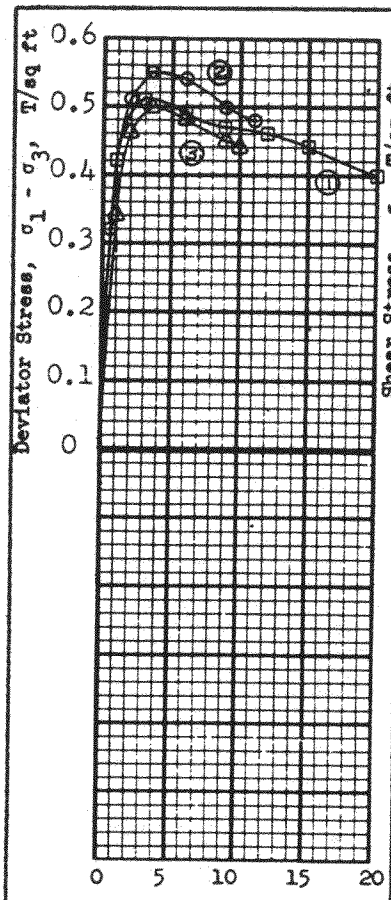
1968 - NEW SHIP LOCK

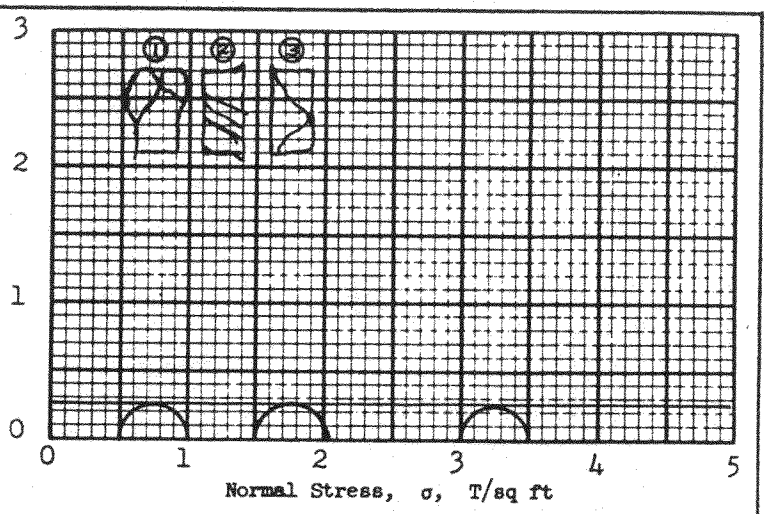
Area

Boring No. 2-UL | Sample No. 12 D

Depth ~~El~~ 35.0 | Date 8 AUG. 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.26 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	64.2 %	63.8 %	63.4 %	%
	Void ratio	e_o	1.77	1.77	1.76	
	Saturation	S_o	98.6 %	98.0 %	98.0 %	%
	Dry density, lb/cu ft	γ_d	61.3	61.2	61.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.51	0.55	0.50	
Time to failure, min		t_f	23	29	32	
Rate of strain, percent/min			0.13	0.12	0.11	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.41	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, homogeneous

LL 87 | PL 26 | PI 61 | | G_s 2.72

Remarks _____

Project MISS. RIVER - GULF OUTLET- GDM

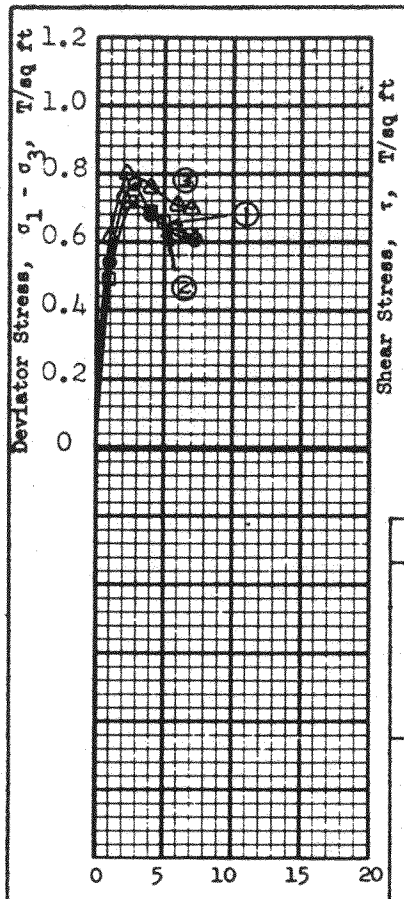
1968 - NEW SHIP LOCK

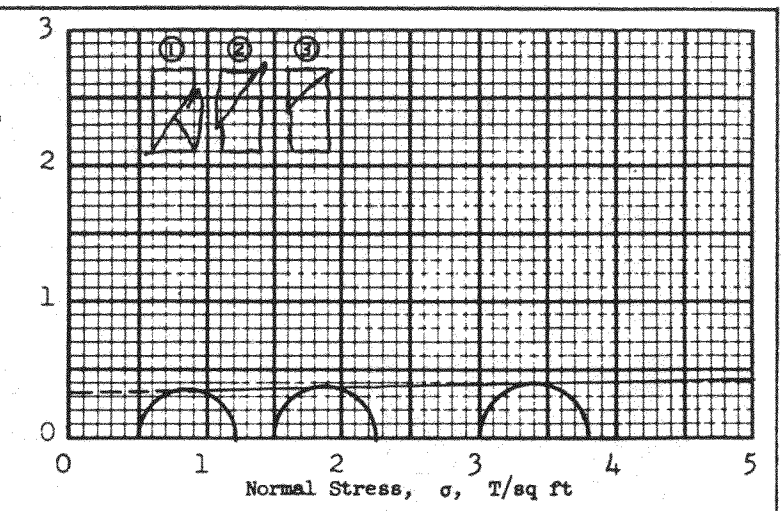
Area

Boring No. 2-UL | Sample No. 14-B

Depth ~~El~~ 40.8 | Date 8 AUG. 1968

FAM TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	49.0 %	53.1%	50.1%	%
	Void ratio	e_o	1.40	1.47	1.42	
	Saturation	S_o	94.2 %	97.2%	94.9 %	%
	Dry density, lb/cu ft	γ_d	70.1	68.1	69.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.71	0.77	0.80	
Time to failure, min		t_f	16	28	21	
Rate of strain, percent/min			0.16	0.10	0.11	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.42	1.41	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 1 °

tan ϕ = 0.018

c = 0.34 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains sand seams

LL	PL	PI		G_s
61	21	40		2.69

Remarks _____

Project MISS. RIVER - GULF OUTLET -GDM

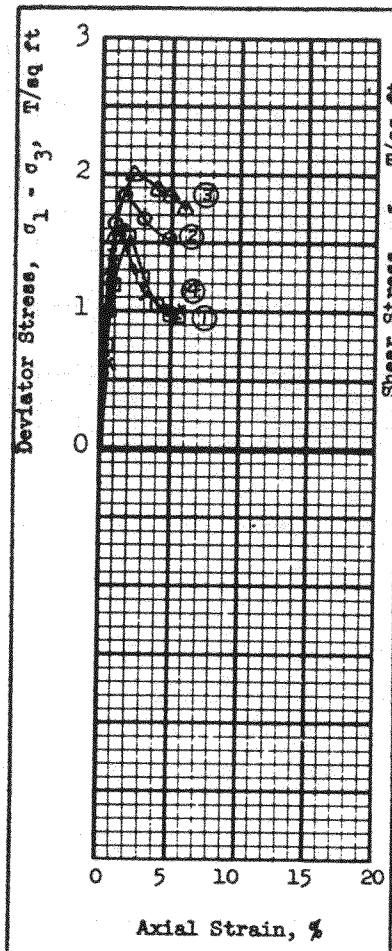
1968- NEW SHIP LOCK

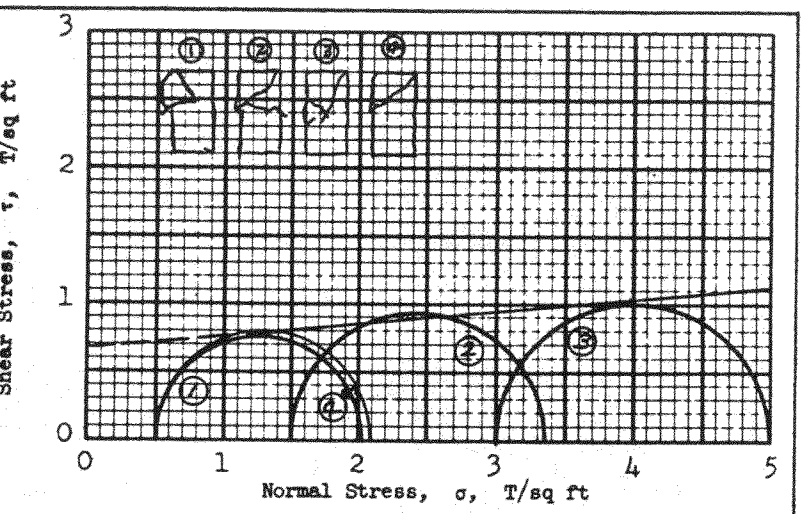
Area

Boring No. 2-UL | Sample No. 16-C_1

Depth ~~Et~~ 50.2 | Date 8 AUG. 1968

GDA TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 5 °

tan ϕ = 0.088

c = 0.69 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	4
Initial	Water content	w_o	38.4 %	36.8 %	36.9 %	35.2 %
	Void ratio	e_o	1.08	1.02	1.03	0.980
	Saturation	S_o	97.4 %	98.8 %	98.2 %	98.4 %
	Dry density, lb/cu ft	γ_d	82.1	84.5	84.1	86.4
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	0.5
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.53	1.85	2.00	1.59
Time to failure, min		t_f	25	28	33	23
Rate of strain, percent/min			0.08	0.06	0.07	0.06
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.39	1.39
Initial height, in.		H_o	3.00	3.00	3.00	3.00

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray w/brown spots, contains 1/16" silty *

LL 60 | PL 22 | PI 38 | | G_s 2.74

Remarks * sand seam

Project MISS. RIVER - GULF OUTLET - GDM

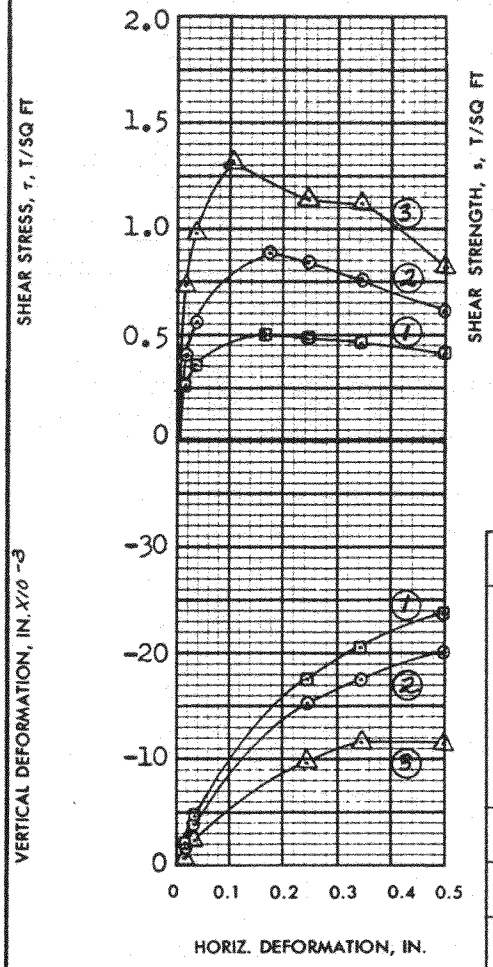
1968 - NEW SHIP LOCK

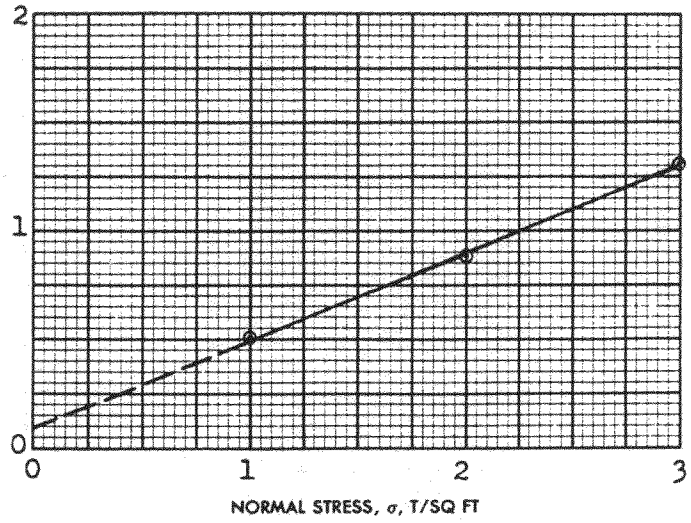
Area

Boring No. 2-UL | Sample No. 23-D

Depth ~~El~~ 78.7 | Date 8 AUG. 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





SHEAR STRENGTH PARAMETERS

$\phi' =$ 22°

TAN $\phi' =$ 0.404

$c' =$ 0.10 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	69.9%	69.4%	69.8%	%
	VOID RATIO	e_o	1.89	1.91	1.91	
	SATURATION	S_o	99.5%	97.7%	98.3%	%
	DRY DENSITY, LB/CU FT	γ_d	58.2	57.7	57.7	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	9	9	4	
FINAL	WATER CONTENT	w_f	53.2%	46.9%	43.0%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.50	0.88	1.31	
ACTUAL TIME TO FAILURE, MIN		t_f	960	1050	690	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, homogeneous

LL 85 | PL 25 | PI 60 | G_s 2.69

REMARKS

PROJECT MISS. RIVER GULF OUTLET - GDM

1968 - NEW SHIP LOCK

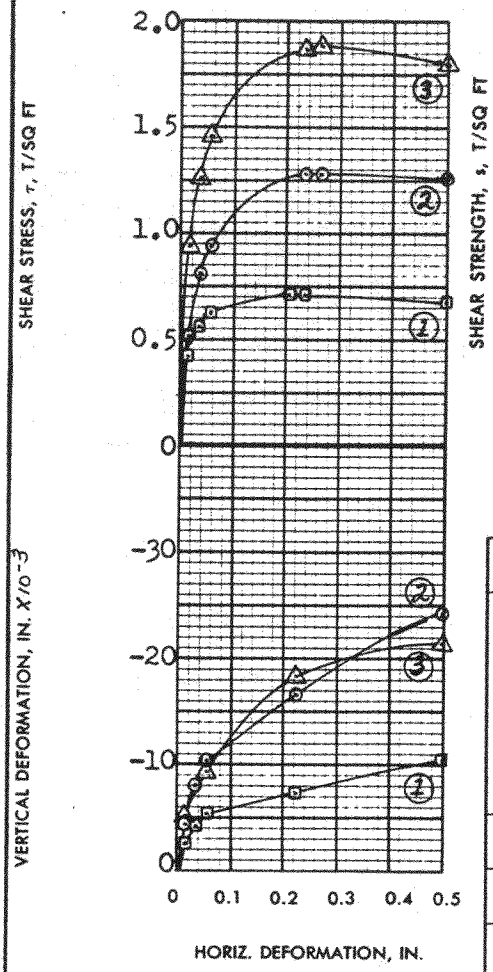
AREA

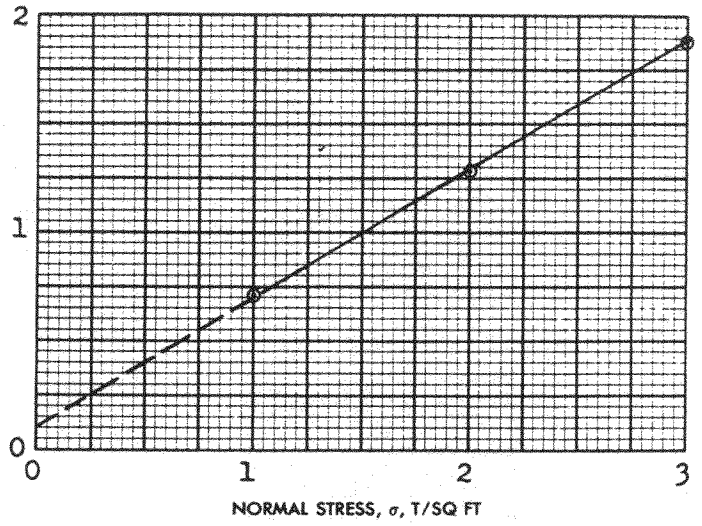
BORING NO. 2-UL | SAMPLE NO. 13-B

DEPTH 37.1 | DATE 13 August 1968

JHMc **DIRECT SHEAR TEST REPORT**

USAEWES SOILS TEST SECTION





SHEAR STRENGTH PARAMETERS

$\phi' =$ 31°

TAN $\phi' =$ 0.601

$c' =$ 0.11 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	24.5%	22.7%	23.8%	%
	VOID RATIO	e_o	0.686	0.641	0.730	
	SATURATION	S_o	94.6%	93.8%	86.4%	%
	DRY DENSITY, LB/CU FT	γ_d	98.1	100.8	95.6	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	22.6%	23.1%	24.6%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.71	1.28	1.88	
ACTUAL TIME TO FAILURE, MIN		t_f	1170	1500	1500	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION SILTY SAND (SM), gray, contains pockets of clay 1/8" to 1/4" in *

LL – PL – PI – G_s 2.65

REMARKS * diameter, shells & shell fragments and trace of gravel 1/4" in diameter

PROJECT MISS. RIVER - GULF OUTLET -GDM

1968 - NEW SHIP LOCK

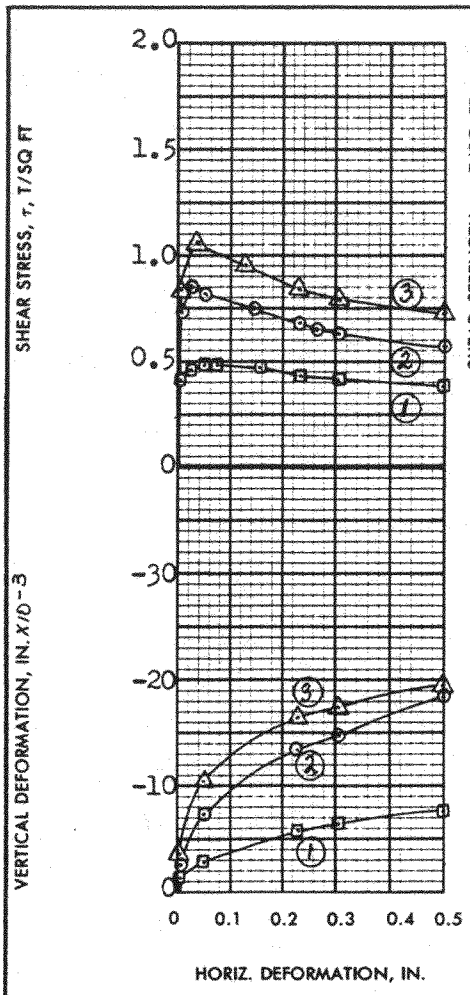
AREA

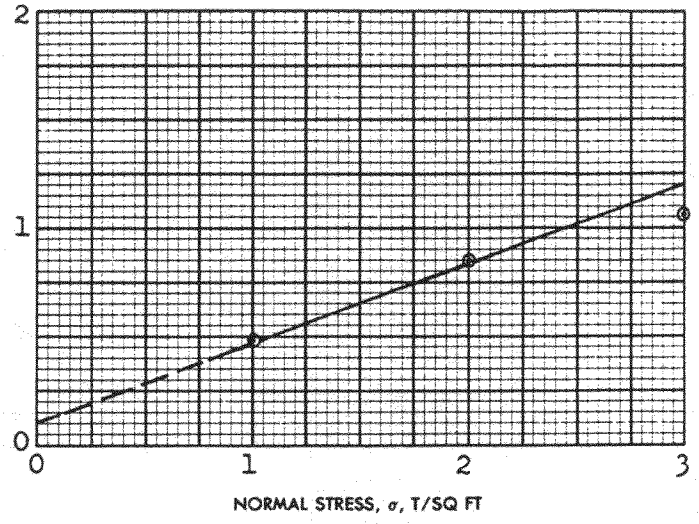
BORING NO. 2-UL SAMPLE NO. 17-D

DEPTH 54.9 DATE 13 August 1968

JHMc **DIRECT SHEAR TEST REPORT**

ENG FORM 1 JUN 65 **2092** (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTION PLATE IX-3





TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	45.2 %	47.0%	45.2%	%
	VOID RATIO	e_o	1.31	1.35	1.40	
	SATURATION	S_o	95.2%	96.1%	89.1%	%
	DRY DENSITY, LB/CU FT	γ_d	74.6	73.2	71.7	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	49.4%	46.7%	47.2%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.48	0.85	1.06	
ACTUAL TIME TO FAILURE, MIN		t_f	360	240	300	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

$\phi' =$ 20°

TAN $\phi' =$ 0.364

$c' =$ 0.12 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, fissured, slickensided

LL	PL	PI		G.
98	32	66		2.76

REMARKS

PROJECT MISS. RIVER - GULF OUTLET - GDM

1968 - NEW SHIP LOCK

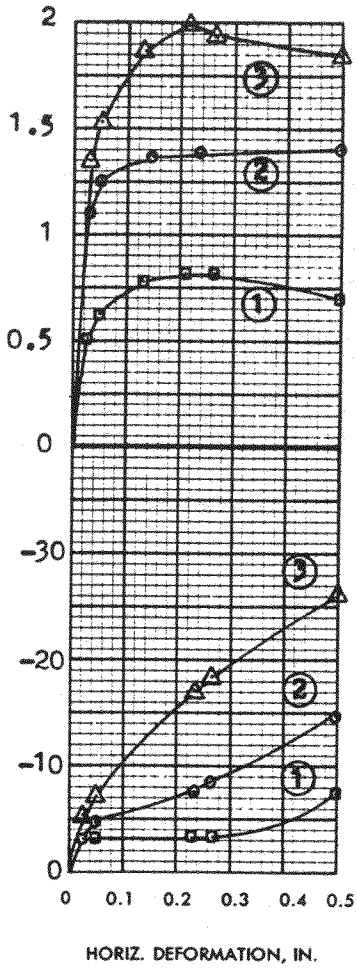
AREA

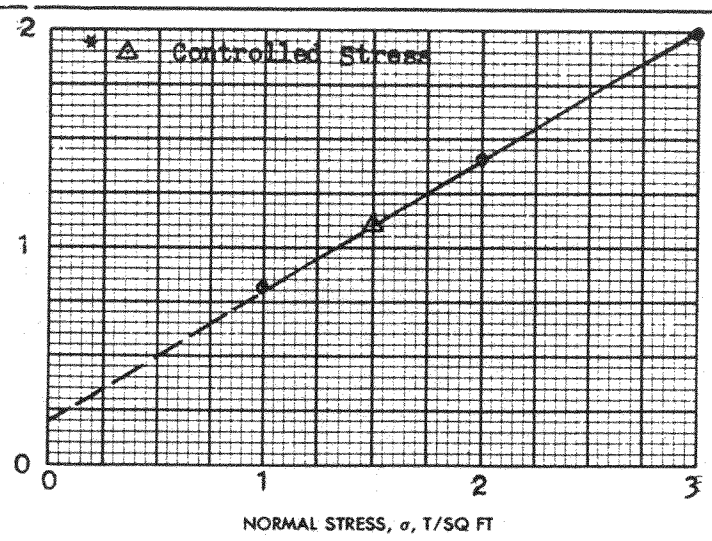
BORING NO. 2-UL — SAMPLE NO. 21-D

DEPTH 71.0 — DATE 14 August 1968

JHMc

DIRECT SHEAR TEST REPORT





TEST NO.			①	②	③	
INITIAL	WATER CONTENT	w_o	25.2%	26.9%	24.7%	%
	VOID RATIO	e_o	0.752	0.743	0.718	
	SATURATION	S_o	89.8%	97.0%	92.2%	%
	DRY DENSITY, LB/CU FT	γ_d	95.5	96.0	97.4	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	< 1	< 1	< 1	
FINAL	WATER CONTENT	w_f	27.5%	26.2%	26.9%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.82	1.42	1.99	
ACTUAL TIME TO FAILURE, MIN		t_f	1200	2760	1200	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 31°

TAN ϕ' = 0.601

c' = 0.20 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN: UNDISTURBED — 3.01 IN. SQUARE — 0.542 IN. THICK

CLASSIFICATION: CLAYEY SILT (ML), gray

LL — PL — PI — G_s 2.68

REMARKS * Only shear stress recorded

PROJECT: MISS. RIVER GULF OUTLET - GDM

1968 NEW SHIP LOCK

AREA

BORING NO. 2-UL — SAMPLE NO. 24-C

DEPTH EL 82.0 — DATE 10 September, 1968

JHMc — DIRECT SHEAR TEST REPORT

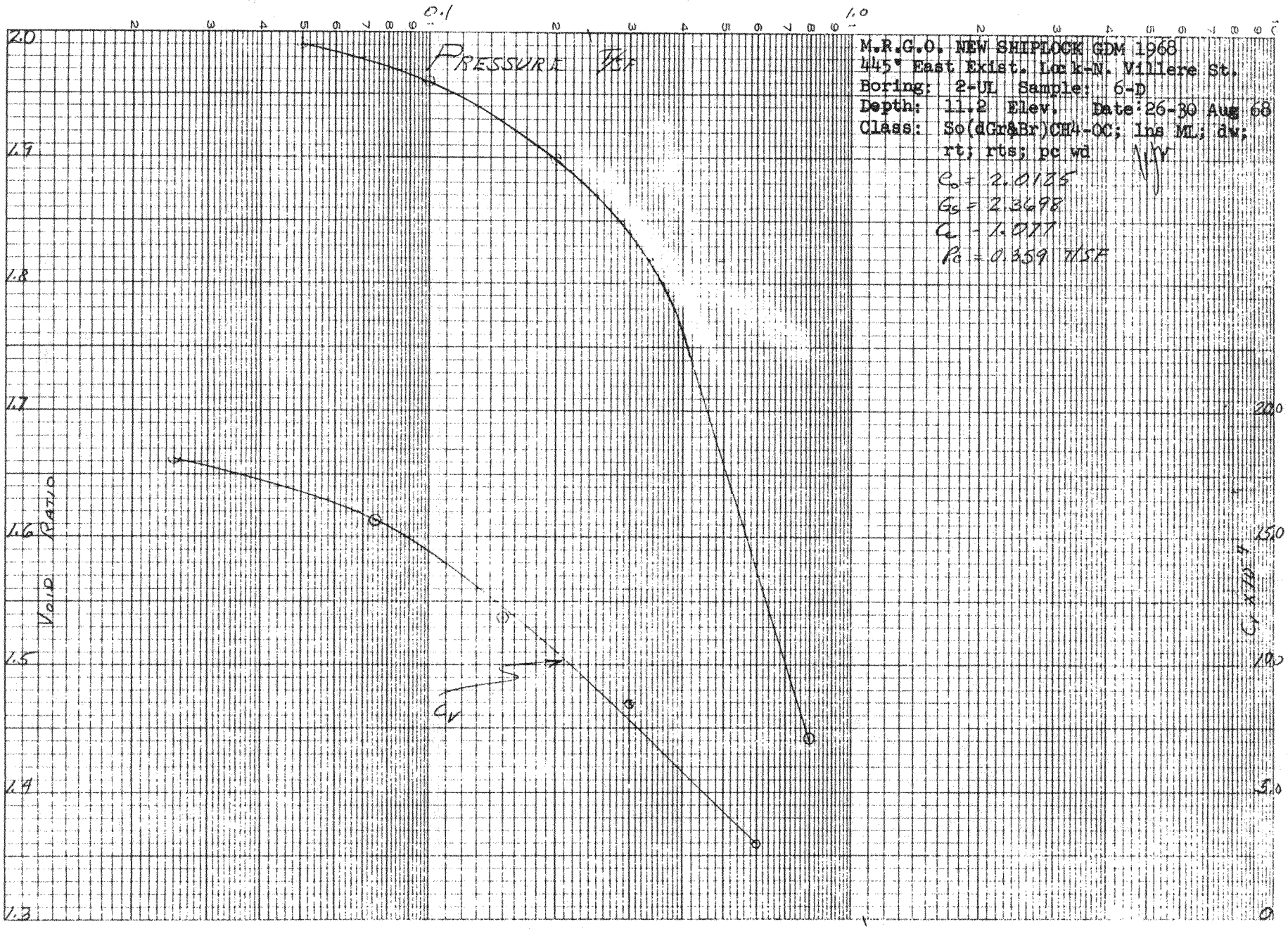
ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

USAEWES SOILS TEST SECT

PLATE IX-3

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



NO. 340-L310 DIETZGEN GRAPH PAPER
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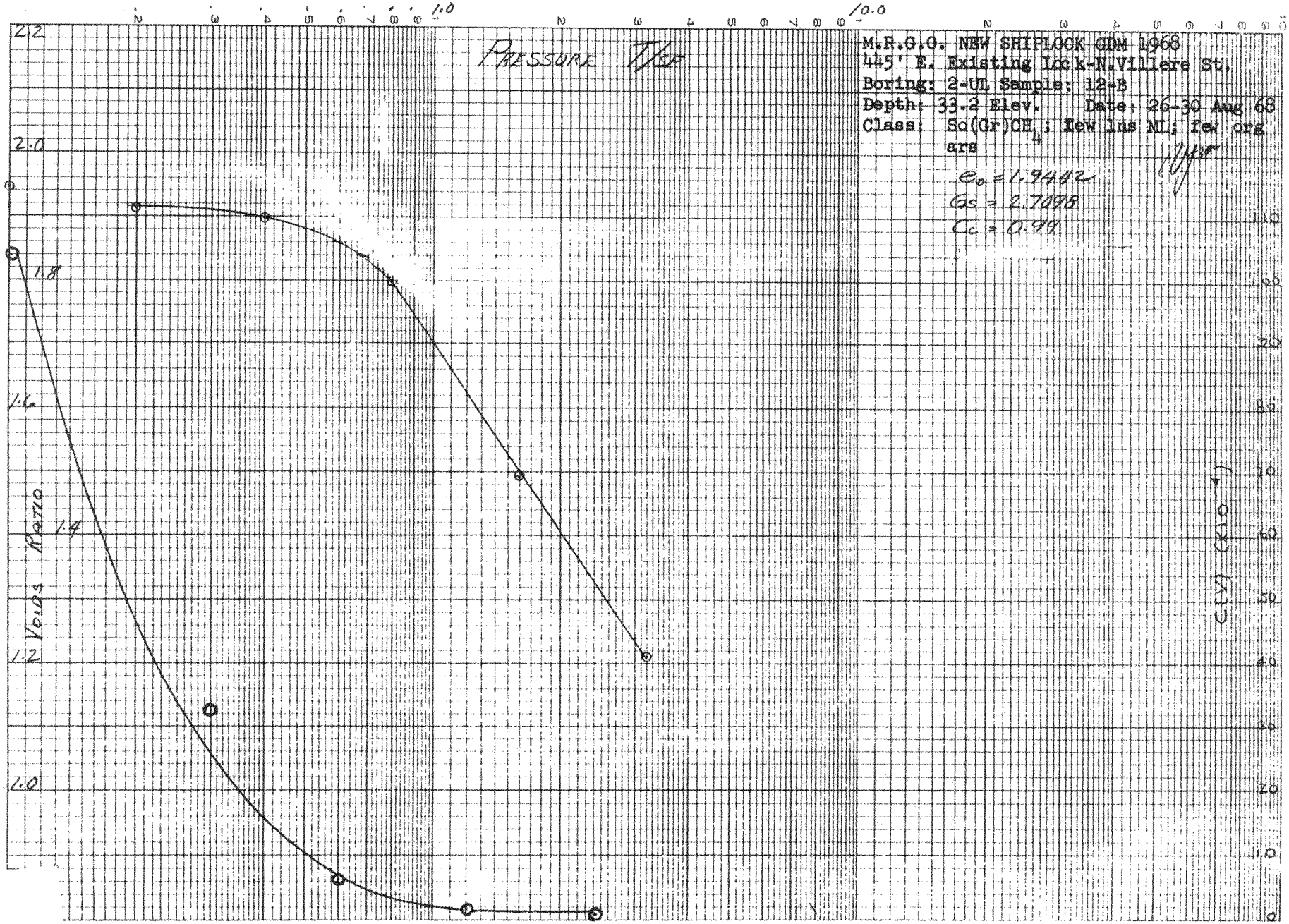

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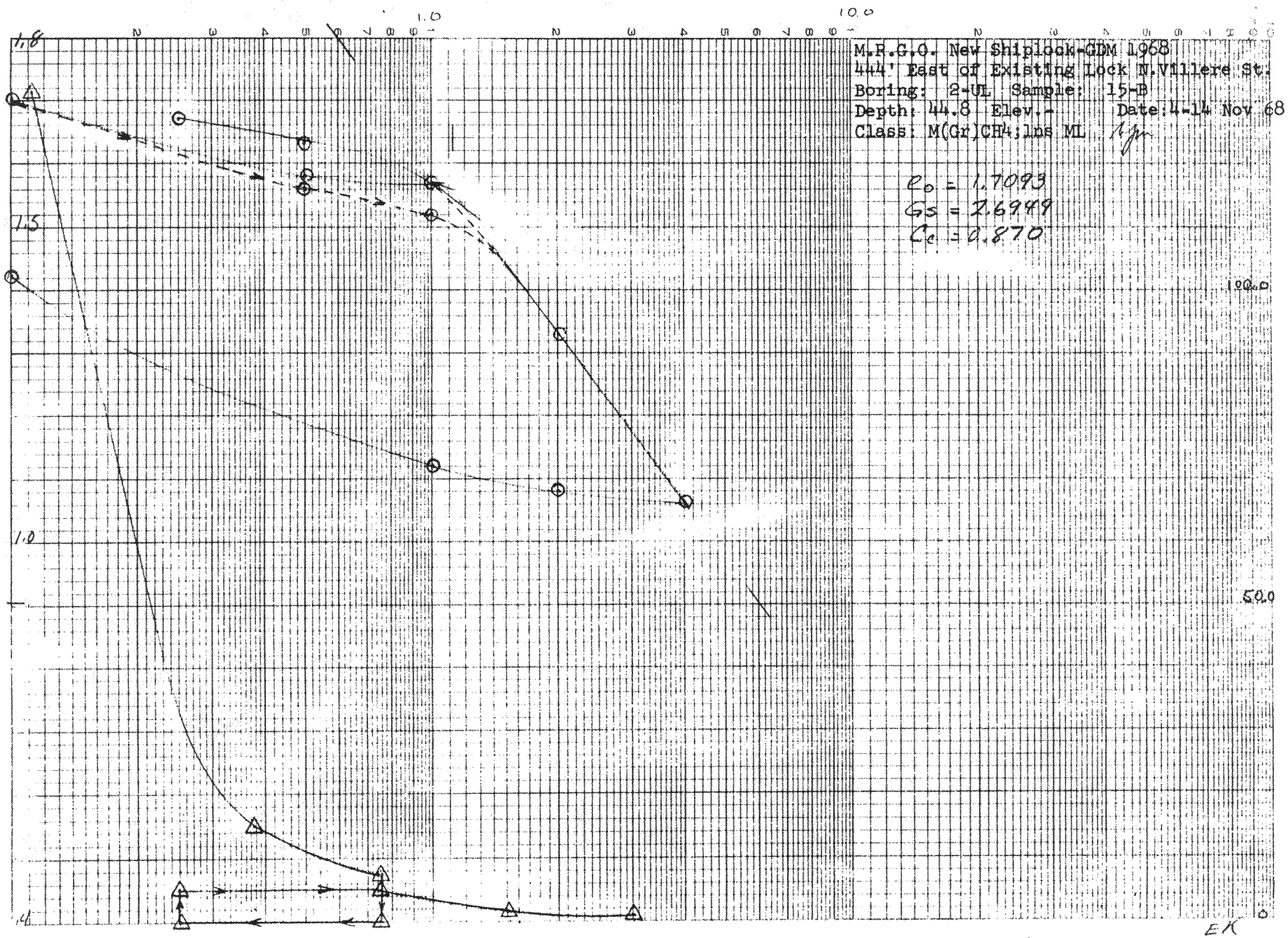

NO. 340-L310 DIETZGEN GRAPH PAPER
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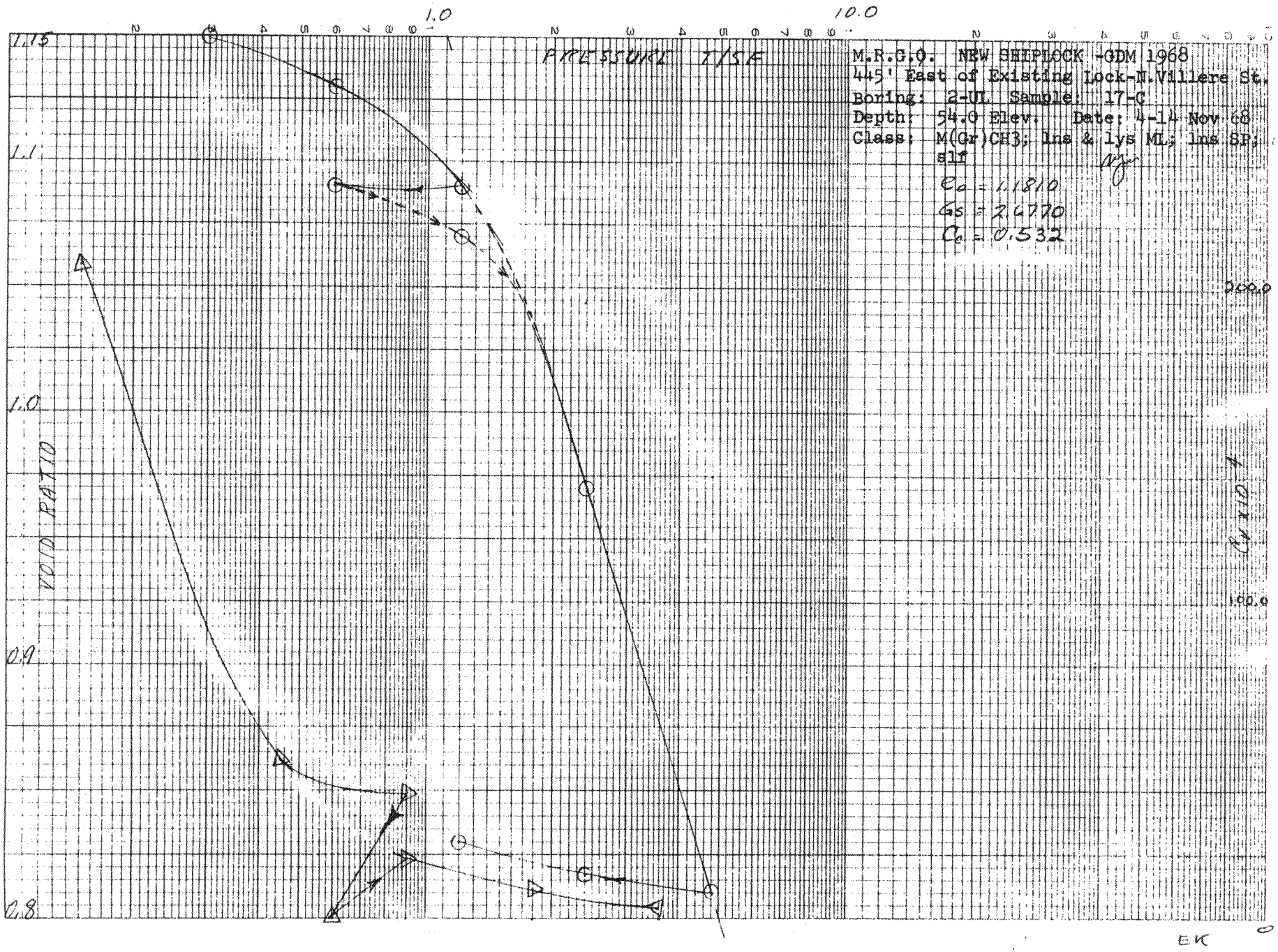
MADE IN U. S. A.



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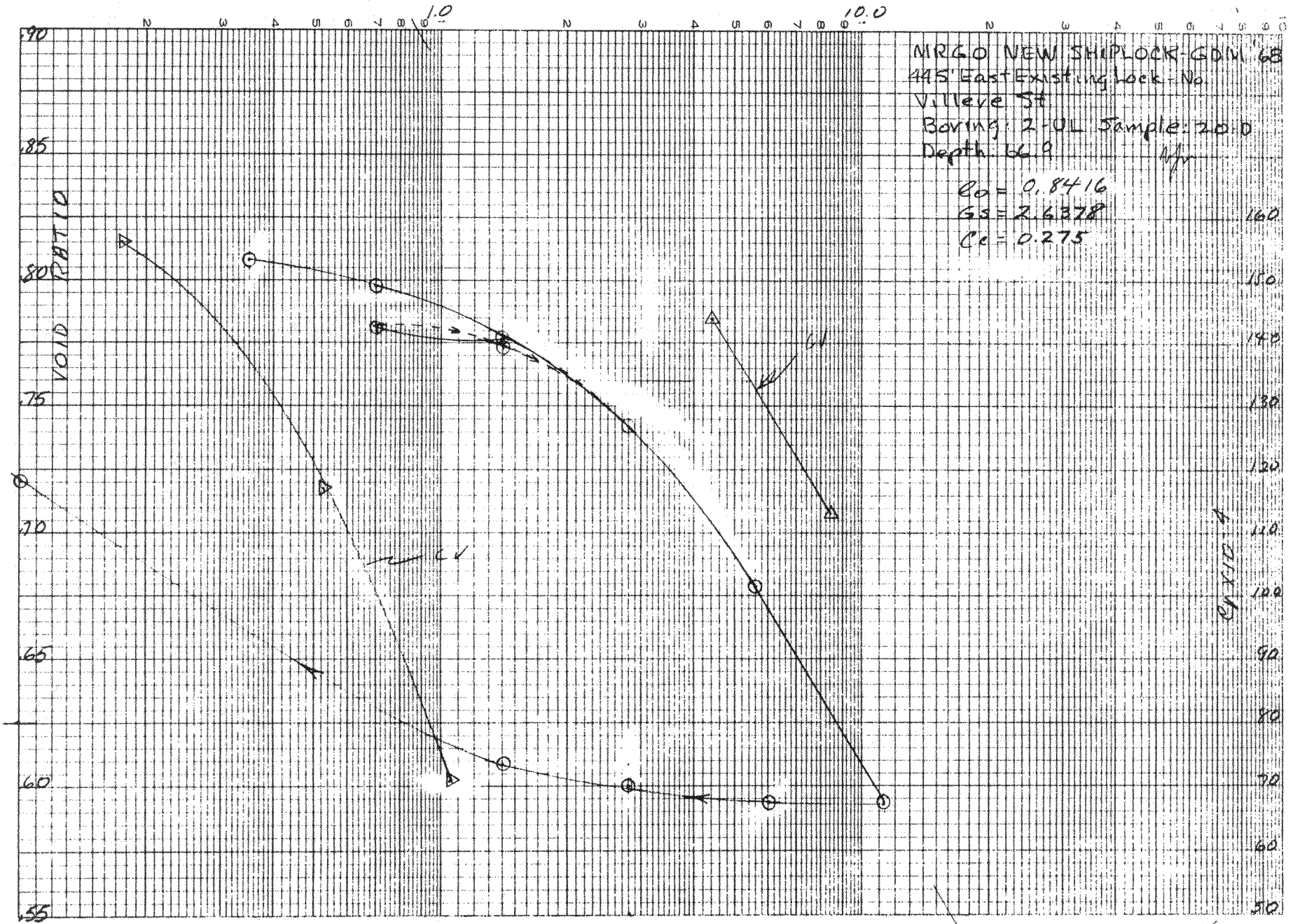

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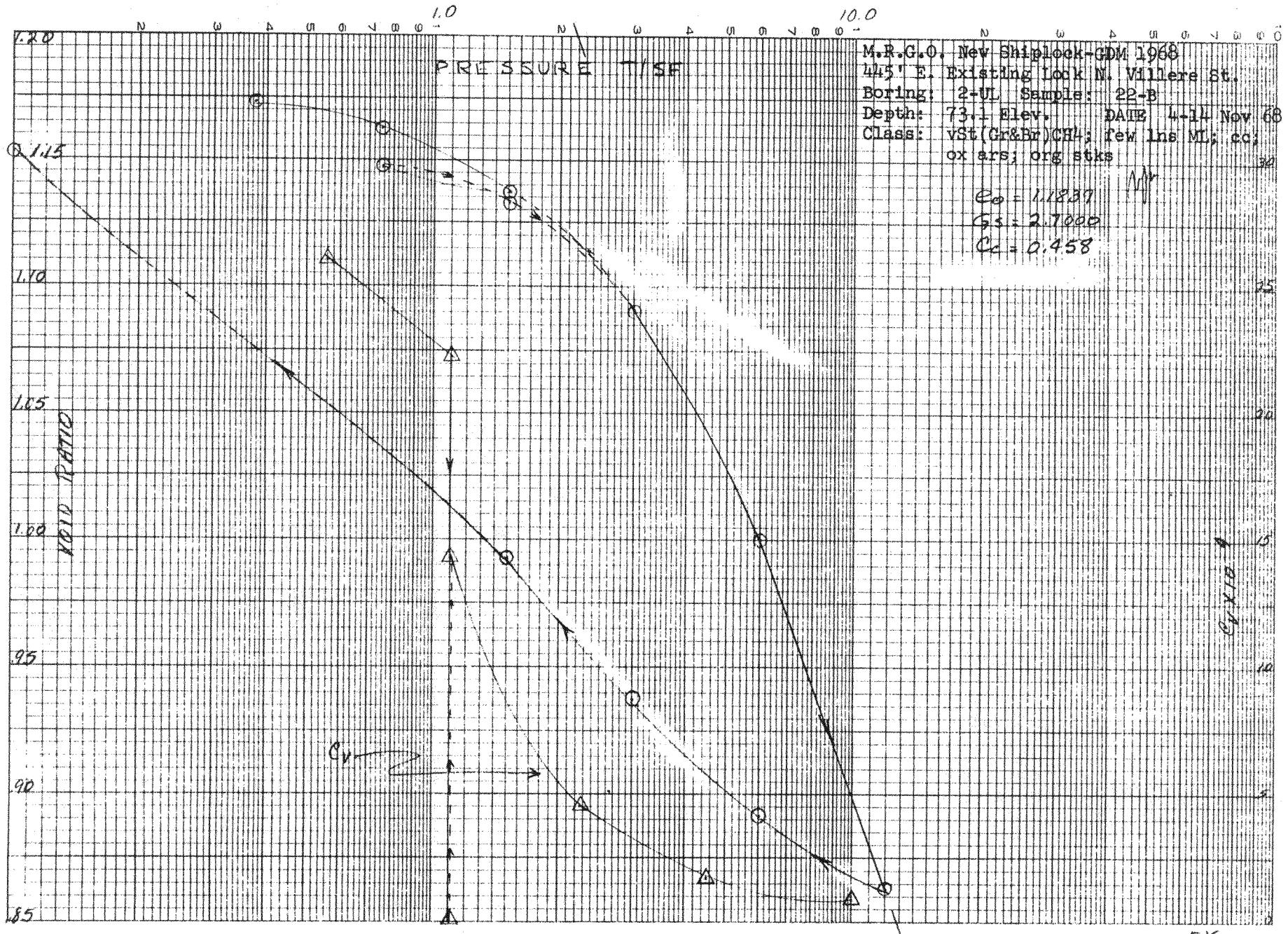

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3 CYCLES X 10 DIVISIONS PER INCH

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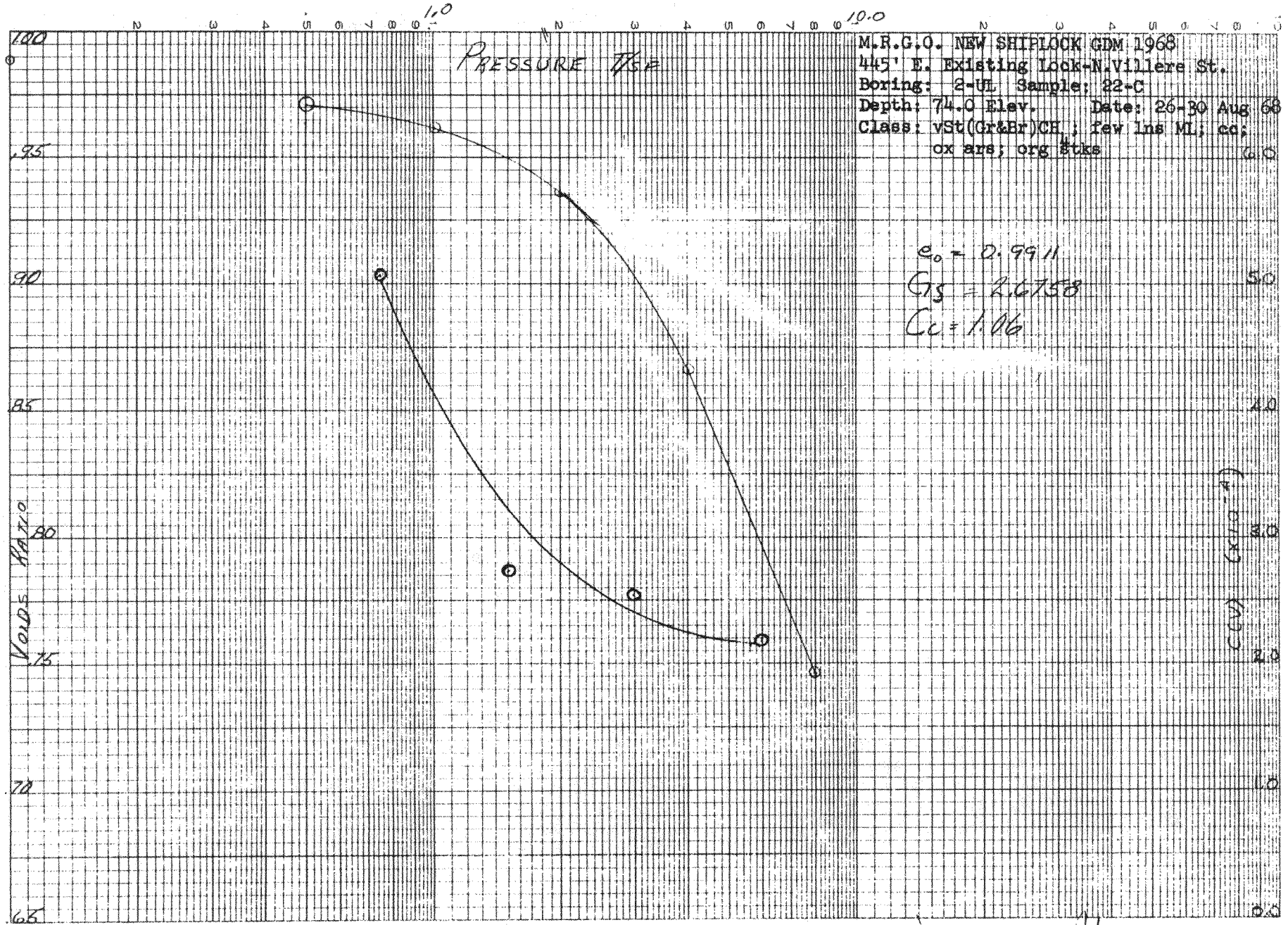
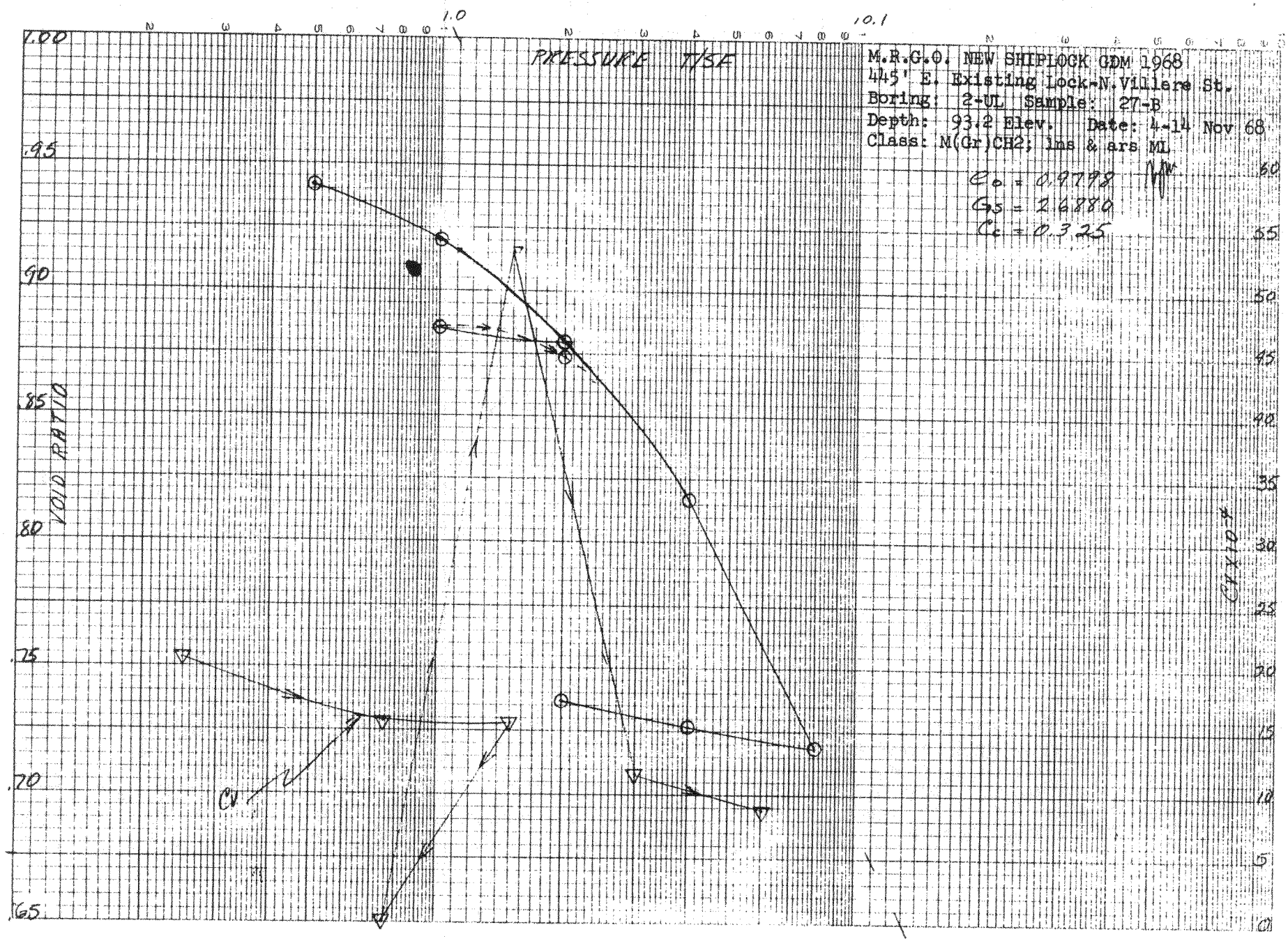


L.G.

NO. 310-1 310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

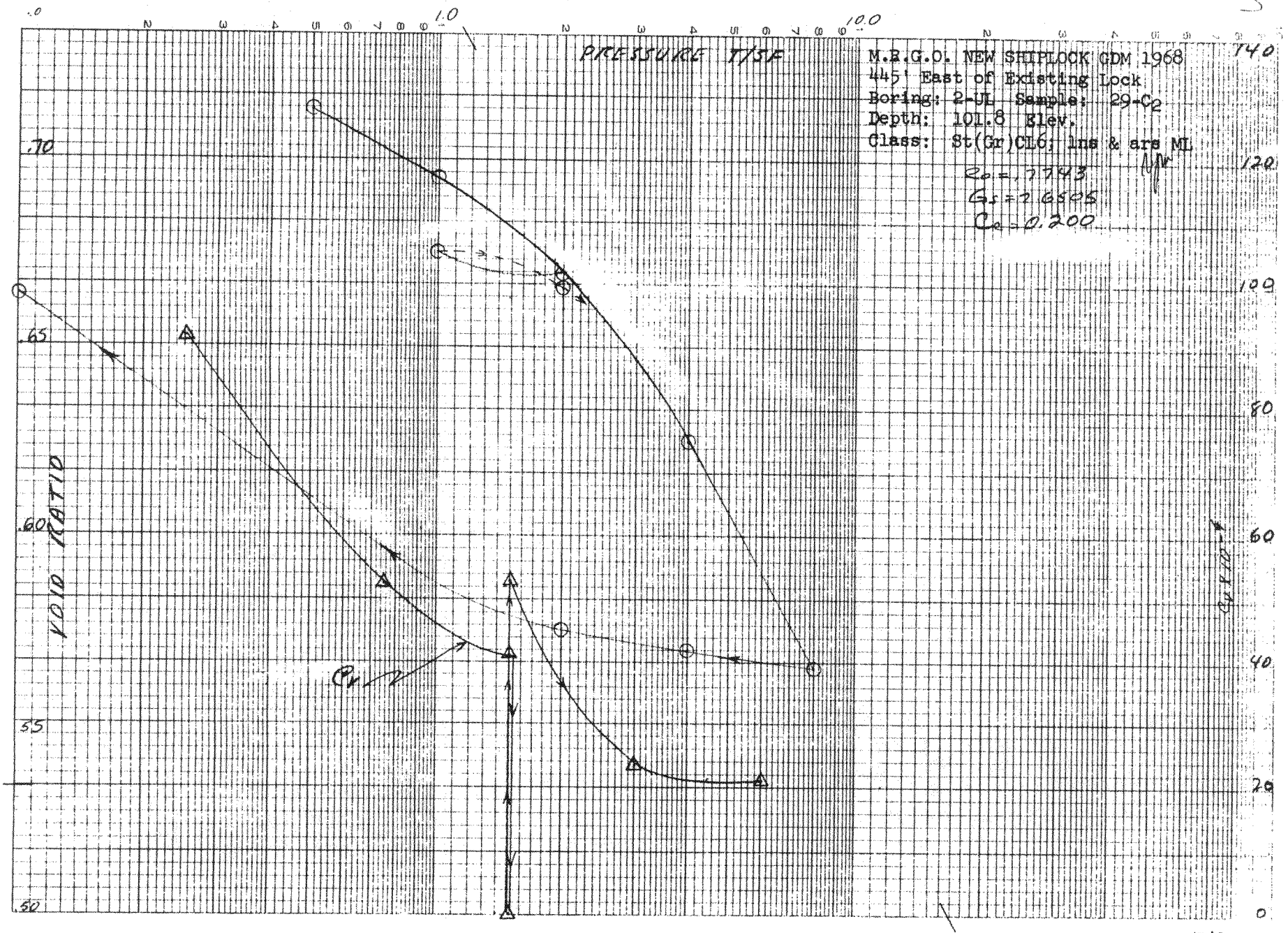
EUGENE DIETZGEN CO.
MADE IN U. S. A.



EK

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



EK

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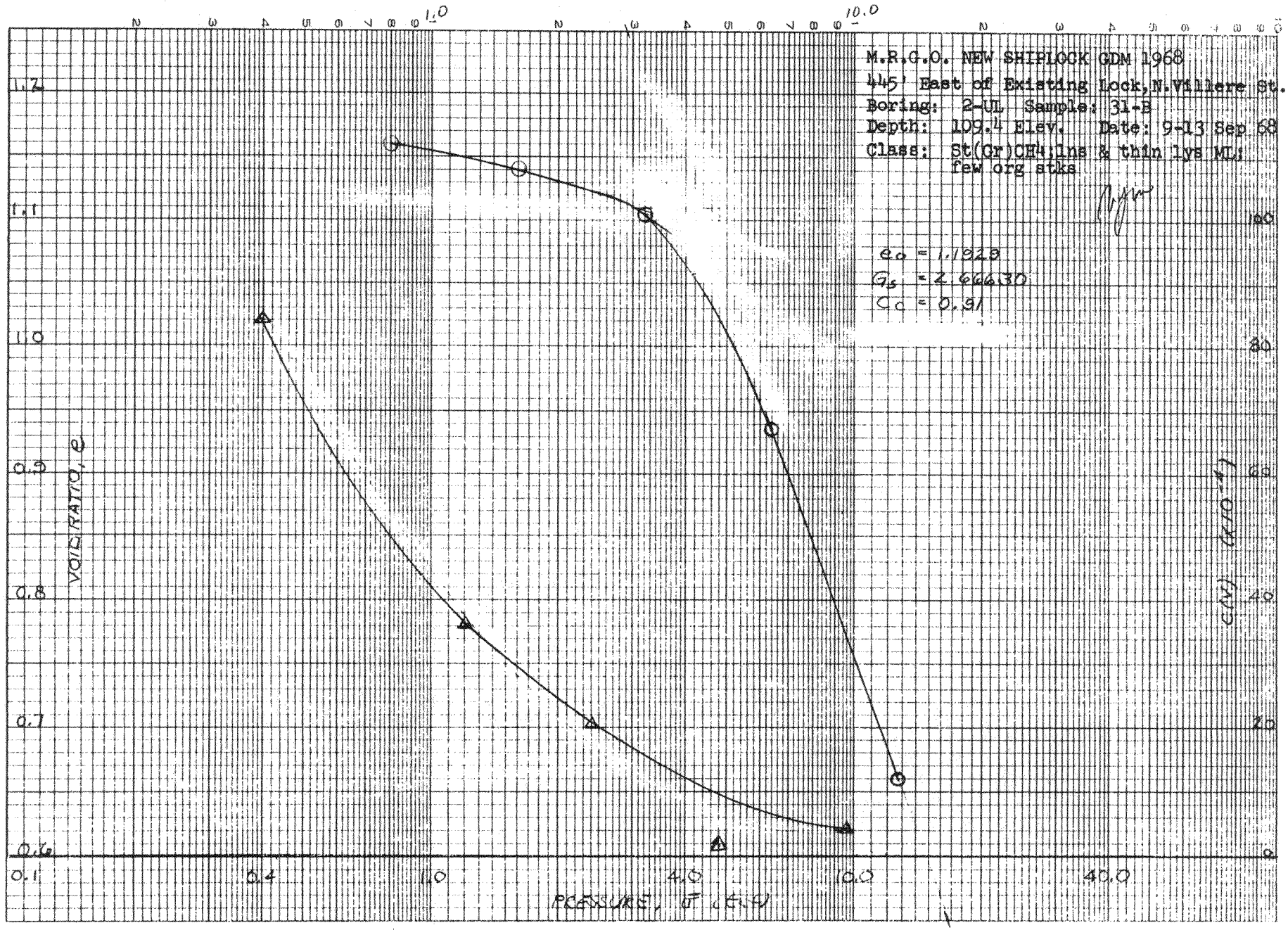
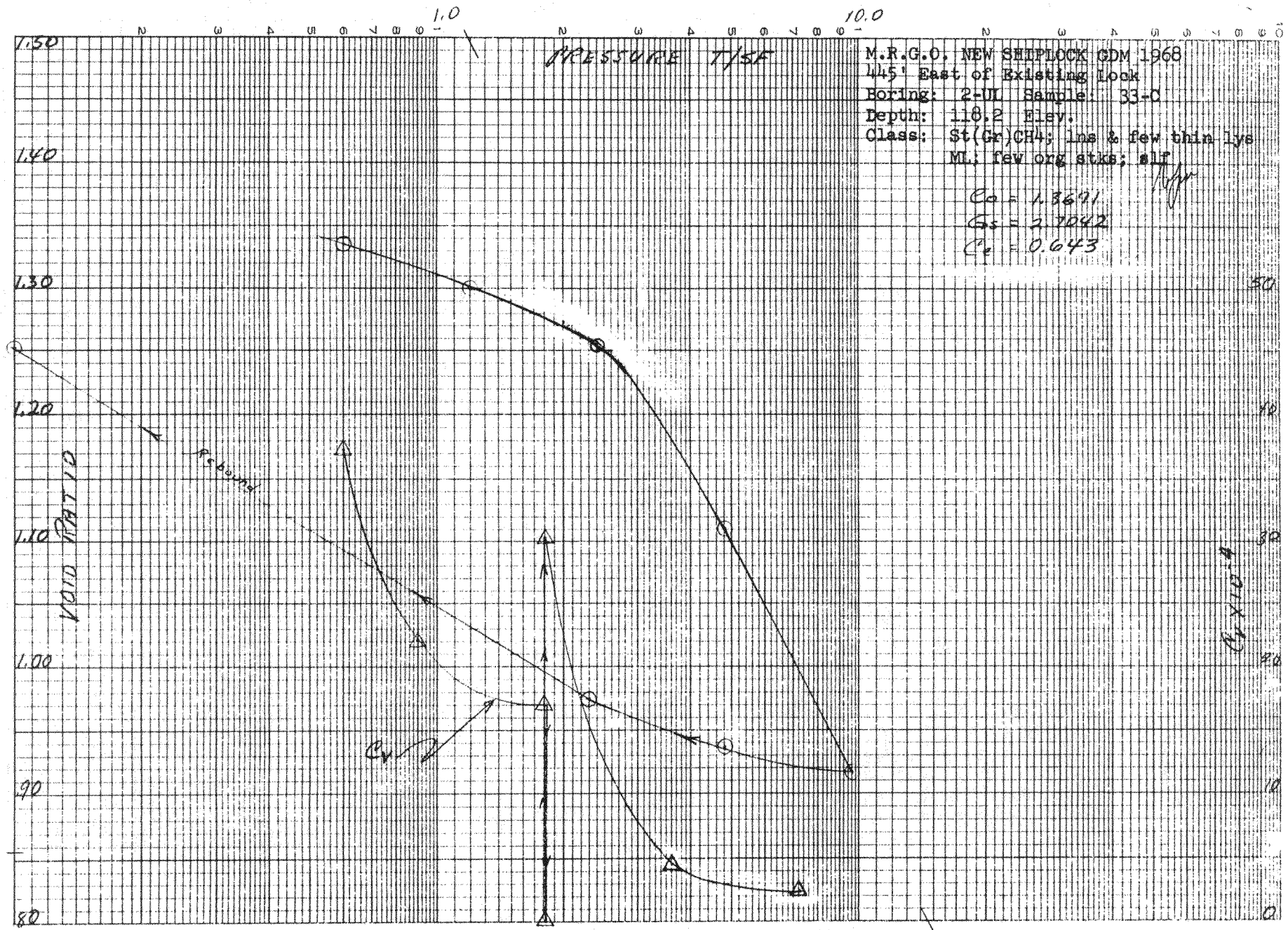
MADE IN U. S. A.



LG

NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



NO. 340-L310 DIETZGEN GRAPH PAPER
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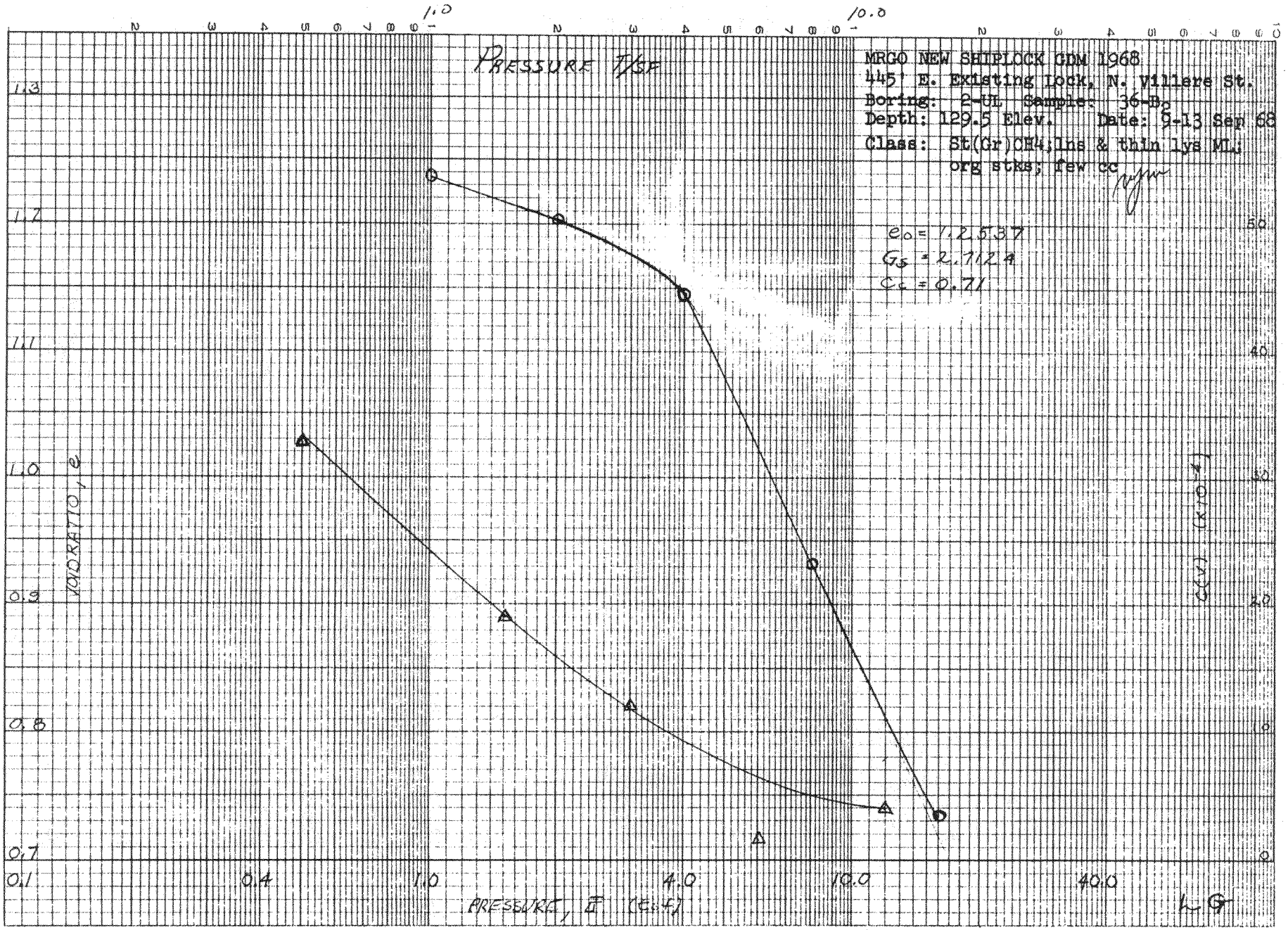

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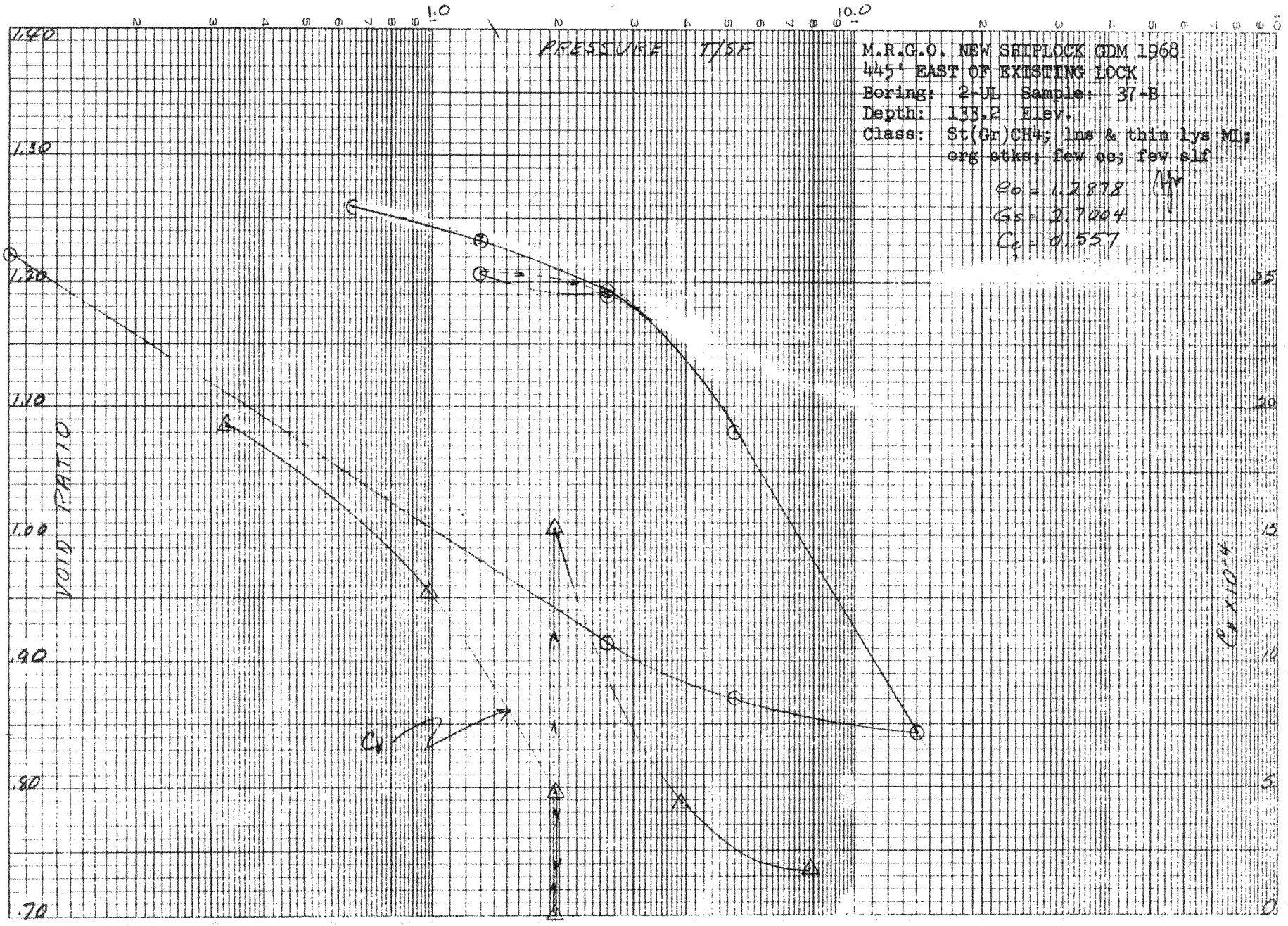
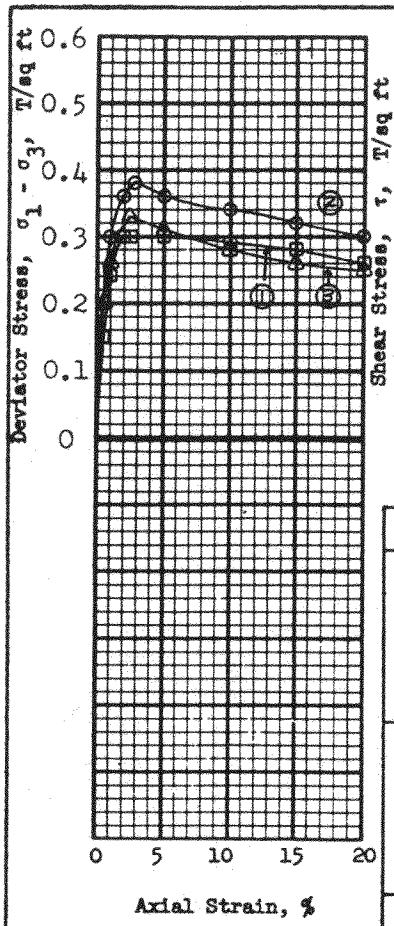
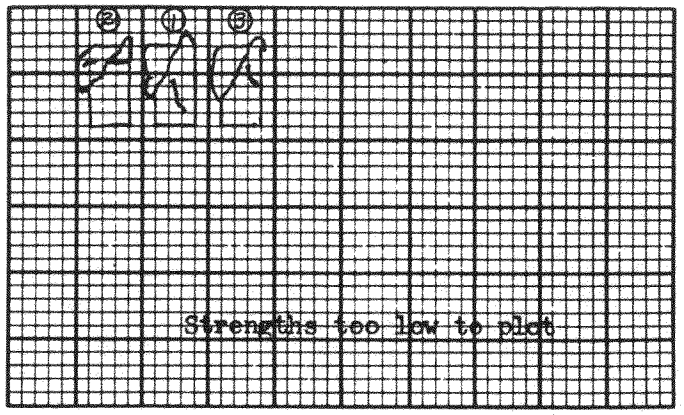


EK





Test No.			1	2	3	
Initial	Water content	w_o	99.0 %	108.2%	104.2%	%
	Void ratio	e_o	2.65	2.90	2.82	
	Saturation	S_o	98.6 %	98.5%	97.5%	%
	Dry density, lb/cu ft	γ_d	45.2	42.2	43.2	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.30	0.38	0.33	
Time to failure, min		t_f	16	25	16	
Rate of strain, percent/min			0.16	0.11	0.15	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.17 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, with scattered 1/8" dia. roots fragments

LL	PL	PI		G_s
130	45	85		2.64

Remarks Sample contained ½" to 1" dia. roots not used in specimens.

☐ A-(CH) dark gray with organic matter

☒ CH gray

Typical Specimen

Project MISS. RIVER - GULF OUTLET, GDM

INTERSECTION URQUHART & JOURDAN AVE.

Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 7-B

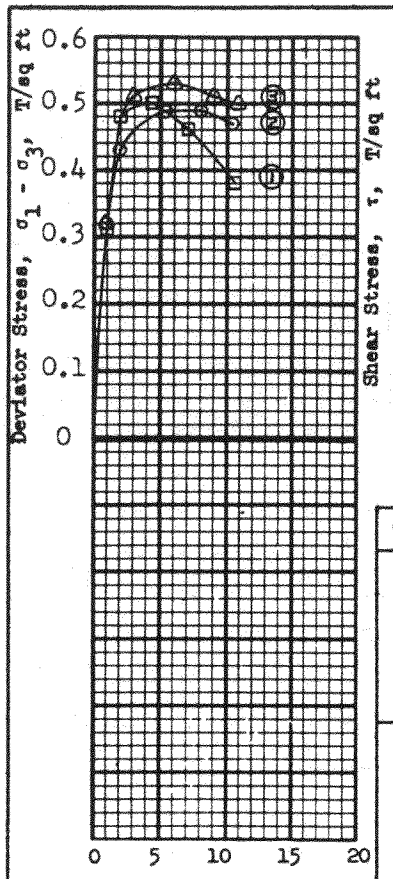
Depth 12.0 | Date 16 AUGUST 1968

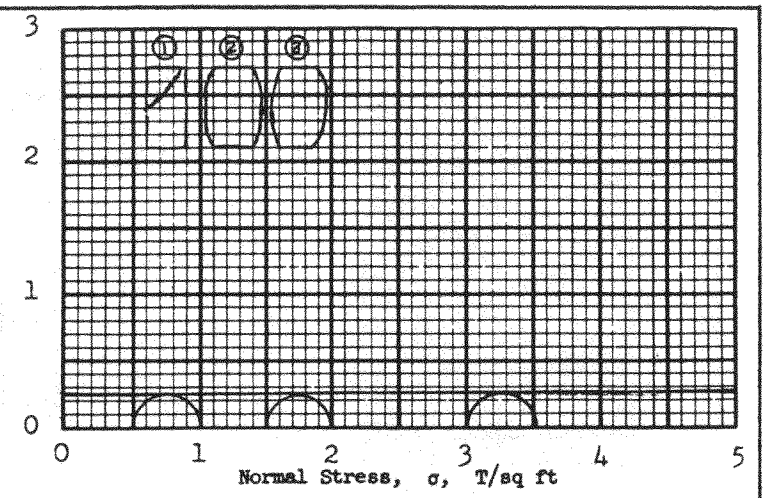
JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 *(EM 1110-2-1902)* PREVIOUS EDITIONS ARE OBSOLETE

TRANSLUCENT

USAEWES SOILS TEST SECTION





Test No.			1	2	3	
Initial	Water content	w_o	56.0 %	57.9 %	57.2 %	%
	Void ratio	e_o	1.53	1.59	1.58	
	Saturation	S_o	99.6 %	99.0 %	98.5 %	%
	Dry density, lb/cu ft	γ_d	67.1	65.6	65.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.50	0.49	0.53	
Time to failure, min		t_f	54	88	40	
Rate of strain, percent/min			0.08	0.06	0.15	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.25 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, homogeneous

LL 72 | PL 23 | PI 49 | | G_s 2.72

Remarks _____

Project MISS. RIVER - GULF OUTLET, GDM

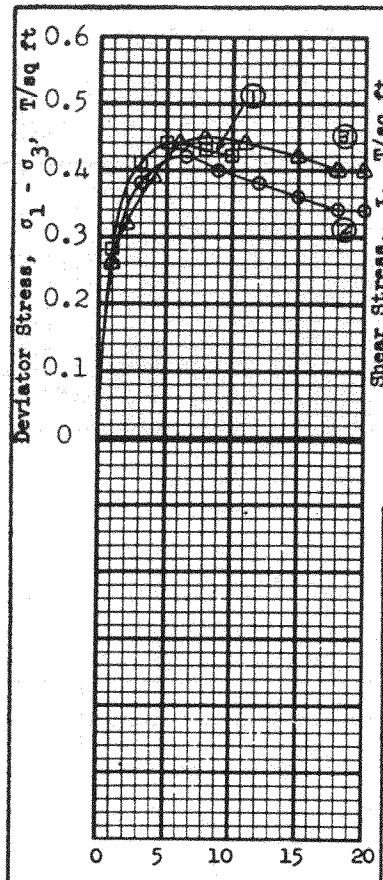
INTERSECTION URQUHART & JOURDAN AVE.

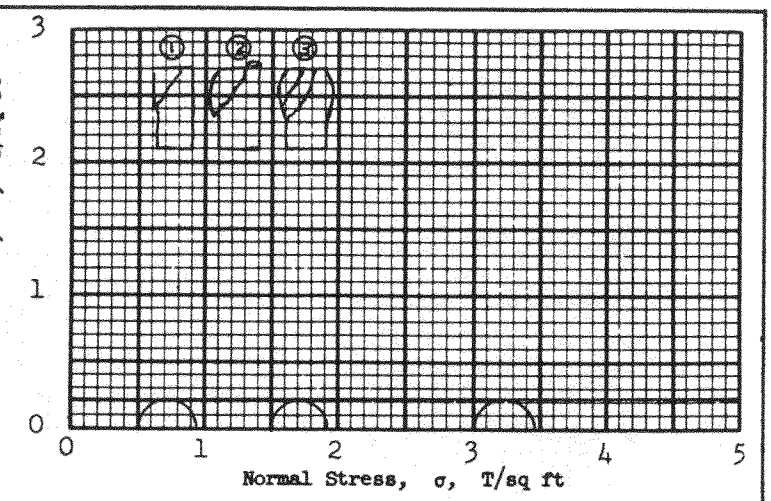
Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 12-C

Depth ~~El~~ 33.0 | Date 17 AUGUST 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	68.0 %	67.6 %	65.8 %	%
	Void ratio	e_o	1.85	1.86	1.79	
	Saturation	S_o	100 %	98.8 %	100 %	%
	Dry density, lb/cu ft	γ_d	59.5	59.4	60.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.44	0.42	0.45	
Time to failure, min		t_f	42	60	42	
Rate of strain, percent/min			0.12	0.11	0.19	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.22 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, homogeneous

LL 89 | PL 30 | PI 59 | | G_s 2.72

Remarks _____

Project MISS. RIVER - GULF OUTLET, GDM

INTERSECTION URQUHART & JOURDAN AVE.

Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 13-D

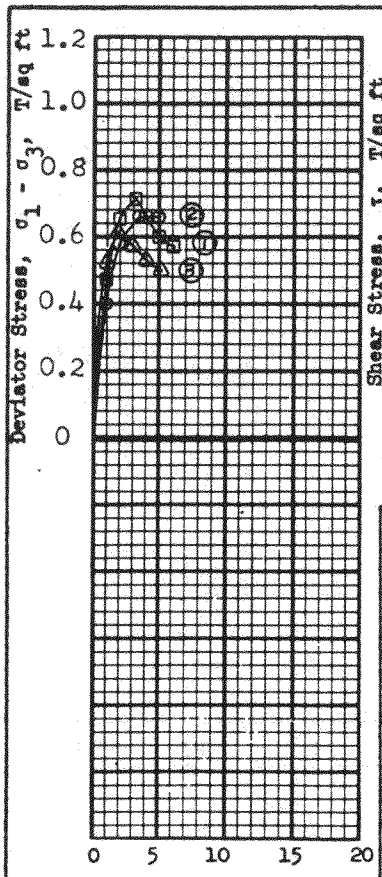
Depth ~~81~~ 38.0 | Date 19 AUGUST 1968

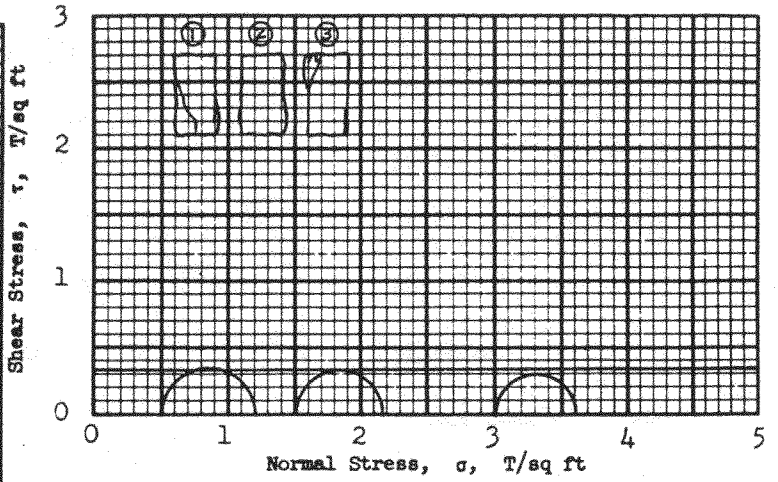
JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 *(EM 1110-2-1902)* PREVIOUS EDITIONS ARE OBSOLETE

TRANSLUCENT

USAEWES SOILS TEST SECTION





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.33 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	63.8 %	62.1 %	63.8 %	%
	Void ratio	e_o	1.75	1.75	1.75	
	Saturation	S_o	99.2 %	96.5 %	99.2 %	%
	Dry density, lb/cu ft	γ_d	61.8	61.7	61.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.71	0.66	0.61	
Time to failure, min		t_f	64	117	48	
Rate of strain, percent/min			0.05	0.03	0.04	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.36	1.37	1.36	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray

LL 86 | PL 33 | PI 53 | | G_s 2.72

Remarks _____

Project MISS. RIVER - GULF OUTLET, GDM

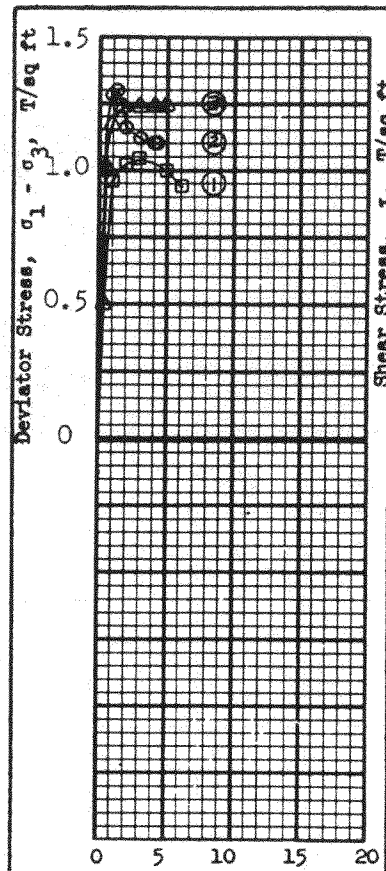
INTERSECTION URQUHART & JOURDAN AVE.

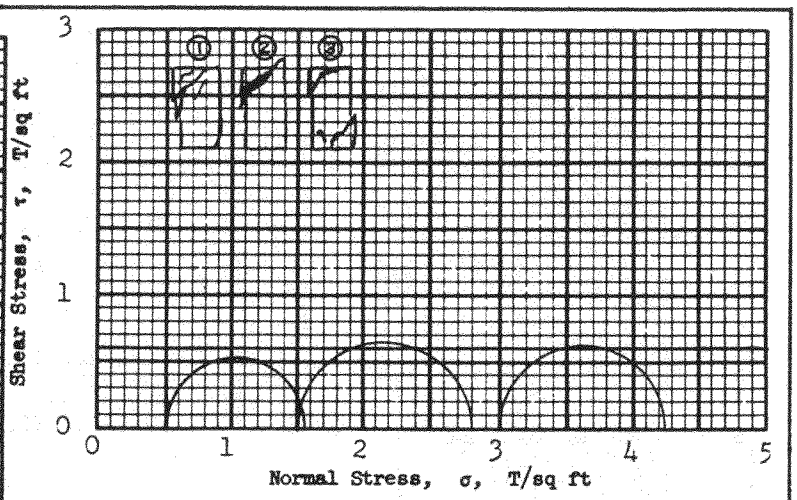
Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 15-B

Depth ~~El~~ 44.1 | Date 19 AUG. 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	43.9 %	44.6%	43.2%	%
	Void ratio	e_o	1.20	1.22	1.19	
	Saturation	S_o	100+ %	100+%	99.8%	%
	Dry density, lb/cu ft	γ_d	78.0	77.4	78.3	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.04	1.30	1.24	
Time to failure, min		t_f	16	13	90	
Rate of strain, percent/min			0.19	0.10	0.02	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.60 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), light bluish gray & tan, slickensided

LL 96 | PL 24 | PI 72 | | G_s 2.75

Remarks _____

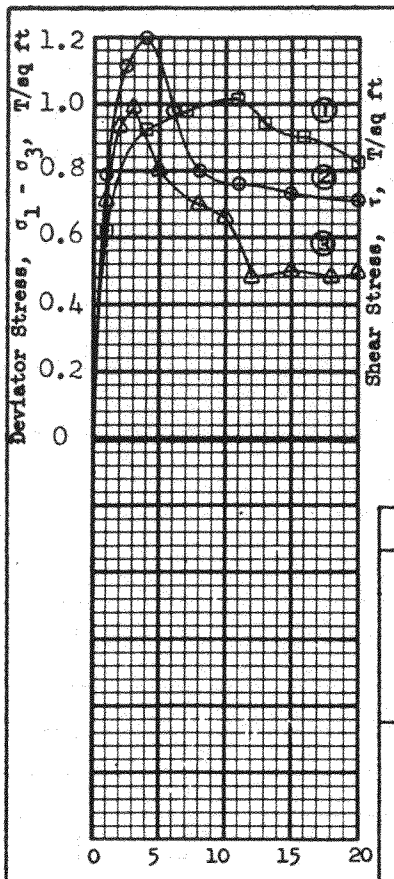
Project MISS. RIVER - GULF OUTLET, GDM
INTERSECTION URQUHART & JOURDAN AVE.

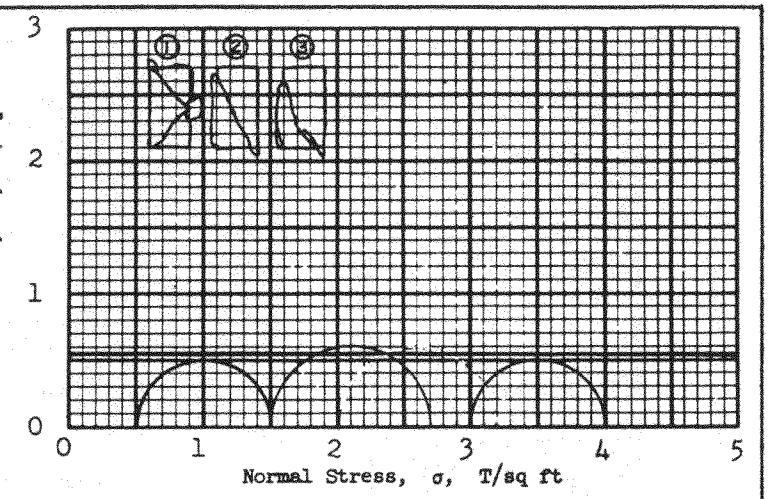
Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 21-C

Depth ~~Ft~~ 69.0 | Date 20 AUGUST 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	43.7 %	45.2 %	47.1 %	%
	Void ratio	e_o	1.19	1.23	1.31	
	Saturation	S_o	100+ %	100+ %	98.5 %	%
	Dry density, lb/cu ft	γ_d	78.0	76.8	74.0	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.01	1.20	0.99	
Time to failure, min		t_f	122	21	16	
Rate of strain, percent/min			0.09	0.19	0.19	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.54 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains silt laminations

LL 68 | PL 26 | PI 42 | G_s 2.74

Remarks _____

Project MISS. RIVER - GULF OUTLET, GDM

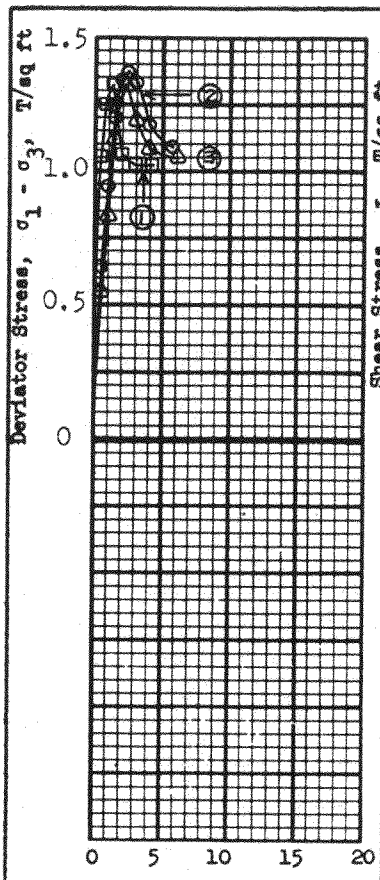
INTERSECTION URQUHART & JOURDAN AVE.

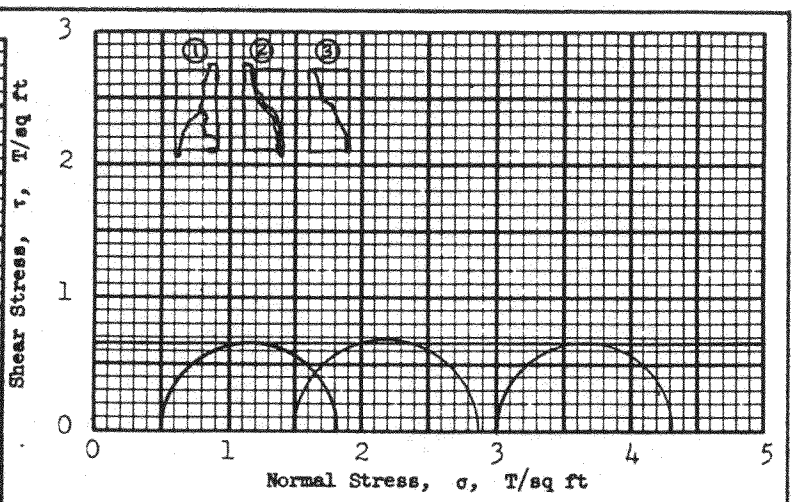
Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 29-D

Depth ~~El~~ 102.0 | Date 20 AUG. 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.67 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	42.0 %	42.3 %	42.8 %	%
	Void ratio	e_o	1.15	1.15	1.16	
	Saturation	S_o	99.3 %	100 %	100+ %	%
	Dry density, lb/cu ft	γ_d	79.0	78.9	78.6	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.32	1.37	1.32	
Time to failure, min		t_f	18	30	80	
Rate of strain, percent/min			0.07	0.08	0.03	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.41	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q	Type of specimen UNDISTURBED		
Classification PLASTIC CLAY (CH), gray, contains 1/8" layer of silty sand			
LL 65	PL 20	PI 45	G_s 2.72

Remarks _____

Project MISS. RIVER - GULF OUTLET, GDM

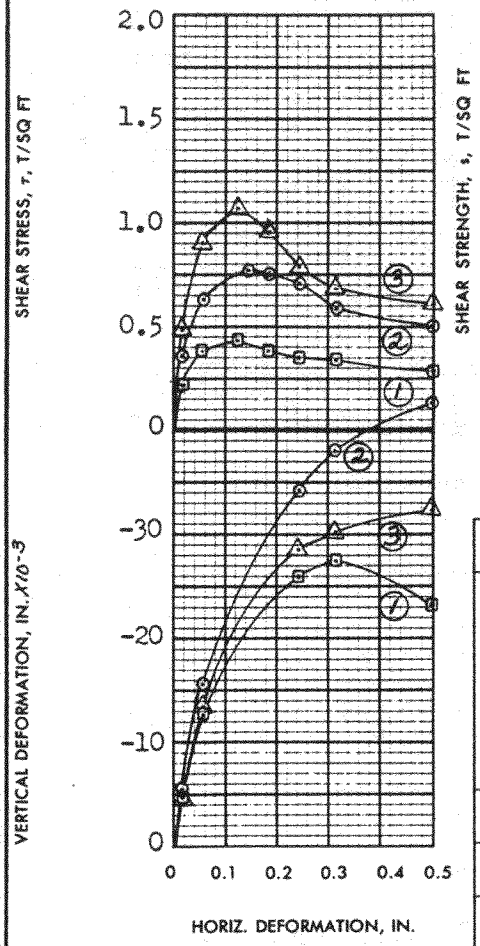
INTERSECTION URQUHART & JOURDAN AVE.

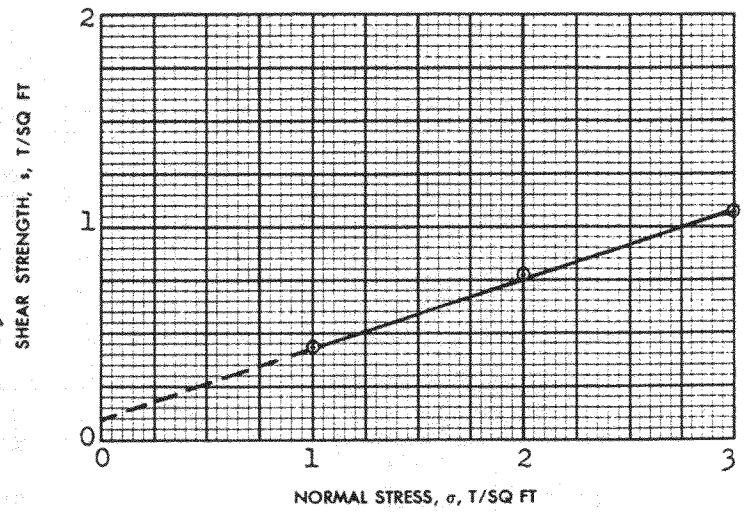
Area NEW SHIPLOCK

Boring No. 8-UL | Sample No. 36-A

Depth ~~Ft~~ 127.3 | Date 20 AUGUST 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	79.6 %	80.2 %	80.5 %	%
	VOID RATIO	e_o	2.18	2.18	2.19	
	SATURATION	S_o	97.5 %	98.2 %	98.1 %	%
	DRY DENSITY, LB/CU FT	γ_d	52.4	52.4	52.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	4	20	80	
FINAL	WATER CONTENT	w_f	64.6 %	51.1 %	46.7 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.43	0.77	1.07	
ACTUAL TIME TO FAILURE, MIN		t_f	690	780	720	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 18°

TAN ϕ' = 0.325

c' = 0.10 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, contains roots, rootlets and organic *

LL 95 — PL 30 — PI 65 — G_s 2.67

REMARKS * matter, slightly slickensided

PROJECT MISS. RIVER - GULF OUTLET, GDM
INTERSECTION URQUART & JOURDAN AVE.

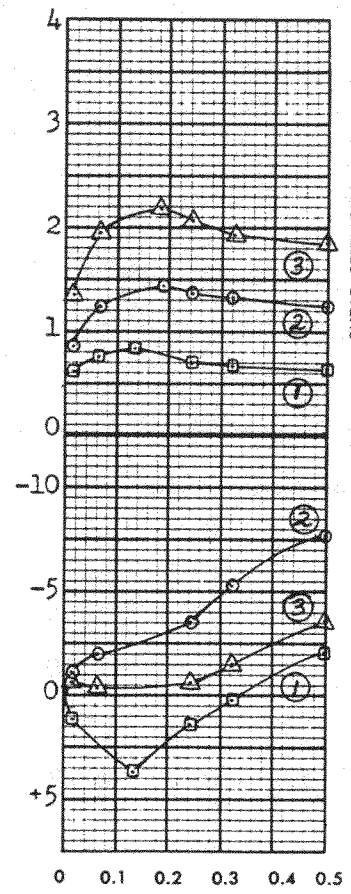
AREA NEW SHIP LOCK

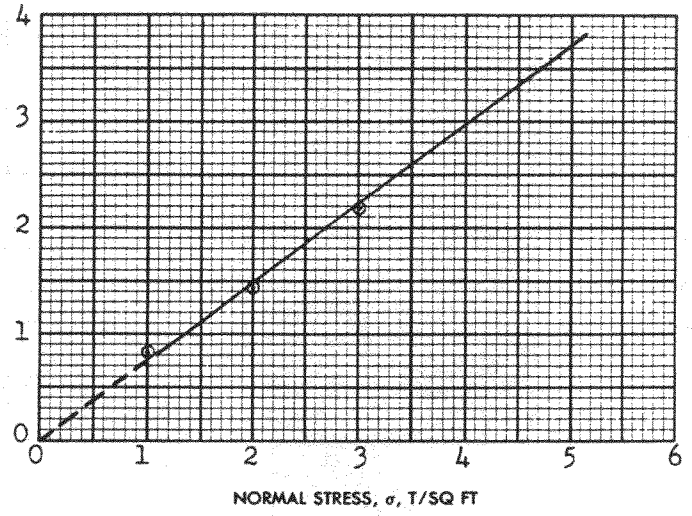
BORING NO. 8-UL — SAMPLE NO. 7-D

DEPTH 14.0 — DATE 20 August 1968

JHMc **DIRECT SHEAR TEST REPORT**

ENG FORM 1 JUN 65 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTIO PLATE IX-3





TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	26.6%	26.2%	26.5%	%
	VOID RATIO	e_o	0.754	0.754	0.743	
	SATURATION	S_o	94.5%	93.1%	95.6%	%
	DRY DENSITY, LB/CU FT	γ_d	95.4	95.4	96.0	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	28.5%	30.1%	28.2%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.82	1.43	2.19	
ACTUAL TIME TO FAILURE, MIN		t_f	780	1080	1020	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

$\phi' =$ 37°

TAN $\phi' =$ 0.754

$c' =$ 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN: UNDISTURBED — 3.00 IN. SQUARE — 0.563 IN. THICK

CLASSIFICATION: SANDY SILT (ML), gray

LL – PL – PI – G_s 2.68

REMARKS

PROJECT: MISS. RIVER - GULF OUTLET GDM

INTERSECTION URQUHART & JOURDAN AVE.

AREA: NEW SHIP LOCK

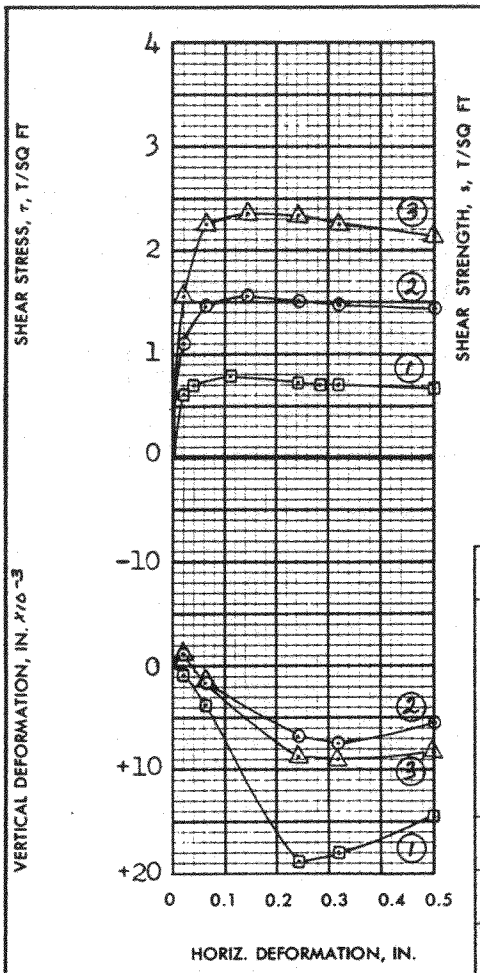
BORING NO. 8-UL SAMPLE NO. 8-D

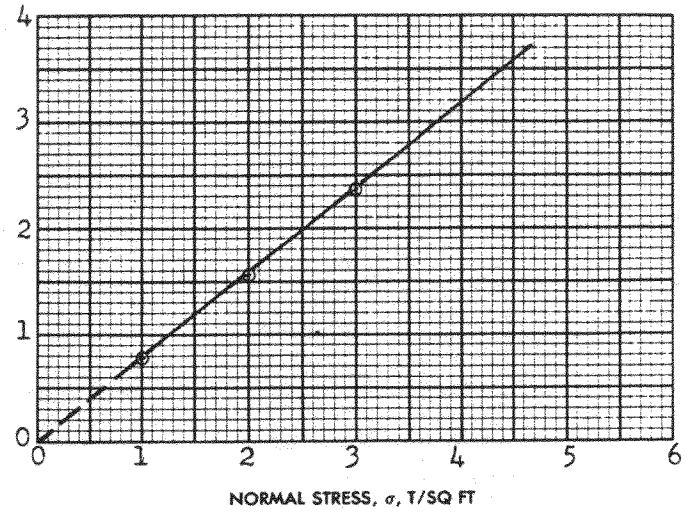
DEPTH IN 18.0 DATE 19 August 1968

JB

DIRECT SHEAR TEST REPORT

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST LAB-310





TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	21.6%	21.9%	21.5 %	%
	VOID RATIO	e_o	0.688	0.693	0.682	
	SATURATION	S_o	83.5%	84.1%	83.8 %	%
	DRY DENSITY, LB/CU FT	γ_d	98.4	98.1	98.7	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	25.1%	25.7%	25.0 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.79	1.56	2.37	
ACTUAL TIME TO FAILURE, MIN		t_f	840	1020	1020	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

ϕ' = 39°

TAN ϕ' = 0.810

c' = 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.563 IN. THICK

CLASSIFICATION SILTY SAND (SM), gray, contains shell fragments

LL – | PL – | PI – | G_s 2.66

REMARKS

PROJECT MISS. RIVER - GULF OUTLET, GDM
INTERSECTION URGUART & JOURDAN AVE.

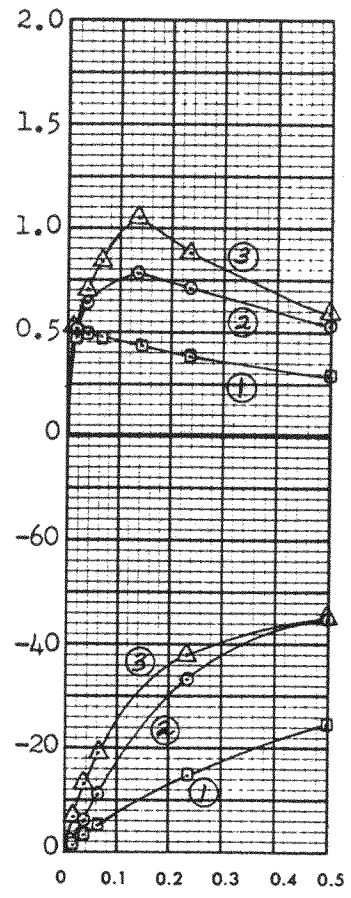
AREA NEW SHIP LOCK

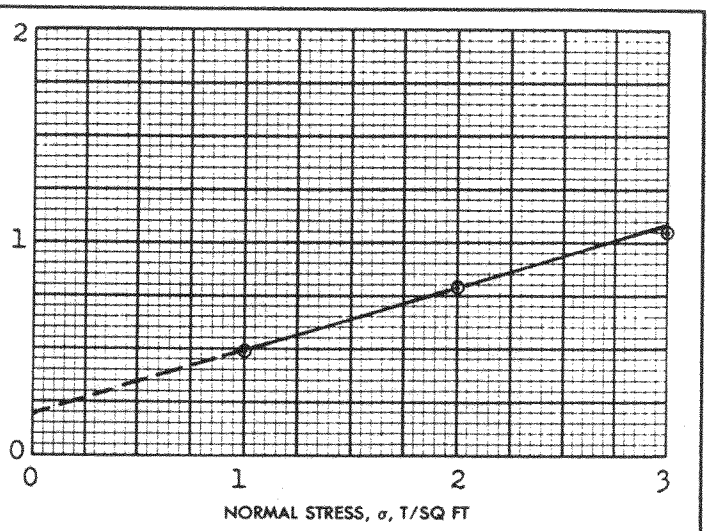
BORING NO. 8-UL | SAMPLE NO. 18-C

DEPTH 57.0 | DATE 20 August 1968

JB **DIRECT SHEAR TEST REPORT**

ENG FORM 1 JUN 65 **2092** (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES FORM 2092 TEST PLATE IX-3





SHEAR STRENGTH PARAMETERS

$\phi' =$ 17°

TAN $\phi' =$ 0.306

$c' =$ 0.20 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	48.8%	50.6%	48.4%	%
	VOID RATIO	e_o	1.40	1.38	1.36	
	SATURATION	S_o	95.5%	100+%	97.5%	%
	DRY DENSITY, LB/CU FT	γ_d	71.4	71.9	72.4	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	2	2	2	
FINAL	WATER CONTENT	w_f	52.5%	44.2%	41.6%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.49	0.78	1.05	
ACTUAL TIME TO FAILURE, MIN		t_f	210	780	780	
RATE OF STRAIN, IN./MIN			.00020	.00020	.00020	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, contains trace of small layers & pockets *

LL 74 | PL 23 | PI 51 | G. 2.74

REMARKS * of silt

Specimen 1 contained a trace of organic matter

PROJECT MISS. RIVER - GULF OUTLET, GDM

INTERSECTION URQUHART & JOURDAN AVE.

AREA NEW SHIP LOCK

BORING NO. 8-UL | SAMPLE NO. 31-D

DEPTH 110.0 | DATE 21 August 1968

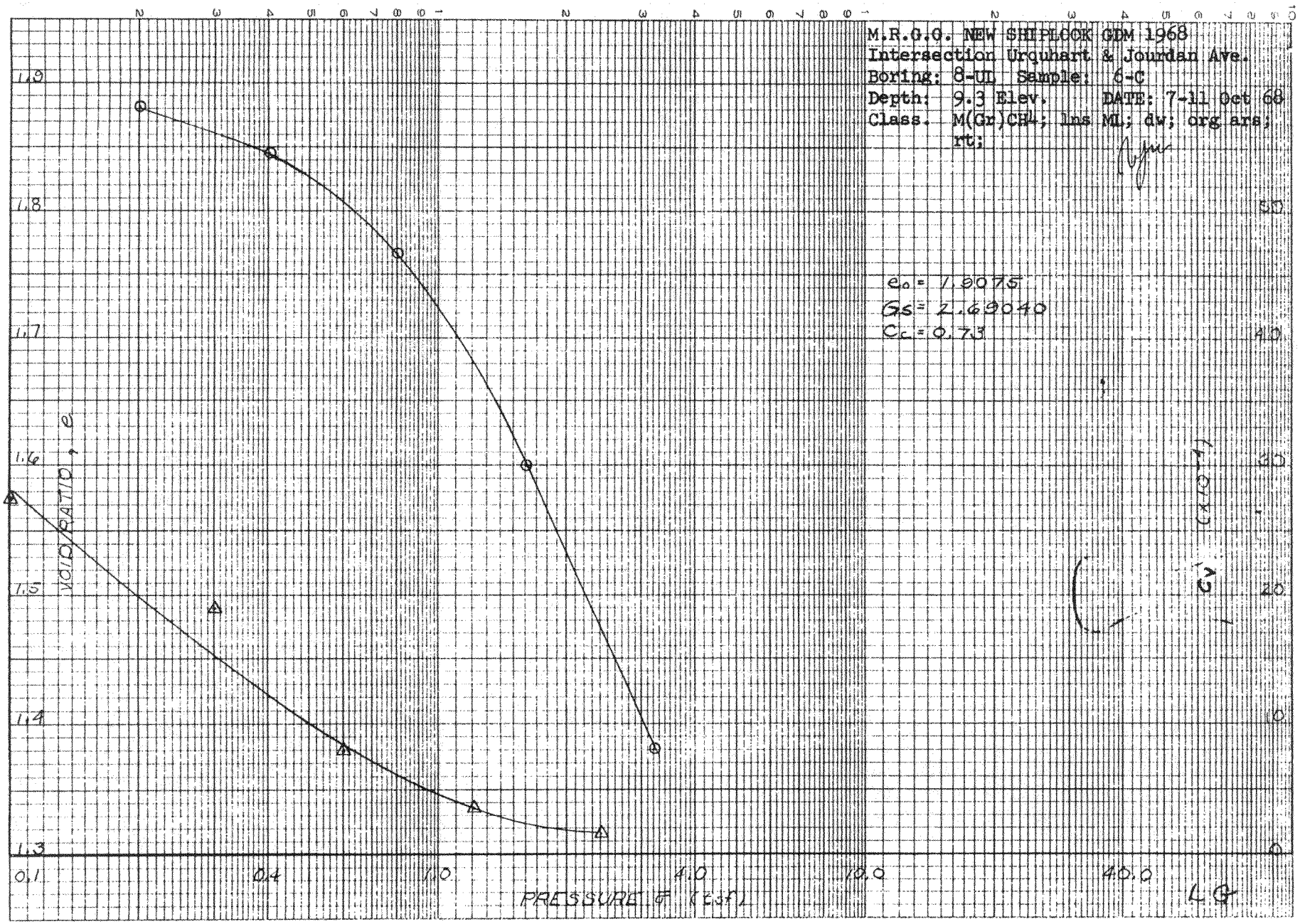
JHMc

DIRECT SHEAR TEST REPORT

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTION

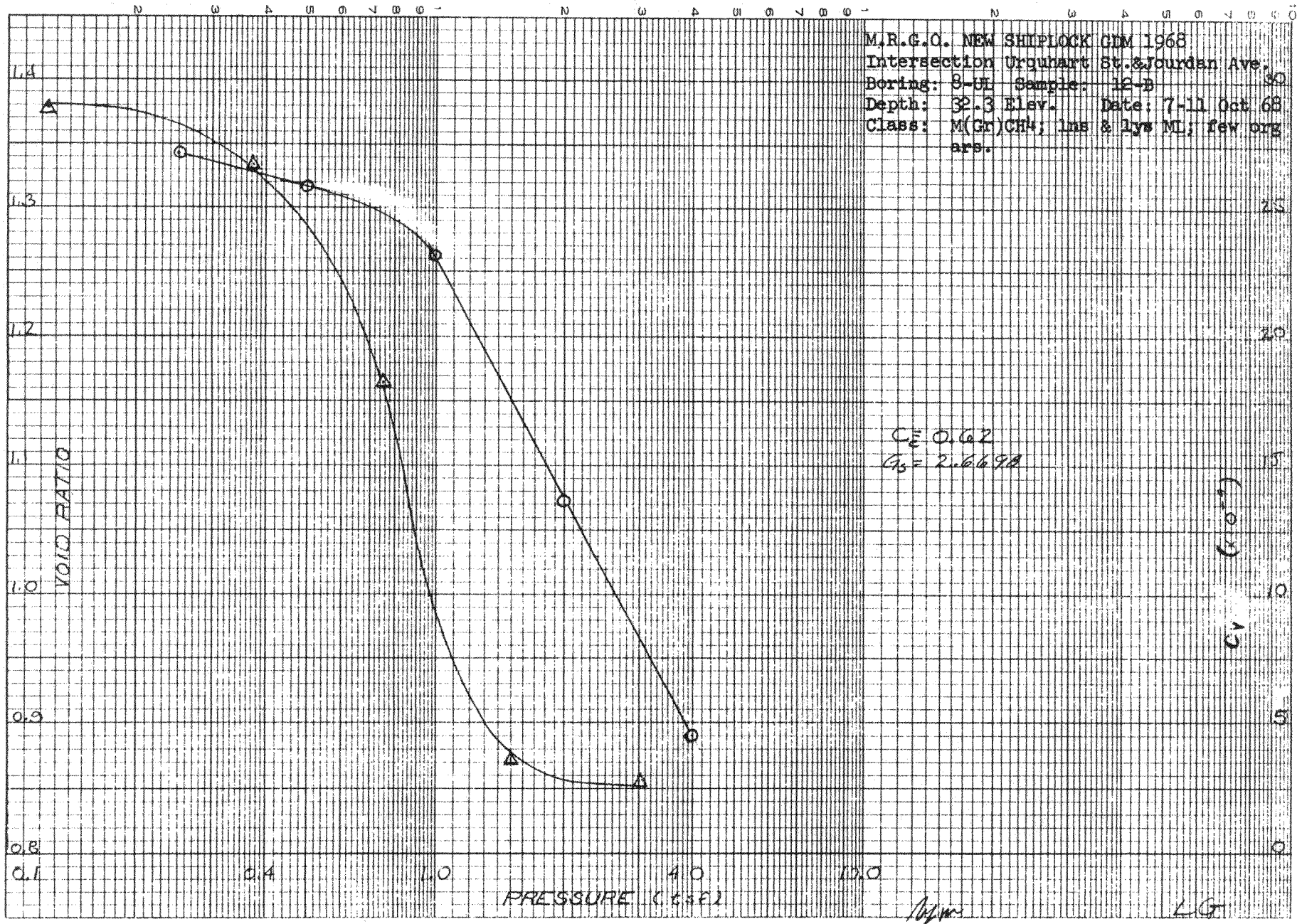
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



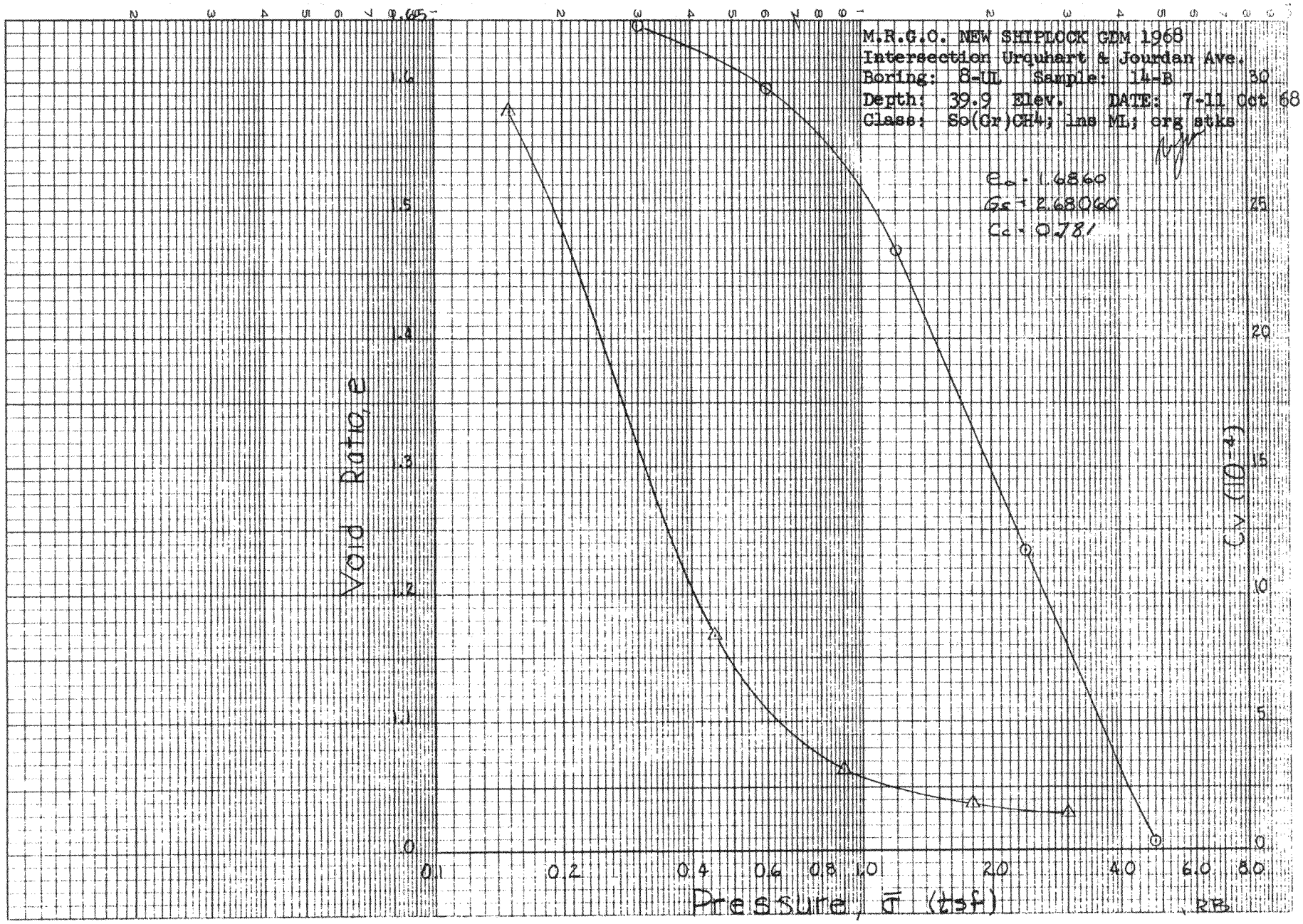
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



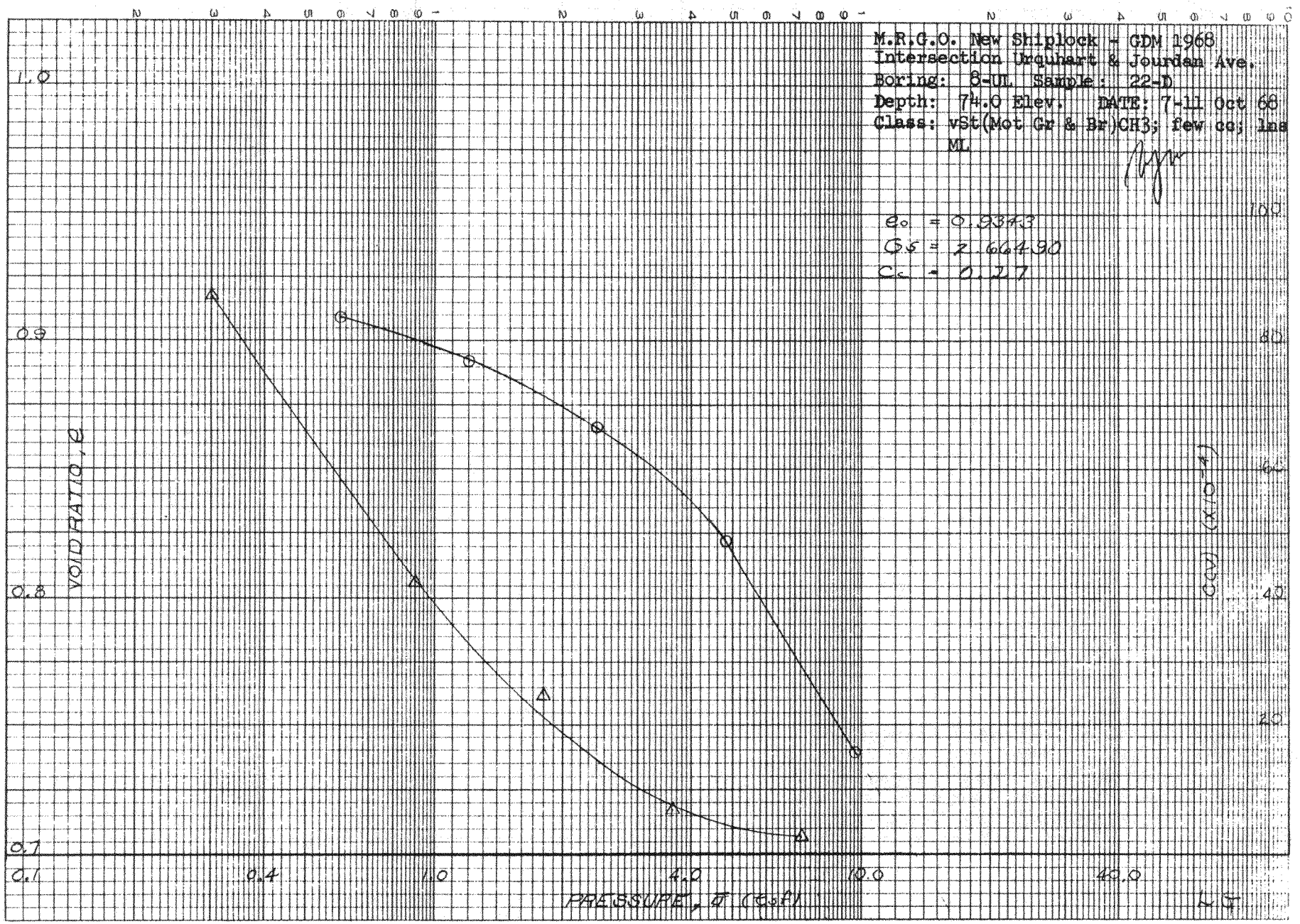
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



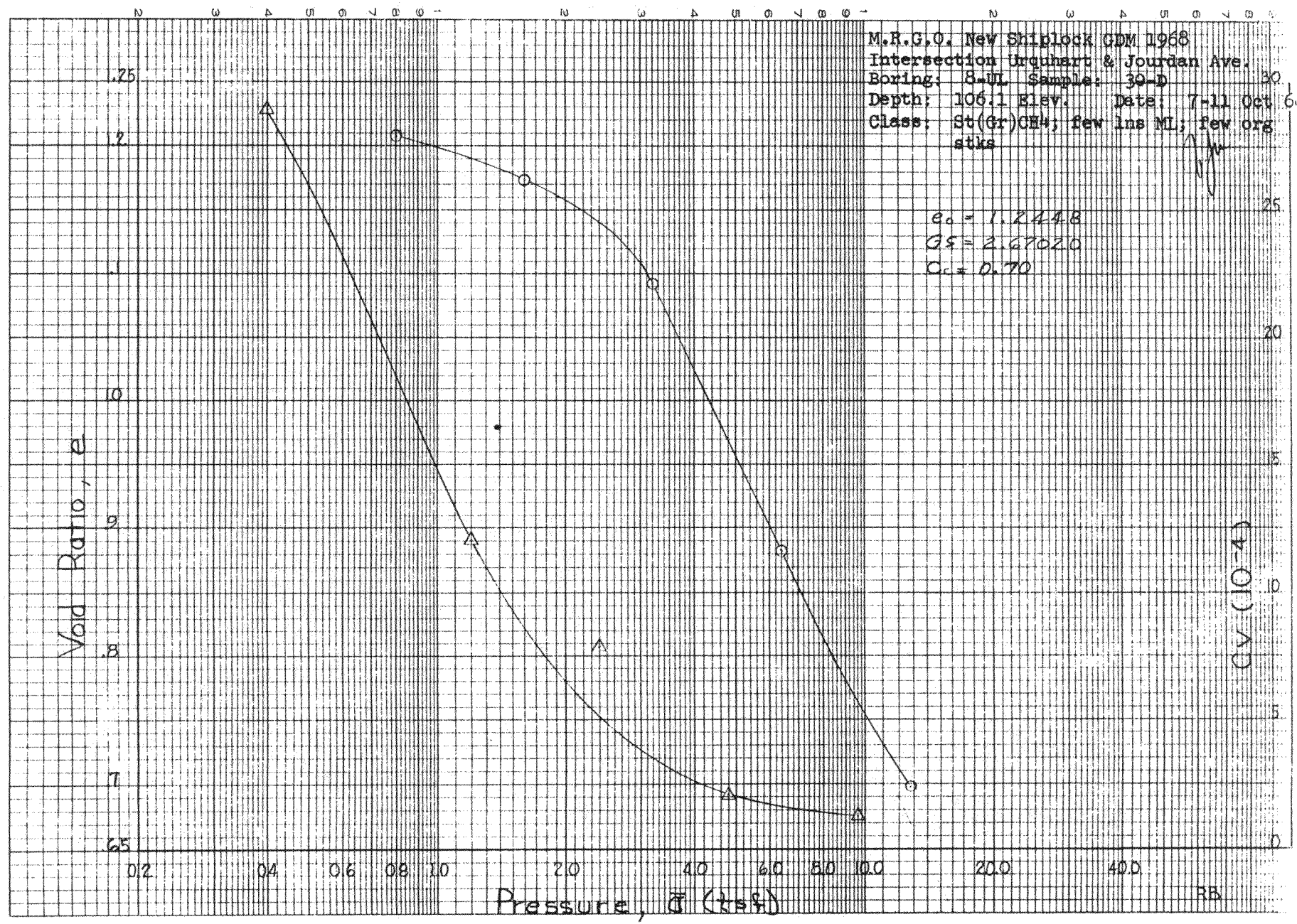
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



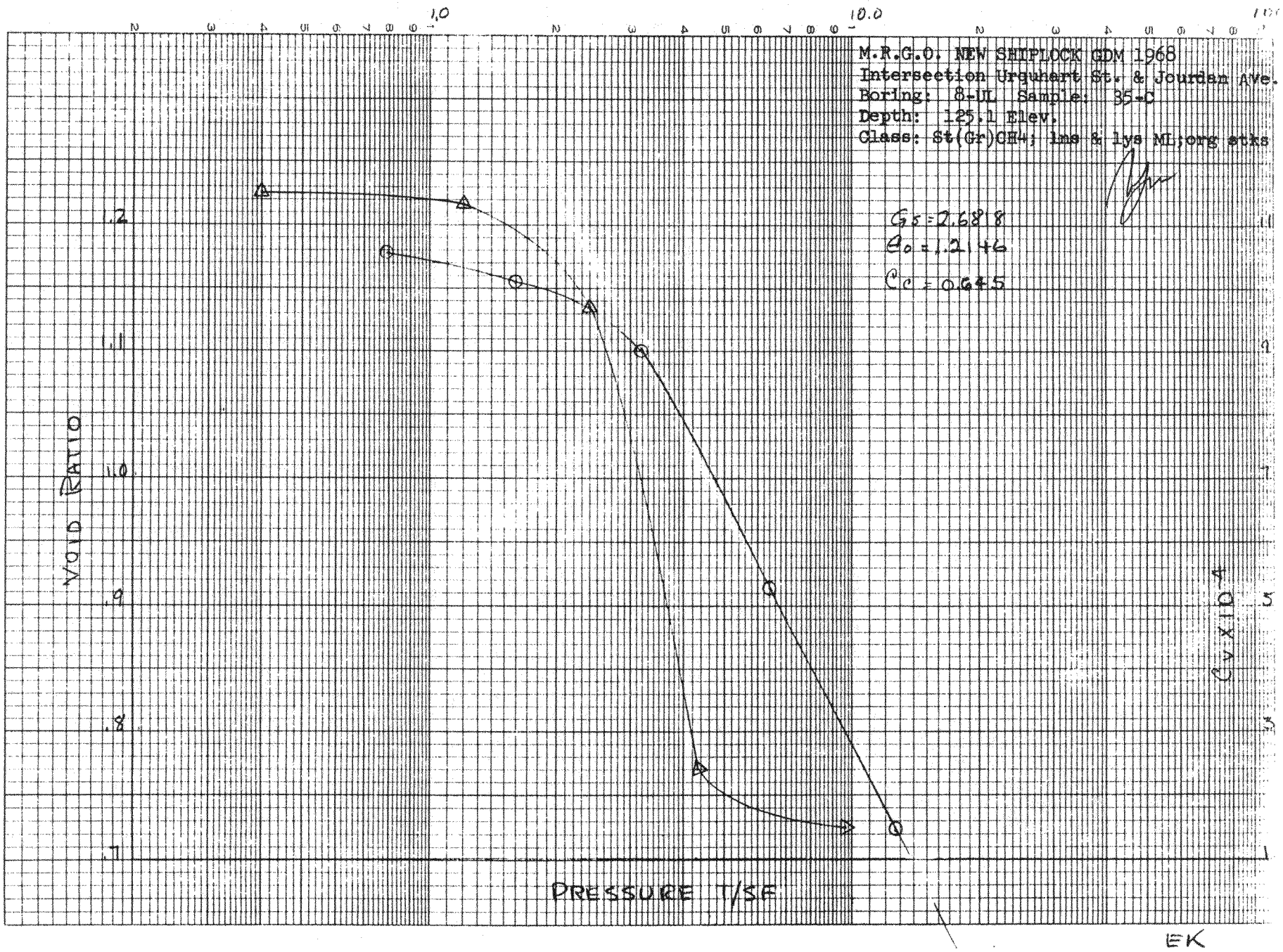
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



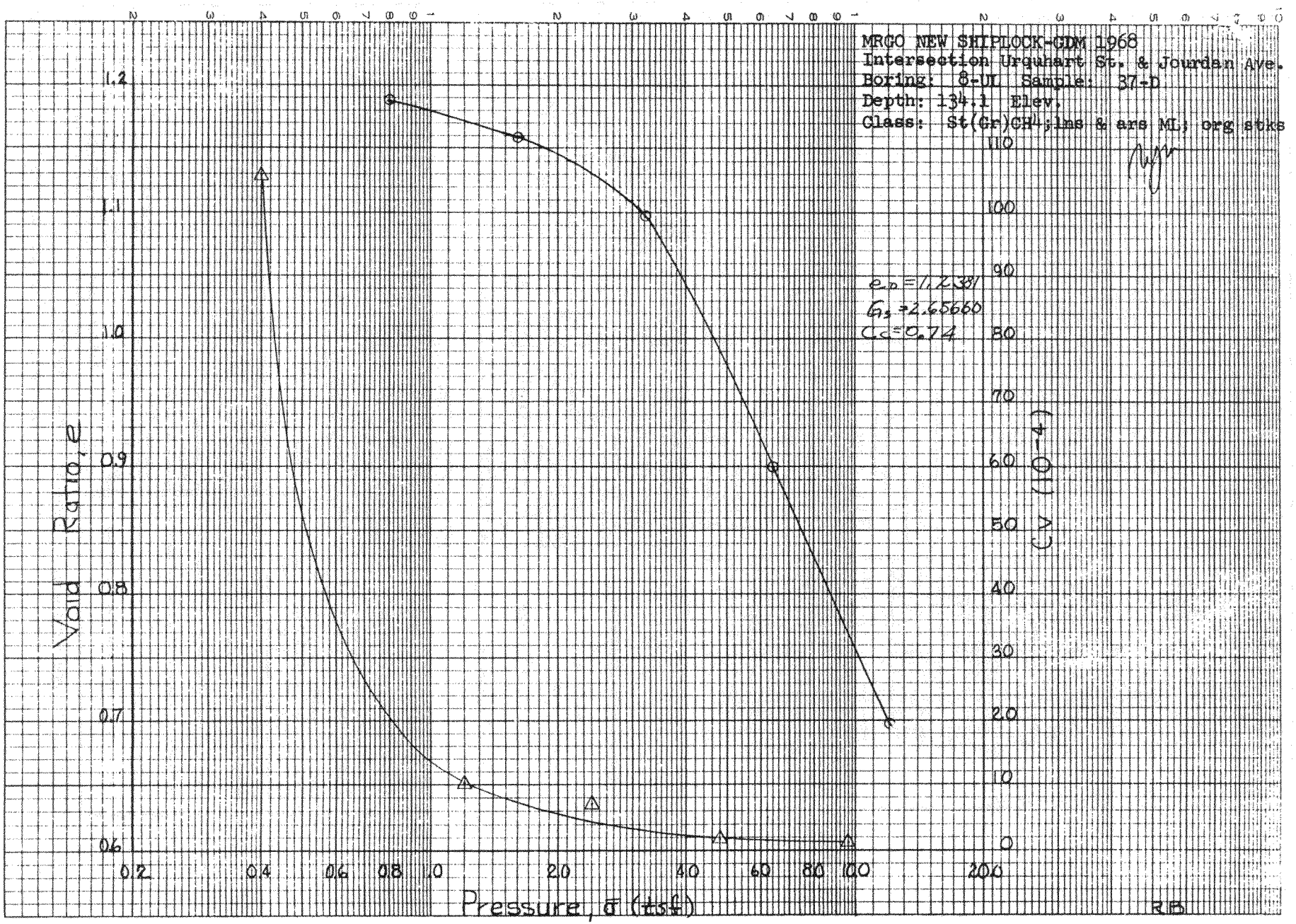
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

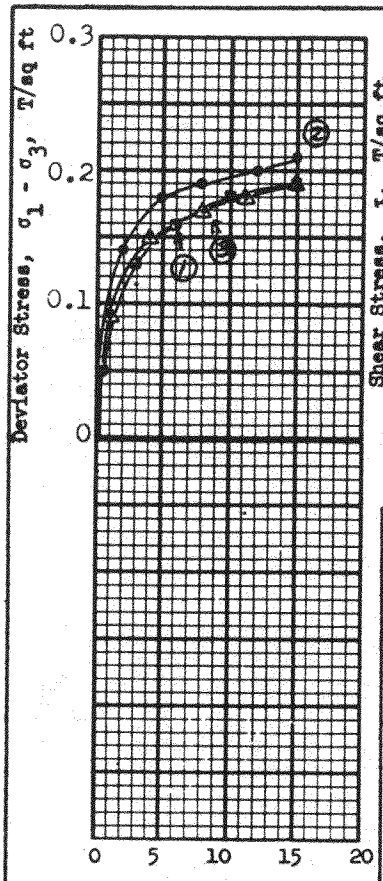
EUGENE DIETZGEN CO.
MADE IN U. S. A.

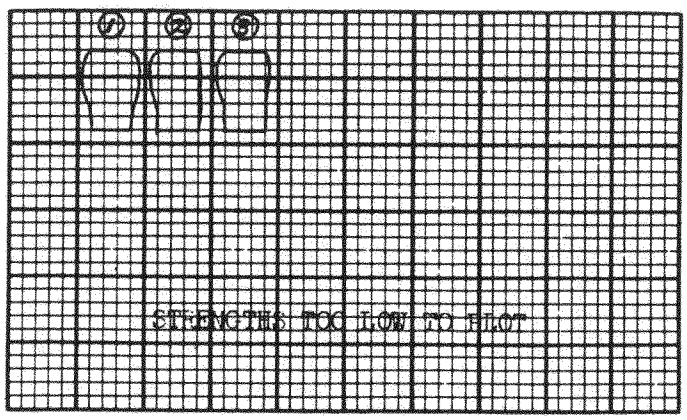


NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.







Test No.			1	2	3	
Initial	Water content	w_o	61.2 %	60.2 %	65.2 %	%
	Void ratio	e_o	1.60	1.57	1.74	
	Saturation	S_o	100+ %	100+ %	100+ %	%
	Dry density, lb/cu ft	γ_d	64.3	65.1	61.1	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.19	0.21	0.19	
Time to failure, min		t_f	58	50	40	
Rate of strain, percent/min			0.26	0.30	0.38	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.41	1.40	1.41	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.10 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, homogeneous

LL 70 | PL 23 | PI 47 | | G_s 2.68

Remarks _____

Project MISS. RIVER - GULF OUTLET

NEW SHIP LOCK - GDM

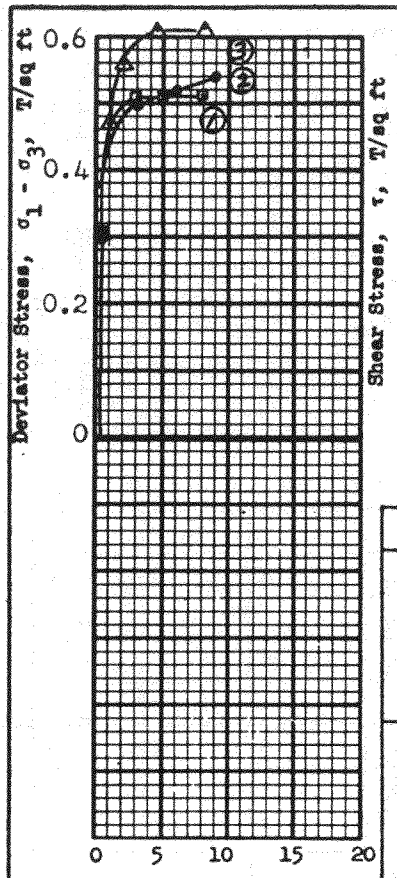
Area

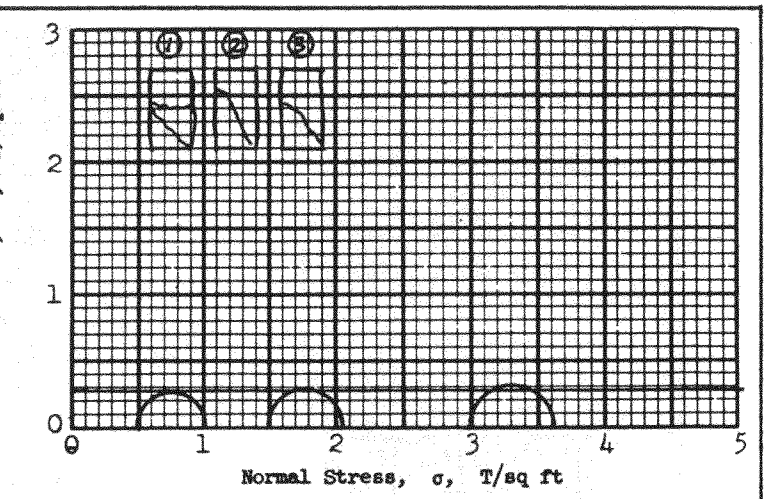
Boring No. 4-UL | Sample No. 2-B

Depth ~~Ft~~ 5.0 | Date 26 JULY 1968

JMS TRIAXIAL COMPRESSION TEST REPORT

Incl 2





Test No.			1	2	3	
Initial	Water content	w_o	48.0 %	39.8 %	43.1 %	%
	Void ratio	e_o	1.20	1.15	1.15	
	Saturation	S_o	100+ %	93.1 %	100+ %	%
	Dry density, lb/cu ft	γ_d	76.4	78.1	78.1	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.51	0.54	0.62	
Time to failure, min		t_f	27	69	90	
Rate of strain, percent/min			0.11	0.13	0.05	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.28 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray and brown, homogeneous

LL 72 | PL 24 | PI 48 | G_s 2.69

Remarks _____

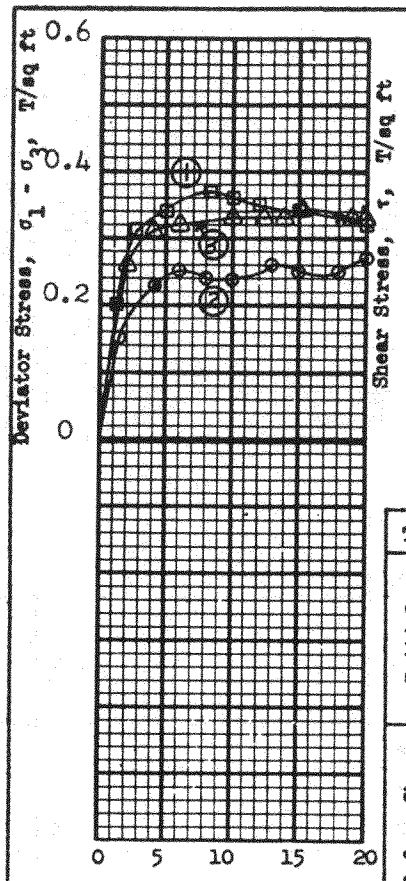
Project MISS. RIVER - GULF OUTLET
NEW SHIP LOCK - GDM

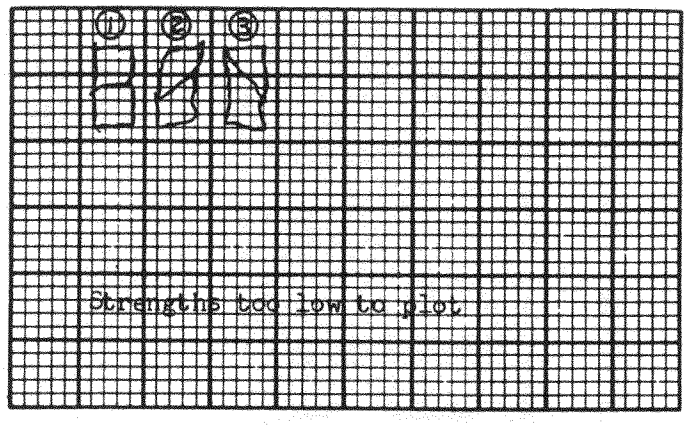
Area

Boring No. 4-UL | Sample No. 4-C

Depth 13.8 | Date 26 JULY 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	97.3 %	102.3%	99.7 %	%
	Void ratio	e_o	2.61	2.75	2.67	
	Saturation	S_o	97.3%	97.1%	97.4 %	%
	Dry density, lb/cu ft	γ_d	45.1	43.4	44.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.37	0.25	0.33	
Time to failure, min		t_f	92	27	56	
Rate of strain, percent/min			0.09	0.22	0.22	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.39	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.16 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), dark gray, contains small roots

LL 145 | PL 42 | PI 103 | | G_s 2.61

Remarks _____

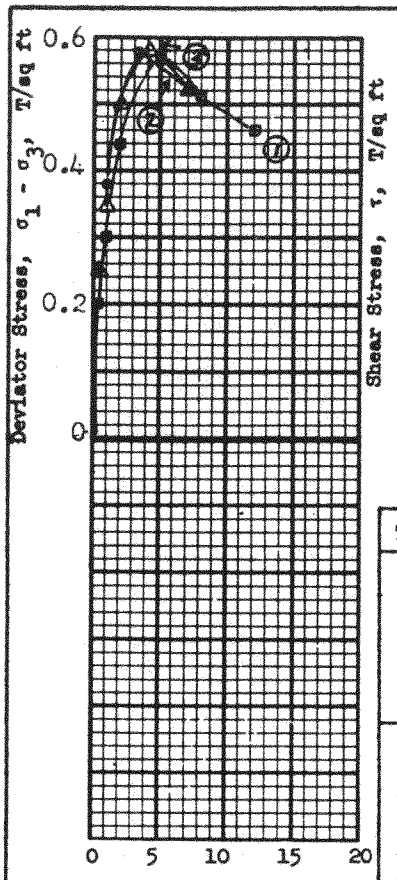
Project MISS. RIVER - GULF OUTLET
NEW SHIP LOCK - GDM

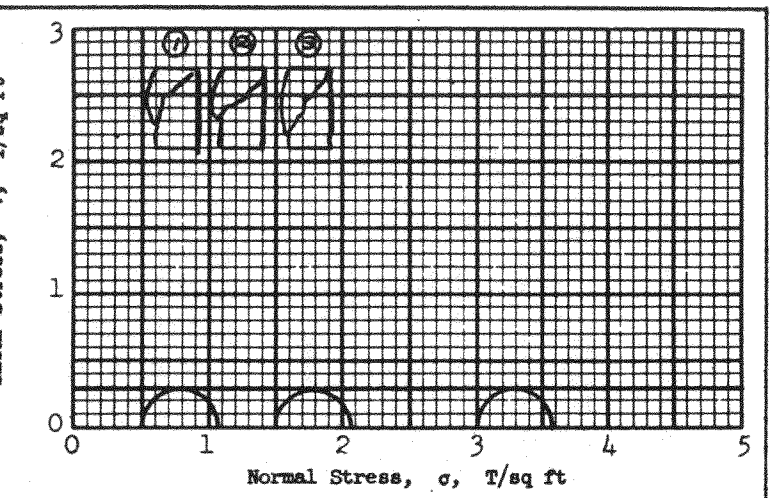
Area

Boring No. 4-UL | Sample No. 6-D

Depth Ft 23.1 | Date 29 JULY 1968

GDA TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	65.0 %	59.7 %	61.9 %	%
	Void ratio	e_o	1.77	1.64	1.70	
	Saturation	S_o	99.9 %	99.0 %	99.0 %	%
	Dry density, lb/cu ft	γ_d	61.2	64.4	62.9	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.57	0.58	0.58	
Time to failure, min		t_f	16	27	44	
Rate of strain, percent/min			0.32	0.13	0.09	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.29 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains a few 1/8" to 1/4" dia. *

LL 85 | PL 29 | PI 56 | | G_s 2.72

Remarks * roots

specimen 1 patched where root removed

Project MISS. RIVER - GULF OUTLET

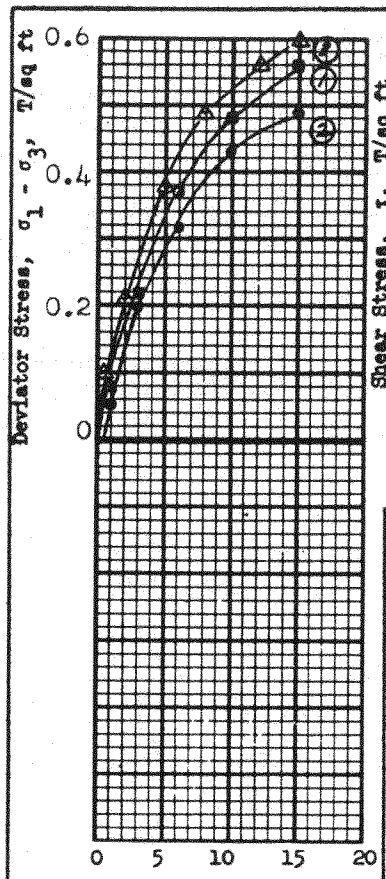
NEW SHIP LOCK - GDM

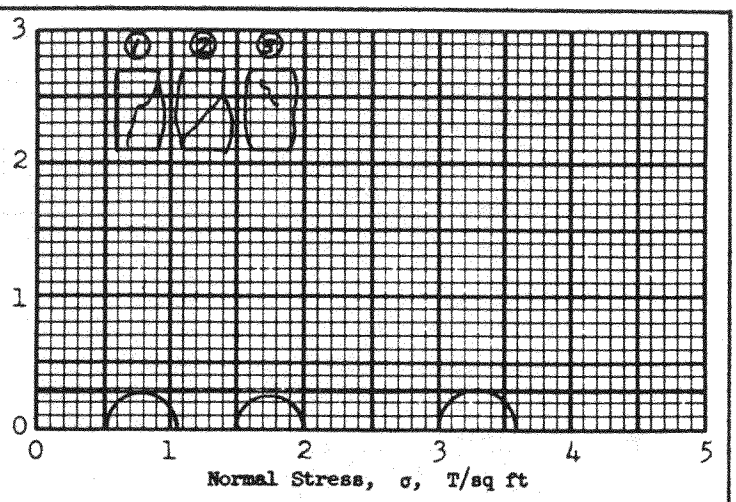
Area

Boring No. 4-UL | Sample No. 7-C

Depth ~~Bl~~ 26.0 | Date 26 JULY 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.28 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	39.5 %	39.0 %	39.7 %	%
	Void ratio	e_o	1.05	1.05	1.04	
	Saturation	S_o	100+ %	100+ %	100+ %	%
	Dry density, lb/cu ft	γ_d	81.4	81.5	81.6	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.56	0.49	0.60	
Time to failure, min		t_f	60	52	45	
Rate of strain, percent/min			0.25	0.29	0.33	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification SILTY CLAY (CL), gray

LL 40 | PL 25 | PI 15 | | G_s 2.67

Remarks _____

Project MISS. RIVER - GULF OUTLET

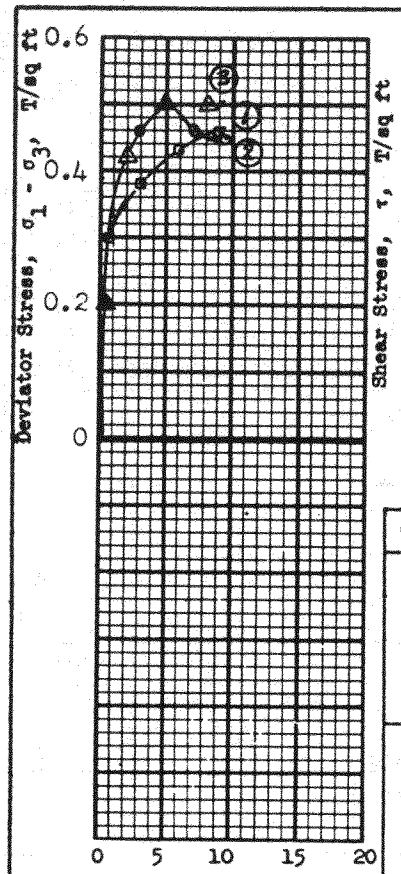
NEW SHIP LOCK - GDM

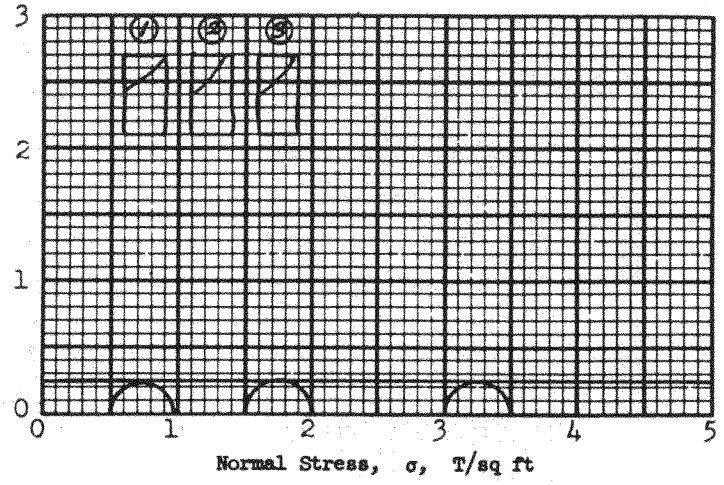
Area

Boring No. 4-UL | Sample No. 10-A

Depth 36.5 | Date 29 JULY 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	51.0 %	52.2 %	49.8%	%
	Void ratio	e_o	1.38	1.40	1.38	
	Saturation	S_o	100+ %	100+ %	98.5%	%
	Dry density, lb/cu ft	γ_d	71.6	71.0	71.7	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.46	0.50	0.50	
Time to failure, min		t_f	50	56	50	
Rate of strain, percent/min			0.18	0.09	0.10	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.24 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains fine sand seams

LL 69 | PL 23 | PI 46 | G_s 2.73

Remarks _____

Project MISS. RIVER - GULF OUTLET

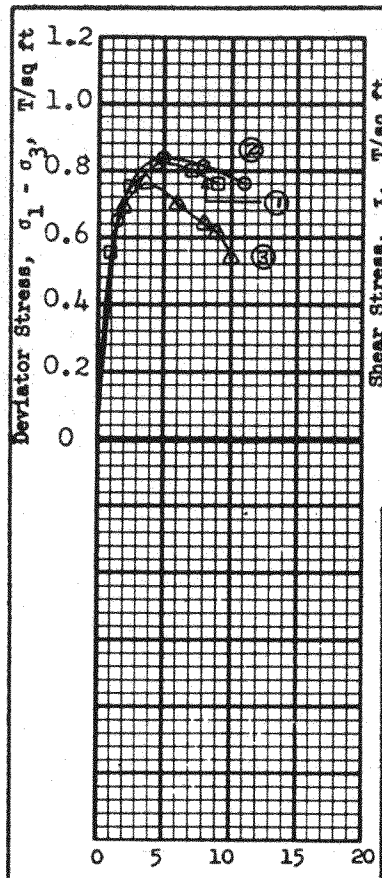
NEW SHIP LOCK - GDM

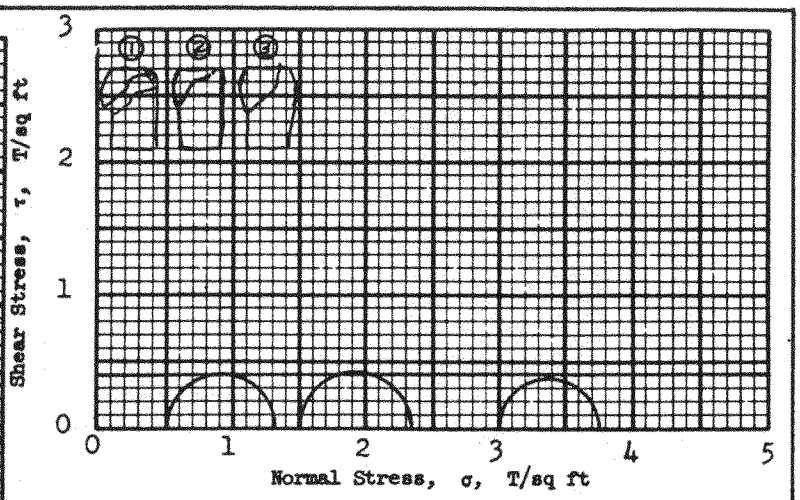
Area

Boring No. 4-UL | Sample No. 11-C_2

Depth 41.9 | Date 29 JULY 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.40 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	57.3 %	57.6%	59.4%	%
	Void ratio	e_o	1.55	1.56	1.61	
	Saturation	S_o	100+ %	100+%	100+%	%
	Dry density, lb/cu ft	γ_d	66.8	66.5	65.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.82	0.84	0.76	
Time to failure, min		t_f	23	28	18	
Rate of strain, percent/min			0.19	0.18	0.20	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), grey, homogeneous

LL 84 | PL 27 | PI 57 | | G_s 2.73

Remarks _____

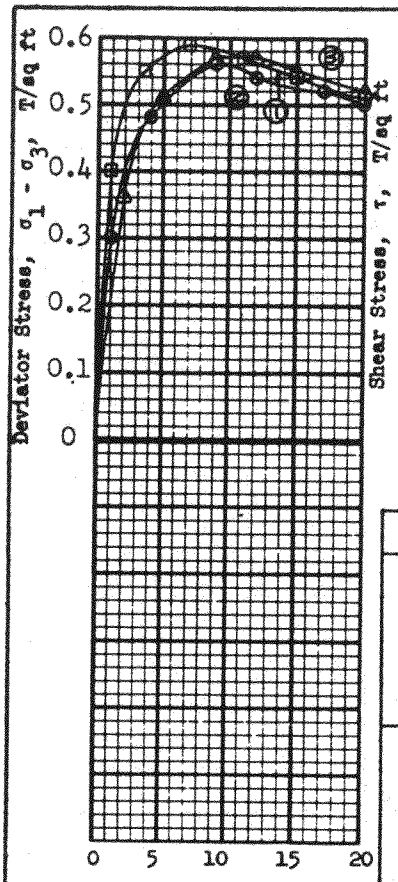
Project MISS. RIVER - GULF OUTLET
NEW SHIP LOCK - GDM

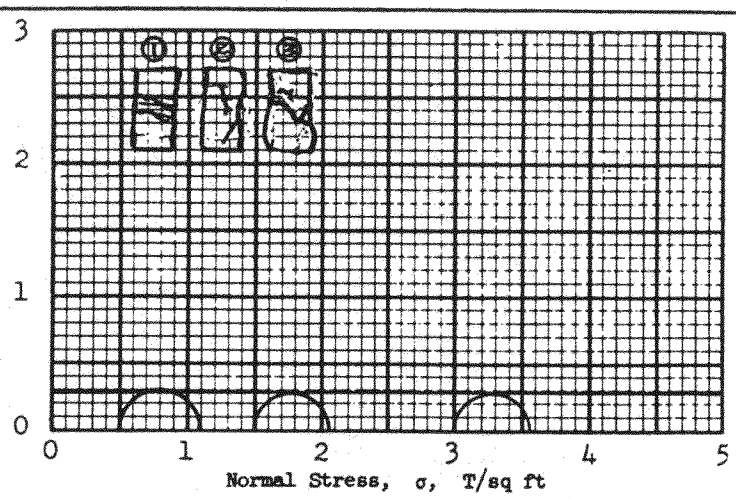
Area

Boring No. 4-UL | Sample No. 12-C

Depth ~~El~~ 46.0 | Date 31 JULY 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	45.7 %	49.6 %	47.5 %	%
	Void ratio	e_o	1.25	1.32	1.27	
	Saturation	S_o	98.3 %	100+ %	100+ %	%
	Dry density, lb/cu ft	γ_d	74.7	72.2	74.0	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.59	0.56	0.57	
Time to failure, min		t_f	88	47	45	
Rate of strain, percent/min			0.08	0.19	0.20	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.29 T/sq ft

Method of saturation _____

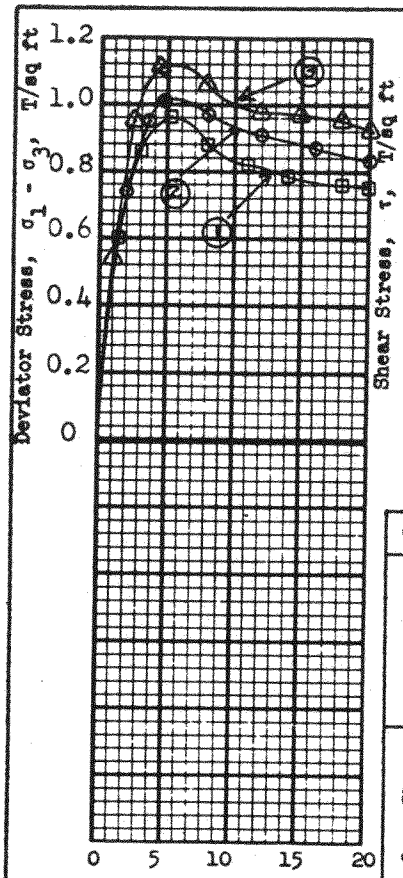
☐ Controlled stress

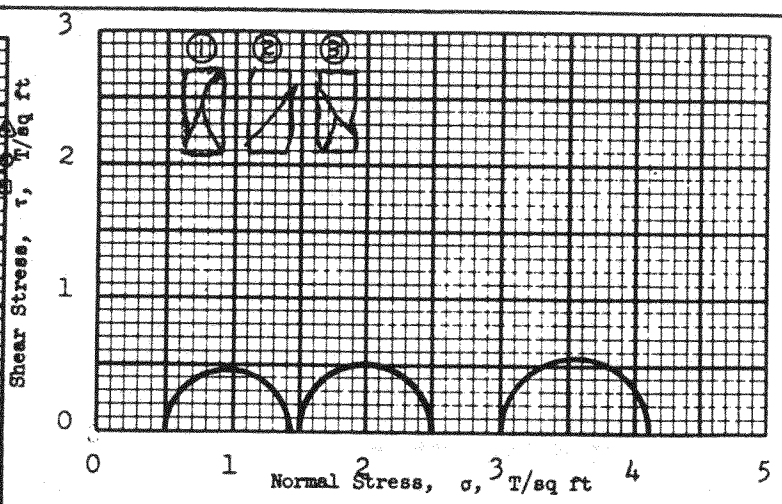
☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY (CH), gray, contains silt seams				
LL 72	PL 25	PI 47		G_s 2.69

Remarks _____

Project	MISS. RIVER - GULF OUTLET
	NEW SHIP LOCK - GDM
Area	
Boring No. 4-UL	Sample No. 13-D
Depth ~~El~~ 51.1	Date 31 JULY 1968
EAK	TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.50 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	46.7 %	44.5%	45.1%	%
	Void ratio	e_o	1.27	1.20	1.22	
	Saturation	S_o	98.2 %	99.0%	98.7%	%
	Dry density, lb/cu ft	γ_d	73.4	75.7	75.0	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.96	1.01	1.11	
Time to failure, min		t_f	26	31	26	
Rate of strain, percent/min			0.20	0.16	0.17	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains pockets of sand

LL 62 | PL 20 | PI 42 | | G_s 2.67

Remarks _____

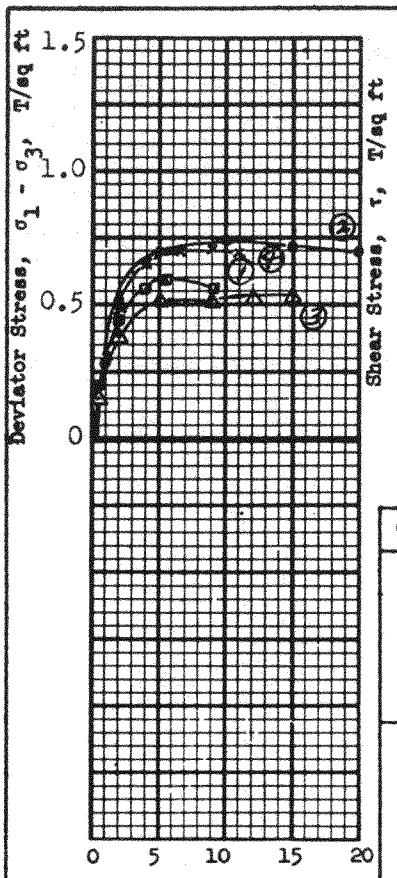
Project MISS. RIVER - GULF OUTLET
NEW SHIPLOCK - GDM

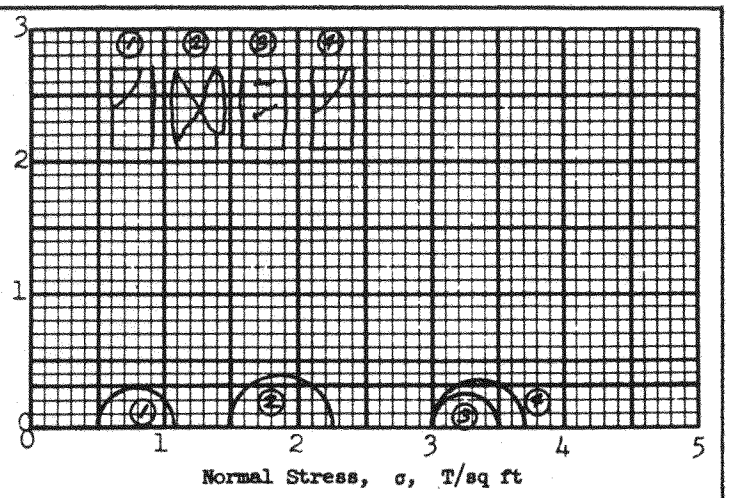
Area

Boring No. 4-UL | Sample No. 16-A

Depth 60.6 | Date 1 AUG. 1968

GDA TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	4
Initial	Water content	w_o	34.7 %	32.2 %	36.3%	32.0%
	Void ratio	e_o	0.916	0.869	0.961	0.864
	Saturation	S_o	100+ %	98.9 %	100+%	98.9%
	Dry density, lb/cu ft	γ_d	87.0	89.2	85.0	89.4
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	3.0
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.58	0.74	0.51	0.70
Time to failure, min		t_f	34	77	24	36
Rate of strain, percent/min			0.16	0.13	0.21	0.18
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.39	1.40
Initial height, in.		H_o	3.00	3.00	3.00	3.00

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.31 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification LEAN CLAY (CL), gray, contains a few silty sand pockets & *

LL 40 | PL 16 | PI 24 | | G_s 2.67

Remarks * shells 1/8" in diameter

Specimens trimmed from second level

Project MISS. RIVER - GULF OUTLET

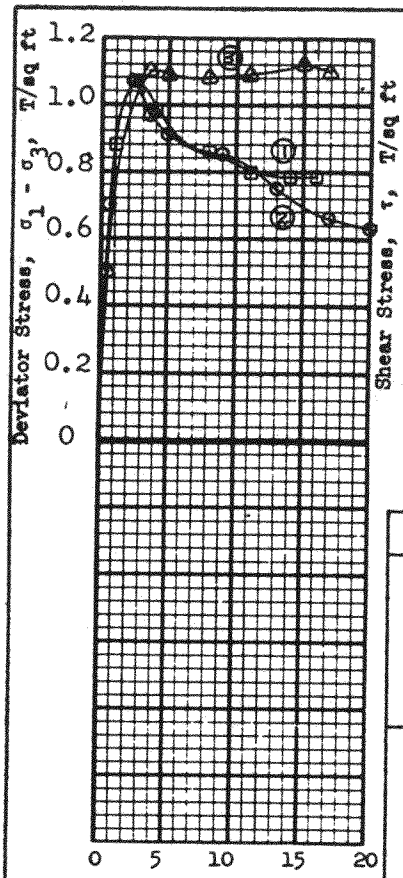
NEW SHIP LOCK - GDM

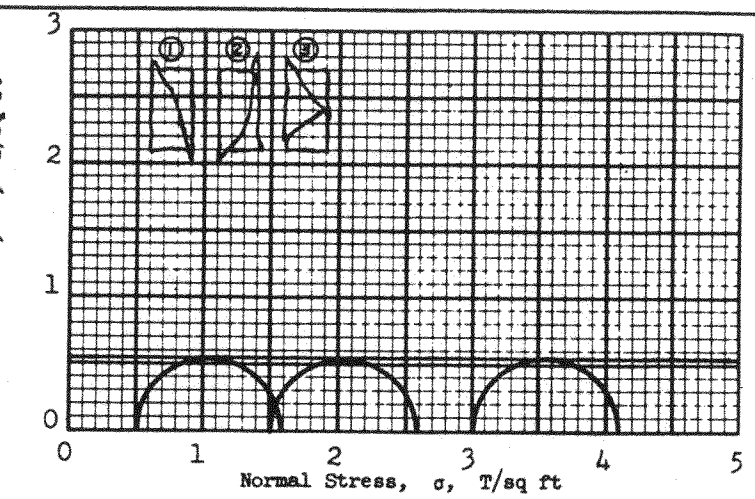
Area

Boring No. 4-UL | Sample No. 18-A

Depth ~~El~~ 68.4 | Date 1 AUGUST 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	38.8 %	39.2%	39.5%	%
	Void ratio	e_o	1.07	1.09	1.09	
	Saturation	S_o	99.4 %	98.5%	99.3%	%
	Dry density, lb/cu ft	γ_d	82.6	81.7	81.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.07	1.07	1.10	
Time to failure, min		t_f	13	12	11	
Rate of strain, percent/min			0.19	0.20	0.31	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.41	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.54 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), light bluish gray

LL 77 | PL 26 | PI 51 | | G_s 2.74

Remarks All specimens sheared in slickenside

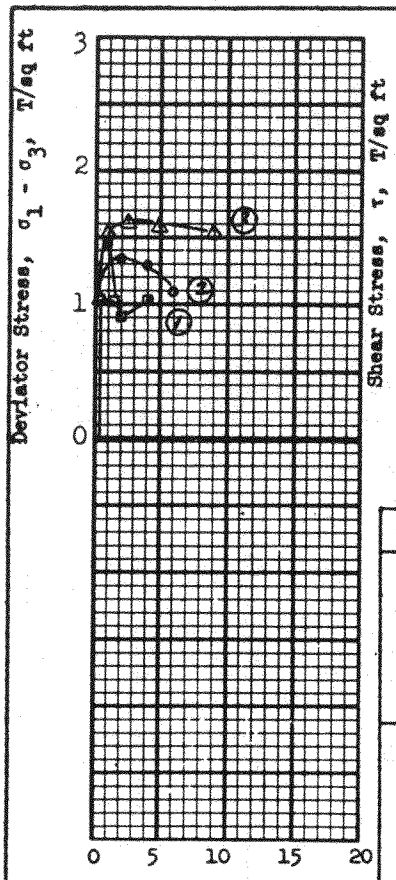
Project MISS. RIVER - GULF OUTLET
NEW SHIP LOCK - GDM

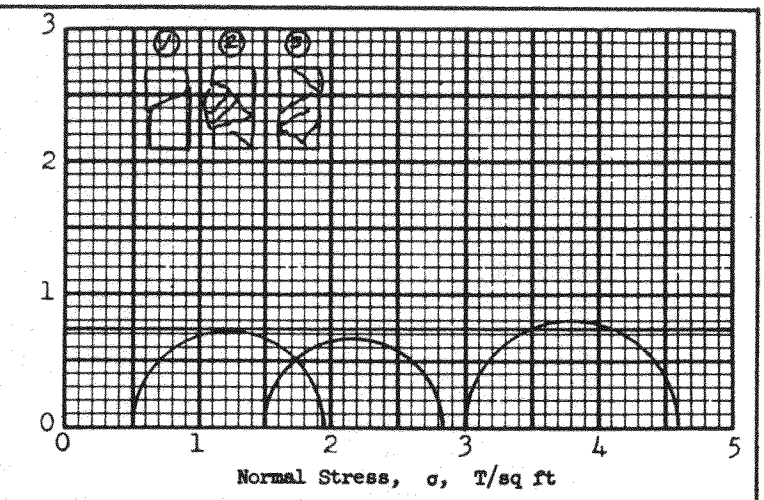
Area

Boring No. 4-UL | Sample No. 20-C

Depth ~~ft~~ 78.1 | Date 1 AUG. 1968

FAM TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	49.3 %	49.4 %	49.3 %	%
	Void ratio	e_o	1.34	1.35	1.35	
	Saturation	S_o	100+ %	99.9 %	99.7 %	%
	Dry density, lb/cu ft	γ_d	72.9	72.5	72.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.47	1.34	1.61	
Time to failure, min		t_f	15	33	42	
Rate of strain, percent/min			0.06	0.06	0.06	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.38	1.38	1.38	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.74 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), light gray and brown

LL 100 | PL 24 | PI 76 | G_s 2.73

Remarks _____

Project MISS. RIVER - GULF OUTLET

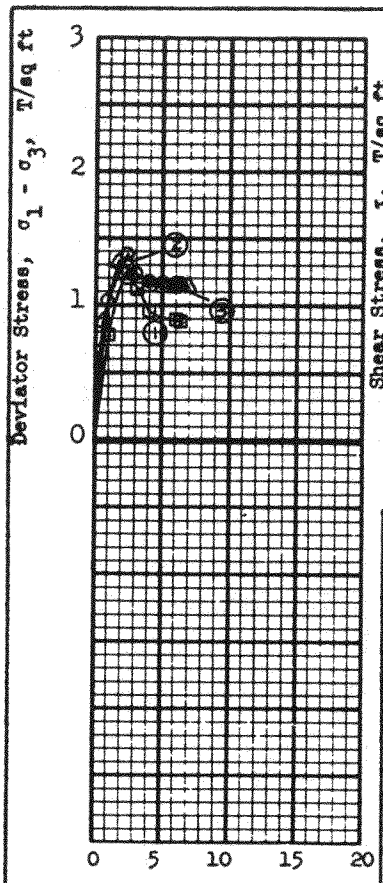
NEW SHIP LOCK - GBM

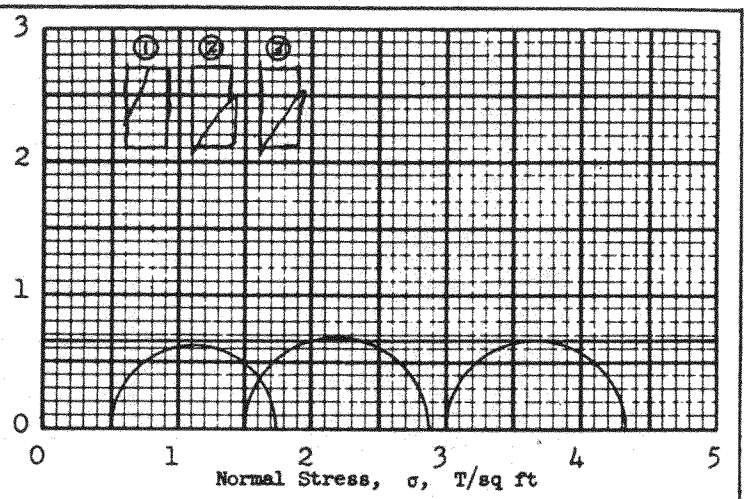
Area

Boring No. 4-UL | Sample No. 21-C

Depth Ft 81.8 | Date 1 AUGUST 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	39.5 %	39.6%	39.7%	%
	Void ratio	e_o	1.09	1.11	1.10	
	Saturation	S_o	99.3 %	97.8 %	98.9 %	%
	Dry density, lb/cu ft	γ_d	82.0	81.1	81.4	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.23	1.38	1.32	
Time to failure, min		t_f	14	38	20	
Rate of strain, percent/min			0.16	0.06	0.09	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.39	1.38	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.66 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), grav, contains seams of silty sand

LL 57 | PL 21 | PI 36 | G_s 2.74

Remarks _____

Project MISS. RIVER - GULF OUTLET

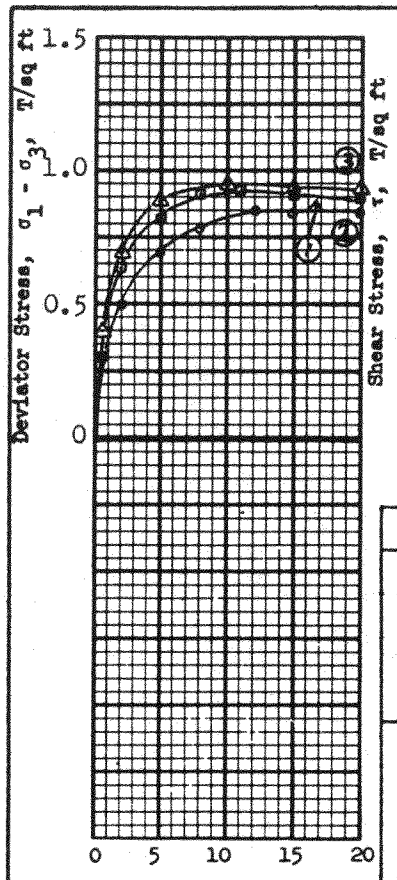
NEW SHIP LOCK - GDM

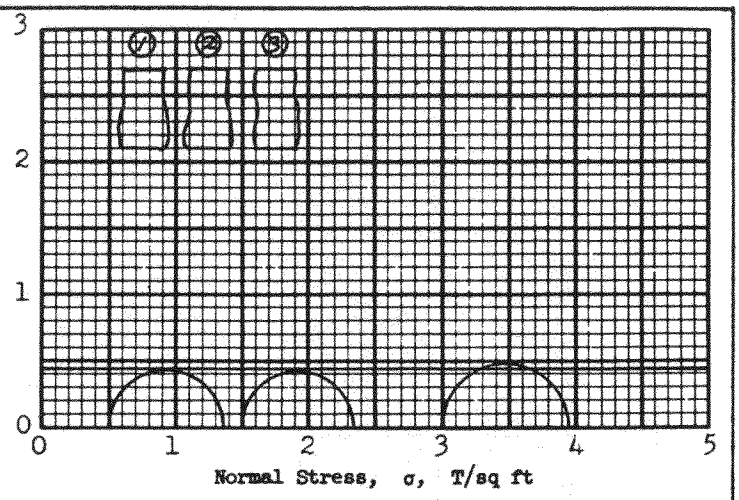
Area

Boring No. 4-UL | Sample No. 23-B_2

Depth ~~El~~ 89.4 | Date 2 AUG. 1968

GDA TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	36.0 %	36.9 %	34.8 %	%
	Void ratio	e_o	0.973	0.977	0.959	
	Saturation	S_o	100+ %	100+ %	99.1 %	%
	Dry density, lb/cu ft	γ_d	86.4	86.2	87.0	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.87	0.85	0.94	
Time to failure, min		t_f	122	50	43	
Rate of strain, percent/min			0.09	0.24	0.23	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.44 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY (CH), gray, homogeneous				
LL 54	PL 18	PI 36		G_s 2.73

Remarks _____

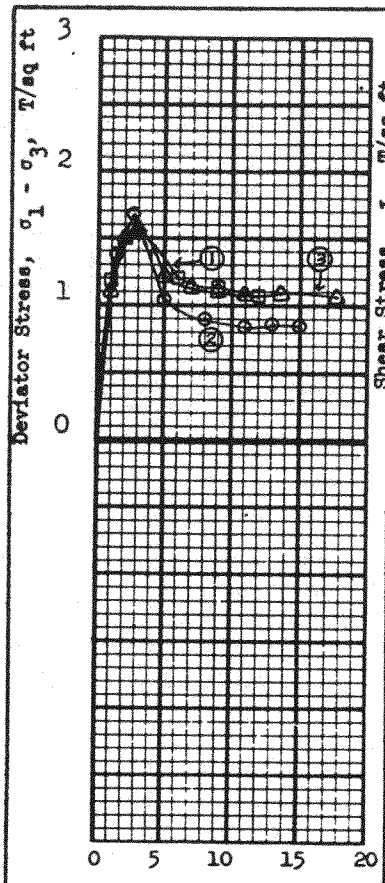
Project MISS. RIVER - GULF OUTLET
NEW SHIP LOCK - GDM

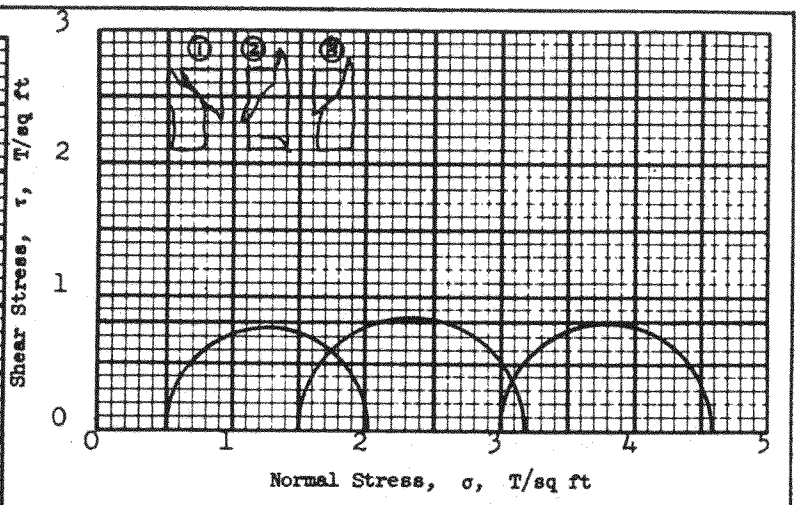
Area

Boring No. 4-UL | Sample No. 26-D

Depth ~~ft~~ 102.8 | Date 2 AUGUST 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.80 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Test No.			1	2	3	
Initial	Water content	w_o	43.2 %	43.8 %	45.6 %	%
	Void ratio	e_o	1.20	1.21	1.25	
	Saturation	S_o	98.3 %	98.8 %	99.6 %	%
	Dry density, lb/cu ft	γ_d	77.4	77.0	75.8	
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.54	1.68	1.58	
Time to failure, min		t_f	39	10	14	
Rate of strain, percent/min			0.07	0.26	0.20	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$			•	
Initial diameter, in.		D_o	1.40	1.37	1.37	
Initial height, in.		H_o	3.00	3.00	3.00	

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains silt lenses approx. 1/8" *

LL 67 | PL 22 | PI 45 | G_s 2.73

Remarks * thick

All specimens failed in slickenside

Project MISS. RIVER - GULF OUTLET

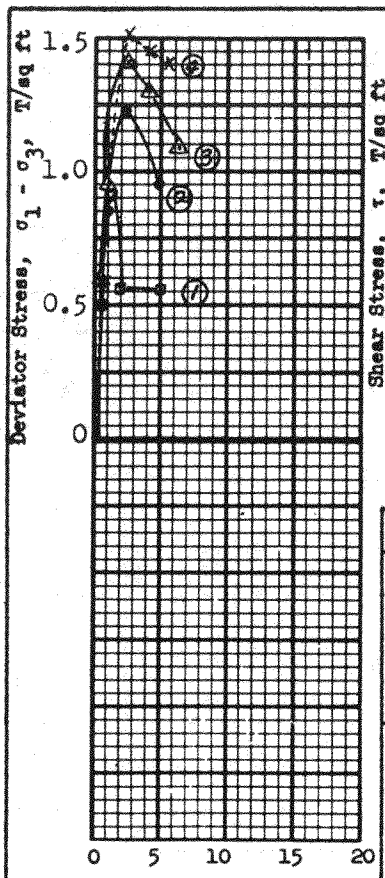
NEW SHIPLOCK - GDM

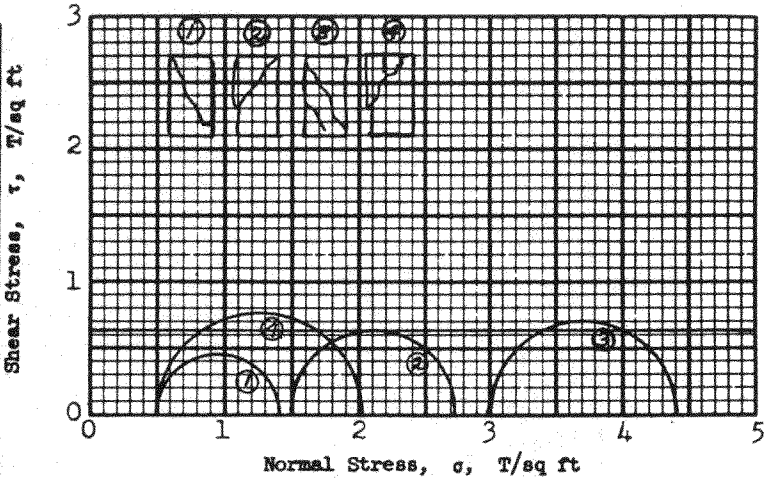
Area

Boring No. 4-UL | Sample No. 29-B

Depth ~~El~~ 113.1 | Date 2 AUG. 1968

FAM TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	4
Initial	Water content	w_o	44.8 %	44.0 %	43.5 %	44.3 %
	Void ratio	e_o	1.21	1.19	1.19	1.22
	Saturation	S_o	100+ %	100+ %	99.8 %	99.1 %
	Dry density, lb/cu ft	γ_d	77.2	77.9	77.9	76.8
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	0.5
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.91	1.23	1.41	1.52
Time to failure, min		t_f	13	44	50	29
Rate of strain, percent/min			0.10	0.05	0.05	0.08
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	1.41
Initial height, in.		H_o	3.00	3.00	3.00	3.00

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.63 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains silt seams, fissured

LL 65 | PL 22 | PI 43 | G_s 2.73

Remarks Specimen 1 failed in fissured area

Project MISS.RIVER - GULF OUTLET

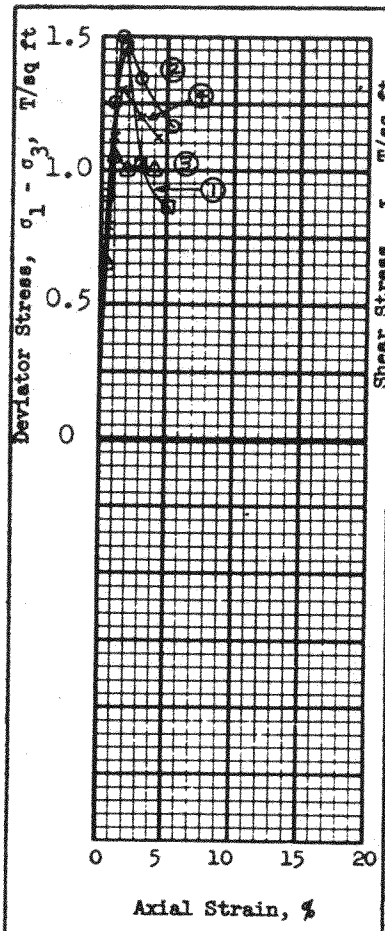
NEW SHIP LOCK - GEM

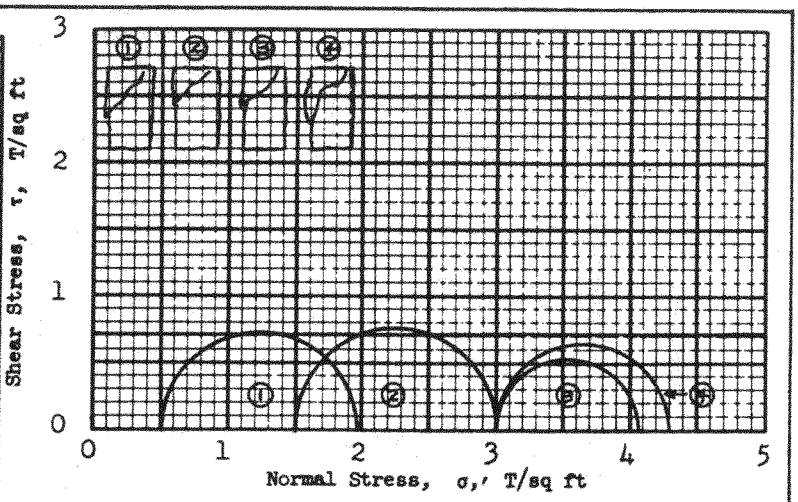
Area

Boring No. 4-UL | Sample No. 33-C

Depth 129.8 | Date 5 AUGUST 1968

EAK TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	4
Initial	Water content	w_o	46.2 %	45.0 %	45.2 %	45.1 %
	Void ratio	e_o	1.26	1.24	1.24	1.24
	Saturation	S_o	100+ %	99.1 %	99.5 %	99.3 %
	Dry density, lb/cu ft	γ_d	75.5	76.2	76.0	76.2
Before Shear	Water content	w_c	%	%	%	%
	Void ratio	e_c				
	Saturation	S_c	%	%	%	%
	Final back pressure, T/sq ft	u_o				
Final	Water content	w_f	%	%	%	%
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	0.5	1.5	3.0	3.0
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	1.46	1.50	1.05	1.30
Time to failure, min		t_f	17	12	33	80
Rate of strain, percent/min			0.11	0.14	0.03	0.02
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.40	1.40	1.41
Initial height, in.		H_o	3.00	3.00	3.00	3.00

Shear Strength Parameters

ϕ = 0 °

tan ϕ = 0

c = 0.71 T/sq ft

Method of saturation _____

☐ Controlled stress

☒ Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains a 1/8" silty sand layer

LL 71 | PL 24 | PI 47 | | G_s 2.73

Remarks _____

Project MISS. RIVER - GULF OUTLET

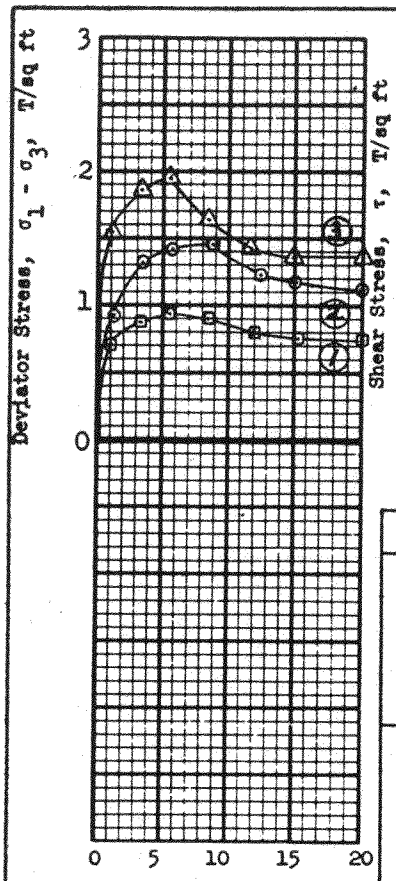
NEW SHIP LOCK

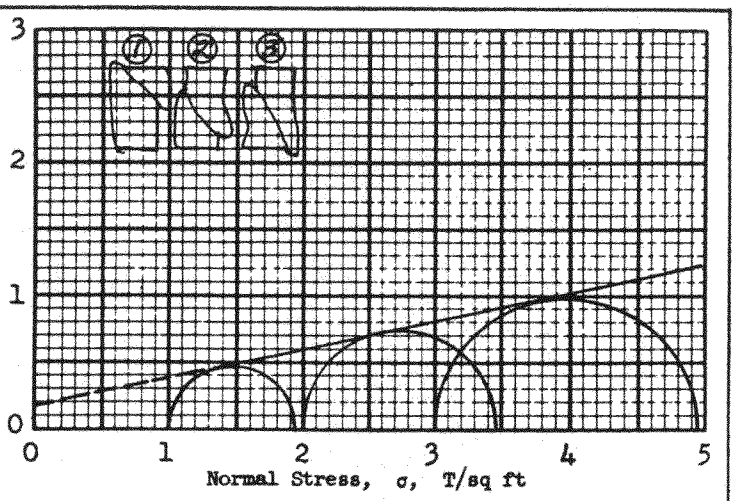
Area

Boring No. 4-UL | Sample No. 36-C

Depth ~~El~~ 142.1 | Date 2 AUG. 1968

JMS TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	97.7 %	92.0 %	87.8 %	%
	Void ratio	e_o	2.57	2.42	2.30	
	Saturation	S_o	99.2 %	99.2 %	99.6 %	%
	Dry density, lb/cu ft	γ_d	45.6	47.7	49.3	
Before Shear	Water content	w_c	84.7 %	69.3 %	62.9 %	%
	Void ratio	e_c	1.59	1.19	1.47	
	Saturation	S_c	100+ %	100+ %	100+ %	%
	Final back pressure, PSI	u_o	50	50	50	
	Dry density lb/cu ft	γ_d	62.9	74.4	66.0	
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	1.0	2.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.94	1.46	1.95	
Time to failure, min		t_f	110	178	110	
Rate of strain, percent/min			0.05	0.05	0.05	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.40	1.39	1.40	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 12 °

tan ϕ = 0.213

c = 0.18 T/sq ft

Method of saturation Back Pressure

☐ Controlled stress

☒ Controlled strain

Type of test R | Type of specimen UNDISTURBED

Classification PLASTIC CLAY (CH), gray, contains organic matter

LL - | PL - | PI - | | G_s 2.61 from Q

Remarks

Project MISS. RIVER - GULF OUTLET

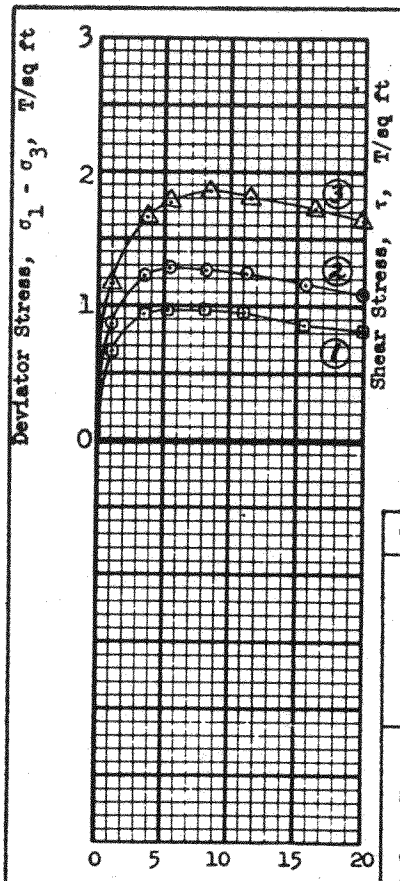
NEW SHIP LOCK - GDM

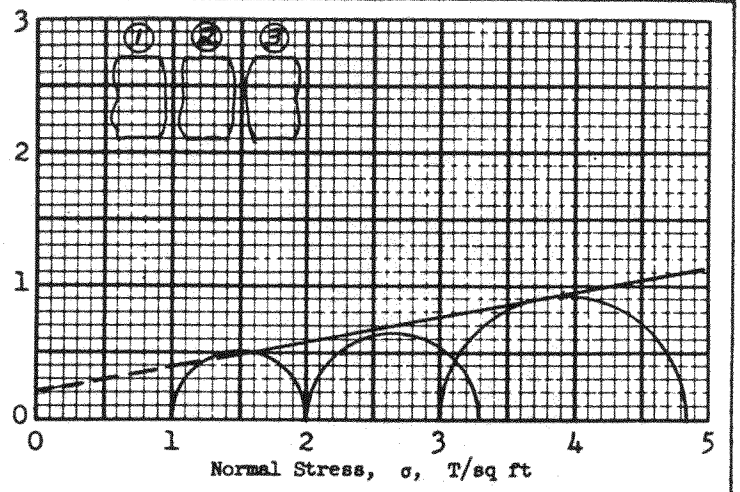
Area

Boring No. 4-UL | Sample No. 6-D

Depth 23.1 | Date 7 July 1968

JL TRIAXIAL COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	62.0 %	62.3 %	62.4 %	%
	Void ratio	e_o	1.68	1.68	1.67	
	Saturation	S_o	100 %	100+ %	100+ %	%
	Dry density, lb/cu ft	γ_d	63.0	63.2	63.3	
Before Shear	Water content	w_c	60.1 %	55.3 %	51.2 %	%
	Void ratio	e_c	1.57	1.41	1.19	
	Saturation	S_c	100+ %	100+ %	100+ %	%
	Final back pressure, PSI	u_o	50	50	50	
	Dry density lb/cu ft	γ_d	65.9	70.3	77.2	
	Void ratio	e_f				
Minor principal stress, T/sq ft		σ_3	1.0	2.0	3.0	
Max deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{max}$	0.99	1.29	1.84	
Time to failure, min		t_f	73	65	106	
Rate of strain, percent/min			0.07	0.08	0.08	
Ult deviator stress, T/sq ft		$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.		D_o	1.39	1.39	1.39	
Initial height, in.		H_o	3.00	3.00	3.00	

Shear Strength Parameters

ϕ = 10 °

tan ϕ = 0.176

c = 0.22 T/sq ft

Method of saturation Back Pressure

☐ Controlled stress

☒ Controlled strain

Type of test R	Type of specimen UNDISTURBED			
Classification PLASTIC CLAY (CH), gray, homogeneous				
LL 86	PL 29	PI 57		G_s 2.71

Remarks

Project MISS. RIVER - GULF OUTLET

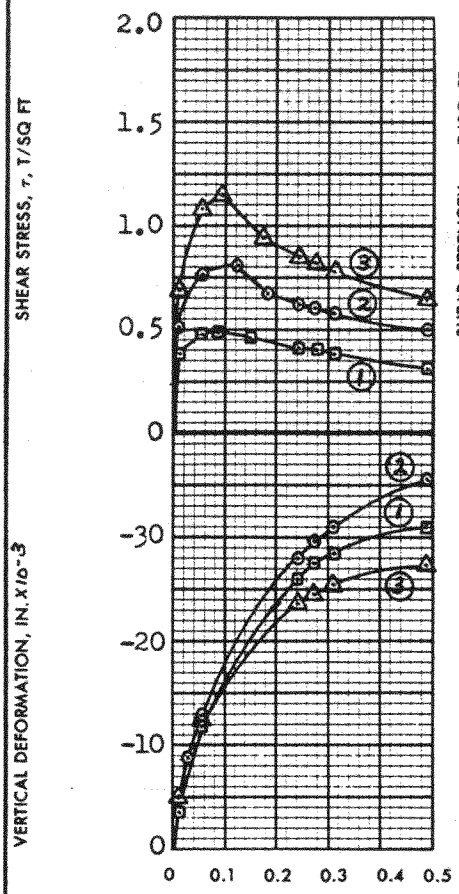
NEW SHIP LOCK - GDM

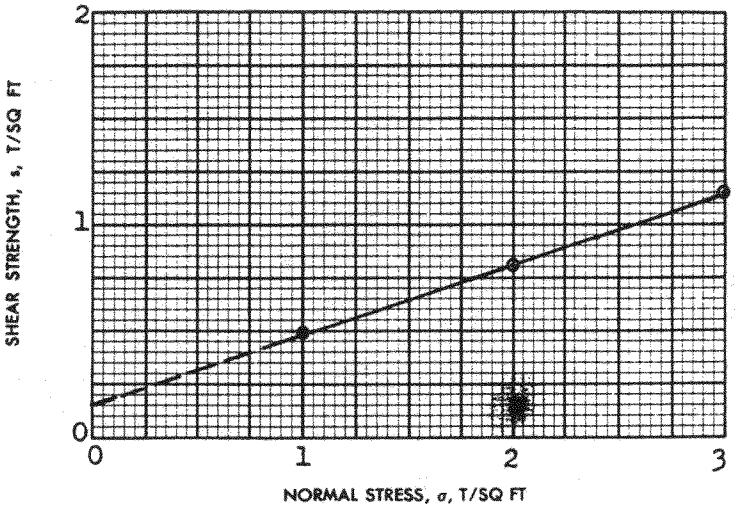
Area

Boring No. 4-UL | Sample No. 12-A

Depth 44.3 | Date 12 August 1968

JL TRIAXIAL COMPRESSION TEST REPORT





SHEAR STRENGTH PARAMETERS

$\phi' =$ 18°

TAN $\phi' =$ 0.325

$c' =$ 0.16 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	52.0 %	53.8 %	48.9 %	%
	VOID RATIO	e_o	1.46	1.49	1.41	
	SATURATION	S_o	96.5 %	97.8 %	94.0 %	%
	DRY DENSITY, LB/CU FT	γ_d	68.9	68.0	70.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	1	2	3	
FINAL	WATER CONTENT	w_f	49.7 %	46.3 %	43.5 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.49	0.81	1.15	
ACTUAL TIME TO FAILURE, MIN		t_f	480	690	540	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, contains a trace of organic matter, *

LL 103 | PL 27 | PI 76 | G. 2.71

REMARKS * fissured, slickensided

PROJECT MISS. RIVER - GULF OUTLET

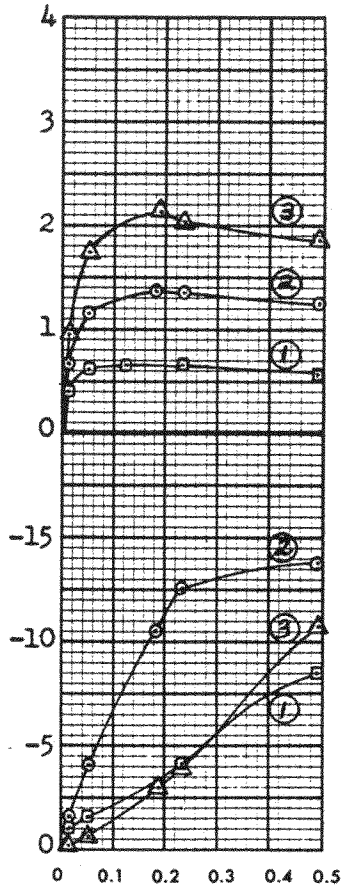
NEW SHIP LOCK - GDM

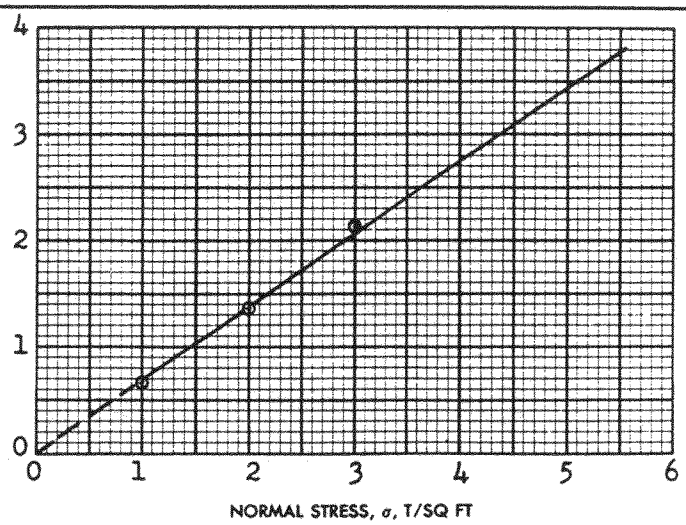
AREA

BORING NO. 4-UL | SAMPLE NO. 5-C

DEPTH 18.2 | DATE 18 July 1968

JHMc **DIRECT SHEAR TEST REPORT**





SHEAR STRENGTH PARAMETERS

$\phi' =$ 35°

TAN $\phi' =$ 0.700

$c' =$ 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	33.4%	33.2%	30.6%	%
	VOID RATIO	e_o	0.855	0.853	0.817	
	SATURATION	S_o	100+%	100+%	99.6%	%
	DRY DENSITY, LB/CU FT	γ_d	89.5	89.6	91.4	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	30.6%	28.7%	27.8%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.66	1.37	2.13	
ACTUAL TIME TO FAILURE, MIN		t_f	750	1050	1080	
RATE OF STRAIN, IN./MIN			.00019	.00019	.00019	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION SANDY SILT (ML), gray, contains a trace of organic matter

LL — PL — PI — G. 2.66

REMARKS

PROJECT MISS. RIVER - GULF OUTLET

NEW SHIP LOCK - GDM

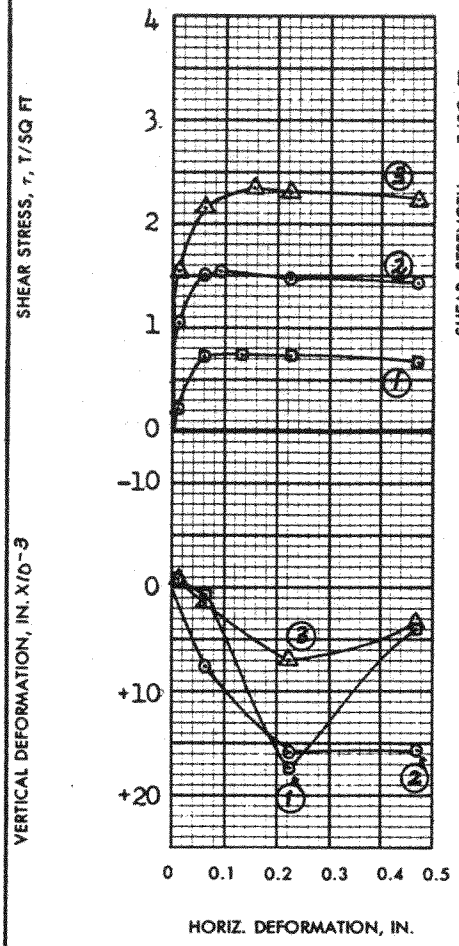
AREA

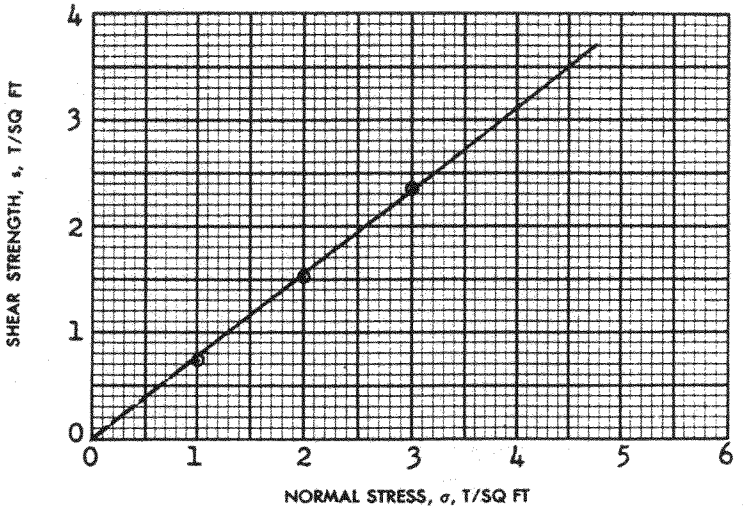
BORING NO. 4-UL — SAMPLE NO. 8-B

DEPTH 29.2 — DATE 18 July 1968

WJH **DIRECT SHEAR TEST REPORT**

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTION





SHEAR STRENGTH PARAMETERS

$\phi' =$ 38°

TAN $\phi' =$ 0.781

$c' =$ 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	22.1 %	22.7 %	21.9 %	%
	VOID RATIO	e_o	0.676	0.674	0.679	
	SATURATION	S_o	87.0 %	89.6 %	85.8 %	%
	DRY DENSITY, LB/CU FT	γ_d	99.1	99.2	98.9	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	22.4 %	21.4 %	21.1 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.73	1.53	2.35	
ACTUAL TIME TO FAILURE, MIN		t_f	840	600	960	
RATE OF STRAIN, IN./MIN			.00017	.00017	.00017	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.562 IN. THICK

CLASSIFICATION SAND (SP), gray, contains a few small pieces of shell

LL ——— PL ——— PI ——— G. 2.66

REMARKS

PROJECT MISS. RIVER-GULF OUTLET

NEW SHIP LOCK - GDM

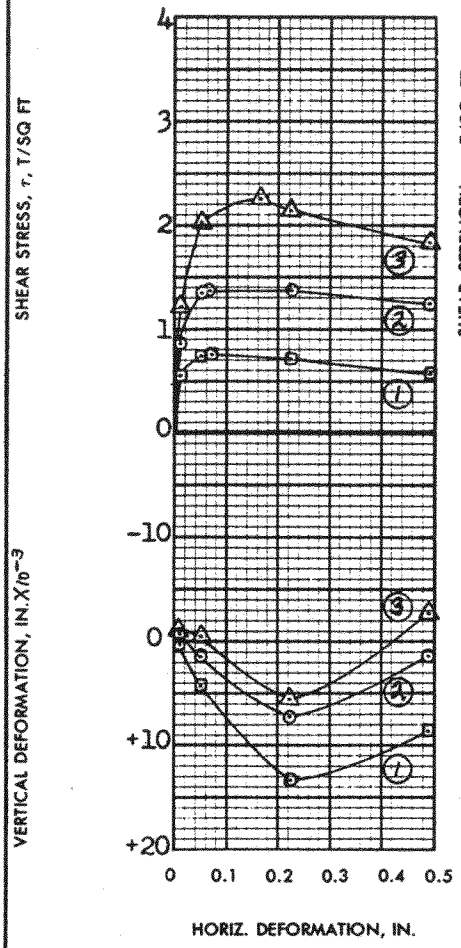
AREA

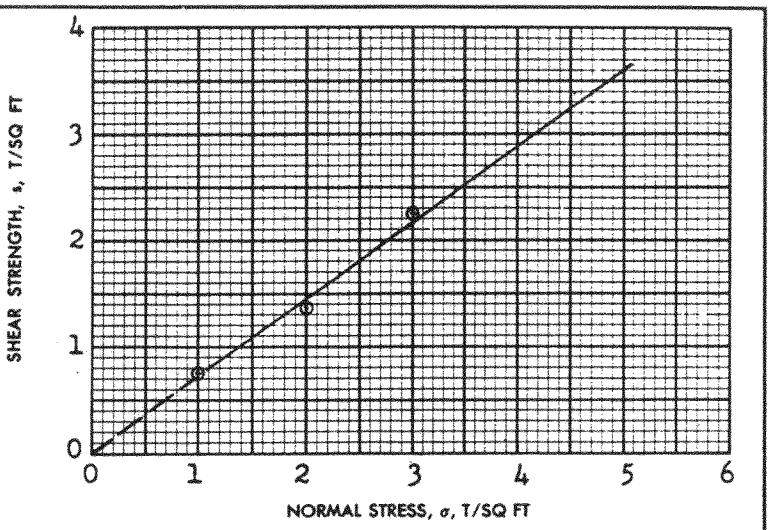
BORING NO. 4-UL SAMPLE NO. 17-B

DEPTH 64.8 DATE 19 July 1968

GDA **DIRECT SHEAR TEST REPORT**

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTION





SHEAR STRENGTH PARAMETERS

$\phi' =$ 36°

TAN $\phi' =$ 0.726

$c' =$ 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	20.9%	21.1%	21.4%	%
	VOID RATIO	e_o	0.594	0.589	0.600	
	SATURATION	S_o	93.6%	95.3%	94.9%	%
	DRY DENSITY, LB/CU FT	γ_d	104.2	104.5	103.8	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	22.7%	22.5%	23.0%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.75	1.38	2.26	
ACTUAL TIME TO FAILURE, MIN		t_f	480	450	1020	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.551 IN. THICK
CLASSIFICATION	SILTY SAND (SM), gray		
LL —	PL —	PI —	G_s 2.66

REMARKS

PROJECT MISS. RIVER - GULF OUTLET

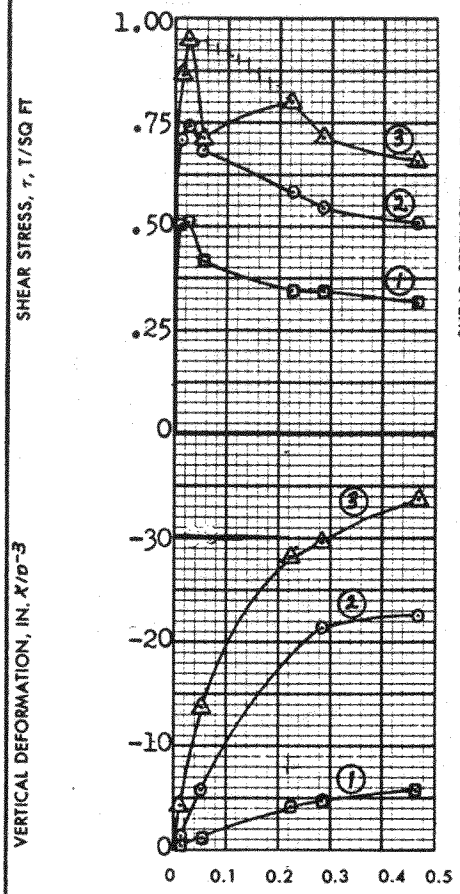
NEW SHIP LOCK - GDM

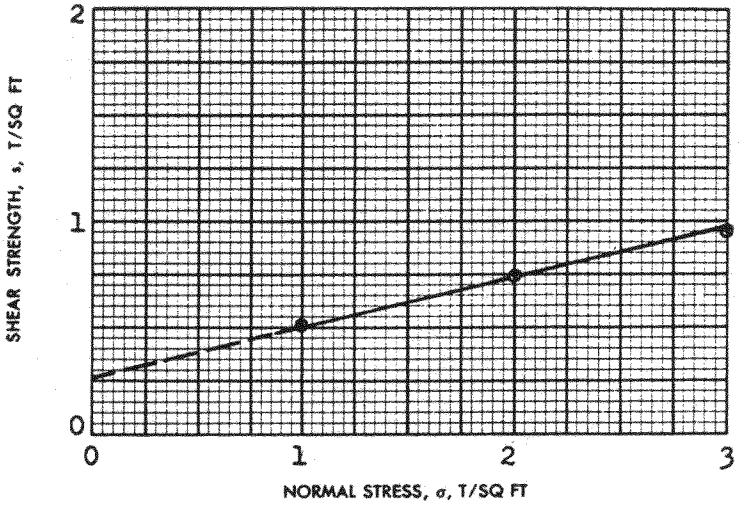
AREA

BORING NO. 4-UL SAMPLE NO. 19-A

DEPTH ~~ft~~ 72.3 DATE 19 July 1968

WJH **DIRECT SHEAR TEST REPORT**





SHEAR STRENGTH PARAMETERS

$\phi' =$ 14°

TAN $\phi' =$ 0.249

$c' =$ 0.27 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	45.4%	45.4%	46.7%	%
	VOID RATIO	e_o	1.31	1.27	1.29	
	SATURATION	S_o	94.6%	97.6%	98.8%	%
	DRY DENSITY, LB/CU FT	γ_d	73.8	75.1	74.4	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	53.3%	46.9%	47.1%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.51	0.74	0.95	
ACTUAL TIME TO FAILURE, MIN		t_f	180	210	180	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.562 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, fissured

LL - | PL - | PI - | | G. 2.73 from Q

REMARKS

PROJECT Miss. RIVER - GULF OUTLET

NEW SHIP LOCK - GDM

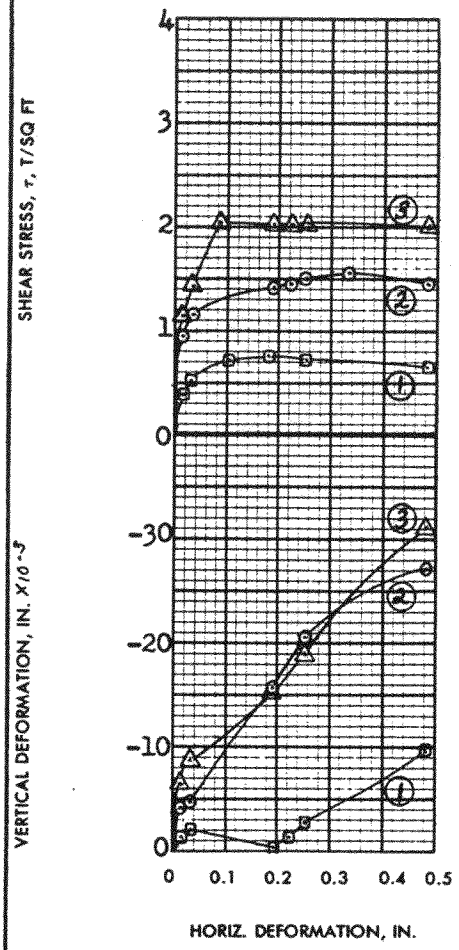
AREA

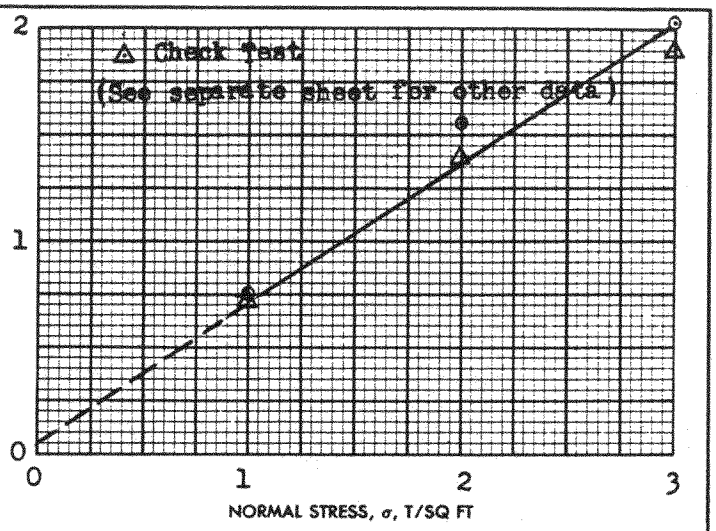
BORING NO. 4-UL | SAMPLE NO. 21-C

DEPTH 81.8 | DATE 18 July 1968

BWG **DIRECT SHEAR TEST REPORT**

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST PLATE 0435





SHEAR STRENGTH PARAMETERS

$\phi' =$ 34°

TAN $\phi' =$ 0.674

$c' =$ 0.05 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	24.2 %	24.2 %	24.0%	%
	VOID RATIO	e_o	0.696	0.712	0.679	
	SATURATION	S_o	92.5 %	90.4 %	94.0%	%
	DRY DENSITY, LB/CU FT	γ_d	97.9	97.0	98.9	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	24.2 %	24.9 %	24.3%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.76	1.56	2.04	
ACTUAL TIME TO FAILURE, MIN		t_f	1170	1920	1140	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION SILTY SAND (SM), gray

LL — PL — PI — G_s 2.66

REMARKS

Sheet 1 of 2

PROJECT MISS. RIVER - GULF OUTLET

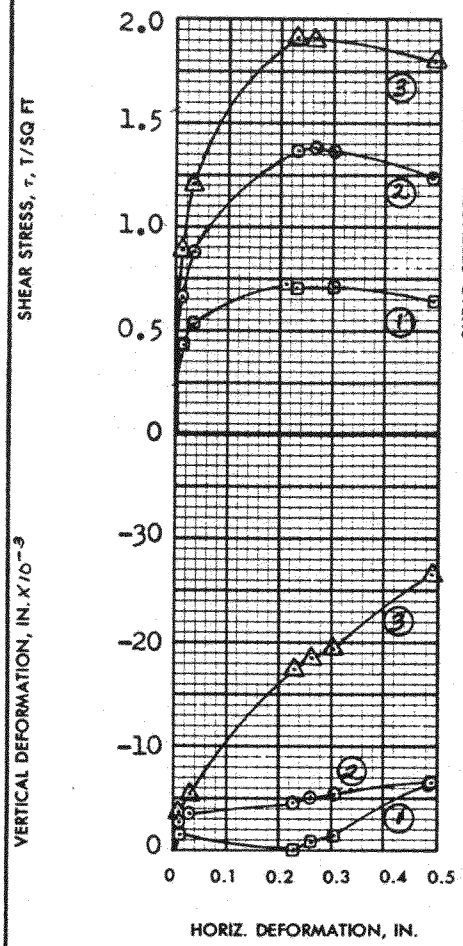
NEW SHIP LOCK - GDM

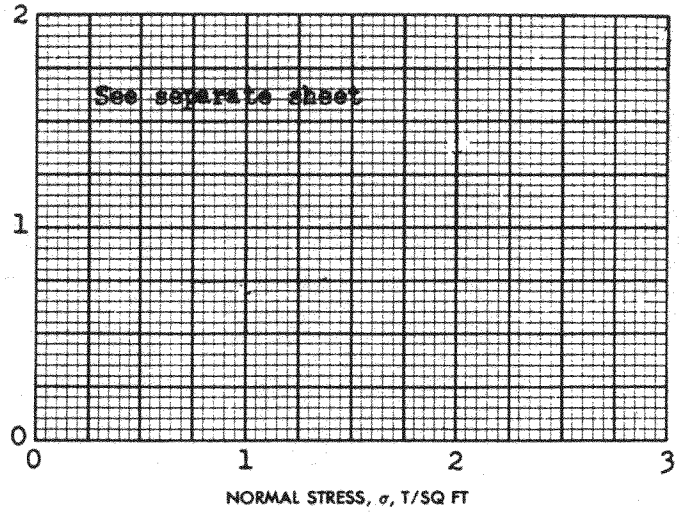
AREA

BORING NO. 4-UL — SAMPLE NO. 24-D

DEPTH 94.6 — DATE 19 July 1968

JHMc **DIRECT SHEAR TEST REPORT**





SHEAR STRENGTH PARAMETERS

ϕ' = _____

TAN ϕ' = _____

c' = _____ T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	25.5 %	25.1 %	25.3 %	%
	VOID RATIO	e_o	0.703	0.696	0.716	
	SATURATION	S_o	96.5 %	95.9 %	94.0 %	%
	DRY DENSITY, LB/CU FT	γ_d	97.5	97.9	96.8	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}				
FINAL	WATER CONTENT	w_f	24.4 %	24.2 %	24.9 %	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.72	1.38	1.91	
ACTUAL TIME TO FAILURE, MIN		t_f	1230	1500	1320	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN	UNDISTURBED	3.00 IN. SQUARE	0.551 IN. THICK
CLASSIFICATION	SILTY SAND (SM), gray		
LL ——	PL ——	PI ——	G_s 2.66

REMARKS Check Test

Sheet 2 of 2

PROJECT MISS. RIVER-GULF OUTLET

NEW SHIP LOCK - GDM

AREA

BORING NO. 4-UL SAMPLE NO. 24-D

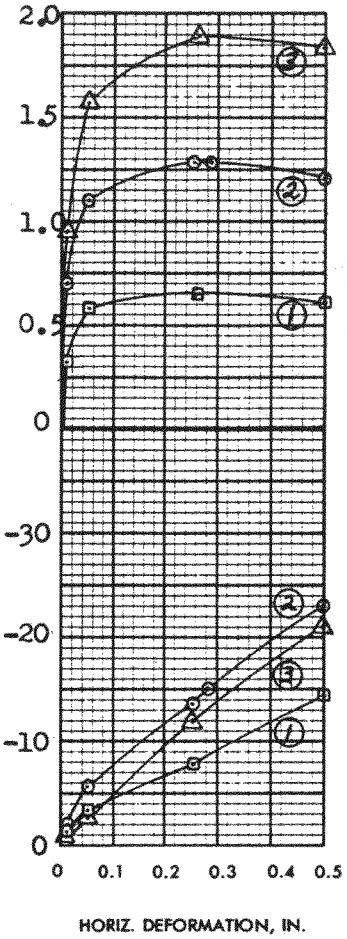
DEPTH 94.6 DATE 31 July 1968

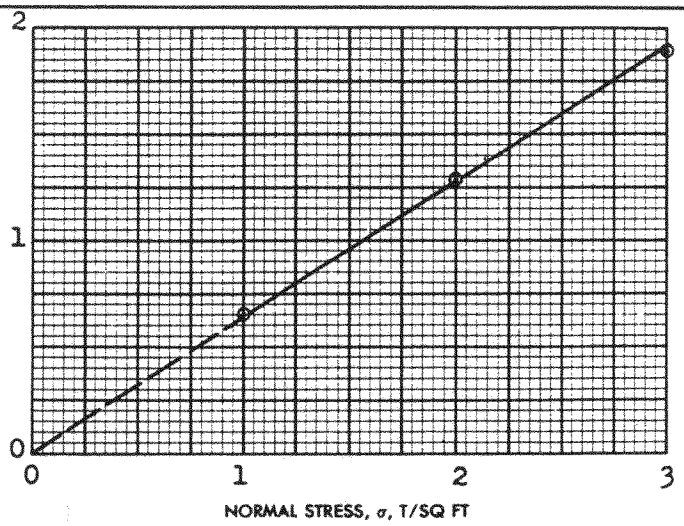
JHMc **DIRECT SHEAR TEST REPORT**

ENG FORM 1 JUN 65 **2092** *(EM 1110-2-1906)* PREVIOUS EDITIONS ARE OBSOLETE *(TRANSLUCENT)* GPO : 1966 OF—214-945

PLATE IX-3

USAEWES SOILS TEST SECT





TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	32.2 %	31.7 %	31.9%	%
	VOID RATIO	e_o	0.879	0.871	0.867	
	SATURATION	S_o	97.8 %	97.2 %	98.2%	%
	DRY DENSITY, LB/CU FT	γ_d	88.7	89.1	89.3	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	30.0 %	29.9 %	27.7%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.65	1.28	1.89	
ACTUAL TIME TO FAILURE, MIN		t_f	1470	1590	1470	
RATE OF STRAIN, IN./MIN			.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

SHEAR STRENGTH PARAMETERS

$\phi' =$ 33°

TAN $\phi' =$ 0.649

$c' =$ 0 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.551 IN. THICK

CLASSIFICATION SILT (ML), dark gray, contains a trace of fine sand & organic matter

LL —— PL —— PI —— G. 2.67

REMARKS

PROJECT MISS. RIVER - GULF OUTLET

NEW SHIP LOCK - GDM

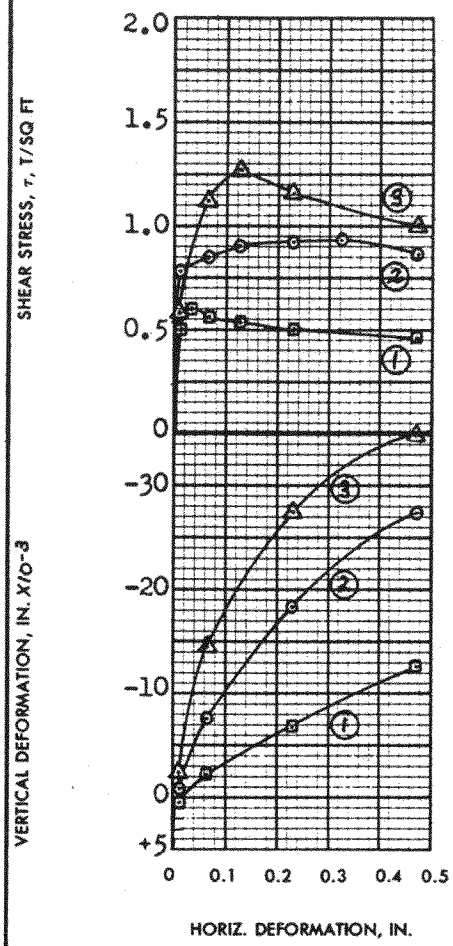
AREA

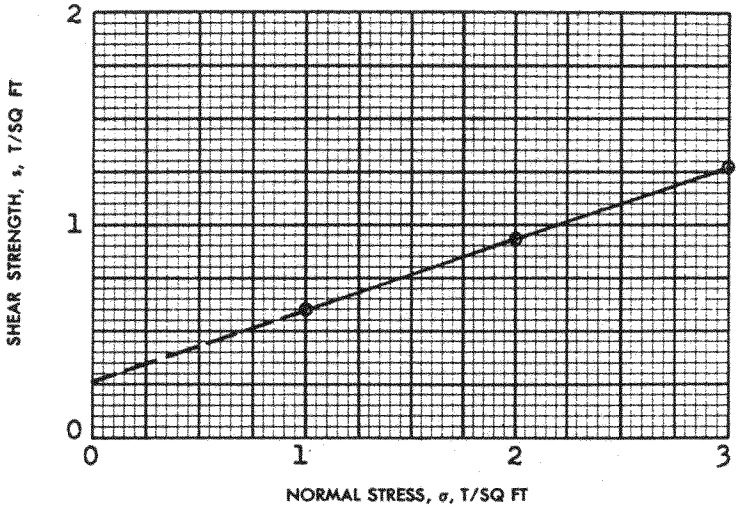
BORING NO. 4-UL SAMPLE NO. 27-B

DEPTH 104.6 DATE 20 July 1968

WJH **DIRECT SHEAR TEST REPORT**

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) USAEWES SOILS TEST SECTION PLATE IX-3





SHEAR STRENGTH PARAMETERS

$\phi' =$ 19°

TAN $\phi' =$ 0.344

$c' =$ 0.26 T/SQ FT

☐ CONTROLLED STRESS

☒ CONTROLLED STRAIN

TEST NO.			1	2	3	
INITIAL	WATER CONTENT	w_o	40.5%	39.5%	37.5%	%
	VOID RATIO	e_o	1.09	1.09	1.03	
	SATURATION	S_o	100+%	98.6%	99.0%	%
	DRY DENSITY, LB/CU FT	γ_d	81.2	81.2	83.8	
VOID RATIO AFTER CONSOLIDATION		e_c				
TIME FOR 50 PERCENT CONSOLIDATION, MIN		t_{50}	<1	<1	<1	
FINAL	WATER CONTENT	w_f	39.0%	38.7%	35.9%	%
	VOID RATIO	e_f				
	SATURATION	S_f	%	%	%	%
NORMAL STRESS, T/SQ FT		σ	1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, T/SQ FT		τ_{max}	0.60	0.93	1.27	
ACTUAL TIME TO FAILURE, MIN		t_f	240	1920	780	
RATE OF STRAIN, IN./MIN			.00017	.00017	.00017	
ULTIMATE SHEAR STRESS, T/SQ FT		τ_{ult}				

TYPE OF SPECIMEN UNDISTURBED — 3.00 IN. SQUARE — 0.562 IN. THICK

CLASSIFICATION PLASTIC CLAY (CH), gray, contains pockets of sand

LL 73 | PL 22 | PI 51 | G. 2.72

REMARKS

PROJECT MISS. RIVER - GULF OUTLET

NEW SHIP LOCK - GDM

AREA

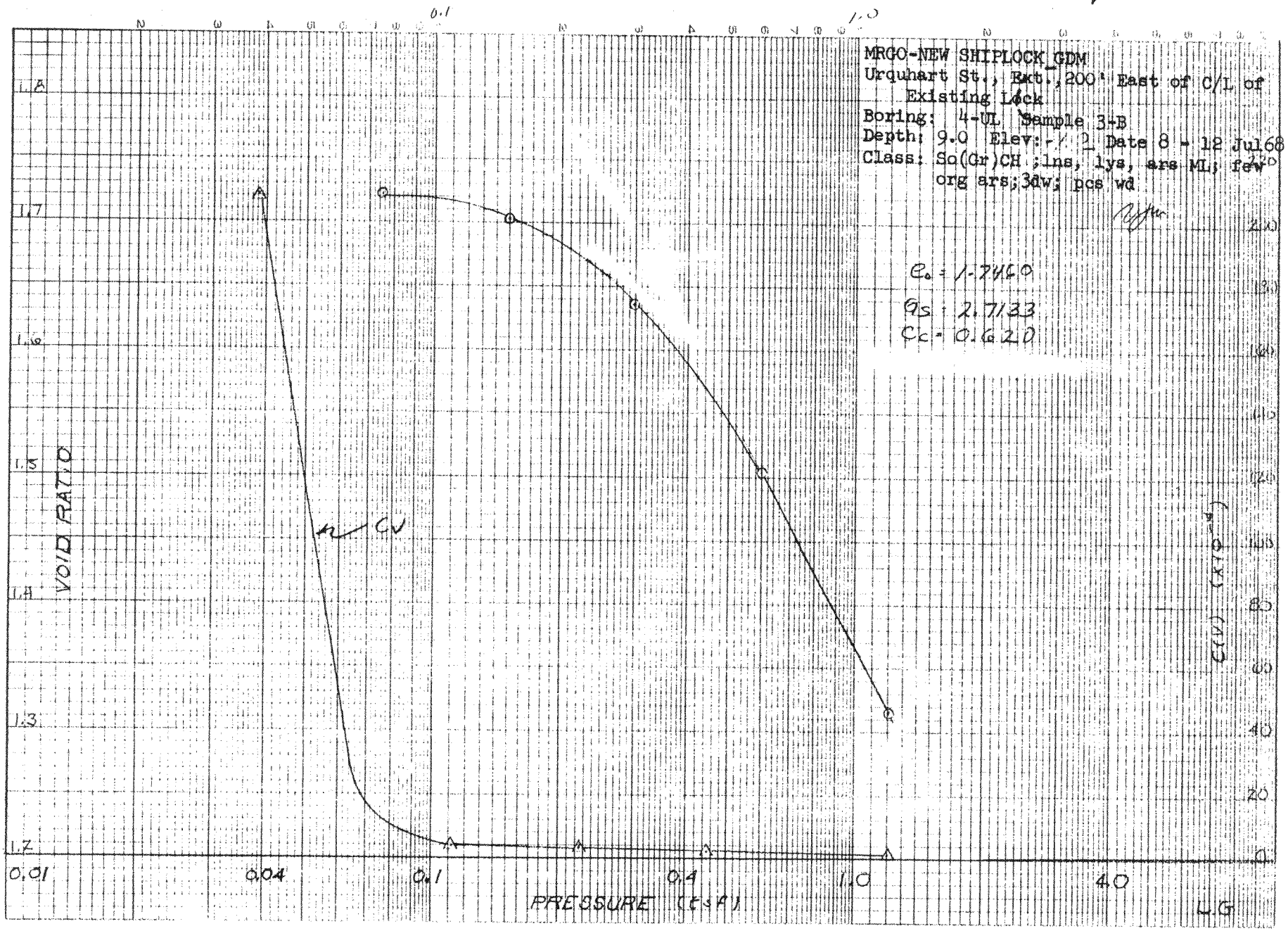
BORING NO. 4-UL | SAMPLE NO. 34-D

DEPTH 134.8 | DATE 22 July 1968

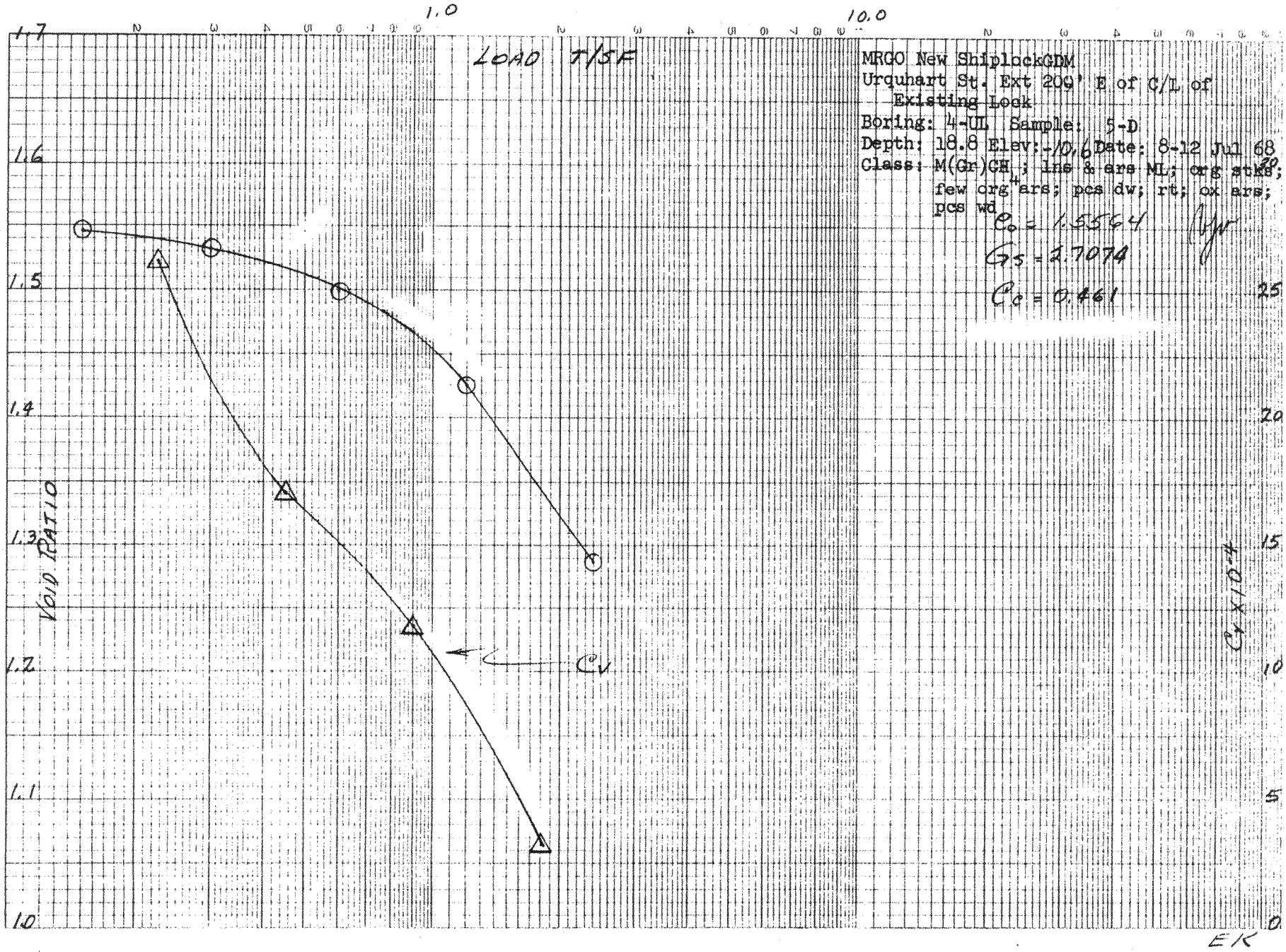
GDA **DIRECT SHEAR TEST REPORT**

ENG FORM 2092 1 JUN 65 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) GPO 1966 O—214-945 PLATE IX-3

USAEWES SOILS TEST SECTIO


MRGO-NEW SHIPLOCK GDM
Urquhart St., Ext., 200' East of C/L of Existing Lock
Boring: 4-UL Sample 3-B
Depth: 9.0 Elev: -1.2 Date 8 - 12 Jul68
Class: So(Gr)CH ;lns, lys, ars ML; few org ars;3dw; pcs wd
e_o = 1.7460
G_s = 2.7133
C_c = 0.620
VOID RATIO
PRESSURE (tsf)
C(V) (x10^-4)
CV
0.01
0.04
0.1
0.4
1.0
4.0
1.8
1.7
1.6
1.5
1.4
1.3
1.2
200
180
160
140
120
100
80
60
40
20
0
L.G

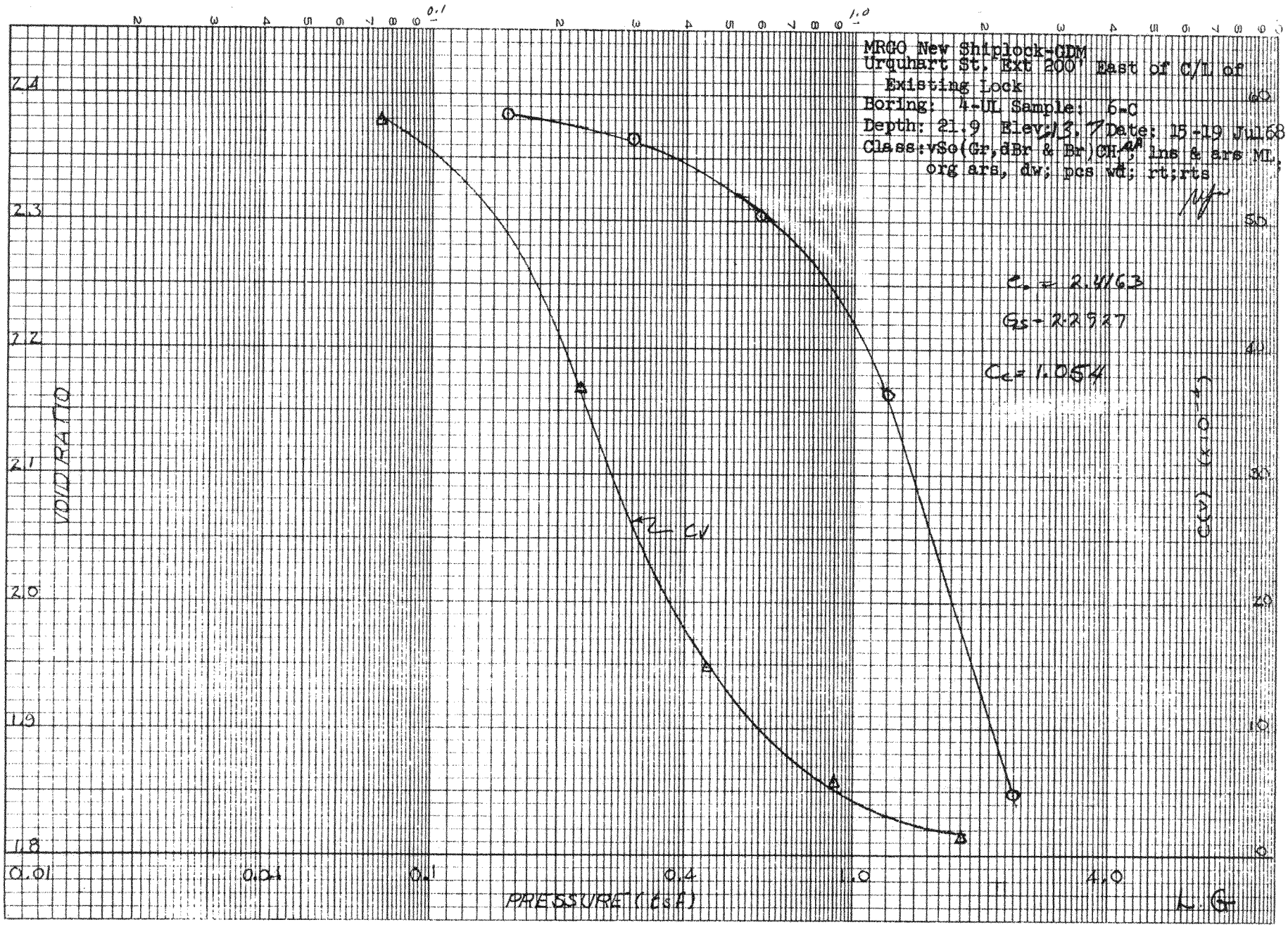
NO. 340-1310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES × 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.



EK

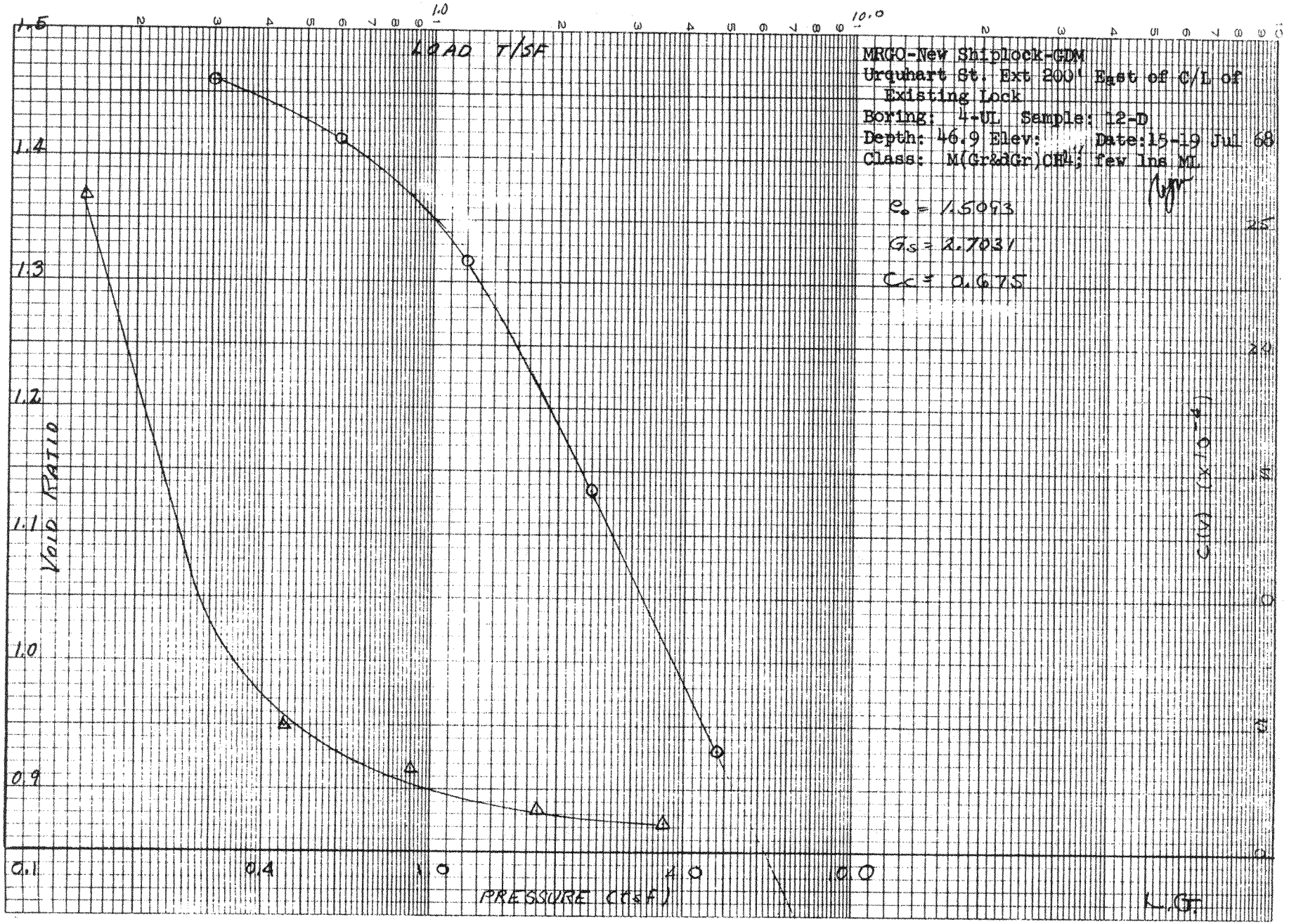
NO. 340-1.310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



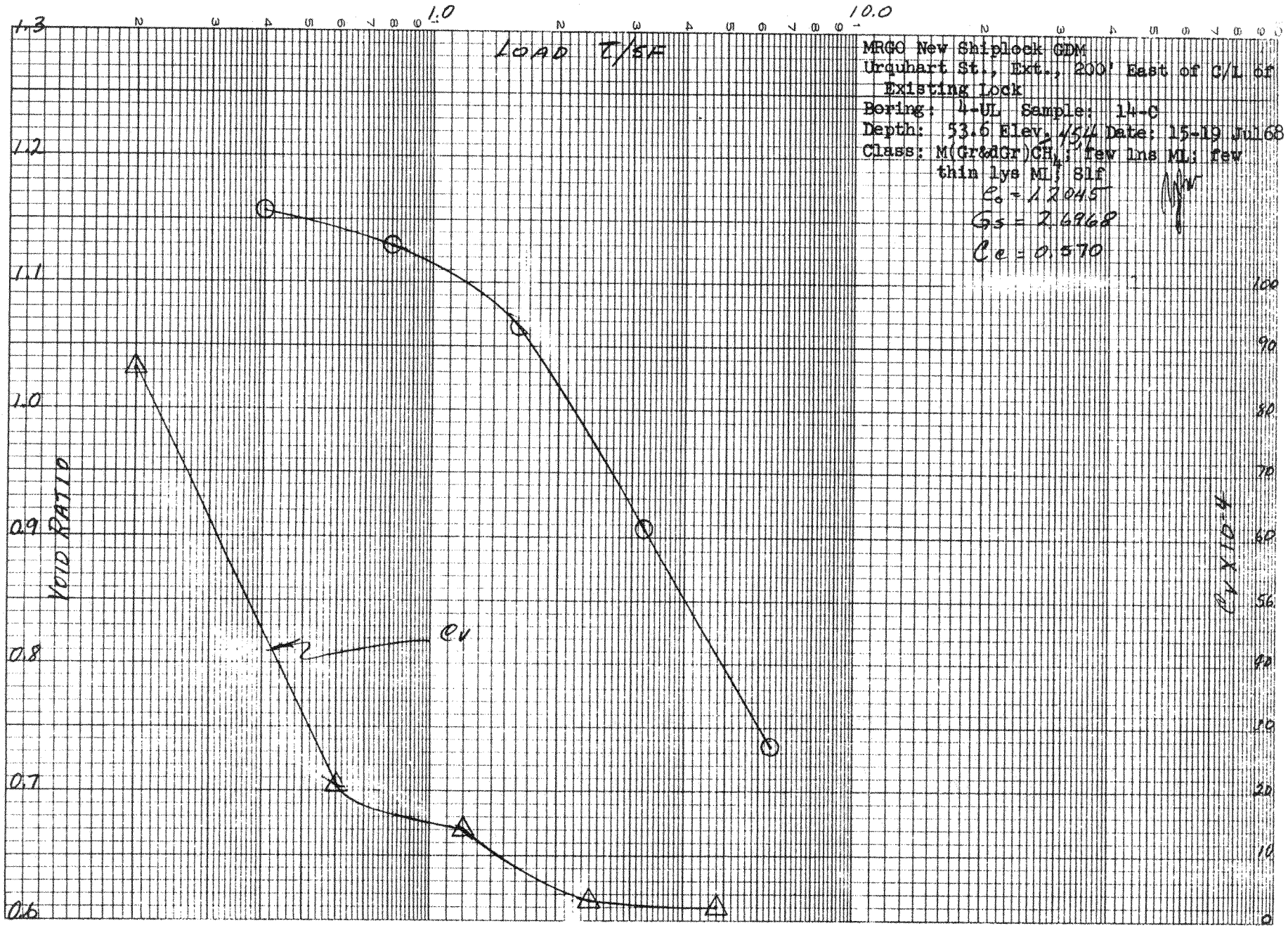
NO. 340-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



NO. 340-L31D DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



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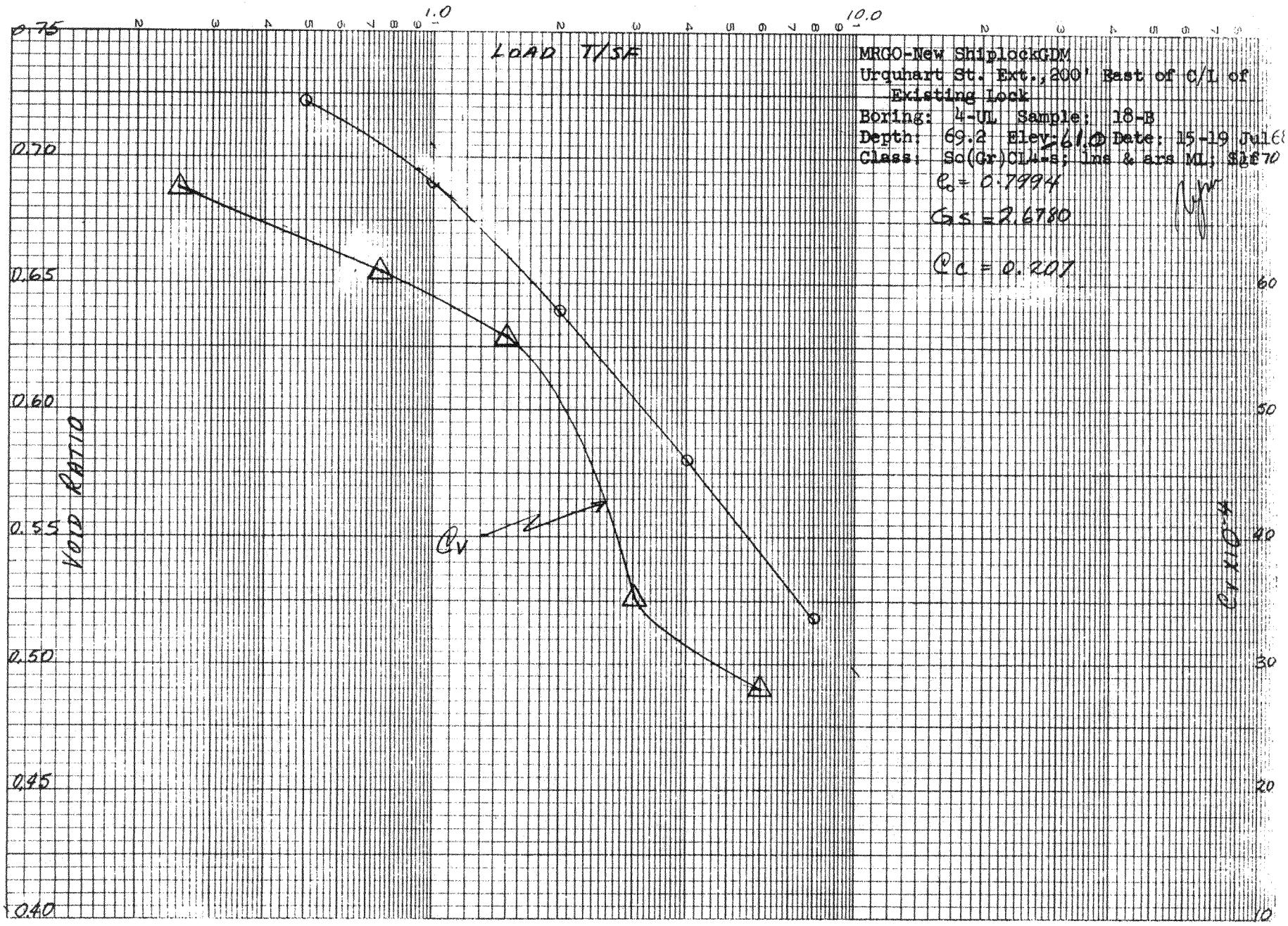

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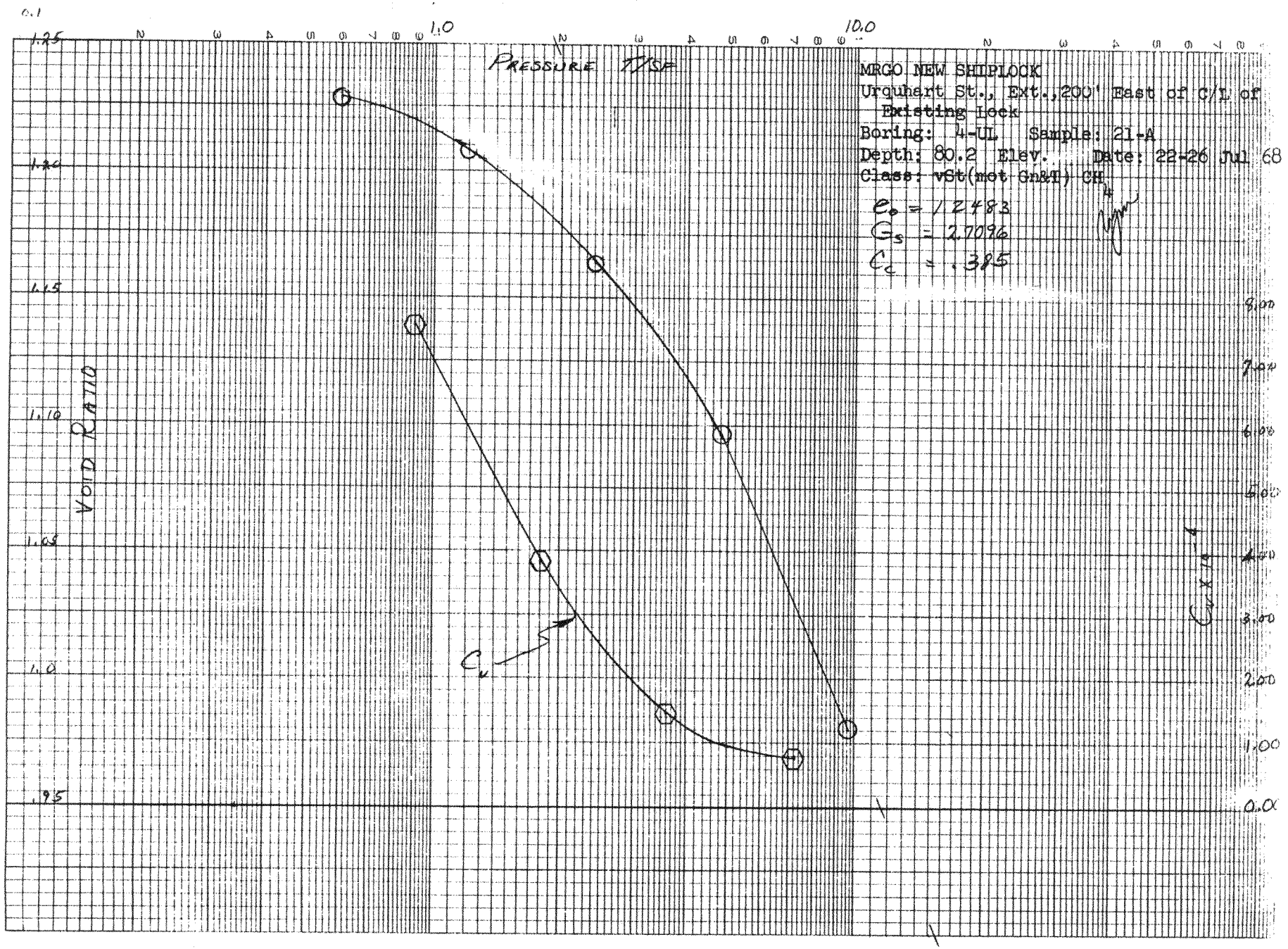
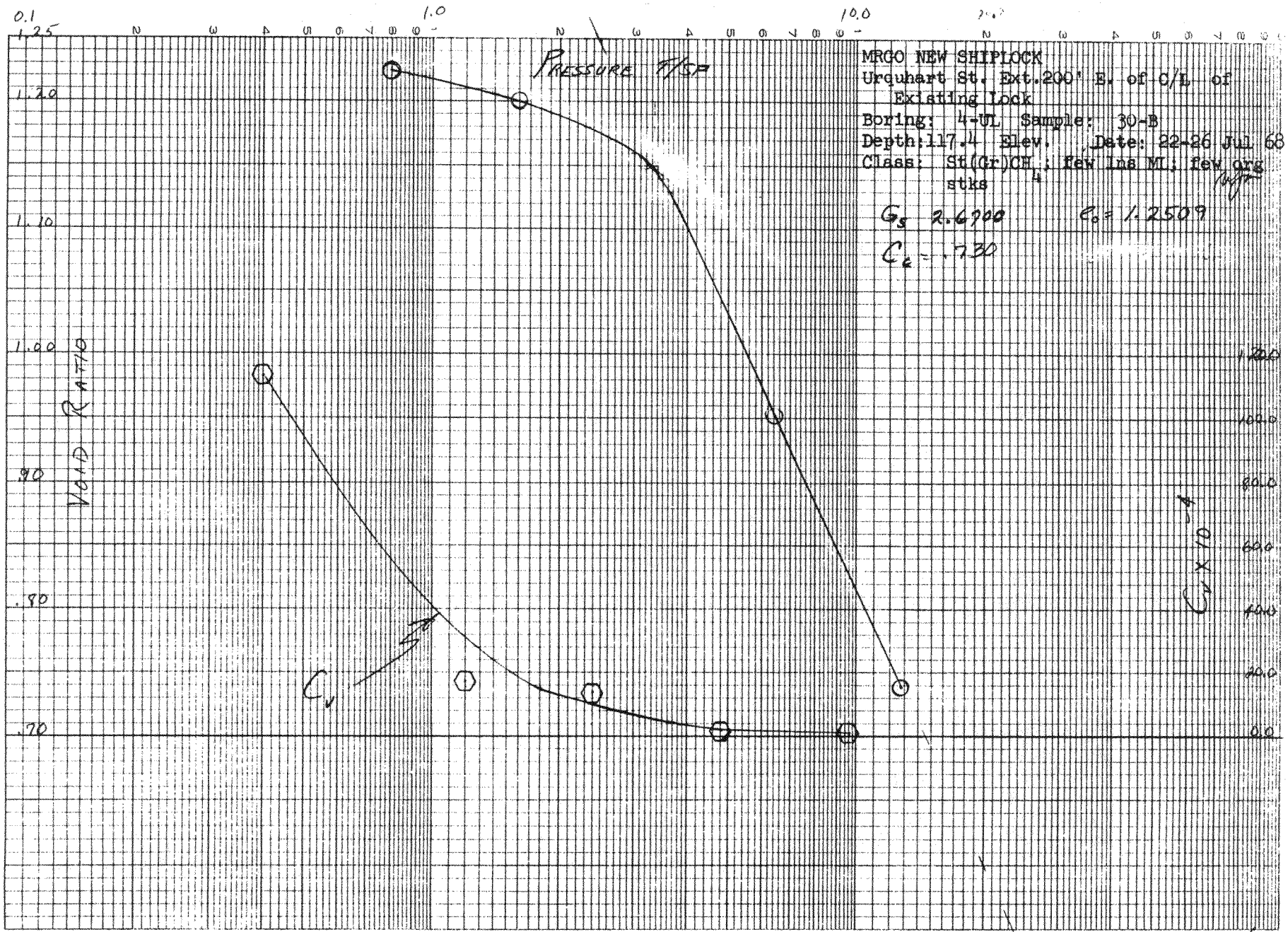
MADE IN U. S. A.



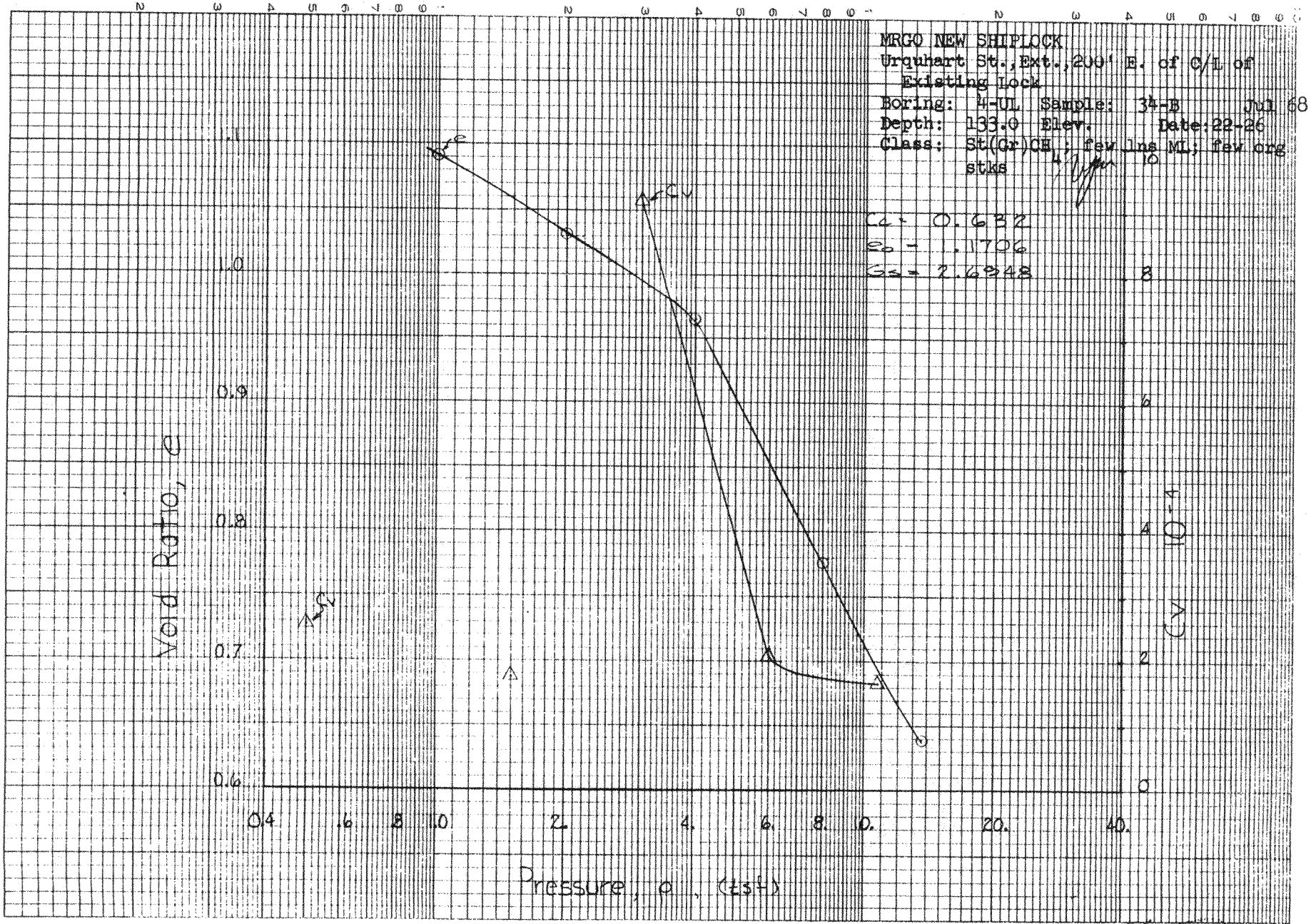
NO. 340-L 310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

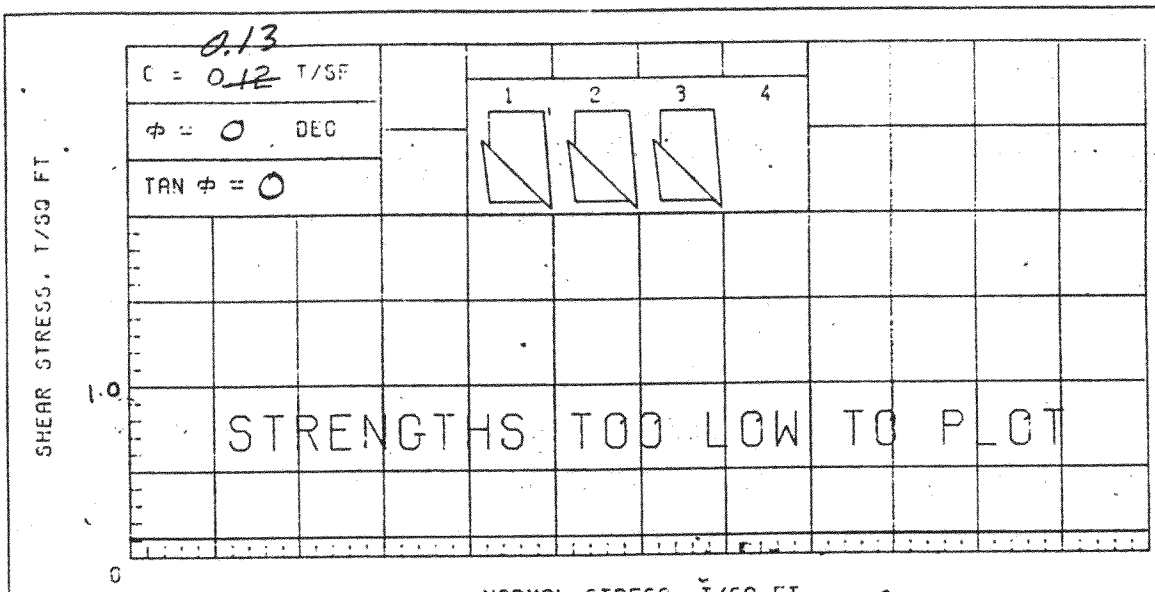
EUGENE DIETZGEN CO.
MADE IN U. S. A.



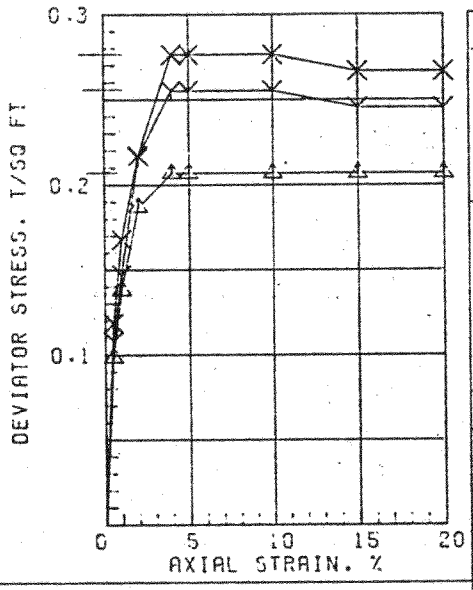
NO. 340-E 110 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.





$\gamma_{sat} = 89.7$



SPECIMEN NO.		Δ1	Y2	X3	AVG.
INITIAL	WATER CONTENT, %	97.1	99.4	116.6	101.0
	DRY DENSITY, PCF	44.5	47.4	39.9	43.6
	SATURATION, %	95.5	95.9	95.4	95.6
	VOID RATIO	2.641	2.425	3.177	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.21	0.26	0.28	0.25
TIME TO FAILURE, MIN.		8	8	8	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ORGANIC MATTER

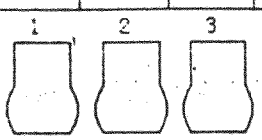
LL 132	PL 38	PI 94	GS 2.60 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT M.R.G.O. - NEW SHIPLOCK	
	IHNC SITE	
	BORING NO. 2-SCU	SAMPLE NO. 3-C
	DEPTH/ELEV 9.9/-17.9	TECH. KOC
	LABORATORY USAE WES	DATE 01 JUL 81
	TRIAXIAL COMPRESSION TEST REPORT	

C = 0.15 / 0.14 T/SF

Φ = 0 DEG

TAN Φ = 0



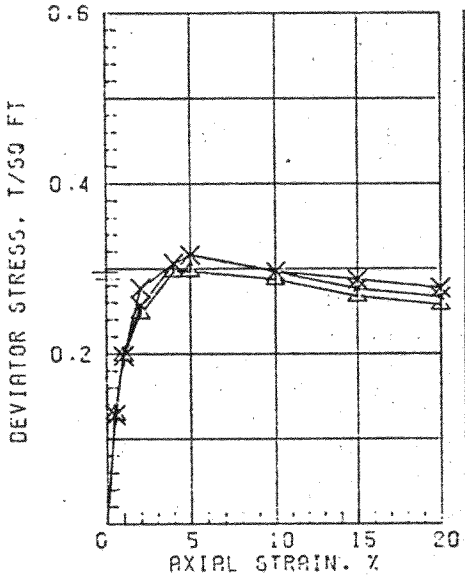
SHEAR STRESS, T/SQ FT

STRENGTHS TOO LOW TO PLOT

0

NORMAL STRESS, T/SQ FT

γsat = 106.6



SPECIMEN NO.		Δ1	Y2	X3	Avg.
INITIAL	WATER CONTENT, %	50.8	49.9	50.8	50.5
	DRY DENSITY, PCF	70.1	71.0	70.1	70.4
	SATURATION, %	98.0	98.3	98.0	98.1
	VOID RATIO	1.395	1.365	1.395	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.30	0.32	0.32	0.313
TIME TO FAILURE, MIN.		8	10	10	
RATE OF STRAIN INCR, %					
INITIAL DIAMETER, IN.		1.41	1.41	1.41	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SHELL FRAGMENTS; SMALL SILT POCKETS

LL 52	PL 16	PI 35	GS 2.69 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.D. - NEW SHIPLOCK

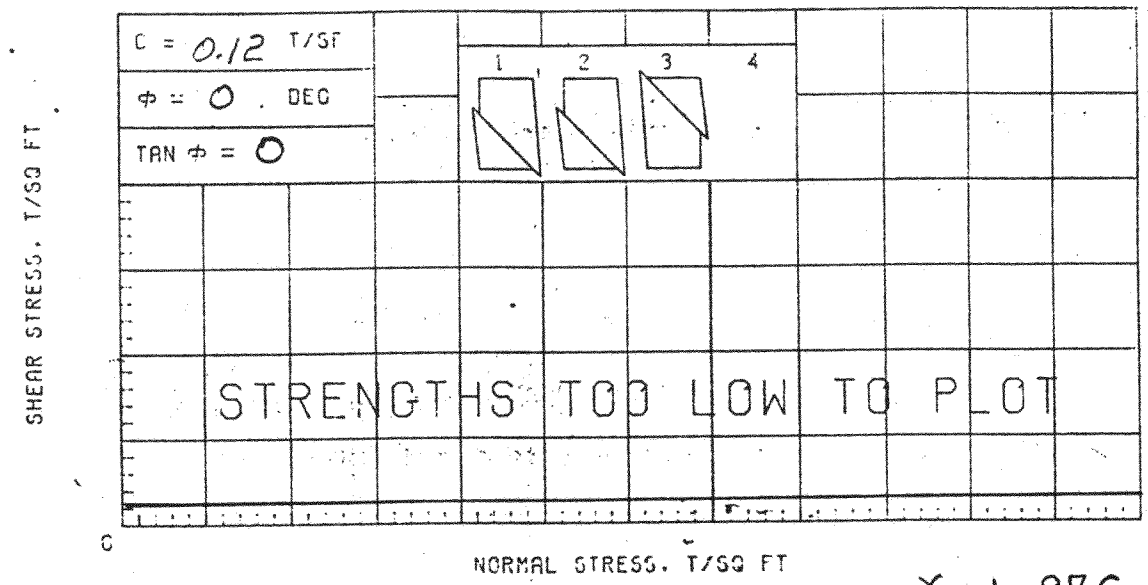
IHNC SITE

BORING NO. 2-SCU | SAMPLE NO. 7-5

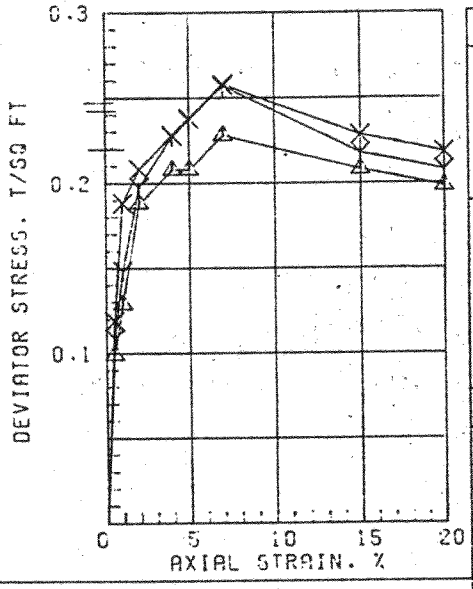
DEPTH/ELEV 24.9/-32.9 | TECH. KOC

LABORATORY USAE WES | DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 97.6$



SPECIMEN NO.		Δ1	Y2	X3	AVG.
INITIAL	WATER CONTENT. %	73.5	75.4	74.3	74.4
	DRY DENSITY. PCF	56.7	55.2	55.6	55.8
	SATURATION. %	100+	99.2	98.8	99.3
	VOID RATIO	1.975	2.052	2.030	
BEFORE SHEAR	WATER CONTENT. %				
	DRY DENSITY. PCF				
	SATURATION. %				
	VOID RATIO				
	BACK PRESS.. TSF				
MIN PRIN. STRESS. TSF		0.5	1.5	3.0	
MAX. DEV. STRESS. TSF		0.21	0.26	0.26	0.243
TIME TO FAILURE. MIN.		8	14	14	
RATE OF STRAIN INCR.%					
INITIAL DIAMETER. IN.		1.41	1.41	1.41	
INITIAL HEIGHT. IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH). GRAY

LL 92	PL 26	PI 56	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.C.O. - NEW SHIPLOCK

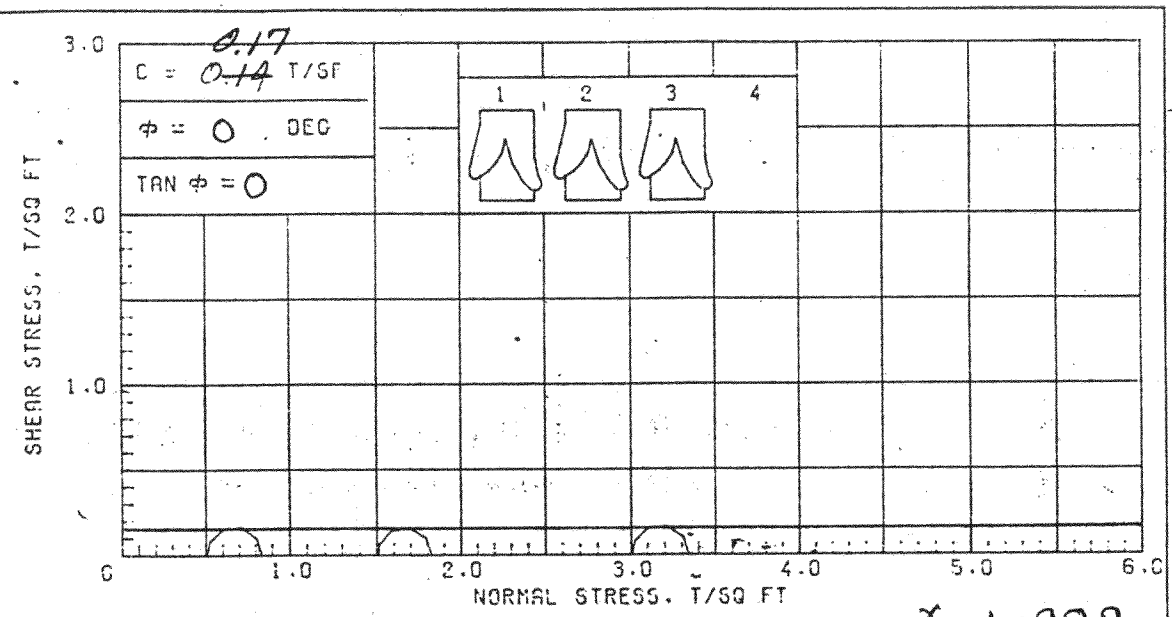
IHNC SITE

BORING NO. 2-SCU | SAMPLE NO. 9-C

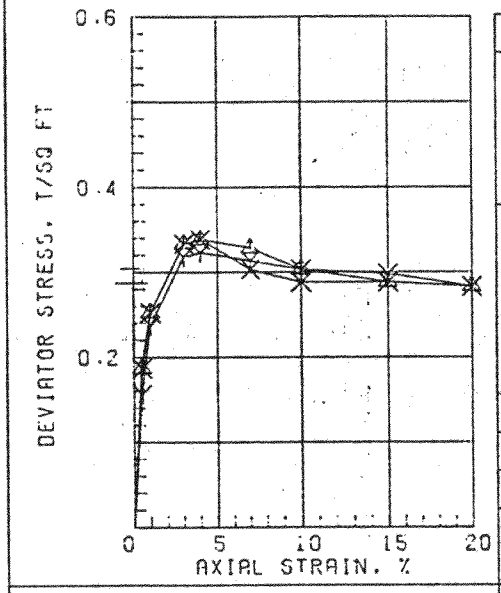
DEPTH/ELEV 33.9/-41.8 | TECH. KOC

LABORATORY USAE WES | DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 98.9$



SPECIMEN NO.		Δ1	Y2	X3	AVG.
INITIAL	WATER CONTENT, %	71.4	72.6	72.5	72.2
	DRY DENSITY, PCF	57.9	57.3	57.3	57.5
	SATURATION, %	100+	100+	100+	100
	VOID RATIO	1.909	1.941	1.941	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		0.34	0.32	0.34	.333
TIME TO FAILURE, MIN.		7	18	18	
RATE OF STRAIN INCR.%			7	14	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT LENSES

LL 72	PL 24	PI 48	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.D. - NEW SHIPLOCK

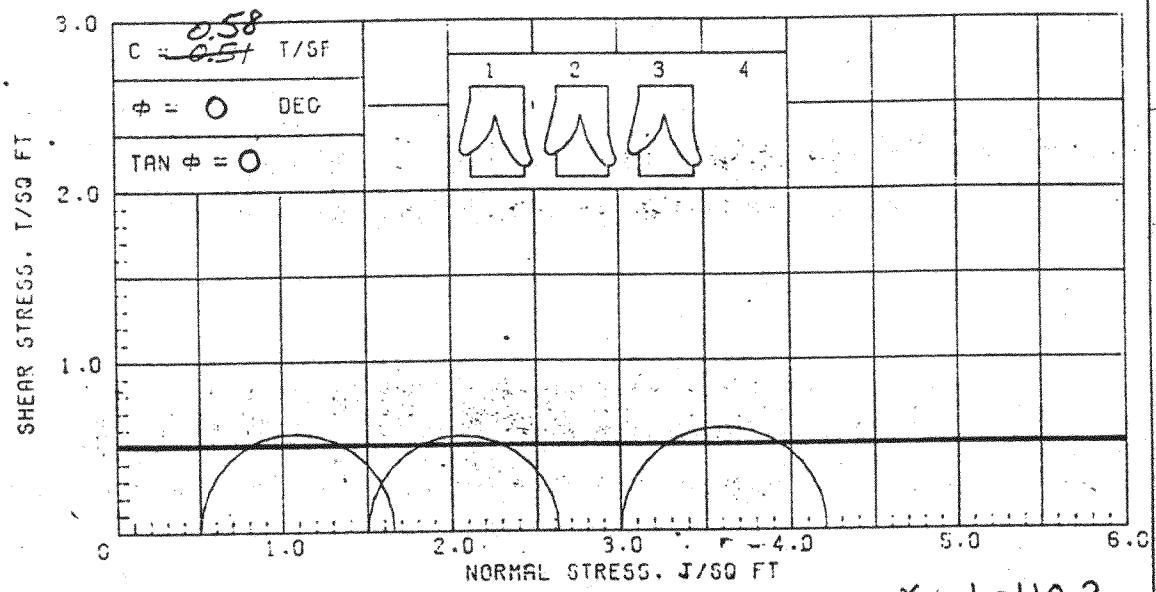
IHNC SITE

BORING NO. 2-SCU | SAMPLE NO. 11-C

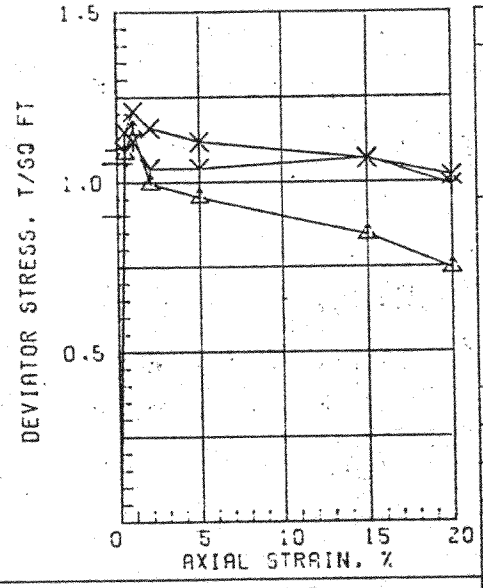
DEPTH/ELEV 41.9/-49.9 | TECH. PJR

LABORATORY USAE WES | DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 110.2$



SPECIMEN NO.		Δ1	Y2	X3	AVG4
INITIAL	WATER CONTENT, %	46.5	47.1	47.1	46.9
	DRY DENSITY, PCF	75.3	74.8	74.9	75.0
	SATURATION, %	100+	100+	100+	100.0
	VOID RATIO	1.238	1.254	1.250	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN. PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.15	1.12	1.21	1.16
TIME TO FAILURE, MIN.		2	5	9	
RATE OF STRAIN INCR, %			2	5	
INITIAL DIAMETER, IN.		1.40	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), LIGHT GRAY; SLICKENSIDED

LL 94	PL 29	PI 65	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.D. - NEW SHIPLOCK

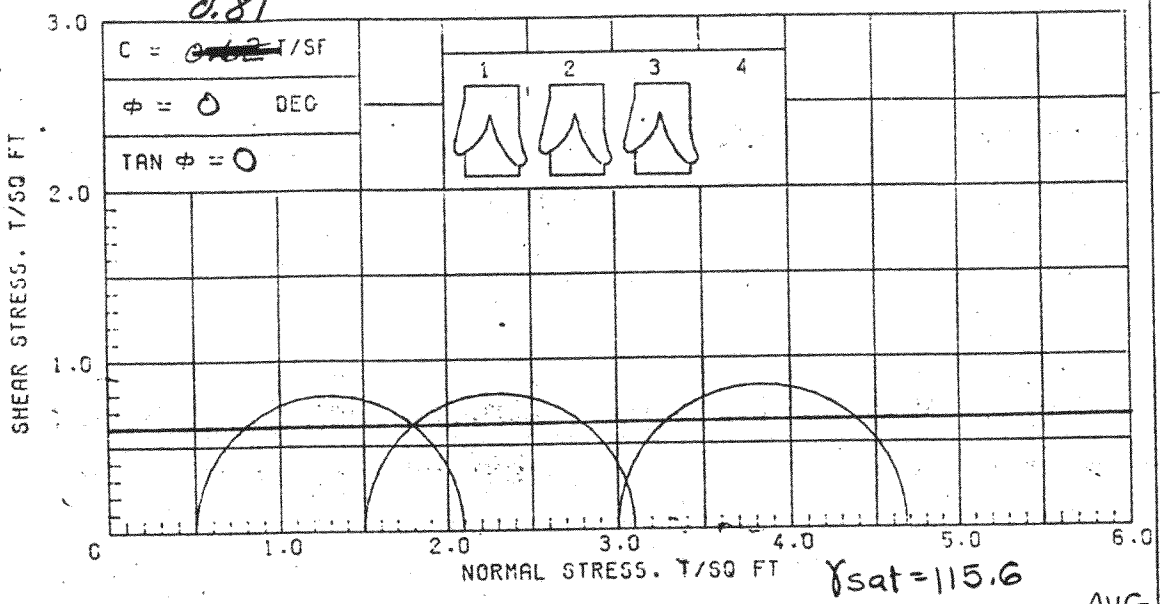
IHNC SITE

BORING NO. 2-SCU | SAMPLE NO. 19-C

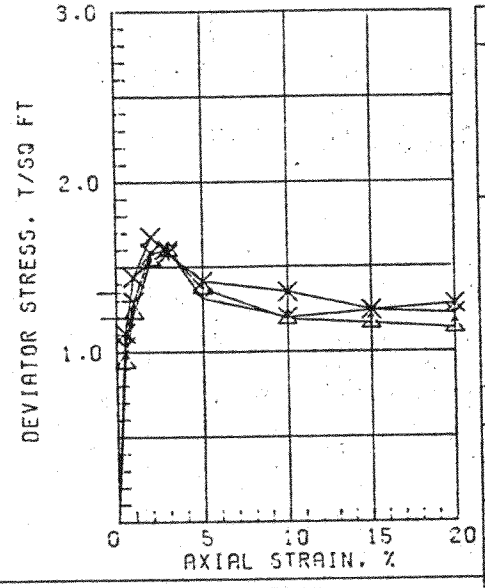
DEPTH/ELEV 74.4/-82.4 | TECH. PJR

LABORATORY USAE WES | DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 115.6$



SPECIMEN NO.		Δ1	Y2	X3	AVG 4
INITIAL	WATER CONTENT, %	36.5	37.8	37.2	37.2
	DRY DENSITY, PCF	94.6	93.8	94.2	84.2
	SATURATION, %	99.3	100+	100+	99.8
	VOID RATIO	0.992	1.011	1.003	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.59	1.60	1.68	1.623
TIME TO FAILURE, MIN.		5	14	9	
RATE OF STRAIN INCR.%			10		
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

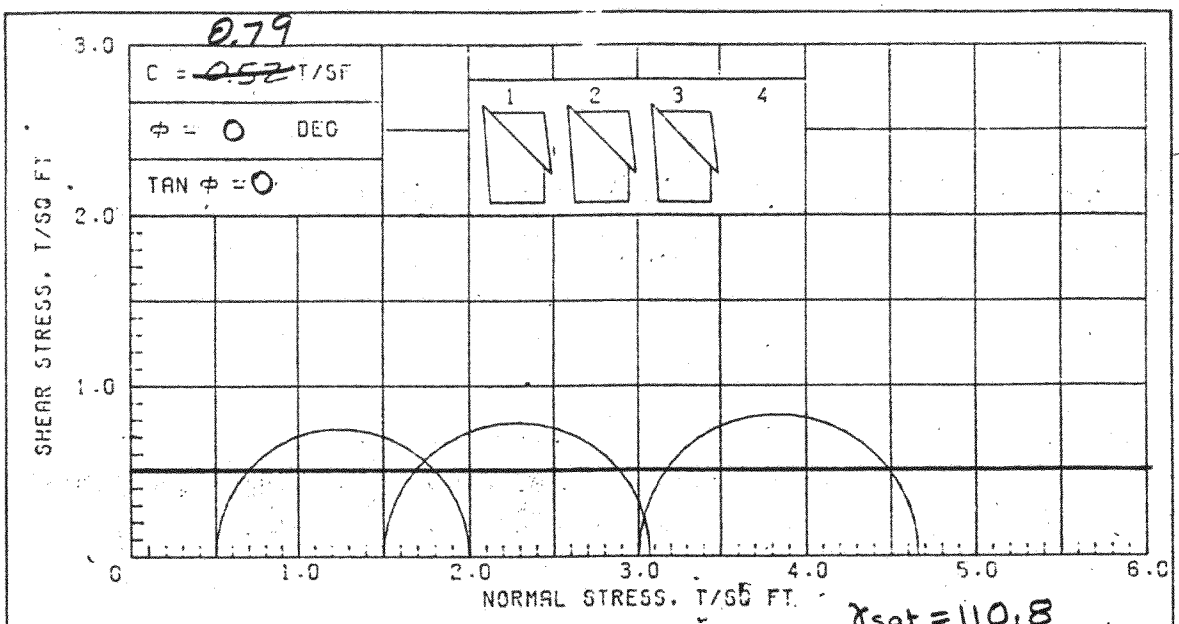
DESCRIPTION OF SPECIMENS. PLASTIC CLAY (CH), GRAY; SILT PARTINGS

LL 59	PL 17	PI 41	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

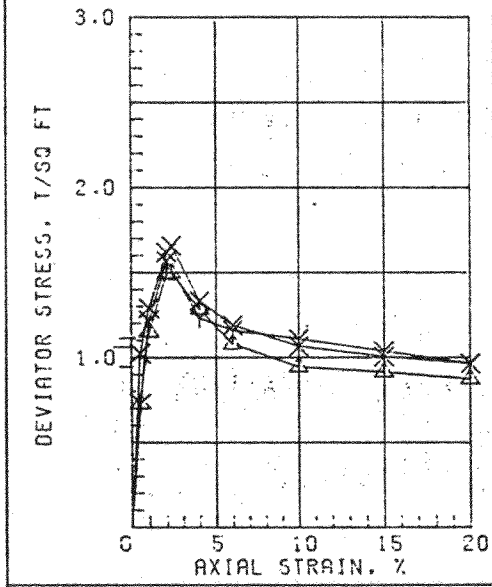
REMARKS:

PROJECT M.R.G.C. - NEW SHIPLOCK
IHNC SITE
BORING NO. 2-SCU
SAMPLE NO. 25-C
DEPTH/ELEV 97.8/-105.0
TECH. PJR
LABORATORY USAE WES
DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 110.8$



SPECIMEN NO.		Δ1	Y2	X3	AVG. 4
INITIAL	WATER CONTENT, %	44.3	43.3	42.5	43.4
	DRY DENSITY, PCF	76.2	76.9	77.3	76.8
	SATURATION, %	98.8	98.0	97.2	98.0
	VOID RATIO	1.211	1.193	1.181	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.50	1.57	1.66	1.577
TIME TO FAILURE, MIN.		22	20	22	
RATE OF STRAIN INCR.%		3	4	4	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; 1/32" SILT SEAMS

LL 70	PL 23	PI 47	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK

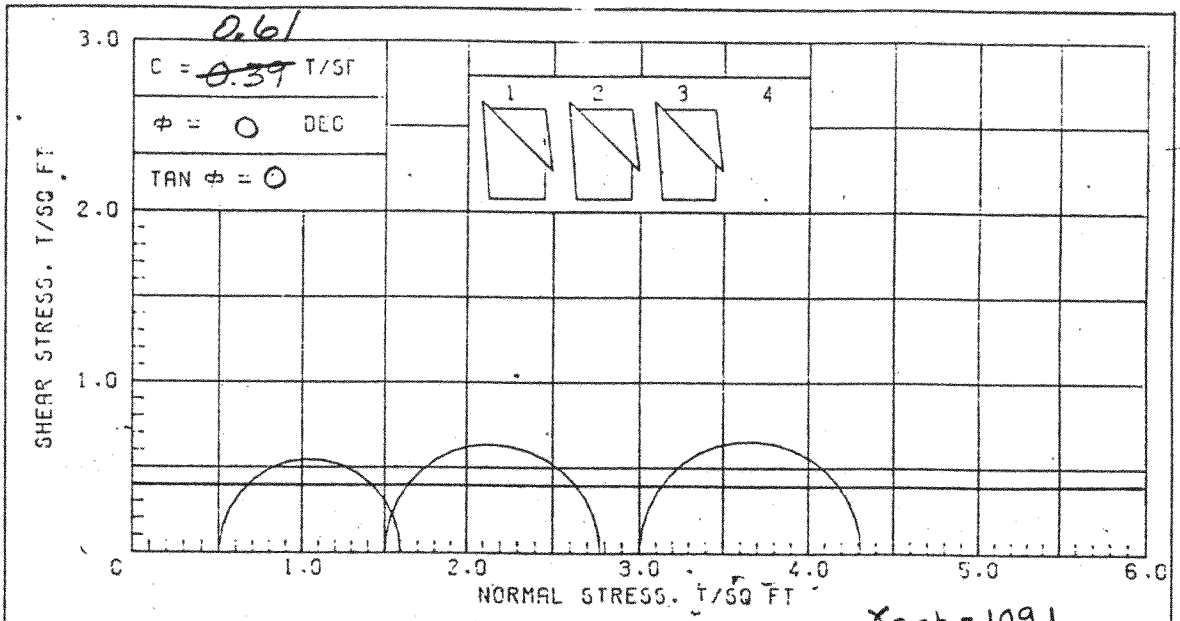
IHNC SITE

BORING NO. 2-SCU | SAMPLE NO. 28-C

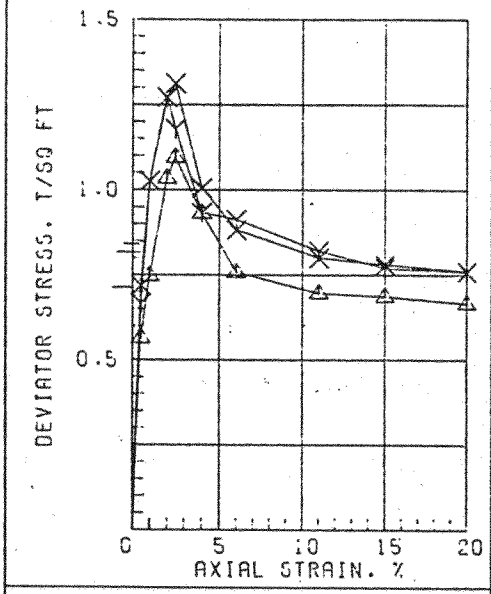
DEPTH/ELEV 109.9/-117.9 | TECH. JAL

LABORATORY USAE WES | DATE 01 JUL 81

TRIAXIAL COMPRESSION TEST REPORT



$\gamma_{sat} = 109.1$ AVG.



SPECIMEN NO.		Δ1	Y2	X3	4
INITIAL	WATER CONTENT, %	47.4	46.9	45.9	46.7
	DRY DENSITY, PCF	73.6	74.2	74.8	74.2
	SATURATION, %	99.1	99.5	99.9	99.2
	VOID RATIO	1.291	1.273	1.253	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.09	1.27	1.31	1.223
TIME TO FAILURE, MIN.		16	16	17	
RATE OF STRAIN INCR.%		4	4	4	
INITIAL DIAMETER, IN.		1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; WITH 1/32" SILT SEAMS

LL 71	PL 20	PI 51	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT M.R.G.D. - NEW SHIPLOCK

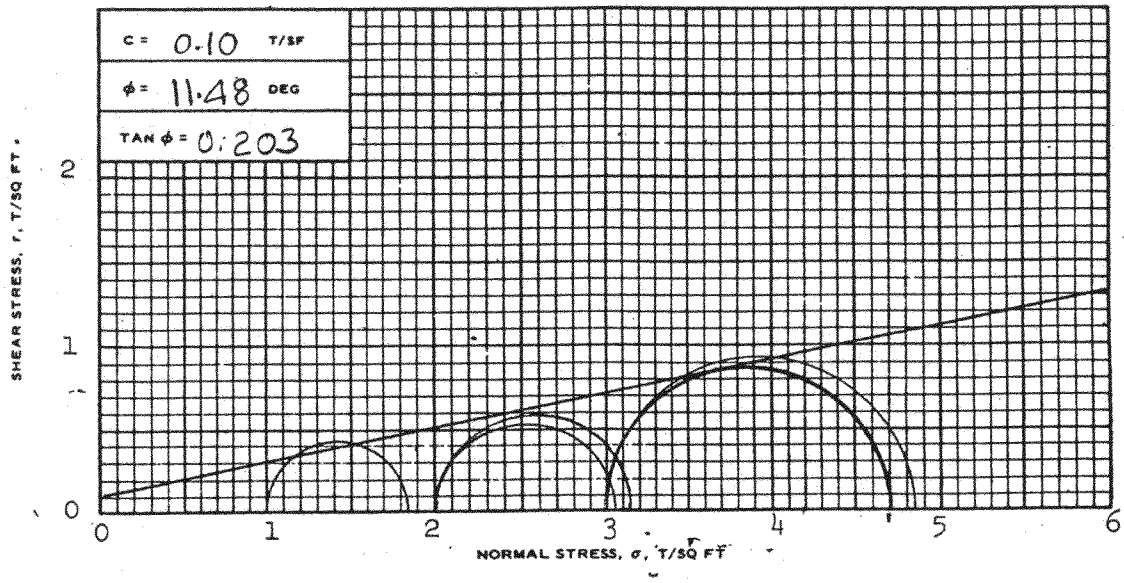
IHNC SITE

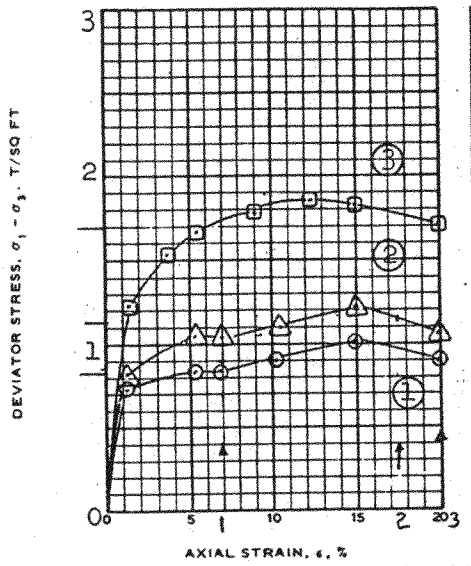
BORING NO. 2-SCU | SAMPLE NO. 32-C

DEPTH/ELEV 126.4/-134.4 | TECH. JAL

LABORATORY USAE WES | DATE 02 JUL 81

TRIAXIAL COMPRESSION TEST REPORT





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o	57.6	57.1	58.1	
	DRY DENSITY LB/ CU FT	γ_{d_o}	64.4	65.2	64.5	
	SATURATION, %	S_o	95.8	96.9	96.7	
	VOID RATIO	e_o	1.635	1.603	1.634	
BEFORE SHEAR	WATER CONTENT, %	w_c	53.2	49.0	44.8	
	DRY DENSITY LB/CU FT	γ_{d_c}	69.9	73.9	75.6	
	SATURATION, %	S_c	100+	100+	97.9*	
	VOID RATIO	e_c	1.428	1.299	1.245	
	FINAL BACK PRESSURE, T/SQ FT	u_o	5.76	5.76	5.76	
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	1.0	2.0	3.0	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.84	1.04	1.84	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f	347	347	833	
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o	1.40	1.39	1.39	
INITIAL HEIGHT, IN.		H_o	3.00	3.00	3.00	

CONTROLLED- STRAIN TEST

DESCRIPTION OF SPECIMENS PLASTIC CLAY (CH), GRAY; WITH SILT LENSES

LL 87	PL 24	PI 63	G_s 2.72(EST)	TYPE OF SPECIMEN UNDISTURBED	TYPE OF TEST R

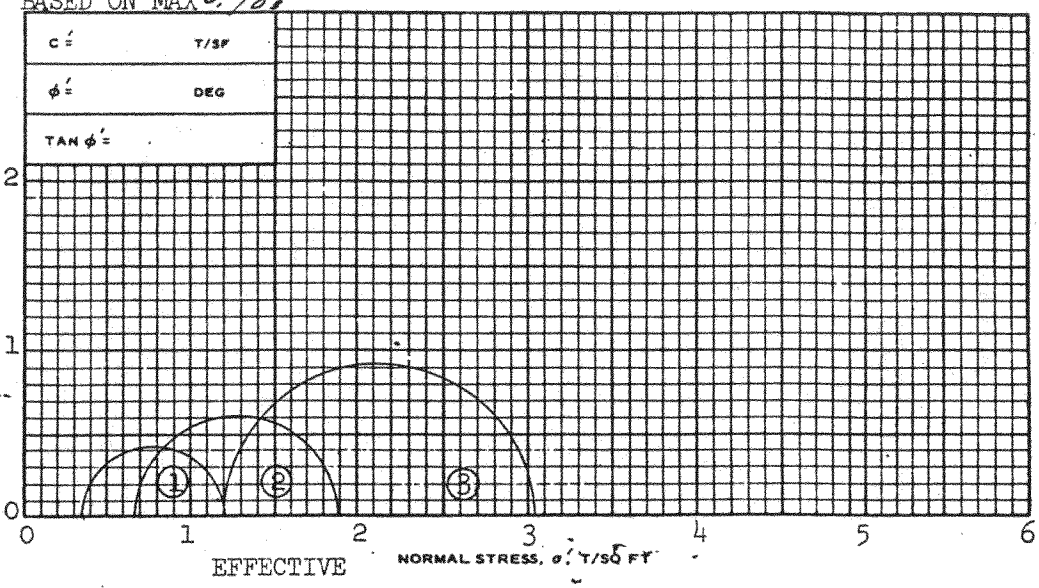
REMARKS: *PORE PRESSURE RESPONSE INDICATED 100% SATURATION

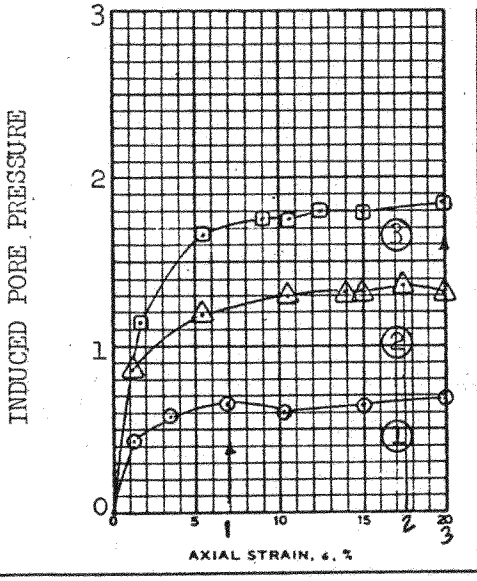
PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 2-SCU SAMPLE NO. 12-B
DEPTH/ELEV 44.8/-52.8
LABORATORY USAEWES DATE 21 JULY 1981
JMS TRIAXIAL COMPRESSION TEST REPORT

SHEET 1 OF 2

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)

BASED ON MAX σ_1'/σ_3'





SPECIMEN NO.			1	2	3	
INITIAL	WATER CONTENT, %	w_o				
	DRY DENSITY LB/ CU FT	γ_{d_o}				
	SATURATION, %	S_o				
	VOID RATIO	e_o				
BEFORE SHEAR	WATER CONTENT, %	w_c				
	DRY DENSITY LB/CU FT	γ_{d_c}				
	SATURATION, %	S_c				
	VOID RATIO	e_c				
	FINAL BACK PRESSURE, T/SQ FT	u_o				
MINOR PRINCIPAL STRESS, T/SQ FT		σ_3	0.35	0.67	1.20	
MAXIMUM DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{MAX}$	0.84	1.21	1.84	
TIME TO $(\sigma_1 - \sigma_3)_{MAX}$, MIN		t_f				
ULTIMATE DEVIATOR STRESS, T/SQ FT		$(\sigma_1 - \sigma_3)_{ULT}$				
INITIAL DIAMETER, IN.		D_o				
INITIAL HEIGHT, IN.		H_o				

CONTROLLED- TEST

DESCRIPTION OF SPECIMENS

LL	PL	PI	G_s

TYPE OF SPECIMEN

TYPE OF TEST

REMARKS:

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE

BORING NO. 2-SCU SAMPLE NO. 12-B

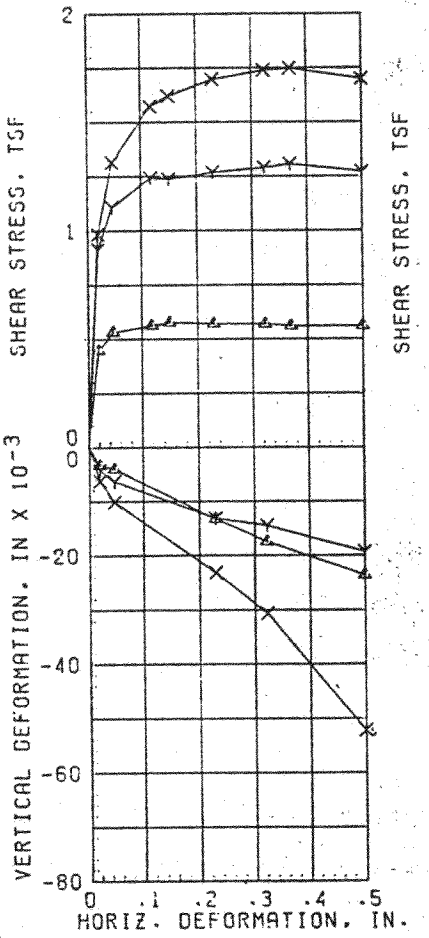
DEPTH/ELEV 44.8/-52.8

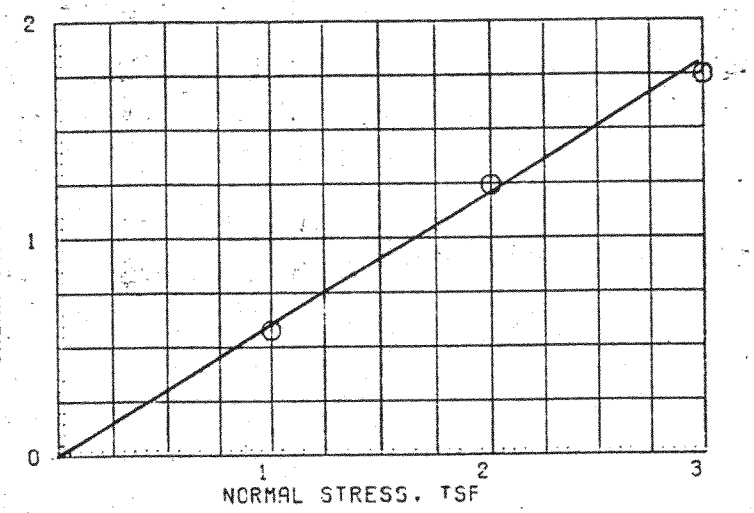
LABORATORY USAEWES DATE 21 JULY 1981

SHEET 2 OF 2

JMS TRIAXIAL COMPRESSION TEST REPORT

ENG FORM NO. 2089 REV JUNE 1970 PREVIOUS EDITION IS OBSOLETE TRANSLUCENT (EM 1110-2-1906)





ϕ = 30.71°

TAN ϕ = 0.594

C = 0

TEST NO.		1 △	2 Y	3 X	
INITAL	WATER CONTENT, %	21.2	22.8	23.2	
	VOID RATIO	0.678	0.706	0.658	
	SATURATION, %	83.0	86.1	93.9	
	DRY DENSITY, PCF	98.9	97.3	100.1	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	26.0	24.9	24.0	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF		0.58	1.24	1.75	
TIME TO FAILURE, MIN		826	649	2036	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED | 3.00 IN. SQUARE | 0.584 IN. THICK

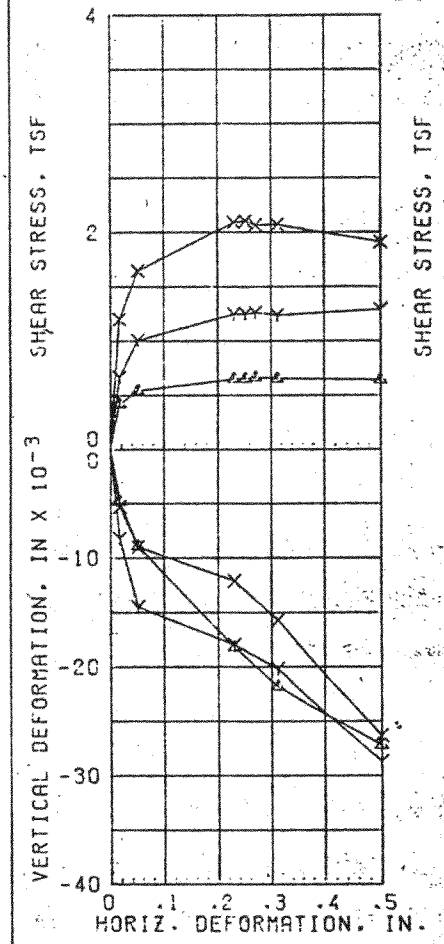
CLASSIFICATION SILTY SAND (SM) LIGHT GRAY;
WITH 1/4" SHELLS

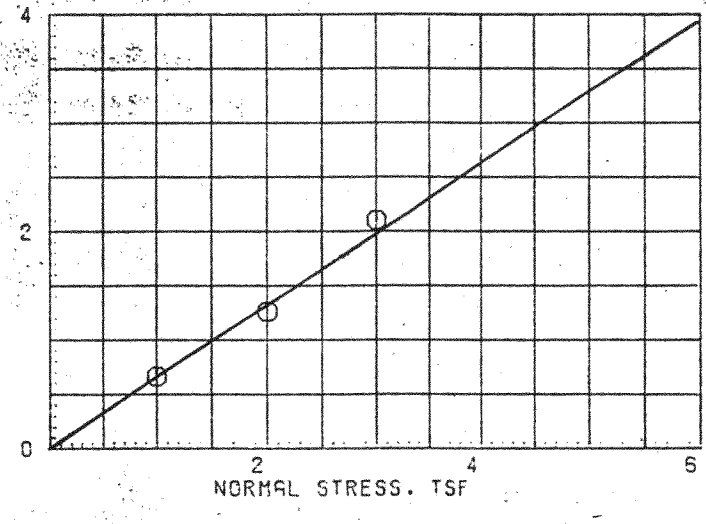
LL	PL	PI		GS 2.66 (EST)

REMARKS;

PROJECT M.R.G.O. - NEW SHIPLOCK
IHNC SITE
BORING NO. 2-SCU | SAMPLE 13-C
DEPTH/ELEV 49.8/-57.8 | DATE 10 AUG 81

DIRECT SHEAR TEST REPORT





$\phi = 33.56^{\circ}$

TAN $\phi = 0.663$

C = 0

TEST NO.		1 △	2 Y	3 X	
INITAL	WATER CONTENT, %	15.8	17.6	15.8	
	VOID RATIO	0.590	0.668	0.563	
	SATURATION, %	71.3	70.3	74.5	
	DRY DENSITY, PCF	104.4	99.5	106.2	
VOID RATIO AFTER CONSOL					
FIFTY PERCENT CONSOL, MIN		< 1	< 1	< 1	
FINAL	WATER CONTENT, %	14.7	16.0	15.6	
	VOID RATIO				
	SATURATION, %				
NORMAL STRESS, TSF		1.0	2.0	3.0	
MAXIMUM SHEAR STRESS, TSF		0.66	1.25	2.10	
TIME TO FAILURE, MIN		1495	1495	1390	
RATE OF STRAIN, IN/MIN		.00018	.00018	.00018	
ULTIMATE SHEAR STRESS, TSF					

TYPE SPECIMEN UNDISTURBED | 3.00 IN. SQUARE | 0.584 IN. THICK

CLASSIFICATION SILTY SAND (SM), LIGHT GRAY;
WITH 1/2" SHELLS

LL | PL | PI | | GS 2.66 (EST)

REMARKS:

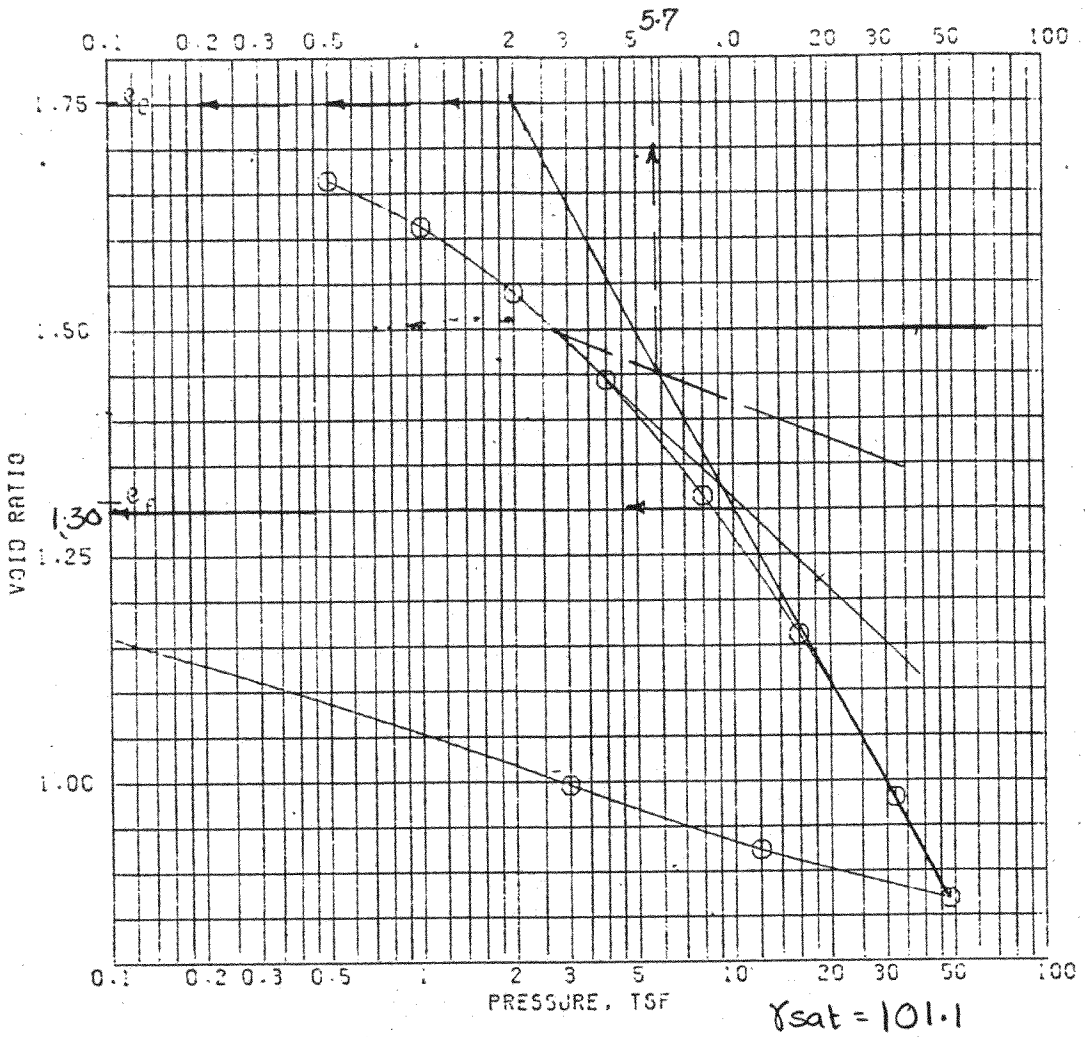
PROJECT M.R.G.C. - NEW SHIPLOCK

IHNC SITE

BORING NO. 2-SCU | SAMPLE 15-C

DEPTH/ELEV 57.9/-65.9 | DATE 12 AUG 81

DIRECT SHEAR TEST REPORT



$C_v = \frac{1.75 - 1.30}{\log 10 - \log 2} = \frac{0.45}{0.699} = 0.644$

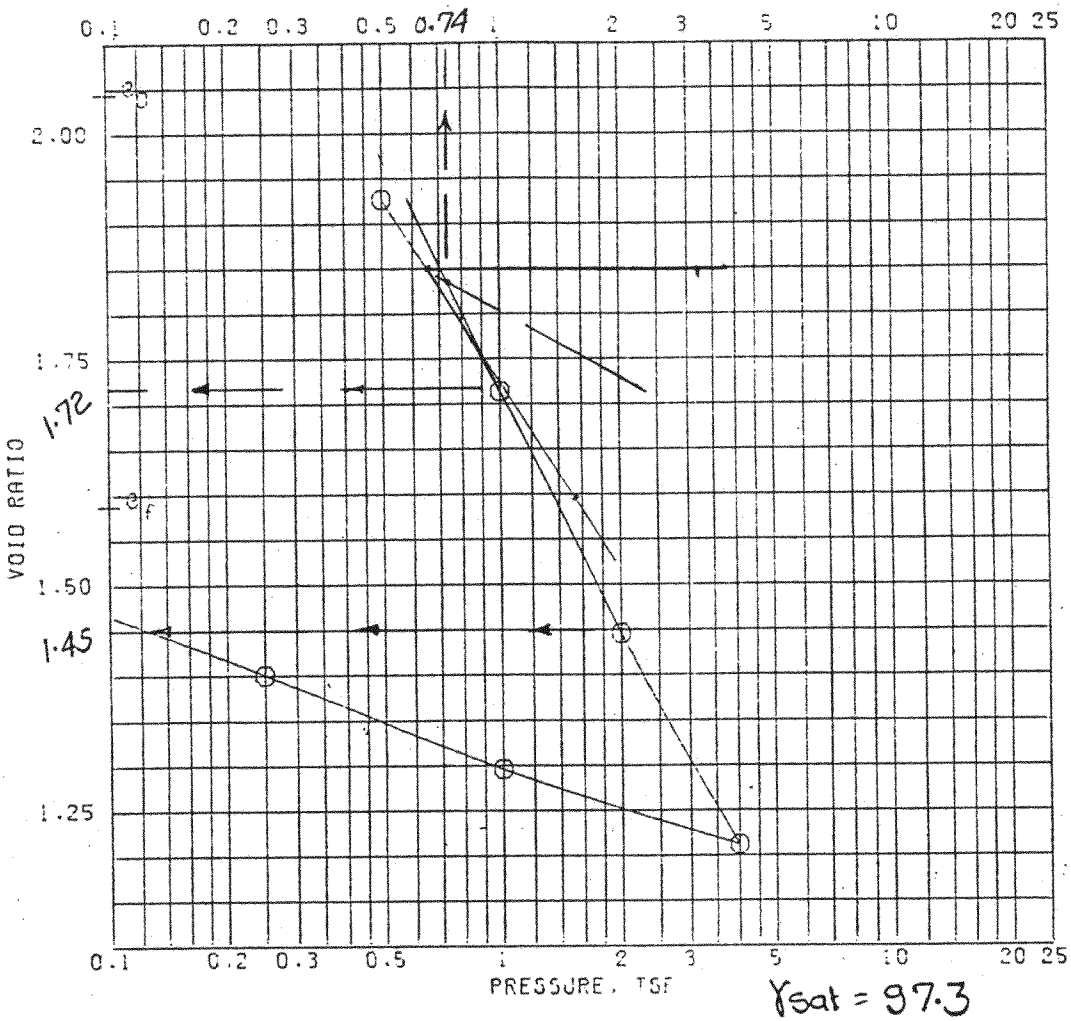
$\gamma_{sat} = 101.1$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	54.0	44.4
PRECONSOL. PRESSURE, TSF	5.70	DRY DENSITY, PCF	61.3	73.0
COMPRESSION INDEX	0.64	SATURATION, %	84.6	91.6
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.751	1.310
DIA. IN 4.44	HT. IN 1.107	BACK PRESSURE, TSF		

CLASSIFICATION ORGANIC CLAY (OH), GRAY

LL 221	PL 97	PI 124	PROJECT M.R.G.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS		BORING NO. 2-SCU	SAMPLE NO. 2-B
ELEV. -12.8		DEPTH/ELEV 4.8/-12.8	DATE 23 SEP 81
$P_c = 5.7$		CONSOLIDATION TEST REPORT	
$C_c = 0.64$			

SHEET 1 OF 13



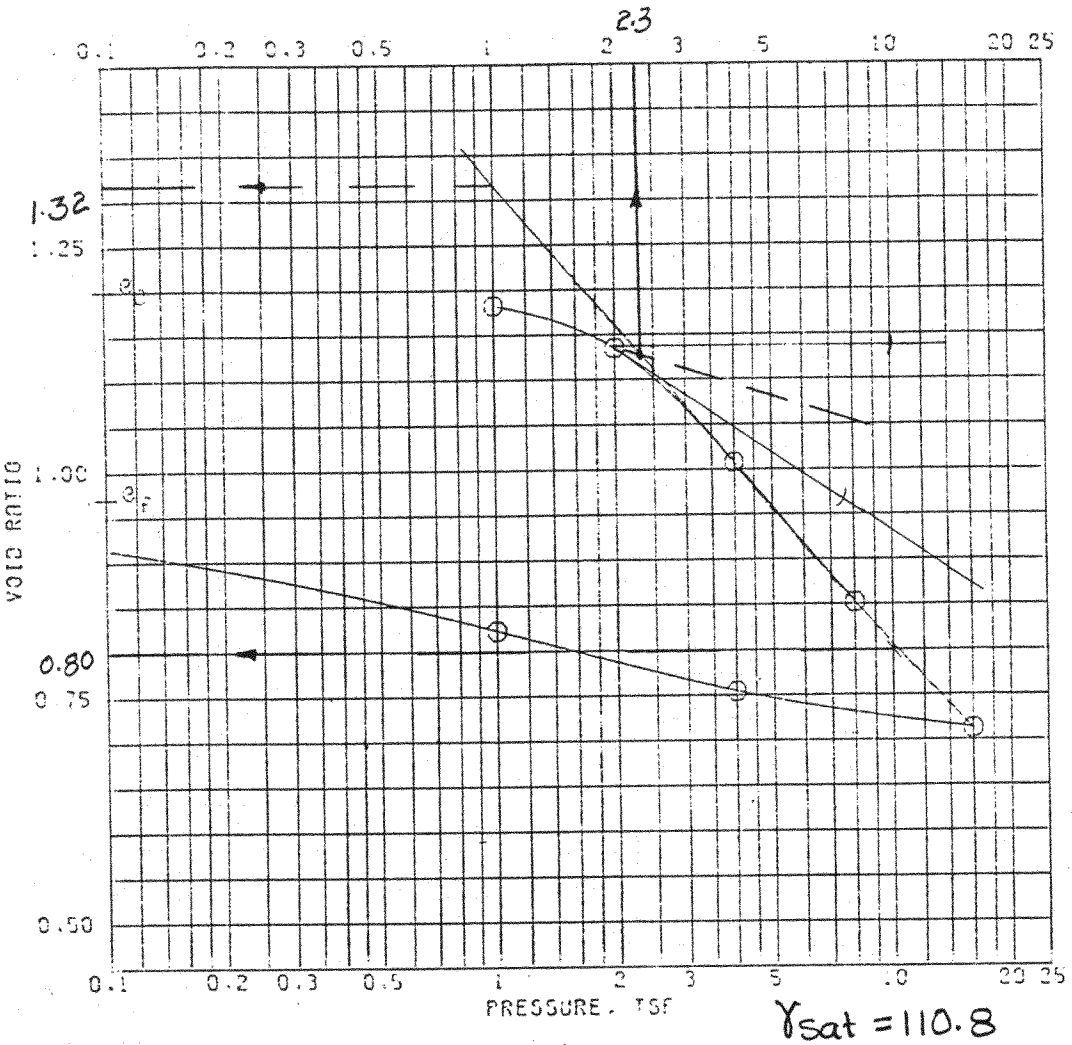
$C_c = \frac{1.72 - 1.45}{\log 2 - \log 1} = 0.90$

$\gamma_{sat} = 97.3$

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	74.3	58.9
PRECONSOL. PRESSURE, TSF	0.74	DRY DENSITY, PCF	55.4	65.2
COMPRESSION INDEX	0.90	SATURATION, %	98.2	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	2.042	1.586
DIA. IN 4.44	HT. IN 1.120	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 91	PL 28	PI 63	PROJECT M.R.G.O. - NEW SHIPLOCK	
OS 2.70 (EST)	D_{10}		IHNC SITE	
REMARKS			BORING NO. 2-SCU	SAMPLE NO. 9-D
Elev. -42.7			DEPTH/ELEV 94.7/-42.7	DATE 23 SEP 81
$P_c = 0.74$			CONSOLIDATION TEST REPORT	
$C_c = 0.90$				



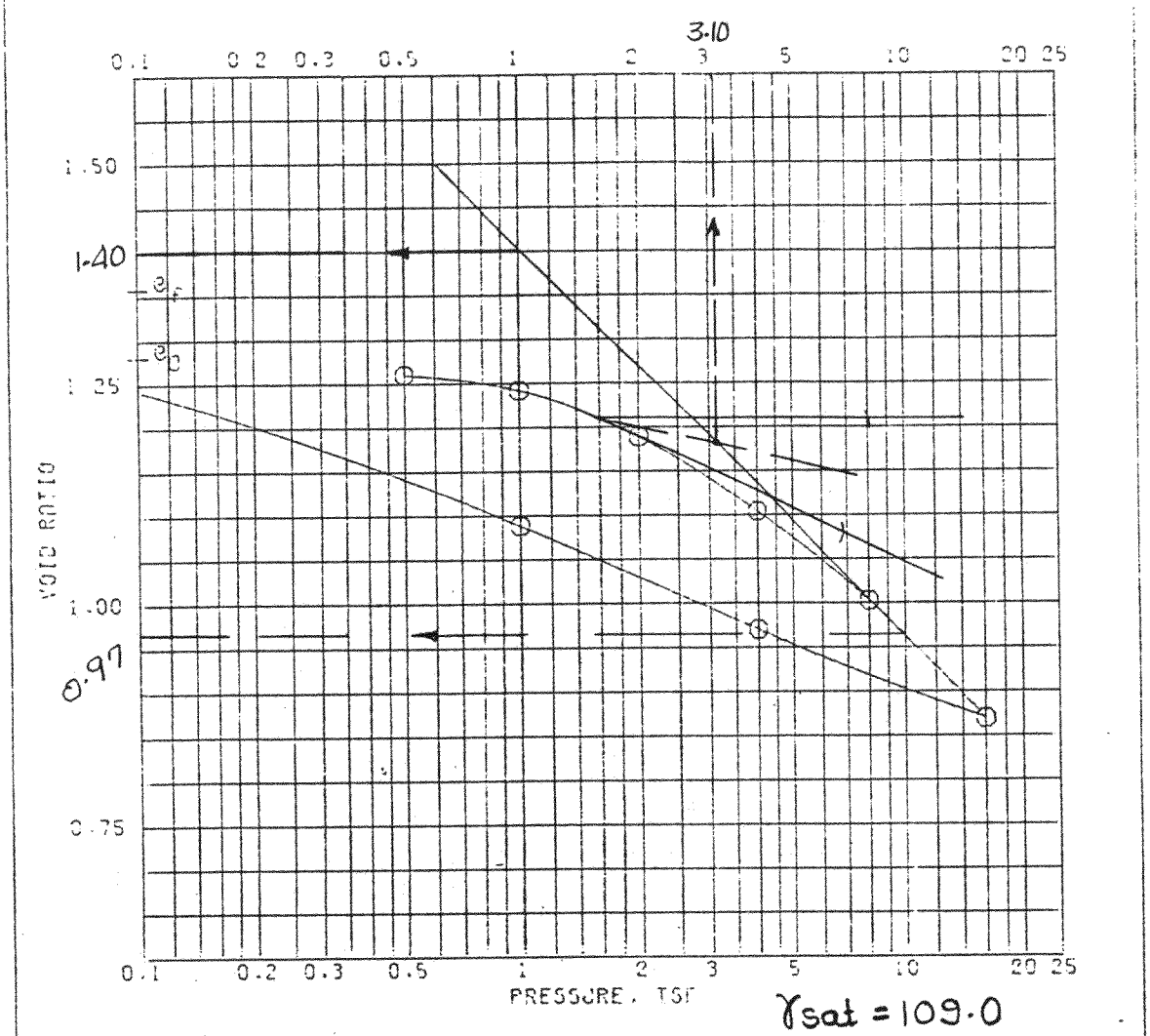
1.32
- .80
.52

$\gamma_{sat} = 110.8$

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 2.30	DRY DENSITY, PCF	76.7	95.6
COMPRESSION INDEX 0.52	SATURATION, %	99.3	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO	1.199	0.969
DIA. IN 4.44 HT. IN 1.125	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY & TAN MOTTLED

LL 71 PL 20 PI 51	PROJECT M.S.G.C - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS	BORING NO. 2-SCU SAMPLE NO. 12-C
EL.-53.7	DEPTH/ELEV 45.7/-53.7 DATE 23 SEP 92
Pc = 2.30	CONSOLIDATION TEST REPORT
Cc = 0.52	



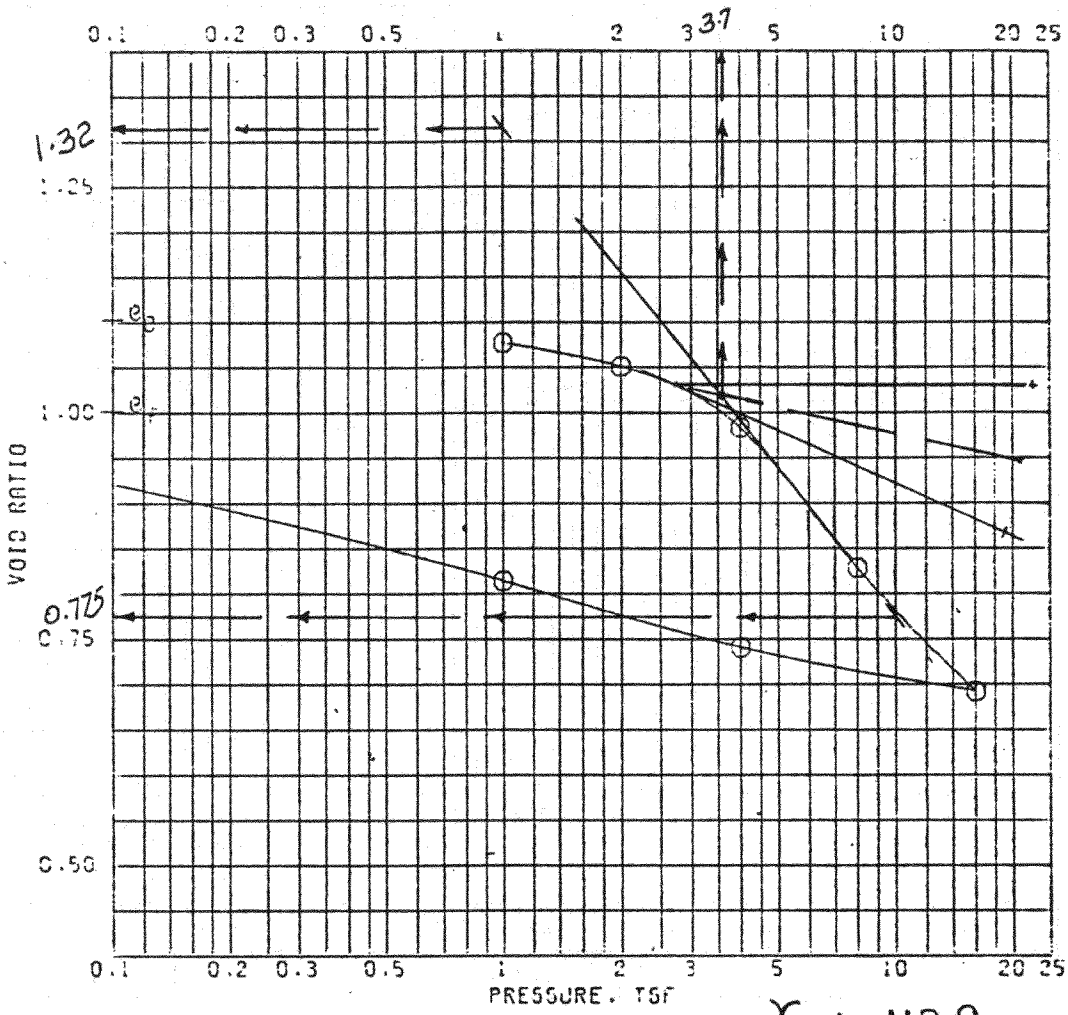
$\gamma_{sat} = 109.0$

1.40
-.97
.43

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	45.3	53.6
PRECONSOL. PRESSURE, TSF	3.10	DRY DENSITY, PCF	74.0	71.5
COMPRESSION INDEX	0.43	SATURATION, %	97.0	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.279	1.356
DIA. IN 4.44	HT. IN 1.130	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY & TAN MOTTLED; SILT LENSES

LL_{100}	PL 23	PI 77	PROJECT M.R.G.O. - NEW SHIPLOCK
GS 2.70 (EST)	D_{10}		IHNC SITE
REMARKS EL. -81.0		BORING NO. 2-SCU	SAMPLE NO. 19-S
$P_c = 3.10$		DEPTH/ELEV 73.0/-81.0	DATE 23 SEP 92
$C_c = 0.43$		CONSOLIDATION TEST REPORT	



$\gamma_{sat} = 112.9$

1.320 − .775 / .545

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 3.70	DRY DENSITY, PCF 80.2	94.3
COMPRESSION INDEX 0.55	SATURATION, % 98.6	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.101	1.000
DIA. IN 4.44 HT. IN 1.112	BACK PRESSURE, TSF	

CLASSIFICATION CLAY (CL), GRAY; SILT LENSES

LL 44 PL 17 PI 27

GS 2.70 (EST) D_{10}

REMARKS ELEV.-137.0

Pc = 3.70

Cc = 0.55

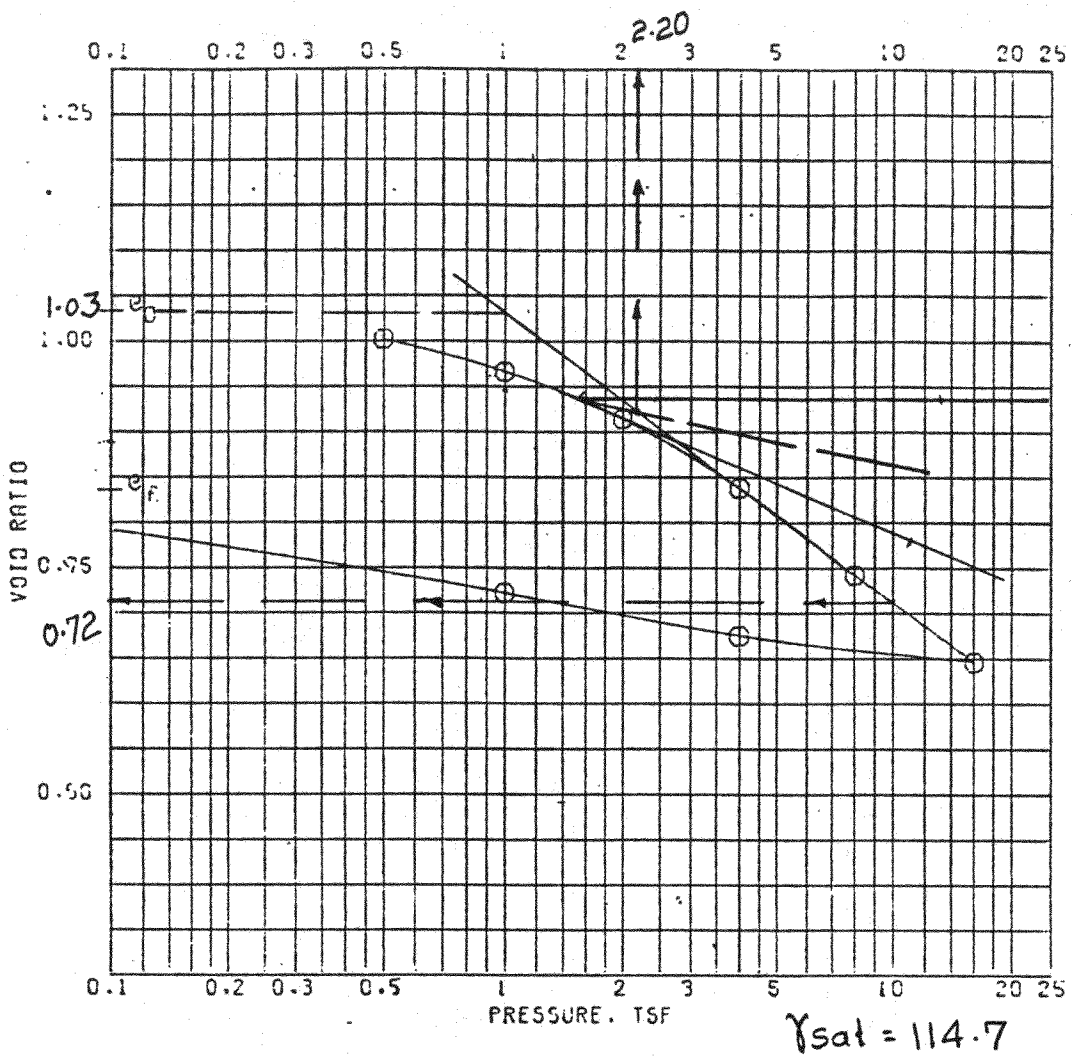
PROJECT M.R.G.C. - NEW SHIPLOCK

IHNC SITE

BORING NO. 2-SCU SAMPLE NO. 33-B

DEPTH/ELEV 133.0/137.0 DATE 25 SEP 81

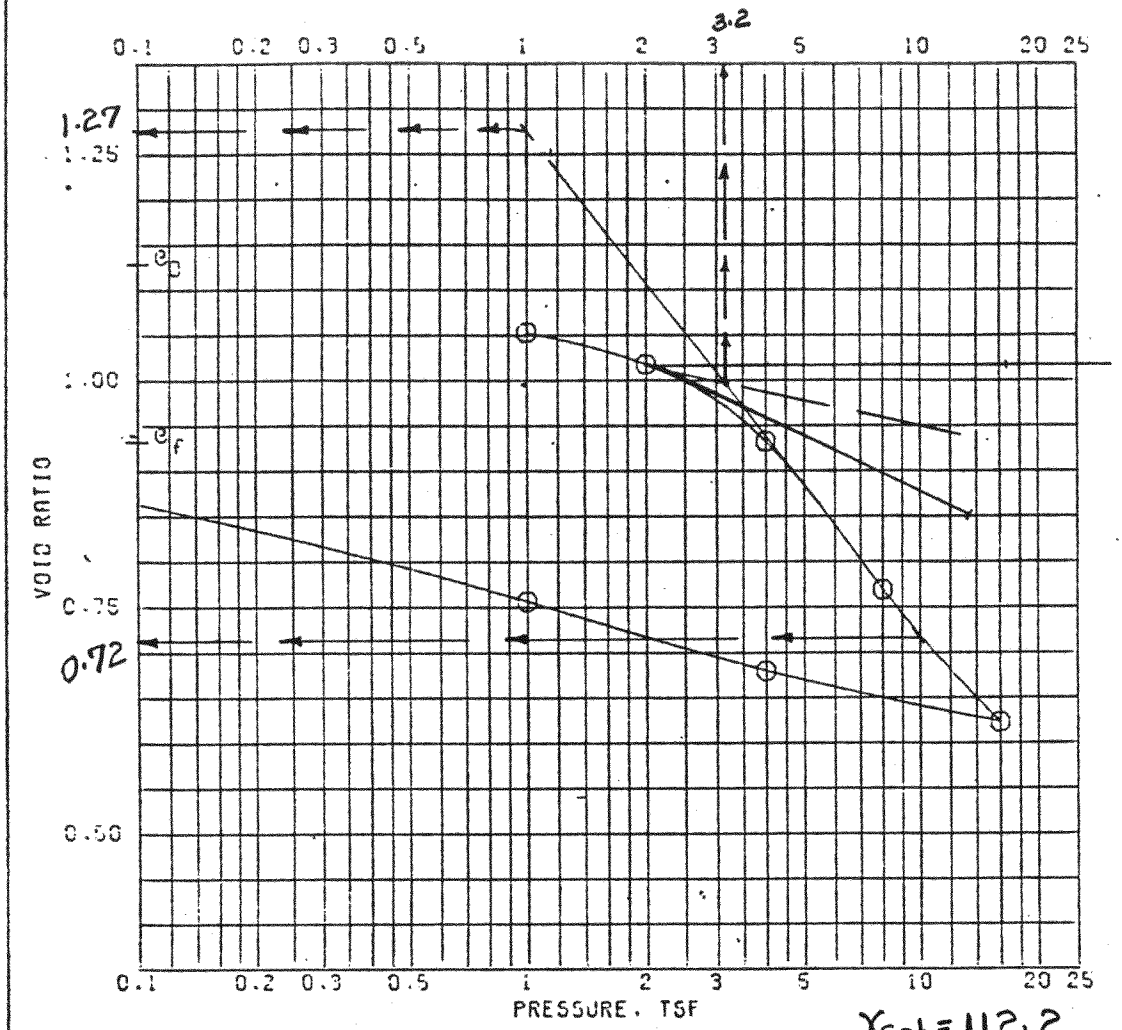
CONSOLIDATION TEST REPORT



$\gamma_{sat} = 114.7$

1.03
-0.72
0.31

	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 2.20	DRY DENSITY, PCF 93.0	91.9
COMPRESSION INDEX 031	SATURATION, % 96.5	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.031	0.934
DIA. IN 4.44 HT. IN 1.136	BACK PRESSURE, TSF	
CLASSIFICATION PLASTIC CLAY (CH), GRAY; SANDY SILT LAYER		
LL 50 PL 18 PI 32	PROJECT M.R.G.C. - NEW SHIPLOCK	
GS 2.70 (EST) D_{10}	IHNC SITE	
REMARKS ELEV.-122.4	BORING NO. 2-SCU	SAMPLE NO. 29-C
$P_c = 2.20$	DEPTH/ELEV 114.4/-122.4	DATE 24 SEP 81
$C_c = 0.30$	CONSOLIDATION TEST REPORT	



$\gamma_{sat} = 112.2$

1.27 − 0.72 / 0.55

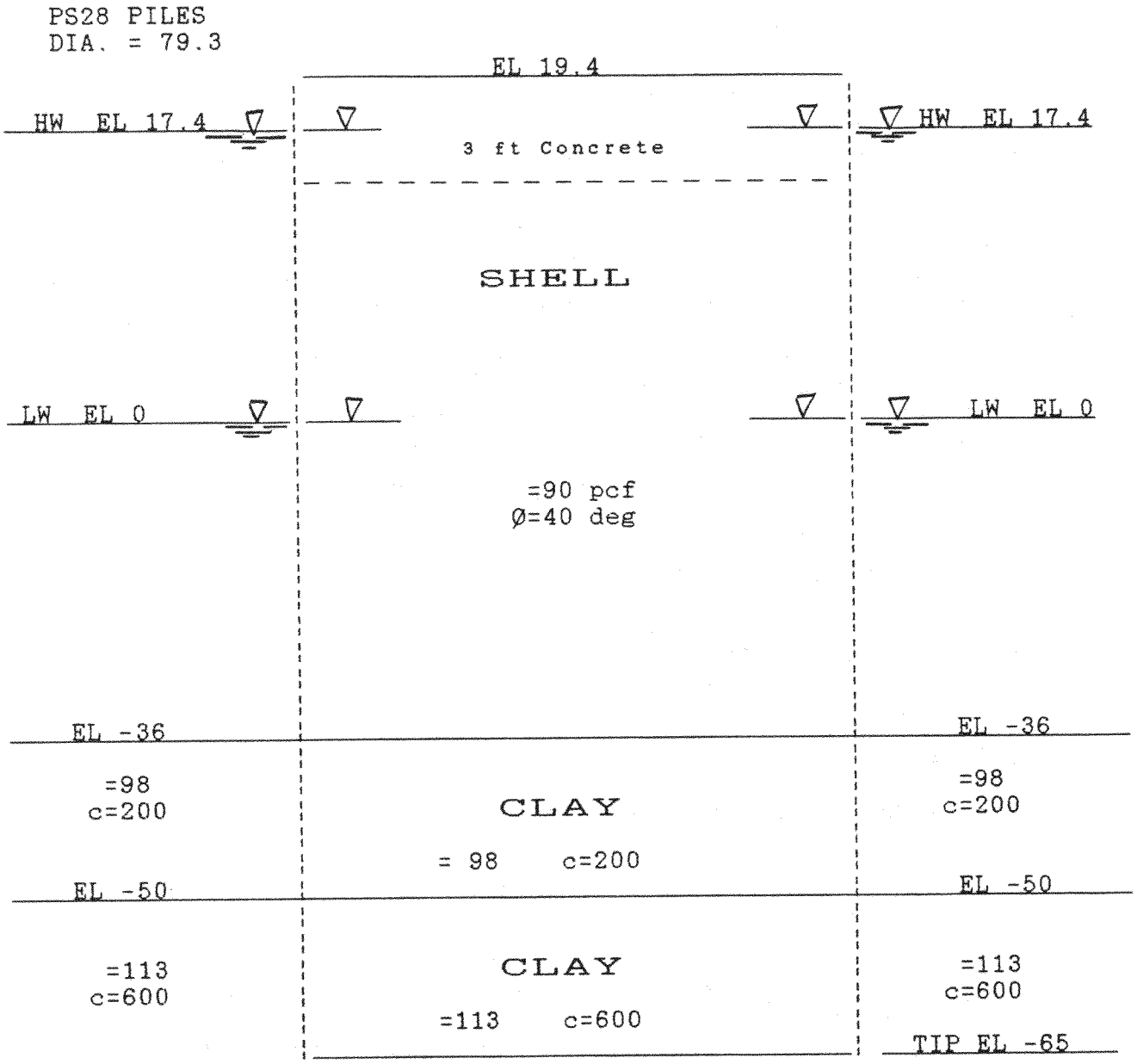
	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF 3.20	DRY DENSITY, PCF 79.2	97.3
COMPRESSION INDEX 0.55	SATURATION, % 99.5	100 +
TYPE SPECIMEN UNDISTURBED	VOID RATIO 1.127	0.931
DIA. IN 4.44 HT. IN 1.124	BACK PRESSURE, TSF	

CLASSIFICATION SILTY CLAY (CL), GRAY

LL 33 PL 20 PI 13	PROJECT M.R.G.D. - NEW SHIPLOCK
GS 2.70 (EST) D_{10}	IHNC SITE
REMARKS	BORING NO. 2-SCU / SAMPLE NO. 26-C
ELEV. 110.4	DEPTH/ELEV 102.4/-110.4 / DATE 24 SEP 81
$P_c = 3.20$	CONSOLIDATION TEST REPORT
$C_c = 0.55$	

ANNEX 4
CELLULAR COFFERDAM DESIGN

Project: IHNC Lock Replacement
Subject: MOORING CELL



MAX. IMPACT FORCE = 650K

THIS MOORING CELL WAS NOT DESIGNED FOR IMPACT LOADS

CELLULAR COFFERDAM DESIGN

IHNC MOORING CELL DIA.= 79.3

INTERLOCK TENSION (HOOP TENSION)

(see Bolwes, pg 557-558)

K_a = (use Rankine or Coulomb K_a)

Case I : Low water at el. 0

t_{max} = Interlock Tension Force = $\frac{\sigma_T \times R}{12}$

where $\sigma_T = K_a \gamma (H_c - H_1) + K_a \gamma' (H_1 - H_c/4) + \gamma_w (H_3 - H_c/4)$

H_c= free height of cofferdam = 55.4 ft

H_1= avg. height of saturation inside cofferdam = 36 ft

H_3= height of saturation line at inboard face = 36 ft

K_a= coefficient of active earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 0.217 for ϕ=40 deg

Utimate interlock stress = 8000 pli (use F.S. = 2)
(see USS Manual, 1975, pg 77 for PS 28 sheetpile)

σ_T= 0.217(90)(55.4-36) + 0.217(27.5)(36-55.4/4)
= 511 psf

$t_{max} = \frac{511 \times 39.7}{12}$ = 1690 lbs/in

F.S. = $\frac{\text{Utimate interlock stress}}{t_{max}} = \frac{8000}{1690}$ = 4.7 >2 OK

SLIDING:

F.S. = $\frac{\text{Resisting}}{\text{Driving}} = \frac{cL + P_p}{P_a} > 1.5$

bottom of cell assumed to slide on clay with c=600 psf

L = R = 79.3 ft

p_p (psf) = $K_p \gamma' H_s + 2c$

p_a (psf) = $K_a \gamma' H_s - 2c$

K_a= coefficient of active earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 1 for clay

K_p= coefficient of passive earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 1 for clay

Resisting Forces:

P_p = 35100 lbs/ft (see diagram 1)

cL = (600)(79.3) = 47600 lbs/ft

Driving Forces:

P_a = 350 lbs/ft (see diagram 1)

F.S. = $\frac{47600 + 35100}{350} > 236$ OK

BEARING CAPACITY:

$$q_{ult} = 1.3N_{cc} + \gamma' D$$

where $N_c = 5.7$ (Terzagi & Peck)
$c = 800$ psf
$\gamma' D = (40.5)(29) = 1175$ psf

$$q_{ult} = (1.3)(5.7)(800) + 1175 = 7100 \text{ psf}$$

$$F.S. = \frac{q_{ult}}{W_{cell} + 6M_o/B^2}$$

CASE I: Water = El 0
Bearing Load = W_{cell}
= 3(150) + 16.4(90) + 36(27.5) + 29(49.5)
= 4350 psf

where $P_w = P_{wR} - P_{wL} = 0$
$P_p = 35100$ lbs/ft
$P_a = 350$ lbs/ft

M_o = overturning moment = (350 x 15.9 - 35100 x 11.6)
= -401600 ft-lbs

$$F.S. = \frac{7100}{4350 + 6(401600)/(79.3)^2} = \frac{7100}{4350 + 380} = 1.5 \quad \text{OK}$$

CASE II: Water = El 17.4
Bearing Load = W_{cell}
= 2(150) + 1(87.5) + 52.4(27.5) + 29(49.5)
= 3100

$$F.S. = \frac{7100}{3100 + 380} = 2.0 \quad \text{OK}$$

SHEAR FAILURE ON CENTERLINE OF CELL: (VERTICAL SHEAR):

For simplicity, assume cell filled with shell down to bottom:

CASE II: Water = El 17.4

$F.S. = \frac{S_T}{Q}$ and $Q = 3M_o/2B$

$K_a = \frac{\cos^2(\phi)}{2-\cos^2(\phi)} = 0.415$

$S_T = P_s\tan(\phi) + fP_T$

where f = 0.3 (friction between steel interlocks)
because of clay foundation, $P_s = P_T$ (see USS Manual, 1975, pg 77)
$P_s = P_T = 60725$ (see diagram 2)
$S_T = 60725 \times \tan(40) + (0.3)(60725) = 69{,}200$ lbs/ft

M_o = overturning moment = 401600 ft-lbs

where $P_w = 0$

$F.S. = \frac{S_T}{Q} = \frac{S_T \times 2B}{3M} = \frac{(69200)(2)(79.3)}{(3)(401600)} = 9.1$ OK

CASE I: Water = El 0

$K_a = 0.415$
$P_s = P_T = 112300$ (see diagram 3)
$S_T = 112300 \times \tan(40) + (0.3)(112300) = 128{,}000$ lbs/ft
M_o = overturning moment = 401600 ft-lbs
f = 0.3

$F.S. = \frac{S_T}{Q} = \frac{S_T \times 2B}{3M} = \frac{(128000)(2)(79.3)}{(3)(401600)} = 16.8$ OK

SLIPPING — SHEETING AND CELL FILL:

For simplicity, assume cell filled with shell down to bottom:

$F.S. = \frac{B(P_w + P_a)\tan\delta + P_pH_p}{(P_wH/3 + P_aH_a)}$

$P_p = 35100$ lbs/ft
$P_a = 350$ lbs/ft
$P_w = P_{wR} - P_{wL} = 0$
$H_a = 15.9$ ft
$H_p = 11.6$ ft
$\delta = 2/3(\phi) = 26.7$ deg (NAVFAC 7.2)
$F.S. = \frac{79.3[(0 + (350)(0.50)] + 35100(11.6)}{0 + (350)(15.9)} = 75.7$ OK

HORIZONTAL SHEAR (CUMMINGS METHOD):

For simplicity, assume cell filled with shell down to bottom:

$$F.S. = \frac{M_r + M_i + P_pH_p}{P_wH/3 + P_aH_a}$$

where $M_r = \frac{ab^2}{2} + \frac{b^3}{3}$ = resisting moment from cell fill friction

$b = \tan\phi(B) = \tan(40)(79.3) = 66.5$ ft

$a = H-b = 84.4 - 66.5 = 17.9$ ft

so $M_r = \frac{(17.9)(66.5)^2(55)}{2} + \frac{66.5^3(55)}{3} = 7568000$ lb-ft

and $M_i = P_T(B)(f)$ = resisting moment from sheetpile friction

for High water = 17.4 -- P_T = 60725
for Low water = 0 ------ P_T = 112300

M_i (Low water) = (112300)(84.4)(0.3) = 2830000 lb-ft
M_i (High water) = (60725)(84.4)(0.3) = 1537600 lb-ft

$P_w = P_{wR} - P_{wL} = 0$
P_p = 35100 lbs/ft
P_a = 350 lbs/ft
H_a = 15.9 ft
H_p = 11.6 ft

so F.S. (Low water) = $\frac{7568000 + 2830000 + (35100)(11.6)}{0 + (350)(15.9)} = 1940$ OK

and F.S. (High water) = $\frac{7568000 + 1537550 + (35100)(11.6)}{0 + (350)(15.9)} = 1700$ OK

PULL-OUT OF OUTER SHEETING:

$$F.S. = \frac{Q_u}{Q_p} > 1.5$$

for clay, Q_u = c_a x perimeter x embedded length
where c_a= 400 psf (avg)
perimeter = 79.3 x pi = 249 ft and embedded length = 29 ft
Q_u = 2890000 lbs

$$Q_p = \frac{P_aH_s - P_pH_B + P_wH}{3B(1 + B/4L)}$$

$P_w = 0$
P_p = 35100 lbs/ft and P_a = 350 lbs/ft
$H_s = H_B$ = 29 ft

$$Q_p = \frac{350(29) - 35100(29)}{3(79.3)[1 + (79.3/(4)(79.3)]} = -3400$$

F.S. = 2890000/3400 = 850 OK

PENETRATION OF INBOARD SHEETING:

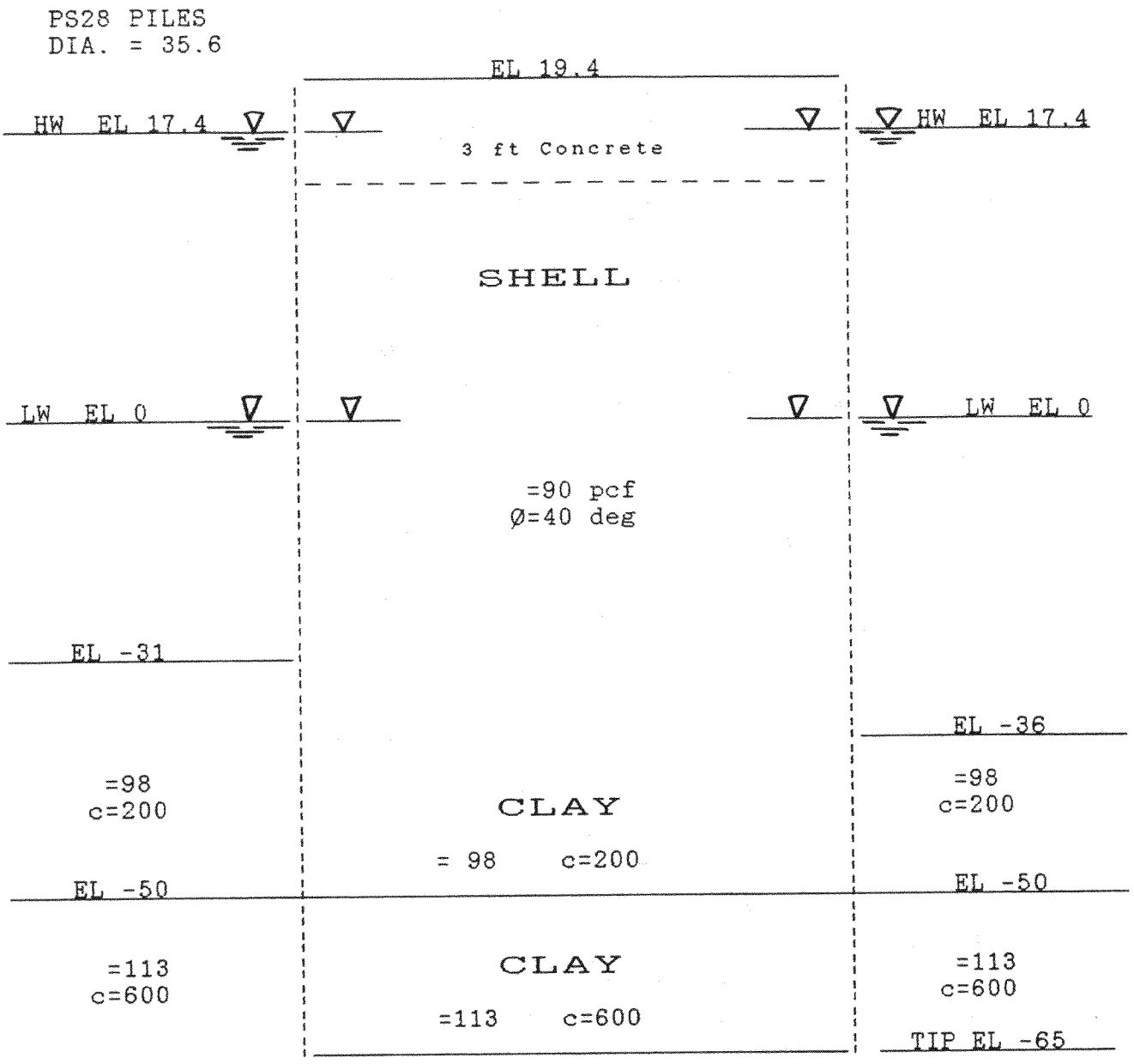
$$F.S. = \frac{(P_p + P_s)\tan\delta_o)}{P_d\tan(\delta_f)} = \frac{P_p\tan\delta_o + cL_s}{P_d\tan(\delta_f)}$$

where δ_f = angle of friction between sheetpile and cell fill
δ_o = angle of friction between sheetpile and soil
P_d = cell fill pressure on inboard sheeting above dredgeline
P_s = soil pressure inside of inboard sheeting below dredgeline
P_p = soil pressure outside of inboard sheeting

P_p = 35100 lbs/ft
P_s = 71800 lbs/ft
P_d = 40500 lbs/ft
δ_o = 0 for clay
δ_f = 26.7 deg

$$F.S. = \frac{400(29) + 400(29)}{40500\tan(26.7)} = 1.14$$

Project: IHNC Lock Replacement
Subject: GUIDEWALL DOLPHIN



MAX. IMPACT FORCE DURING HIGH WATER (17.4) = 270K

MAX. IMPACT FORCE DURING LOW WATER (0.0) = 230K

THIS GUIDEWALL DOLPHIN WAS NOT DESIGNED FOR IMPACT LOADS

CELLULAR COFFERDAM DESIGN

IHNC GUIDEWALL CELL DIA.= 35.6

INTERLOCK TENSION (HOOP TENSION)

(see Bolwes, pg 557-558)

K_a = (use Rankine or Coulomb K_a)

Case I : Low water at el. 0

t_{max} = Interlock Tension Force = $\frac{\sigma_T \times R}{12}$

where $\sigma_T = K_a \gamma (H_c - H_1) + K_a \gamma' (H_1 - H_c/4) + \gamma_w (H_3 - H_c/4)$

H_c= free height of cofferdam = 52.9 ft

H_1= avg. height of saturation inside cofferdam = 33.5 ft

H_3= height of saturation line at inboard face = 33.5 ft

K_a= coefficient of active earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 0.217 for ϕ=40 deg

Utimate interlock stress = 8000 pli (use F.S. = 2)
(see USS Manual, 1975, pg 77 for PS 28 sheetpile)

σ_T= 0.217(90)(52.9-33.5) + 0.217(27.5)(33.5-52.9/4)
= 500 psf

$t_{max} = \frac{500 \times 17.8}{12}$ = 740 lbs/in

F.S. = $\frac{\text{Utimate interlock stress}}{t_{max}} = \frac{8000}{740}$ = 10.8 >2 OK

SLIDING:

F.S. = $\frac{\text{Resisting}}{\text{Driving}} = \frac{cL + P_p}{P_a} > 1.5$

bottom of cell assumed to slide on clay with c=600 psf
L = R = 79.3 ft,
p_p (psf) = $K_p \gamma' H_s + 2c$
p_a (psf) = $K_a \gamma' H_s - 2c$
K_a= coefficient of active earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 1 for clay
K_p= coefficient of passive earth pressure (Rankine)
= $\tan^2(45-\phi/2$ = 1 for clay

Resisting Forces:
P_p = 47275 lbs/ft (see diagram 4)
cL = (600)(35.6) = 21360 lbs/ft

Driving Forces:
P_a = 350 lbs/ft (see diagram 4)

F.S. = $\frac{21360 + 47275}{350} > 196$ OK

BEARING CAPACITY:

$$q_{ult} = 1.3N_c c + \gamma' D$$

where $N_c = 5.7$ (Terzagi & Peck)
$c = 800$ psf
$\gamma' D = (40.5)(29) = 1175$ psf

$$q_{ult} = (1.3)(5.7)(800) + 1175 = 7100 \text{ psf}$$

$$F.S. = \frac{q_{ult}}{W_{cell} + 6M_o/B^2}$$

CASE I: Water = El 0
Bearing Load = W_{cell}
= 3(150) + 16.4(90) + 33.5(27.5) + 31.5(49.5)
= 4400 psf

where $P_w = P_{wR} - P_{wL} = 0$
$P_p = 47275$ lbs/ft
$P_a = 350$ lbs/ft

M_o = overturning moment = (350 x 15.9 - 47275 x 11.8)
= -552300 ft-lbs

$$F.S. = \frac{7100}{4400 + 6(552300)/(35.6)^2} = \frac{7100}{4400 + 2600} = 1.0$$

CASE II: Water = El 17.4
Bearing Load = W_{cell}
= 2(150) + 1(87.5) + 49.9(27.5) + 31.5(49.5)
= 3300

$$F.S. = \frac{7100}{3300 + 2600} = 1.2$$

SHEAR FAILURE ON CENTERLINE OF CELL: (VERTICAL SHEAR):

For simplicity, assume cell filled with shell down to bottom:

CASE II: Water = El 17.4

$F.S. = \frac{S_T}{Q}$ and $Q = 3M_o/2B$

$K_a = \frac{\cos^2(\emptyset)}{2-\cos^2(\emptyset)} = 0.415$

$S_T = P\tan(\emptyset) + fP_T$

where f = 0.3 (friction between steel interlocks)
because of clay foundation, $P_s = P_T$ (see USS Manual, 1975, pg 77)
$P_s = P_T = 62570$ (see diagram 5)
$S_T = 62570 \times \tan(40) + (0.3)(62570) = 71{,}270$ lbs/ft

M_o = overturning moment = 552300 ft-lbs

where $P_w = 0$

$F.S. = \frac{S_T}{Q} = \frac{S_T \times 2B}{3M} = \frac{(71270)(2)(35.6)}{(3)(552300)} = 3.0$ OK

CASE I: Water = El 0

$K_a = 0.415$
$P_s = P_T = 115300$ (see diagram 6)
$S_T = 115300 \times \tan(40) + (0.3)(115300) = 131{,}300$ lbs/ft
M_o = overturning moment = 552300 ft-lbs
f = 0.3

$F.S. = \frac{S_T}{Q} = \frac{S_T \times 2B}{3M} = \frac{(131300)(2)(35.6)}{(3)(552300)} = 5.6$ OK

SLIPPING — SHEETING AND CELL FILL:

For simplicity, assume cell filled with shell down to bottom:

$$F.S. = \frac{B(P_w + P_a)\tan\delta + P_pH_p}{(P_wH/3 + P_aH_a)}$$

where tan = 0.25 (reference Pile Buck Design Manual, 1987)

$P_p = 47275$ lbs/ft
$P_a = 350$ lbs/ft
$P_w = P_{wR} - P_{wL} = 0$
$H_a = 15.9$ ft
$H_p = 11.8$ ft
$\delta = 2/3\emptyset = 26.7$ deg (NAVFAC 7.2)
$F.S. = \frac{35.6[(0 + (350)(0.50)] + 47275(11.8)}{0 + (350)(15.9)} = 101$ OK

HORIZONTAL SHEAR (CUMMINGS METHOD):

For simplicity, assume cell filled with shell down to bottom:

$$F.S. = \frac{M_r + M_i + P_pH_p}{P_wH/3 + P_aH_a}$$

where $M_r = \frac{ab^2}{2} + \frac{b^3}{3}$ = resisting moment from cell fill friction

$b = \tan\phi(B) = \tan(40)(35.6) = 30$ ft

$a = H-b = 84.4 - 30 = 54.4$ ft

so $M_r = \frac{(54.4)(30)^2(55)}{2} + \frac{30^3(55)}{3} = 1841400$ lb-ft

and $M_i = P_T(B)(f)$ = resisting moment from sheetpile friction

for High water = 17.4 -- $P_T = 62570$

for Low water = 0 ------ $P_T = 115300$

M_i (Low water) = (115300)(35.6)(0.3) = 1231400 lb-ft

M_i (High water) = (62570)(35.6)(0.3) = 668200 lb-ft

$P_w = P_{wR} - P_{wL} = 0$

$P_p = 47275$ lbs/ft

$P_a = 350$ lbs/ft

$H_a = 15.9$ ft

$H_p = 11.8$ ft

so F.S. (Low water) = $\frac{1841400 + 1231400 + (47275)(11.8)}{0 + (350)(15.9)} = 652$ OK

and F.S. (High water) = $\frac{1841400 + 668200 + (47275)(11.8)}{0 + (350)(15.9)} = 551$ OK

PULL-OUT OF OUTER SHEETING:

$$F.S. = \frac{Q_u}{Q_p} > 1.5$$

for clay, Q_u = c_a x perimeter x embedded length

where c_a= 400 psf (avg)

perimeter = 35.6 x pi = 112 ft and embedded length = 29 ft

$Q_u = 1300000$ lbs

$$Q_p = \frac{P_aH_s - P_pH_B + P_wH}{3B(1 + B/4L)}$$

$P_w = 0$

$P_p = 47275$ lbs/ft and $P_a = 350$ lbs/ft

$H_s = H_B = 29$ ft

$$Q_p = \frac{350(29) - 47275(29)}{3(35.6)[1 + (35.6/(4)(35.6)]} = -10200$$

F.S. = 1300000/10200 = 127 OK

PENETRATION OF INBOARD SHEETING:

$$F.S. = \frac{(P_p + P_s)\tan(\delta_o)}{P_d\tan(\delta_f)} = \frac{P_p\tan\delta + cL_s}{P_d\tan(\delta_f)}$$

where ~~deltaf~~ = angle of friction between sheetpile and cell fill
~~delta~~$_o$ = angle of friction between sheetpile and soil
P_d = cell fill pressure on inboard sheeting above dredgeline
P_s = soil pressure inside of inboard sheeting below dredgeline
P_p = soil pressure outside of inboard sheeting

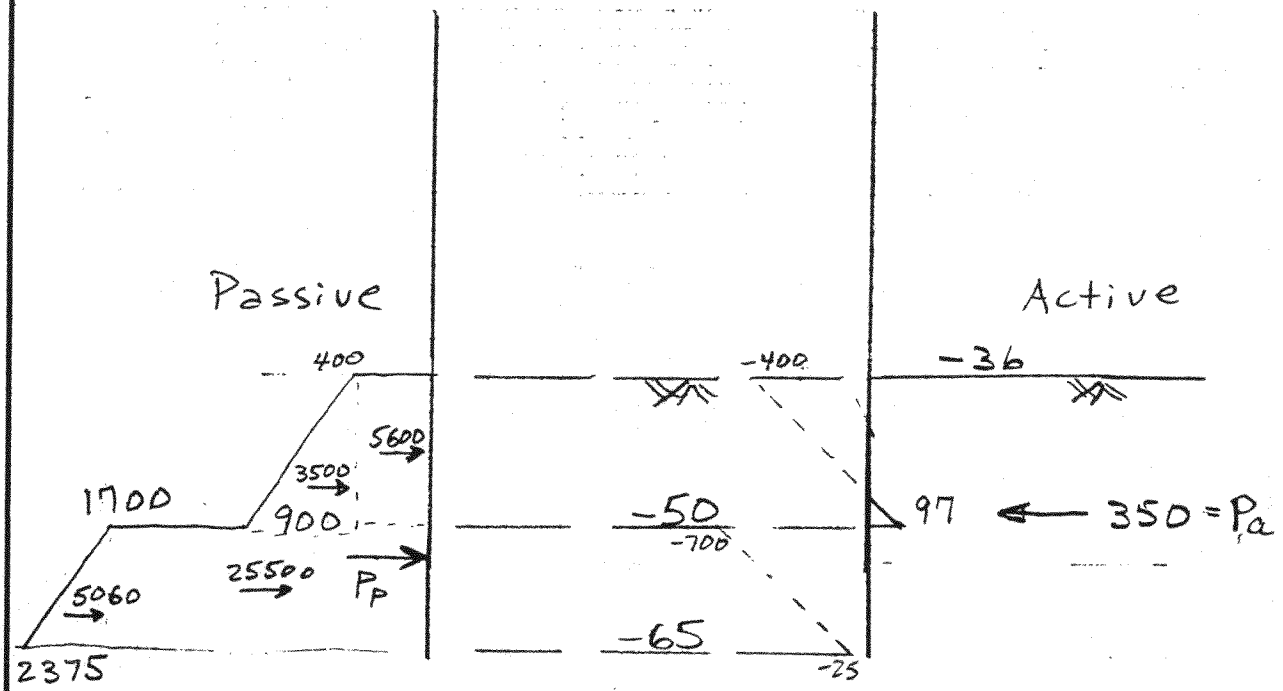
P_p = 47275 lbs/ft
P_s = 77700 lbs/ft
P_d = 37600 lbs/ft
δ_o = 0 for clay
δ_f = 26.7 deg

$$F.S. = \frac{400(29) + 400(29)}{37600\tan(26.7)} = 1.23$$

COMPUTATION SHEET

PROJECT	IHNC Shiplock	PAGE OF	COMPUTED BY	DATE Sep 93
SUBJECT	Mooring Cell, B = 79.3'		CHECKED BY	DATE

Active & Passive pressure on sheetpile walls from soil foundation.



$P_p = 35100$

$P_a = 97(2.7)^2/2 = 350$

distance from base

for P_a, $x = 15 + \frac{1}{3}(2.7) = 15.9'$

for P_p, $x = \frac{5600(22) + 3500(19.7) + 25500(7.5) + 5060(5)}{5600 + 3500 + 25500 + 5060}$

$x = 11.6$

Diagram 1

COMPUTATION SHEET

PROJECT IHNC Shiplock	PAGE OF	COMPUTED BY KF	DATE Sep 93
SUBJECT Mooring Cell, B = 79.3'		CHECKED BY	DATE

High Water = EL. 17.4

Active pressure inside of the cell wall. (For vert. shear)

@ 17.4 $p = K_A \gamma' H - 2c$

$P_{17.4} = 0.415(90)(2) = 75$

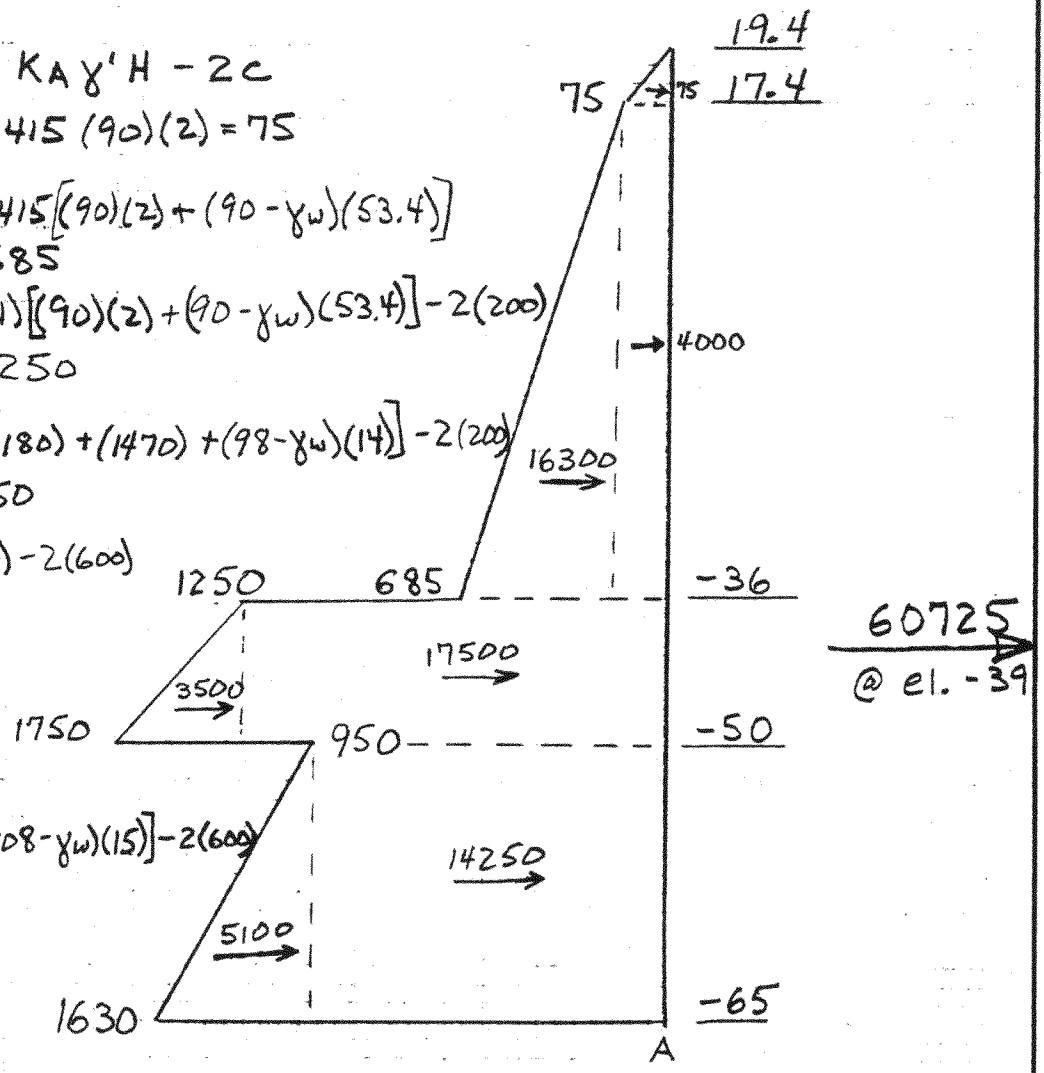
$P_{-36} = 0.415[(90)(2) + (90 - \gamma_w)(53.4)]$
$= 685$

$P_{-36} = (1)[(90)(2) + (90 - \gamma_w)(53.4)] - 2(200)$
$= 1250$

$P_{-50} = (1)[(180) + (1470) + (98 - \gamma_w)(14)] - 2(200)$
$= 1750$

$P_{-50} = (1)(2150) - 2(600)$
$= 950$

$P_{-65} = (1)[2150 + (108 - \gamma_w)(15)] - 2(600)$
$= 1630$



Σ Resultants = 60725 p/f

distance "x" up from (p+A) is

$[75(83.1) + 4000(55.7) + 16300(46.8) + 17500(22) + 3500(19.7) + 14250(7.5) + 5100(5)] \div 60725$

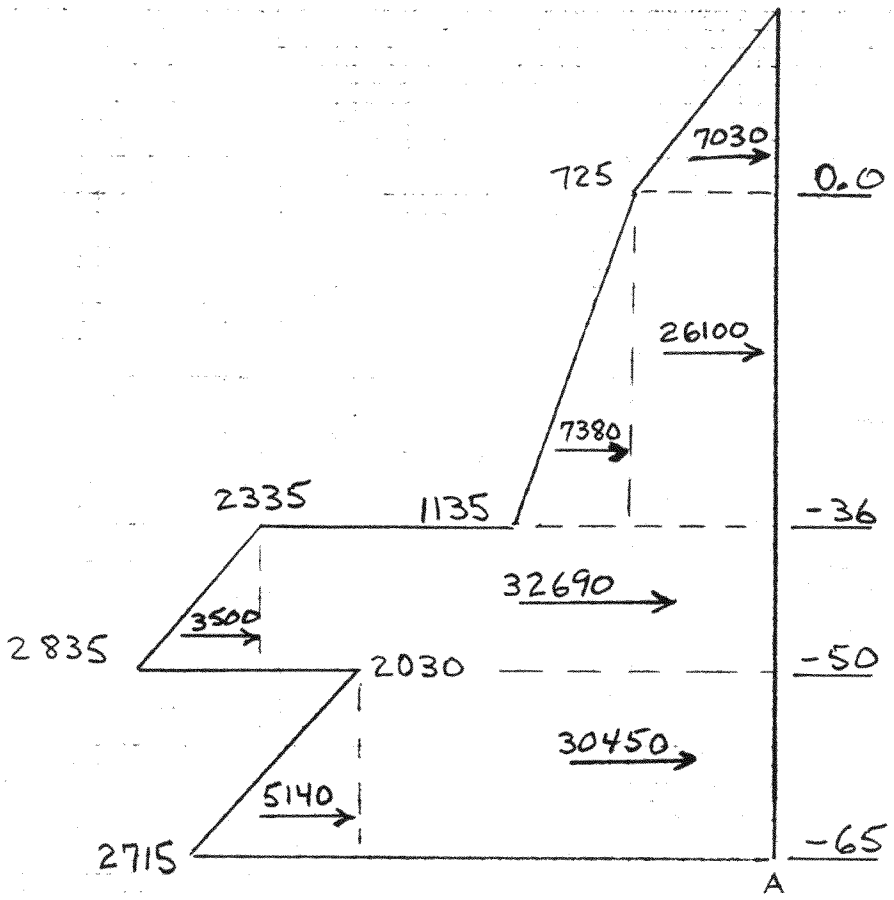
$x = 26'$ = elev. -39

Diagram 2

PROJECT	PAGE OF	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

Low Water = EL 0.0

Active pressure inside of cell wall.
(For Vert. shear)



$\Sigma R = 112300$

distance "x" up from pt. A is

$[7030(71.5) + 26100(47) + 7380(41) + 32690(22) + 3500(19.7) + 30450(7.5) + 5140(5)] \div 112300$

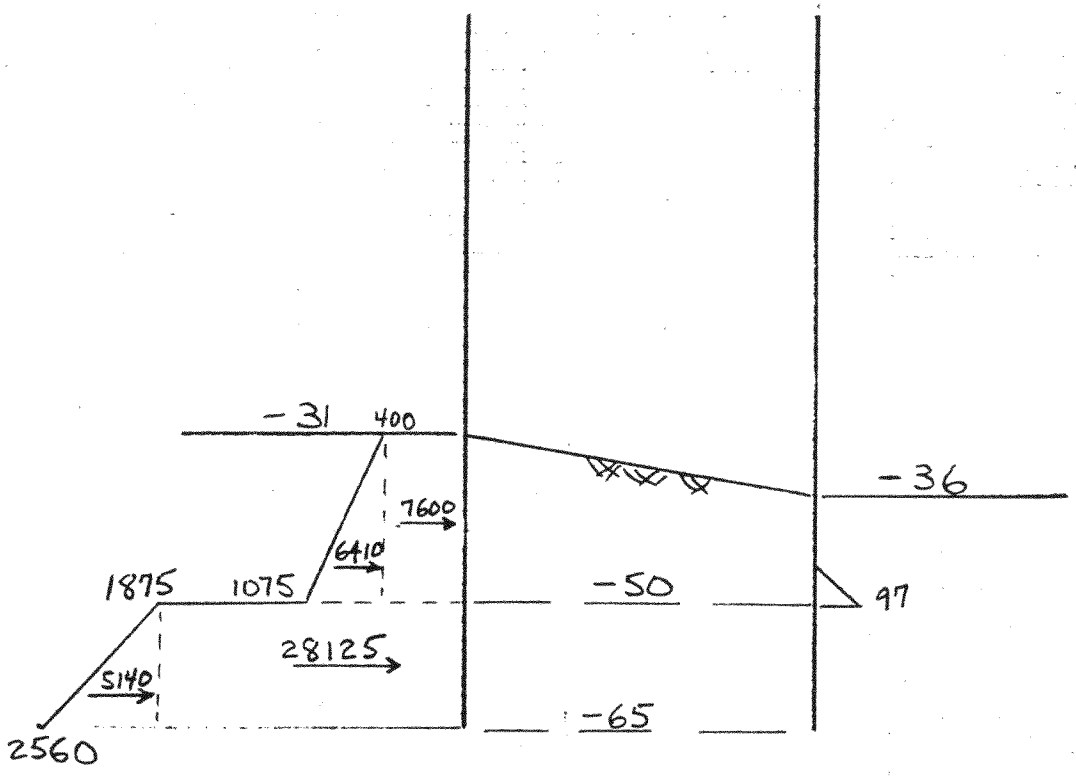
$x = 27.4$ = elev. 37.6

Diagram 3

COMPUTATION SHEET

PROJECT IHNC Shiplock	PAGE OF	COMPUTED BY	DATE Sep 93
SUBJECT Guidewall Dolphin		CHECKED BY	DATE

Active & Passive pressures on Sheetpile walls from foundation soils.



$P_p = 47275$ $P_a = 350$

distance from base for Resultant P_p

$$X = \frac{7600(24.5) + 6410(21.3) + 28125(7.5) + 5140(5)}{47275} = 11.8$$

Diagram 4

COMPUTATION SHEET

PROJECT	IHNC Shiplock	PAGE OF	COMPUTED BY LAT	DATE Sep 93
SUBJECT	Guidewall Dolphin		CHECKED BY	DATE

High Water = 17.4

Active pressures inside cell wall from cell fill

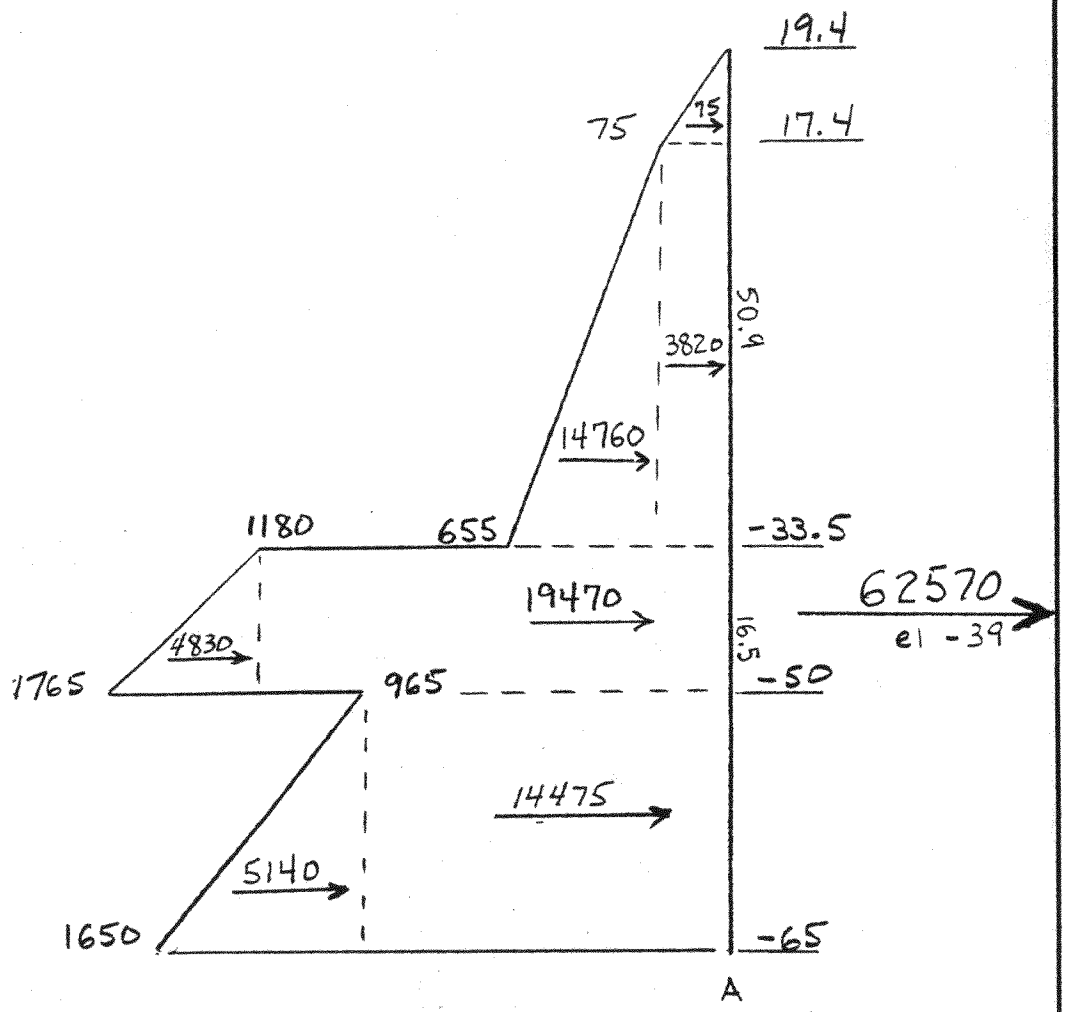


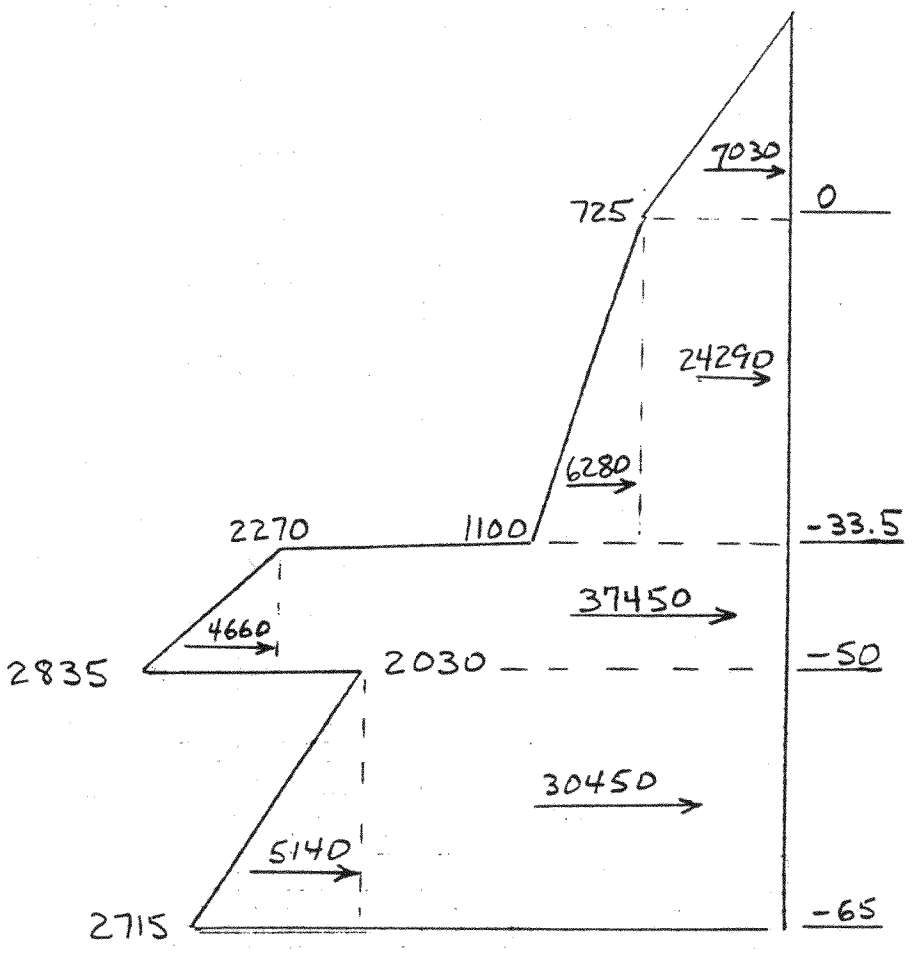
Diagram 5

COMPUTATION SHEET

PROJECT IHNC Shiplock	PAGE OF	COMPUTED BY KT	DATE Sep 93
SUBJECT Guidewall Dolphin		CHECKED BY	DATE

Low Water = EL 0.0

Active pressure inside cell wall from cell fill.



$\Sigma R = 115300$ @ EL -39

Diagram 6