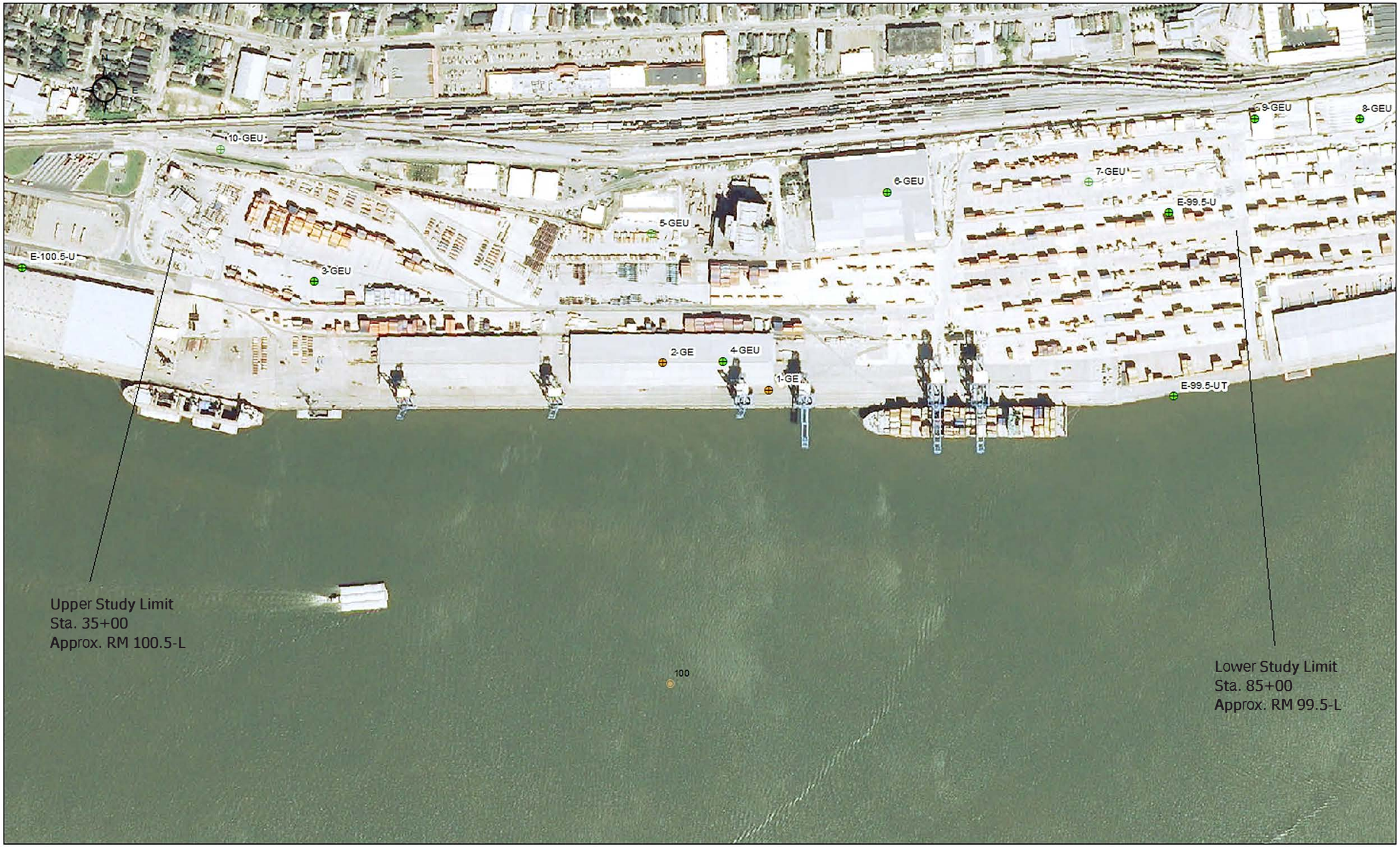
Port of New Orleans Deepening Feasibility Study

Appendix A: Engineering

Annex 1

Geotechnical Plates

March 2020



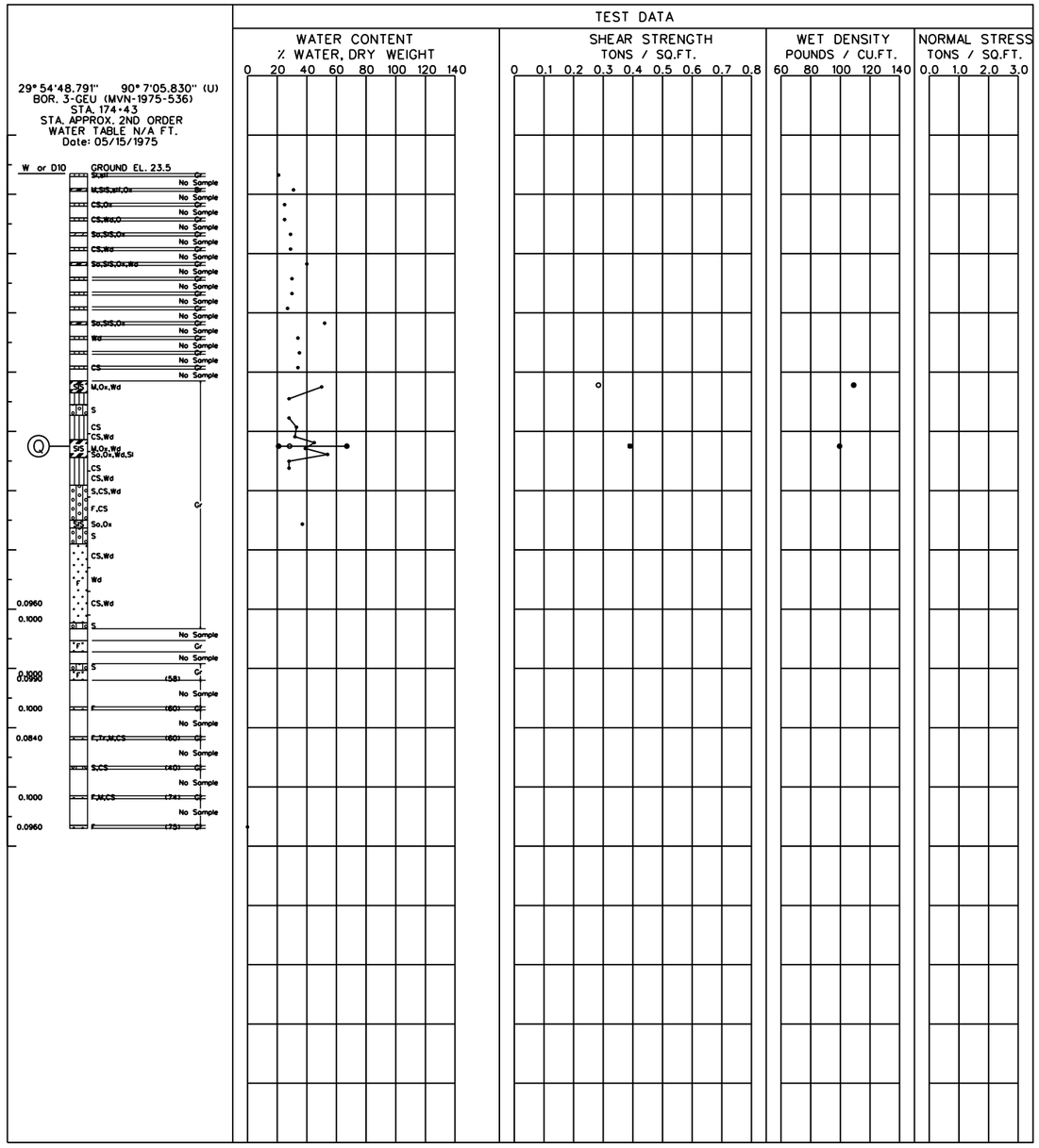
Port of New Orleans
Channel Deepening Study

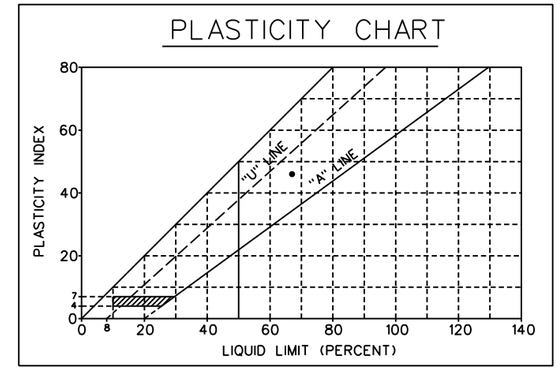
Boring Location Map

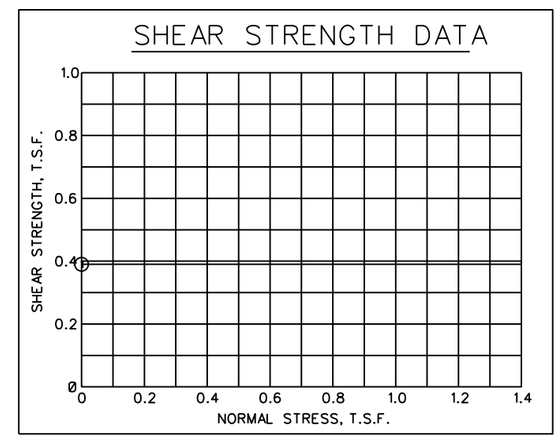
Plate 1

Port of New Orleans
Channel Deepening Study
Dredged Material Grab Samples

Plate 1a







TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C or Pc-TSF	CLASS
1	-22.5	0	0.0	0.390	CH

NOTES

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (3 POINT)
□ - (q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (1 POINT)
▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
◇ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

US ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

MARK | DESCRIPTION | DATE | APPR.
MARK | DESCRIPTION | DATE | APPR.

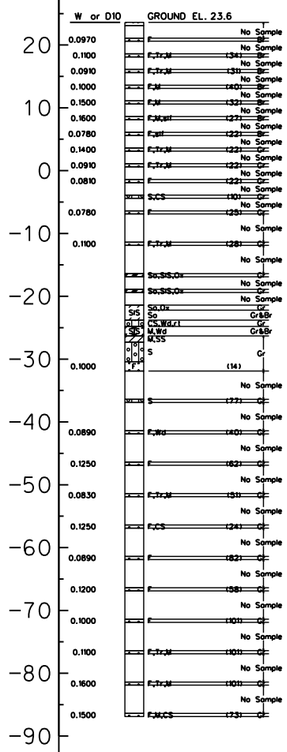
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MISSISSIPPI VALLEY DIVISION

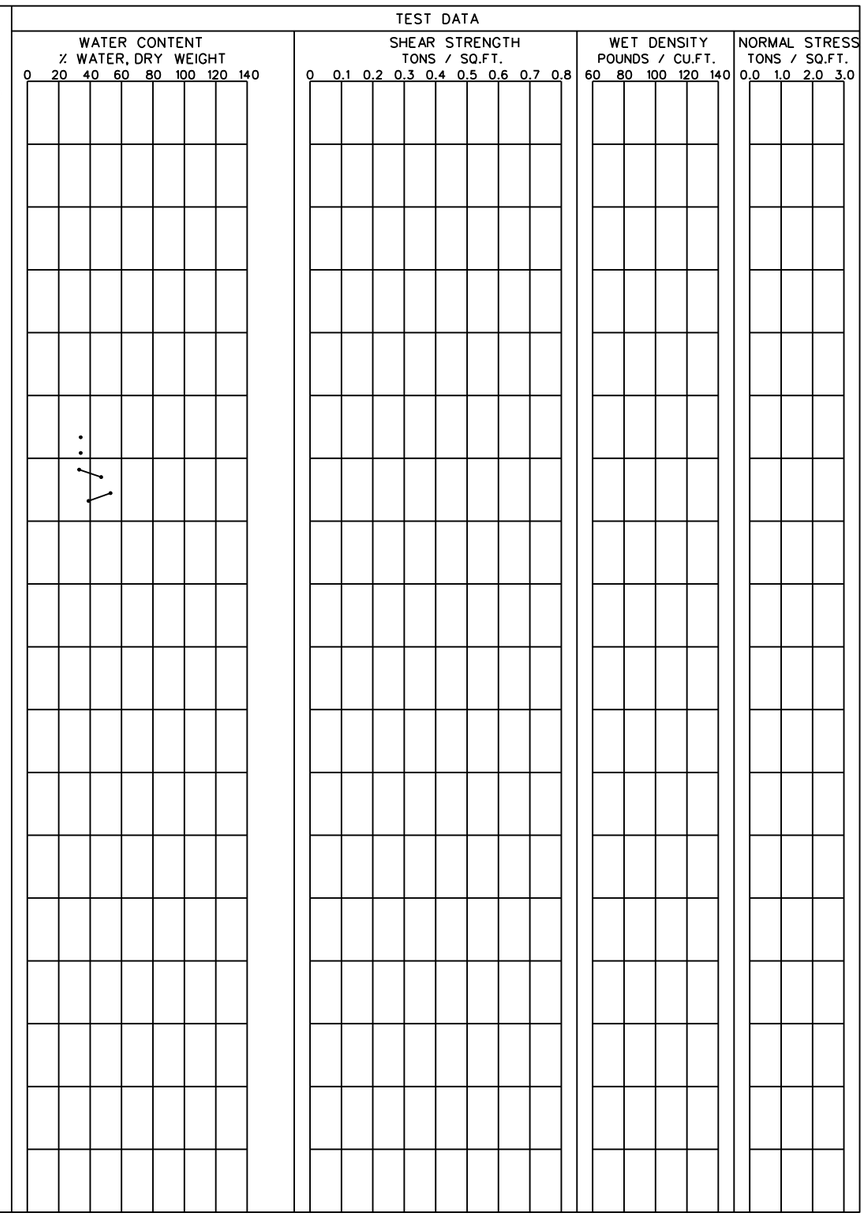
DESIGNED BY: | DATE:
DWN BY: | CKD BY: | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
FILE NAME: | PLOT DATE:
SIZE: | PLOT SCALE:

BORING
3-GEU

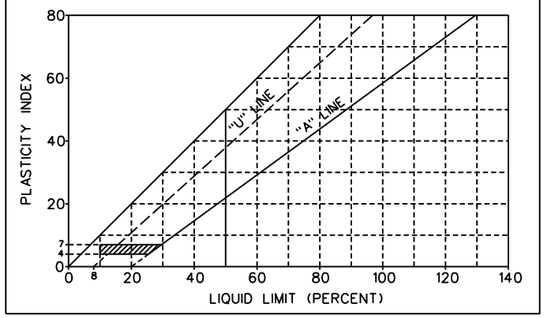
SHEET IDENTIFICATION NUMBER
Plate 2

29° 54'44.827" 90° 6'45.284" (U)
BOR. 4-GEU (MVN-1975-536)
STA. 192+76
STA. APPROX. 2ND ORDER
WATER TABLE N/A FT.
Date: 05/19/1975

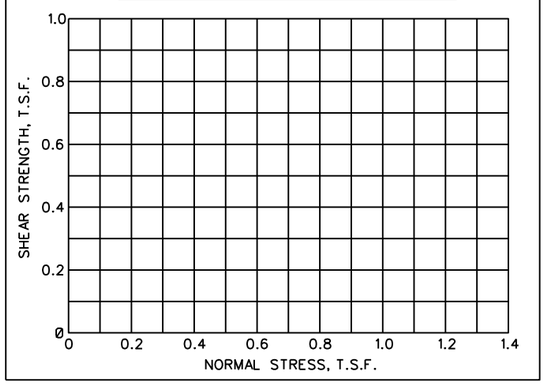




PLASTICITY CHART



SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C or Pc-TSF	

NOTES

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (3 POINT)
□ - (q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (1 POINT)
▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
◇ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER
STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

US ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

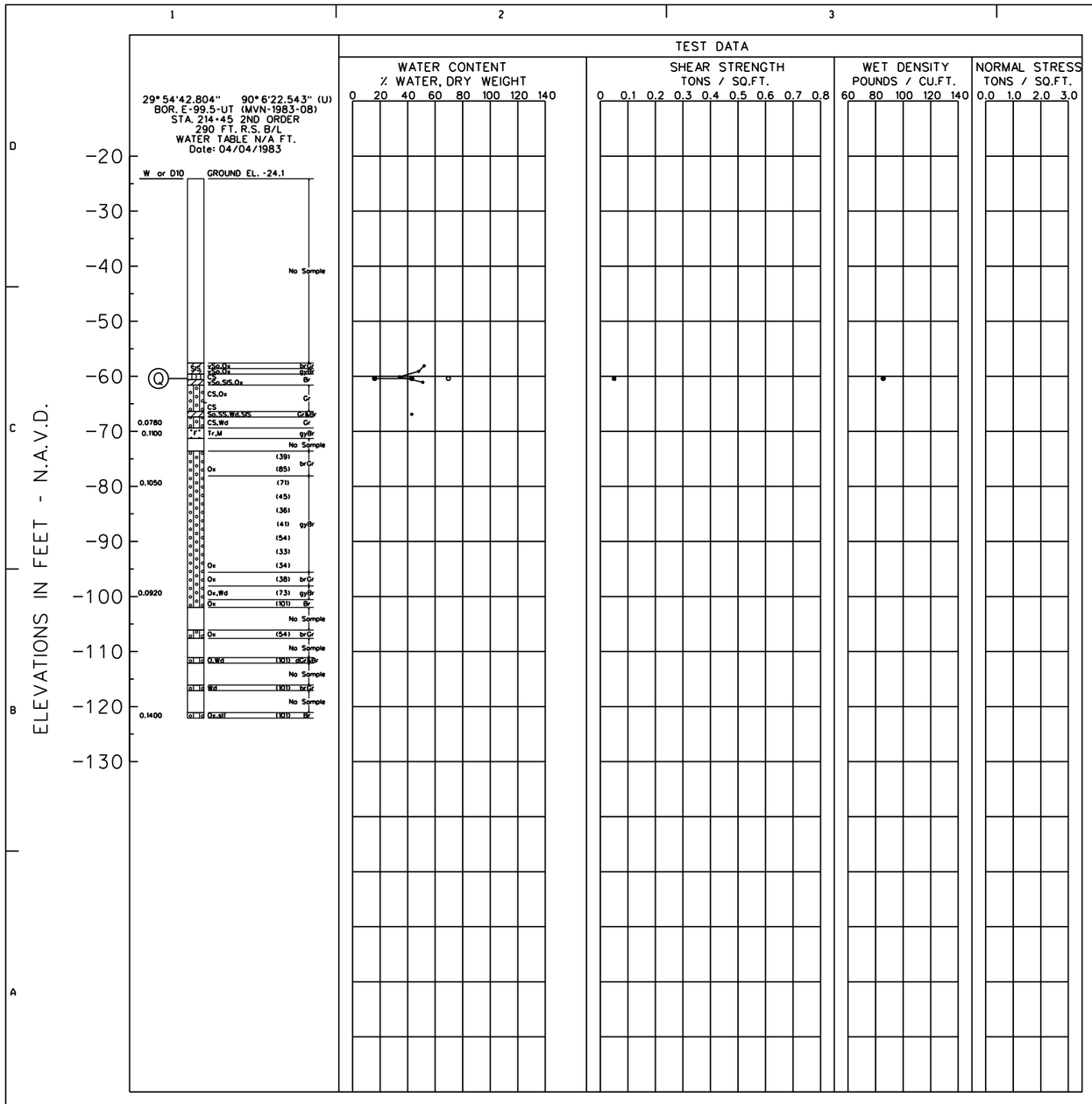
MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MISSISSIPPI VALLEY DIVISION

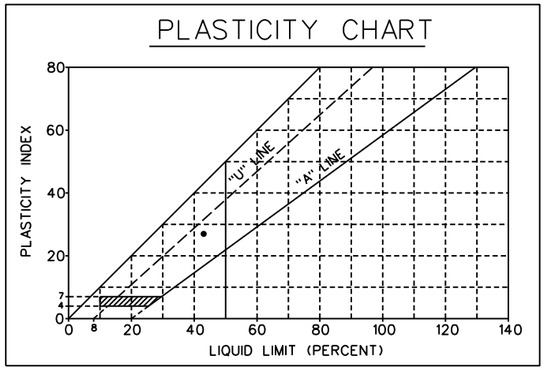
DESIGNED BY: | DATE:
DWN BY: | CKD BY: | SUBMITTED BY: | SOLICITATION NO.:
CONTRACT NO.:
FILE NAME:
FILE NUMBER:
SIZE: | PLOT SCALE: | PLOT DATE:

BORING
4-GEU

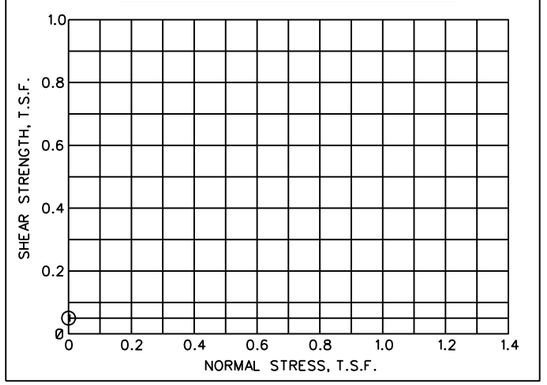
SHEET IDENTIFICATION NUMBER
Plate 3



PLASTICITY CHART



SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C or Pc-TSF	CLASS
1	-60.4	0	0.0	0.050	CL

NOTES

○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (3 POINT)
□ - (q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST (1 POINT)
▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
◇ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

US ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

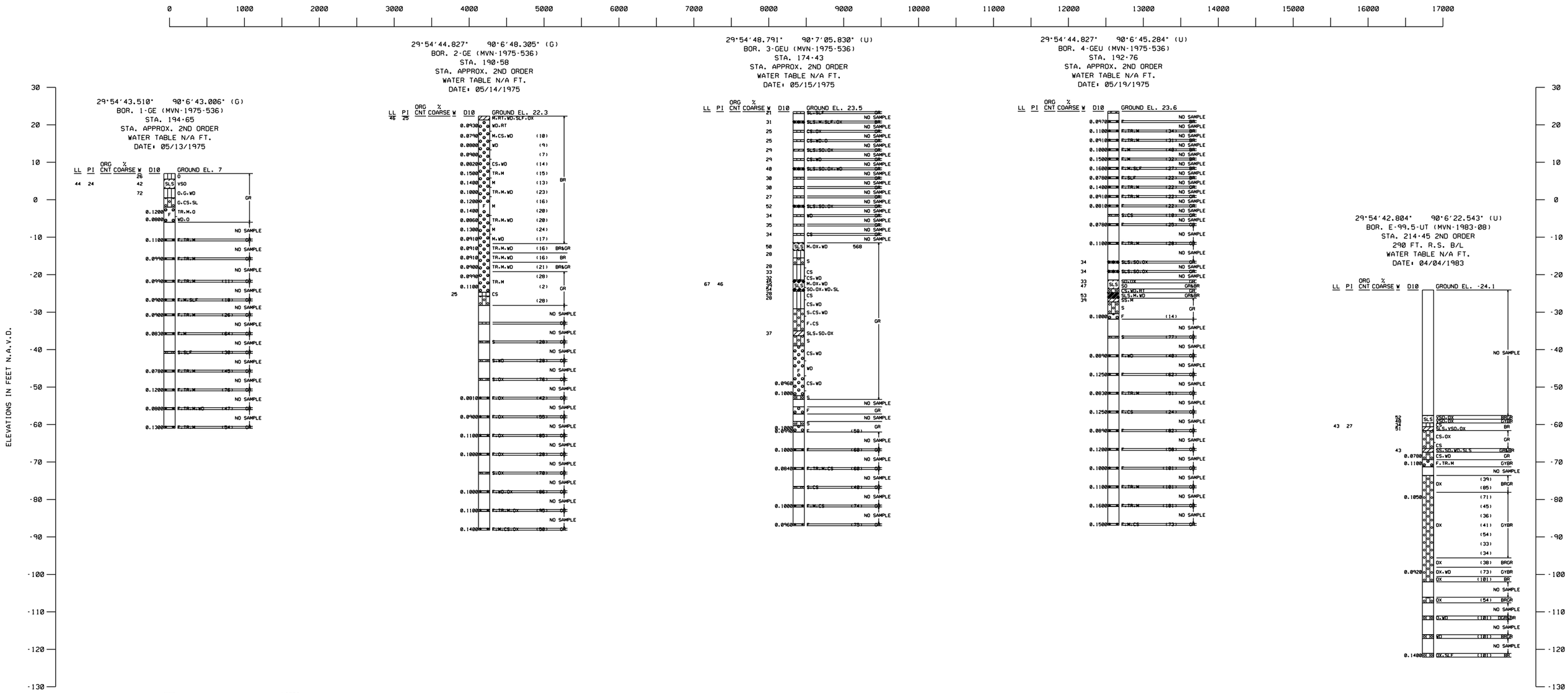
MARK | DESCRIPTION | DATE | APPR. | MARK | DESCRIPTION | DATE | APPR.

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MISSISSIPPI VALLEY DIVISION

DESIGNED BY: | DWG:
DWN BY: | CKD BY: | SUBMITTED:
SUBMITTED BY: | CONTRACT NO.:
FILE NAME: | FILE NUMBER:
SIZE: | PLOT SCALE: | PLOT DATE:

BORING E-99.5-UT

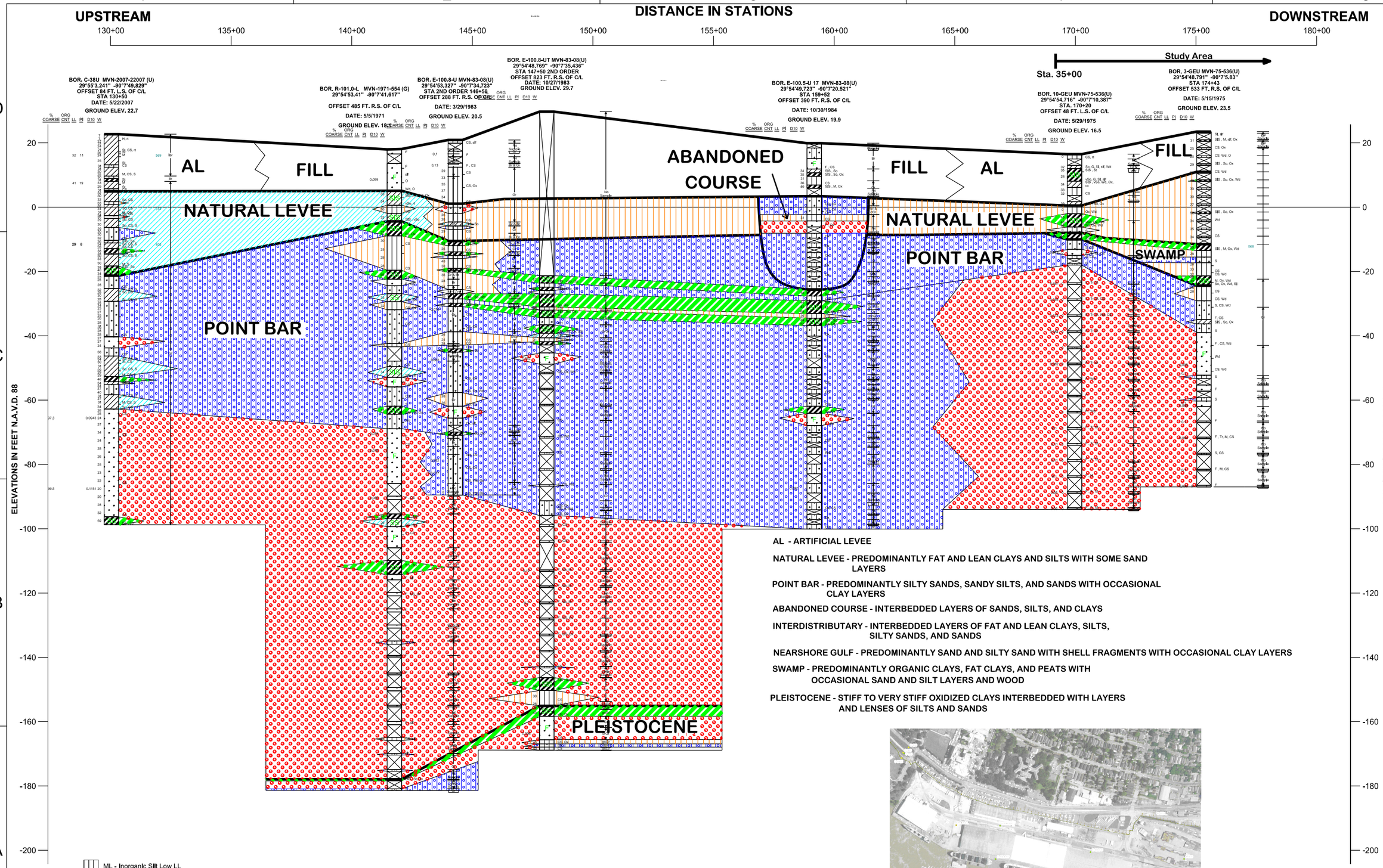
SHEET IDENTIFICATION NUMBER
Plate 4



CH · FAT CLAY
CL · LEAN CLAY
ML · SILT, LOW PLASTICITY
SL · SHELLS
SM · SILTY SAND
SP · SAND, POORLY GRADED

NOTES:
LL · LIQUID LIMIT.
PI · PLASTICITY INDEX.
ORG CNT · ORGANIC CONTENT IN PERCENT.
% COARSE · CUMULATIVE PERCENT RETAINED ON THE #200 SIEVE.
W · WATER CONTENT BY PERCENT DRY WEIGHT.
D10 · GRAIN DIAMETER IN MILLIMETERS WHERE 10% OF SAMPLE IS FINER.

Port of New Orleans
Channel Deepening Study
Soil Boring Logs
Plate 5



AL - ARTIFICIAL LEVEE

NATURAL LEVEE - PREDOMINANTLY FAT AND LEAN CLAYS AND SILTS WITH SOME SAND LAYERS

POINT BAR - PREDOMINANTLY SILTY SANDS, SANDY SILTS, AND SANDS WITH OCCASIONAL CLAY LAYERS

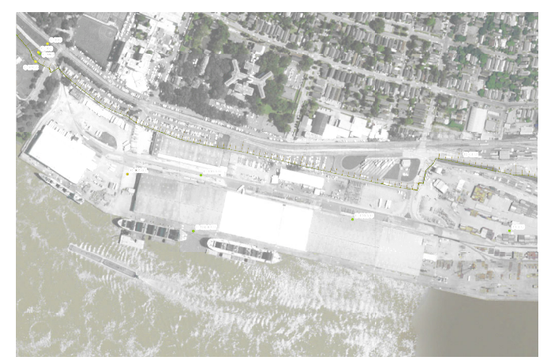
ABANDONED COURSE - INTERBEDDED LAYERS OF SANDS, SILTS, AND CLAYS

INTERDISTRIBUTARY - INTERBEDDED LAYERS OF FAT AND LEAN CLAYS, SILTS, SILTY SANDS, AND SANDS

NEARSHORE GULF - PREDOMINANTLY SAND AND SILTY SAND WITH SHELL FRAGMENTS WITH OCCASIONAL CLAY LAYERS

SWAMP - PREDOMINANTLY ORGANIC CLAYS, FAT CLAYS, AND PEATS WITH OCCASIONAL SAND AND SILT LAYERS AND WOOD

PLEISTOCENE - STIFF TO VERY STIFF OXIDIZED CLAYS INTERBEDDED WITH LAYERS AND LENSES OF SILTS AND SANDS



US ARMY CORPS OF ENGINEERS

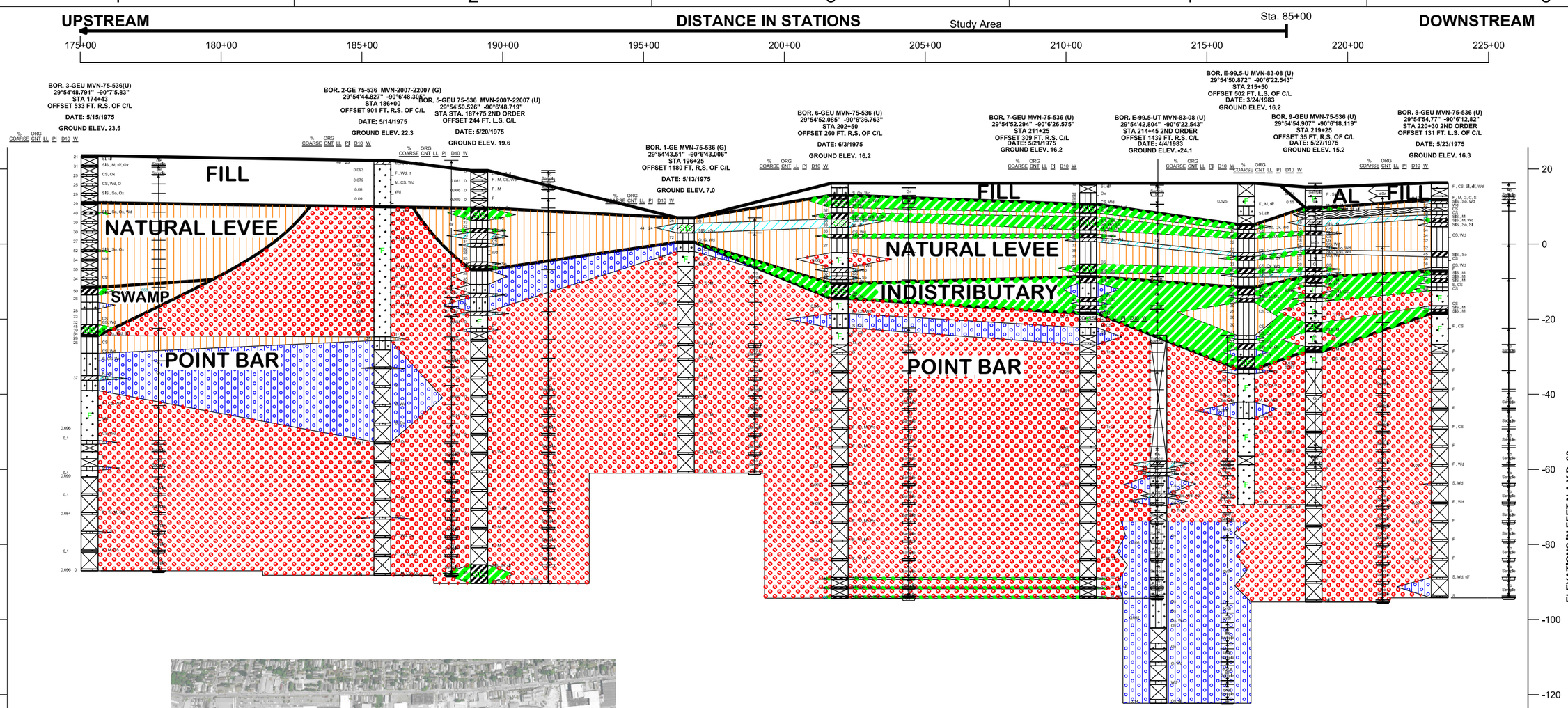
Symbol	Description	Date	Appr.
	Revisions		

Designed by: STEVEN SAVAGE
Date: 10-02-2019
Scale: 200
Drawing code:
Drawn by:
Checked by:
Project Engineer / Architect:
Date:

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

MISSISSIPPI RIVER
PORT OF NEW ORLEANS DEEPENING
Profile 1
SOIL AND GEOLOGIC PROFILE

Plate 6



AL - ARTIFICIAL LEVEE

NATURAL LEVEE - PREDOMINANTLY FAT AND LEAN CLAYS AND SILTS WITH SOME SAND LAYERS

POINT BAR - PREDOMINANTLY SILTY SANDS, SANDY SILTS, AND SANDS WITH OCCASIONAL CLAY LAYERS

INTERDISTRIBUTARY - INTERBEDDED LAYERS OF FAT AND LEAN CLAYS, SILTS, SILTY SANDS, AND SANDS

NEARSHORE GULF - PREDOMINANTLY SAND AND SILTY SAND WITH SHELL FRAGMENTS WITH OCCASIONAL CLAY LAYERS

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PLEISTOCENE - STIFF TO VERY STIFF OXIDIZED CLAYS INTERBEDDED WITH LAYERS AND LENSES OF SILTS AND SANDS

ML - Inorganic Silt Low LL
CL - USCS Lean Clay
SM - Silty Sand (USCS13) USACE CAD 5.0
SP - Sand, Poorly Graded (USCS14) USACE CAD 5.0
NS - No Sample
CH - Fat Clay
SHELL - Shells USACE CAD 5.0
WOOD - Wood USACE CAD 5.0

0 100 0 200 400 600
Horizontal Scale in Feet

US ARMY CORPS OF ENGINEERS

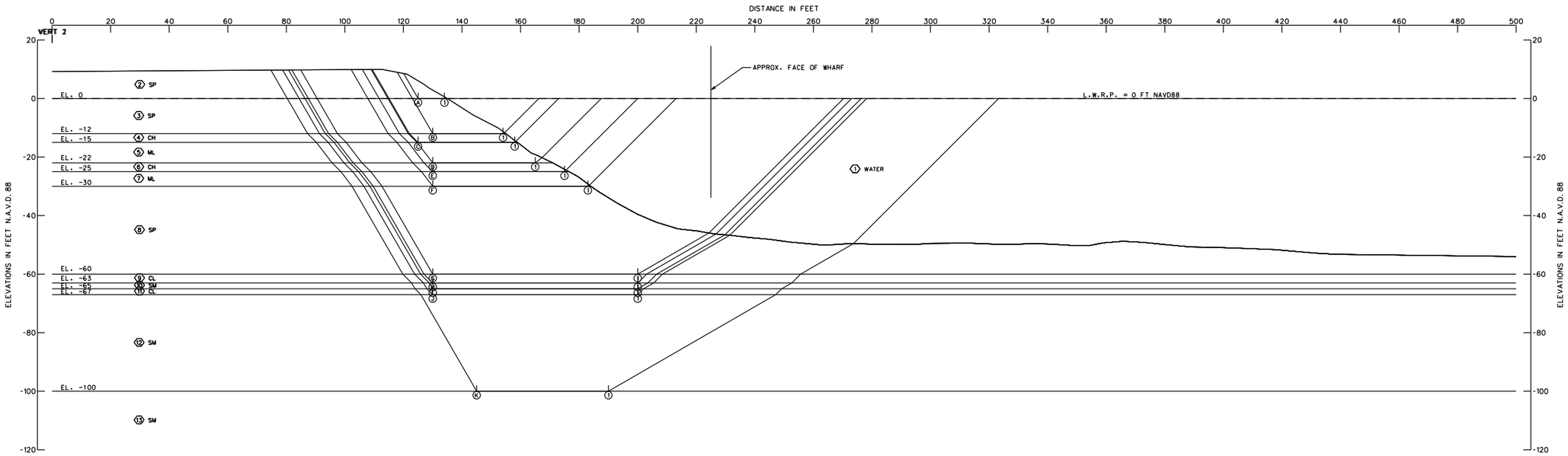
Symbol	Description	Date	Appr.
	Revisions		

Designed by: STEVEN SAVAGE
Date: 09-20-2019
Drawn by:
Scale: 200
Checked by:
Drawing code:
Project Engineer / Architect:
Date:

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

MISSISSIPPI RIVER
PORT OF NEW ORLEANS DEEPENING
Profile 2
SOIL AND GEOLOGIC PROFILE

Plate 7



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES.

THE EXISTING SECTION SHOWN IS BASED ON 2019 SURVEYS AND REPRESENTS THE MOST CRITICAL SECTION WITHIN THE STUDY AREA.

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE DEGREES
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	WA	62	62	0	0	0	0	0
2	SP	122	122	0	0	0	0	30
3	SP	122	122	0	0	0	0	30
4	CH	110	110	580	580	580	580	0
5	ML	117	117	200	200	200	200	15
6	CH	100	100	780	780	780	780	0
7	ML	117	117	200	200	200	200	15
8	SP	122	122	0	0	0	0	30
9	CL	100	100	600	600	600	600	0
10	SM	122	122	0	0	0	0	30
11	CL	100	100	600	600	600	600	0
12	SM	122	122	0	0	0	0	30
13	SM	122	122	0	0	0	0	30

ASSUMED FAILURE SURFACE NO.		ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	0.0	2217	2056	20	3325	10	4293	3315	1.29
B	1	-12.0	10589	6595	10	20384	4471	17194	15913	1.08
C	1	-15.0	18880	12512	479	35025	6982	31871	28043	1.14
D	1	-22.0	25755	14459	1012	54597	15145	41225	39452	1.04
E	1	-25.0	31692	17869	826	67271	19383	50387	47888	1.05
F	1	-30.0	38353	21154	209	89132	27909	59716	61223	0.98
G	1	-60.0	108501	42000	15207	282192	119576	165708	162616	1.02
H	1	-63.0	114652	42000	17596	309309	134133	174248	175176	0.99
I	1	-65.0	120699	42000	21739	326651	143935	184438	182716	1.01
J	1	-67.0	124354	42000	23388	345429	154545	189742	190884	0.99
K	1	-100.0	230370	118436	162088	678111	393800	510894	284310	1.80

NOTES

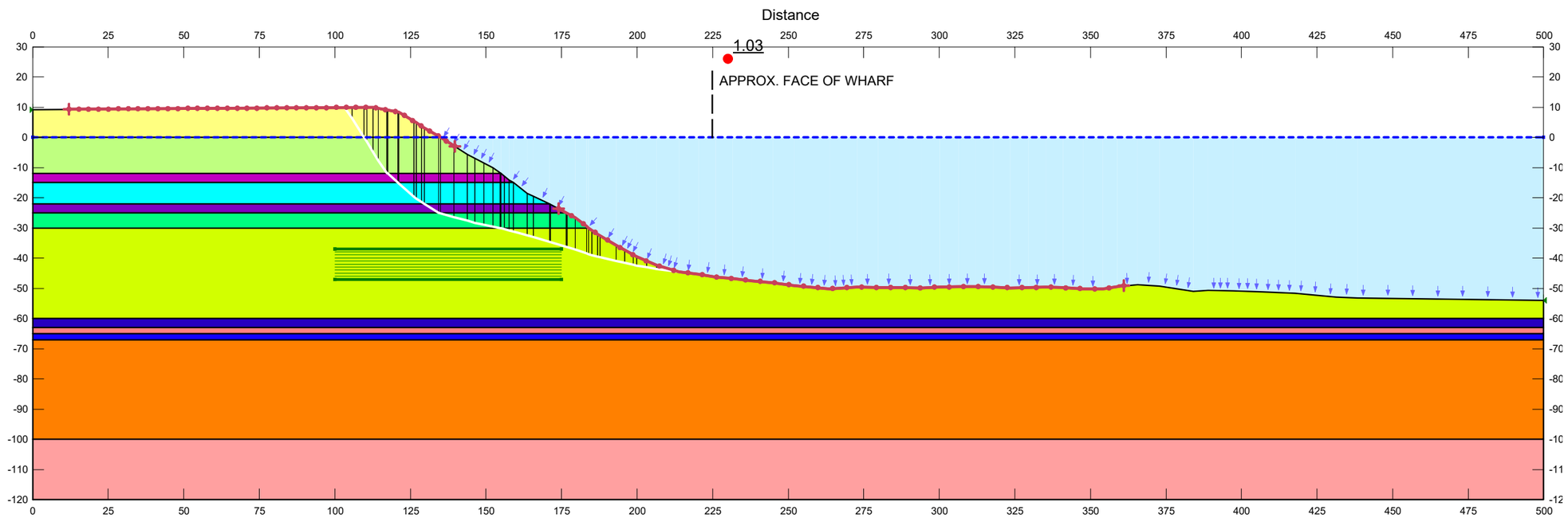
◇ -- STRATUM NUMBER
○ -- WEDGE NUMBER
✗ -- CROSSOVER POINT
φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
Ω -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEEPENING STUDY
BANK STABILITY ANALYSIS
EXISTING CONDITIONS
STA 40+00

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS 1-NOV-19

STABILITY WITH UPLIFT VERSION 1.1



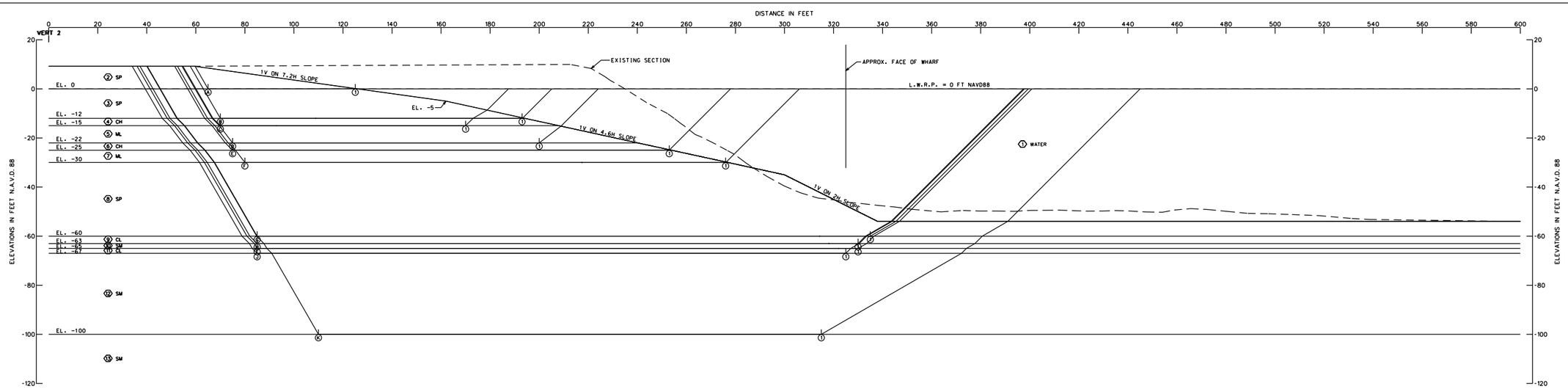
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	01 SP el 14 to 0	Mohr-Coulomb	122	0	30	0	1
	02 SP el 0 to -12	Mohr-Coulomb	122	0	30	0	1
	03 CH el -12 to -15	Mohr-Coulomb	110	580	0	0	1
	04 ML el -15 to -22	Mohr-Coulomb	117	200	15	0	1
	05 CH el -22 to -25	Mohr-Coulomb	100	780	0	0	1
	06 ML el -25 to -30	Mohr-Coulomb	117	200	15	0	1
	07 SP el -30 to -60	Mohr-Coulomb	122	0	30	0	1
	08 CL el -60 to -63	Mohr-Coulomb	100	600	0	0	1
	09 SM el -63 to -65	Mohr-Coulomb	122	0	30	0	1
	10 CL el -65 to -67	Mohr-Coulomb	100	600	0	0	1
	11 SM el -67 to -100	Mohr-Coulomb	122	0	30	0	1
	12 SM el -100 to -120	Mohr-Coulomb	122	0	30	0	1

Station 40+00 Existing

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEEPENING STUDY
BANK STABILITY ANALYSIS
EXISTING CONDITIONS
STA. 40+00

US Army Corps of Engineers
New Orleans District

PLATE 9a



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES.

THE EXISTING SECTION SHOWN IS STA 40-00, WHICH REPRESENTS THE MOST CRITICAL SECTION BETWEEN STA 35-00 AND 67-00 AND IS BASED ON 2019 SURVEYS.

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE DEGREES
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	WA	62	62	0	0	0	0	0
2	SP	122	122	0	0	0	0	30
3	SP	122	122	0	0	0	0	30
4	CH	110	110	580	580	580	580	0
5	ML	117	117	200	200	200	200	15
6	CH	100	100	780	780	780	780	0
7	ML	117	117	200	200	200	200	15
8	SP	122	122	0	0	0	0	30
9	CL	100	100	600	600	600	600	0
10	SM	122	122	0	0	0	0	30
11	CL	100	100	600	600	600	600	0
12	SM	122	122	0	0	0	0	30
13	SM	122	122	0	0	0	0	30

ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	0.0	3172	18192	2	4758	1	21366	4757	4.49
B	1	-12.0	14254	46555	1	25881	4465	60809	21415	2.84
C	1	-15.0	18256	46683	4371	34473	8542	69310	25931	2.67
D	1	-22.0	26089	65355	4623	56362	16603	96067	39758	2.42
E	1	-25.0	31240	83540	279	68314	19376	115059	48938	2.35
F	1	-30.0	37339	91818	88	87986	27901	129245	60085	2.15
G	1	-60.0	105690	146310	1974	276742	112758	253974	163984	1.55
H	1	-63.0	110418	145776	5851	302748	126172	262045	176577	1.48
I	1	-65.0	116582	146455	8219	320073	135044	271237	185030	1.47
J	1	-67.0	119738	143998	11295	338415	145819	275031	192596	1.43
K	1	-100.0	230224	561926	125793	675548	374024	917943	301524	3.04

NOTES

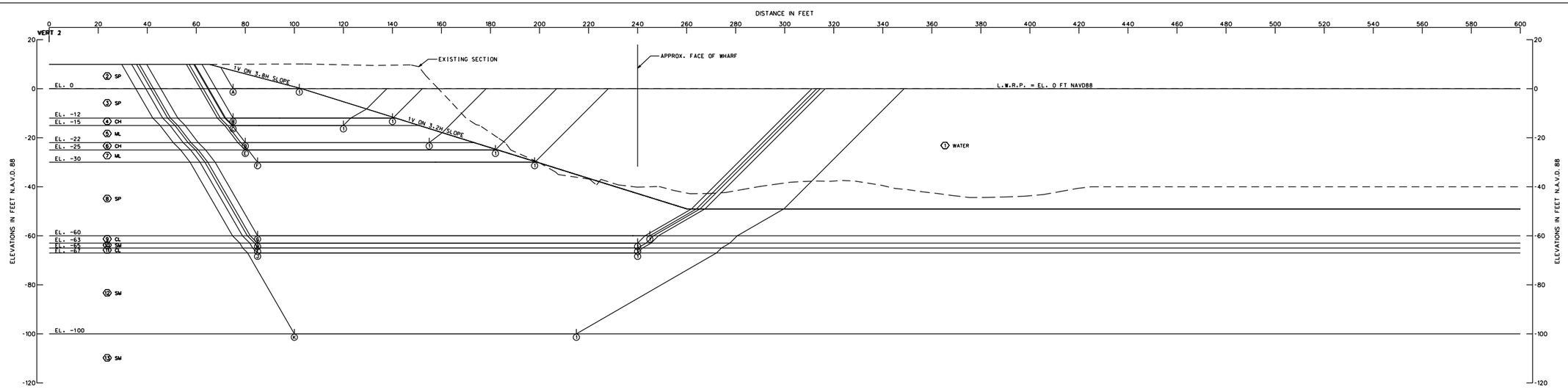
○ -- STRATUM NUMBER
○ -- WEDGE NUMBER
✗ -- CROSSOVER POINT
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∑ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEPENING STUDY

BANK STABLITY ANALYSIS
REMOVE ACCRETION FROM RIPRAP, DREDGE TO -50
STA 35+00 TO 67+00

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS 21-NOV-19
STABILITY WITH UPLIFT VERSION 1.1



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES.

THE EXISTING SECTION SHOWN IS STA 68-00, WHICH REPRESENTS THE MOST CRITICAL SECTION BETWEEN STA 68-00 AND 70-00 AND IS BASED ON 2019 SURVEYS.

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	WA	62	62	0	0	0	0	0
2	SP	122	122	0	0	0	0	30
3	SP	122	122	0	0	0	0	30
4	CH	110	110	580	580	580	580	0
5	ML	117	117	200	200	200	200	15
6	CH	100	100	780	780	780	780	0
7	ML	117	117	200	200	200	200	15
8	SP	122	122	0	0	0	0	30
9	CL	100	100	600	600	600	600	0
10	SM	122	122	0	0	0	0	30
11	CL	100	100	600	600	600	600	0
12	SM	122	122	0	0	0	0	30
13	SM	122	122	0	0	0	0	30

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
(A) (1)	0.0	2607	7261	6	3910	3	9873	3907	2.53
(B) (1)	-12.0	14795	23325	4	26692	4468	38124	22225	1.72
(C) (1)	-15.0	19176	21500	4729	35774	8954	45406	26820	1.69
(D) (1)	-22.0	26803	35451	2553	57143	15650	64807	41493	1.56
(E) (1)	-25.0	32286	44509	371	69546	19376	77167	50169	1.54
(F) (1)	-30.0	37921	47660	116	88040	27902	85697	60138	1.43
(G) (1)	-60.0	107772	95742	9085	281048	116442	212599	164605	1.29
(H) (1)	-63.0	113334	93000	13375	307836	131413	219709	176423	1.25
(I) (1)	-65.0	119589	92999	16807	325330	140935	229396	184395	1.24
(J) (1)	-67.0	123147	93000	18517	344083	151236	234664	192848	1.22
(K) (1)	-100.0	237206	313425	164297	688043	394905	714928	293138	2.44

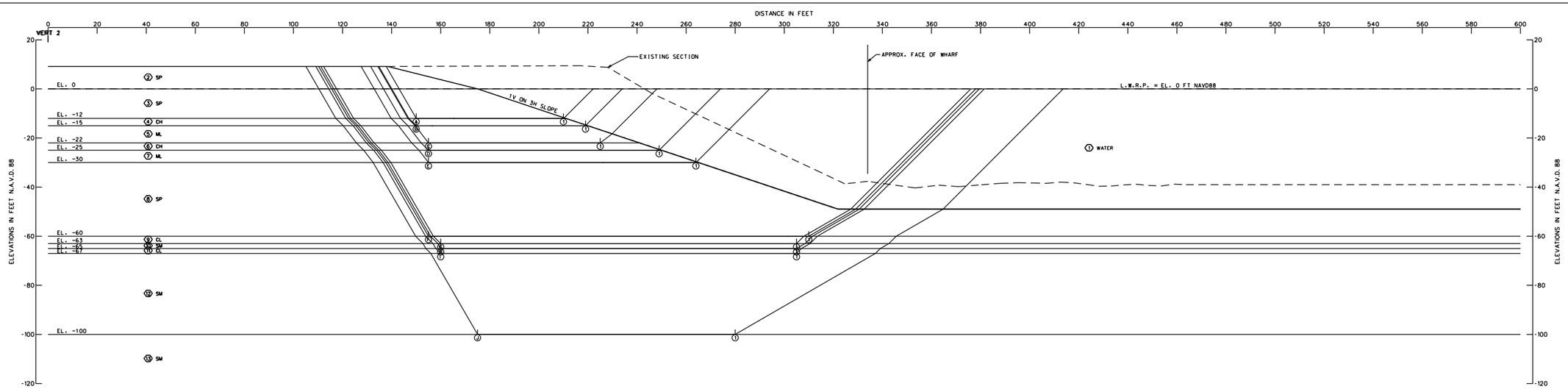
NOTES

○ -- STRATUM NUMBER
○ -- WEDGE NUMBER
⊿ -- CROSSOVER POINT
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
Σ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT,REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEEPENING STUDY
BANK STABILITY ANALYSIS
REMOVE ACCRETION FROM RIPRAP
DREDGE TO -45 (EXISTING)
STA 68-00 TO 70-00

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS 21-FEB-20
STABLITY WITH UPLIFT VERSION 1.1



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES.

THE EXISTING SECTION SHOWN IS STA 77+00 WHICH REPRESENTS THE MOST CRITICAL SECTION BETWEEN STA 71+00 AND 79+00 AND IS BASED ON 2019 SURVEYS.

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE DEGREES
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	WA	62	62	0	0	0	0	0
2	SP	122	122	0	0	0	0	30
3	SP	122	122	0	0	0	0	30
4	CH	110	110	580	580	580	580	0
5	ML	117	117	200	200	200	200	15
6	CH	100	100	780	780	780	780	0
7	ML	117	117	200	200	200	200	15
8	SP	122	122	0	0	0	0	30
9	CL	100	100	600	600	600	600	0
10	SM	122	122	0	0	0	0	30
11	CL	100	100	600	600	600	600	0
12	SM	122	122	0	0	0	0	30
13	SM	122	122	0	0	0	0	30

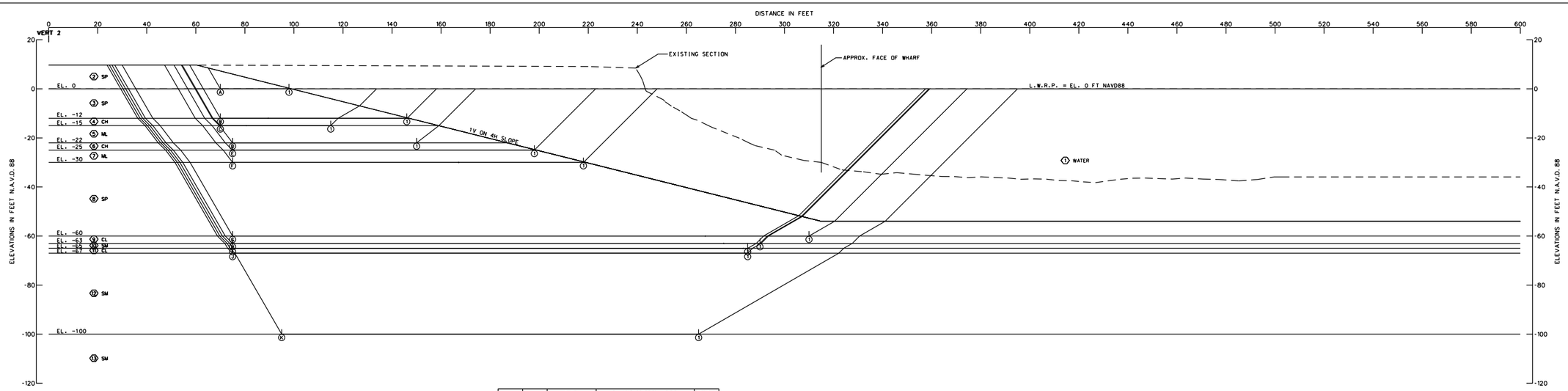
ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	-12.0	12820	29355	2	23730	4486	33877	19264	1.76
B	1	-15.0	17358	26859	290	32629	6977	44507	25652	1.74
C	1	-22.0	24622	32253	2293	53095	15549	59168	37545	1.58
D	1	-25.0	30268	40336	390	65320	19377	70994	45943	1.55
E	1	-30.0	37007	46993	121	86866	27902	84121	58964	1.43
F	1	-60.0	106349	92586	8323	277960	116061	207258	161898	1.28
G	1	-63.0	108729	87000	12524	299552	130882	208252	168670	1.23
H	1	-65.0	114851	87000	15972	316853	140398	217823	176455	1.23
I	1	-67.0	118486	87000	17771	335467	150666	223257	184801	1.21
J	1	-100.0	230264	284538	162842	675971	394177	677644	281794	2.40

NOTES

○ -- STRATUM NUMBER
○ -- WEDGE NUMBER
⊿ -- CROSSOVER POINT
φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT,REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEPENING STUDY
BANK STABILITY ANALYSIS
REMOVE ACCRETION FROM RIPRAP
DREDGE TO -45 (EXISTING)
STA 71+00 TO 79+00
U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS 24-FEB-20
STABLITY WITH UPLIFT VERSION 1.1



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES.

THE EXISTING SECTION SHOWN IS STA 80-00 WHICH REPRESENTS THE MOST CRITICAL SECTION BETWEEN STA 80-00 AND 85-00 AND IS BASED ON 2019 SURVEYS.

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	WA	62	62	0	0	0	0	0
2	SP	122	122	0	0	0	0	30
3	SP	122	122	0	0	0	0	30
4	CH	110	110	580	580	580	580	0
5	ML	117	117	200	200	200	200	15
6	CH	100	100	780	780	780	780	0
7	ML	117	117	200	200	200	200	15
8	SP	122	122	0	0	0	0	30
9	CL	100	100	600	600	600	600	0
10	SM	122	122	0	0	0	0	30
11	CL	100	100	600	600	600	600	0
12	SM	122	122	0	0	0	0	30
13	SM	122	122	0	0	0	0	30

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	0.0	2498	7396	5	3747	3	9899	3745	2.64
B 1	-12.0	14439	25831	1	26158	4485	40270	21692	1.86
C 1	-15.0	18774	21792	5633	35119	9664	46199	25455	1.81
D 1	-22.0	26364	37009	4793	56401	16724	68167	39677	1.72
E 1	-25.0	31807	52525	312	68688	19376	84644	49312	1.72
F 1	-30.0	38544	61138	98	90459	27901	99781	62557	1.60
G 1	-60.0	109888	133257	2035	283940	112788	245179	171152	1.43
H 1	-63.0	114872	128055	8688	310273	128116	251614	182157	1.38
I 1	-65.0	121093	125986	12754	327711	138225	259833	189485	1.37
J 1	-67.0	124239	126000	14565	348143	148150	264805	197993	1.34
K 1	-100.0	236297	445852	138281	686303	380268	820430	306035	2.68

NOTES

○-- STRATUM NUMBER
○-- WEDGE NUMBER
𝒻-- CROSSOVER POINT
φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
𝔚 -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
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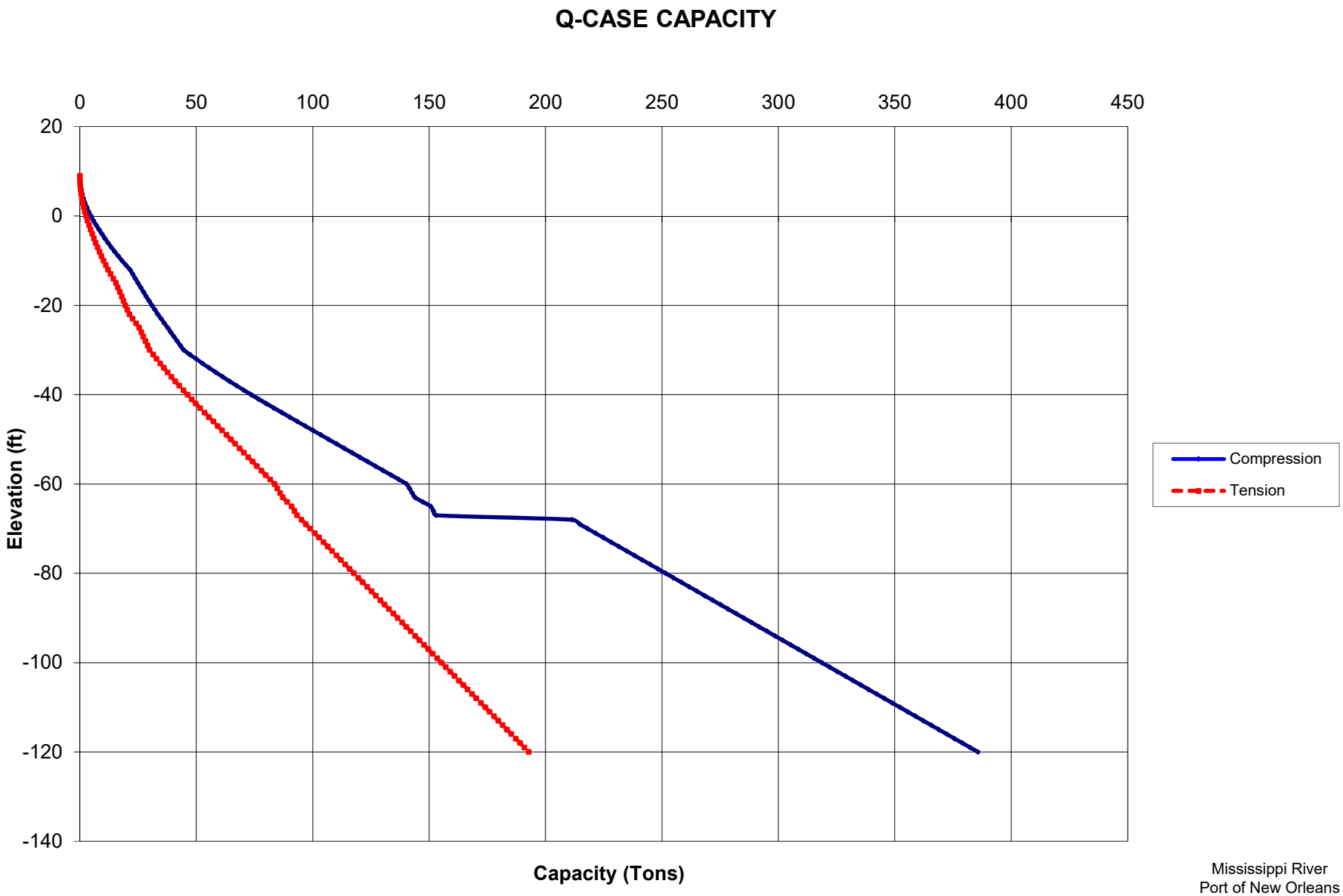
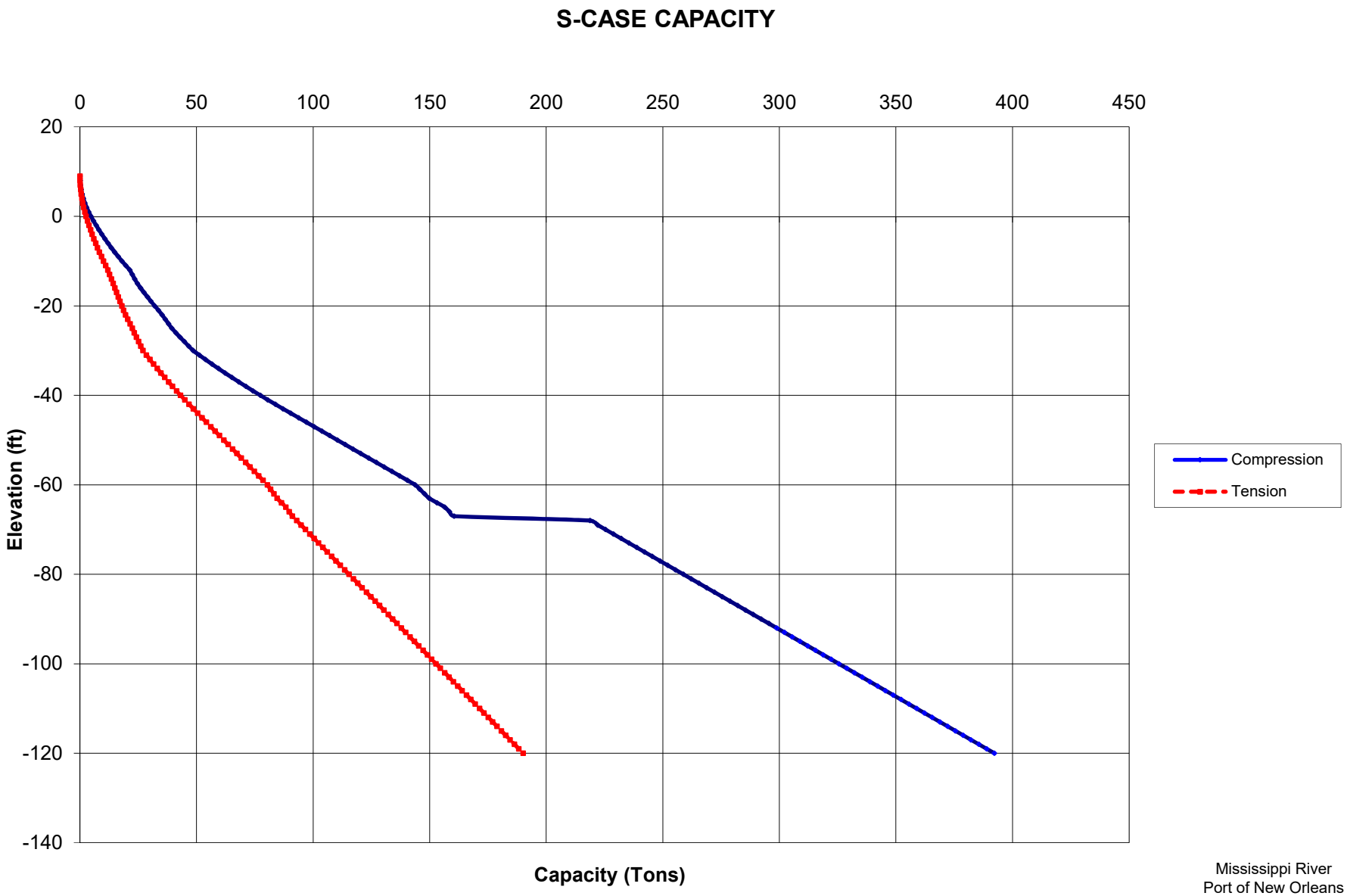
FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

MISSISSIPPI RIVER
PORT OF NEW ORLEANS
CHANNEL DEEPENING STUDY
BANK STABILITY ANALYSIS
DREDGE TO -50
STA 80-00 TO 85-00

U.S. ARMY ENGINEER DISTRICT — NEW ORLEANS
CORPS OF ENGINEERS — 24-FEB-20
STABILITY WITH UPLIFT VERSION 1.1



Mississippi River
Port of New Orleans
Channel Deepening Study
Pile Capacity - Q-case
Nashville B Wharf
16" pipe pile



Mississippi River
Port of New Orleans
Channel Deepening Study
Pile Capacity - S-case
Nashville B Wharf
16" pipe pile