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DRAWING NO.	
C90-D13-P11-006-GI001	
SHEET NO.	REV. NO.
1	0

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1. ALL EXISTING UTILITIES AND SUBSTRUCTURES SHOWN HEREIN HAVE BEEN TAKEN FROM AVAILABLE RECORDS. THE PORT OF HOUSTON AUTHORITY DOES NOT WARRANT THE COMPLETENESS OR CORRECTNESS OF THE LOCATIONS OF UTILITIES AND SUBSTRUCTURES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND PROTECT EXISTING UTILITIES AND SUBSTRUCTURES. SHOULD UTILITIES, PIPELINES, CABLING OR OTHER SUBSTRUCTURES BE ENCOUNTERED THAT ARE NOT IDENTIFIED AND INDICATED ON THESE PLANS, THE PORT OF HOUSTON AUTHORITY SHALL BE NOTIFIED IMMEDIATELY.
2. THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS AND OBTAIN PERMISSION FROM APPLICABLE PROPERTY OWNERS FOR STAGING AREAS AND LOADING BARGES ON PUBLIC OR PRIVATE PROPERTY. ALL COSTS ASSOCIATED WITH PREPARATION AND USE OF SUPPORT FACILITIES FOR THIS PROJECT SHALL BE PAID BY THE CONTRACTOR AT NO COST TO THE PORT OF HOUSTON AUTHORITY. THESE AREAS SHALL BE RESTORED TO PRE-PROJECT CONDITIONS UPON COMPLETION OF WORK.
3. THE CONTRACTOR SHALL TAKE MEASURES TO PROTECT ALL EXISTING IMPROVEMENTS WITHIN AND ADJACENT TO THE WORK AREA. ANY DAMAGE CAUSED BY THE CONTRACTOR'S ACTIVITIES SHALL BE REPLACED OR REPAIRED AT THE EXPENSE OF THE CONTRACTOR AND AT NO COST TO THE PORT OF HOUSTON AUTHORITY. STRUCTURES THAT ARE TO BE PROTECTED FROM DAMAGE OR REPAIRED IF DAMAGED INCLUDE BUT ARE NOT LIMITED TO FENCES, LEVEE EMBANKMENTS, OUTLET STRUCTURES, DRAINAGE PIPES, ROADS, DITCHES, PRIVATE OR PUBLIC GROUNDS, AND OTHER STRUCTURES OR IMPROVEMENTS.
4. THE CONTRACTOR SHALL TAKE PRECAUTIONS, SECURE EQUIPMENT AND PROTECT THE WORK AGAINST ADVERSE WEATHER CONDITIONS AND SURGE / WAKE INFLUENCES FROM PASSING VESSELS. PROVISIONS SHALL BE MADE TO ACCESS SHALLOW AREAS THROUGH THE USE OF LIGHT-LOADED BARGES OR OTHER EQUIPMENT SUITABLE FOR SHALLOWER WATER. EXCAVATION FOR ACCESS AND FLOTATION SHALL BE SUBMITTED TO AND OBTAINED IN WRITING BY THE PORT OF HOUSTON AUTHORITY.
5. THE DREDGING PROJECT MAY BE ADJACENT TO ENVIRONMENTALLY SENSITIVE AREAS. THE CONTRACTOR SHALL AVOID / MINIMIZE DAMAGES TO THESE AREAS DURING THE COURSE OF CONSTRUCTION. ANY DAMAGES CAUSED BY THE CONTRACTOR'S ACTIVITIES SHALL BE RESTORED AT THE EXPENSE OF THE CONTRACTOR AND AT NO COST TO THE PORT OF HOUSTON AUTHORITY. THE CONTRACTOR SHALL COMPLY WITH APPLICABLE ENVIRONMENTAL LAWS AND REQUIREMENTS FROM ALL RELEVANT STATE AND FEDERAL AGENCIES. FOR PURPOSES OF CONTRACT MODIFICATIONS, SCOPE CHANGES, OR CHANGE ORDERS, THE PORT OF HOUSTON AUTHORITY WILL BE THE SOLE DETERMINANT OF DAMAGES. THIS PROVISION IN NO WAY RELIEVES THE CONTRACTOR FROM COMPLIANCE WITH APPLICABLE ENVIRONMENTAL REQUIREMENTS AND DOES NOT CONSTITUTE A WAIVER OF ANY COLLATERAL FEDERAL PERMITTING REQUIREMENTS OR LEGAL OBLIGATION OF THE CONTRACTOR. THE PORT OF HOUSTON AUTHORITY RESERVES THE RIGHT TO SUSPEND WORK AT ANYTIME IF DAMAGES OCCUR AND UNTIL SATISFACTORY CORRECTIVE MEASURES ARE IMPLEMENTED BY THE CONTRACTOR.
6. CONSTRUCTION EQUIPMENT SHALL NOT OPERATE ON PRIVATE PROPERTY UNLESS PERMISSION HAS BEEN ACQUIRED BY THE CONTRACTOR FROM THE LAND OWNER.
7. THE PROJECT IS LOCATED WITHIN THE THE HOUSTON SHIP CHANNEL, WHICH IS HIGHLY UTILIZED BY MARINE TRAFFIC. THE CONTRACTOR SHALL NOT STAGE EQUIPMENT WITHIN THE NAVIGATION CHANNEL NOR INTERFERE WITH OR INTERRUPT COMMERCIAL VESSEL NAVIGATION.
8. THE CONTRACTOR SHALL REQUEST A NOTICE TO MARINERS FROM THE U.S. COAST GUARD PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.
9. THE CONTRACTOR SHALL REMOVE ANY ENCOUNTERED DEBRIS AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
10. THE LOCATIONS OF EXISTING UTILITIES AND SUBSTRUCTURES SHOWN HEREIN HAVE BEEN TAKEN FROM AVAILABLE RECORDS. THE PORT OF HOUSTON AUTHORITY DOES NOT WARRANT THE COMPLETENESS OR CORRECTNESS OF THE LOCATIONS OF UTILITIES AND SUBSTRUCTURES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY AND PROTECT EXISTING UTILITIES AND SUBSTRUCTURES. SHOULD UTILITIES, PIPELINES, CABLING OR OTHER SUBSTRUCTURES BE ENCOUNTERED THAT ARE NOT IDENTIFIED AND INDICATED ON THESE PLANS, THE PORT OF HOUSTON AUTHORITY SHALL BE NOTIFIED IMMEDIATELY.
11. ATTENTION IS DIRECTED TO THE SPECIFICATIONS WHERE BIDDERS ARE REQUIRED TO EXAMINE AND DETERMINE, AS THEIR OWN RESPONSIBILITY THE LOCATION, PHYSICAL CONDITIONS, AND SURROUNDINGS OF THE PROPOSED WORK.
12. THE CONTRACTOR SHALL OBTAIN THE REQUIRED PERMITS AS MAY BE REQUIRED BEYOND THE AUTHORIZATIONS PROVIDED TO PERFORM THE WORK.
13. THE CONTRACTOR SHALL ADHERE TO ALL SAFETY CODES, REGULATIONS AND SPECIFICATIONS FOR THE DURATION OF THIS CONTRACT.
14. THE CONTRACTOR SHALL COMPLETE ALL WORK SHOWN ON THE DRAWINGS AND IN THE SPECIFICATIONS, UNLESS INDICATED AS NOT IN PACKAGE(N.I.P.).

AC	ACRES
AO	ALLOWABLE OVER DEPTH
A.O.R.	ANGLE OF REPOSE
APPROX	APPROXIMATE
ATON	AIDES TO NAVIGATION
BIM	BIRD ISLAND MARSH
BRC	BOLIVAR ROADS CHANNEL
BSC	BAYPORT SHIP CHANNEL
CL	CENTERLINE
DRM	DOLLAR REEF MITIGATION
EXIST	EXISTING
FT	FEET
HSC	HOUSTON SHIP CHANNEL
LBI	LONG BIRD ISLAND
LT	LEFT
NO	NUMBER
OS	OFFSET
P.I.	POINT OF INTERSECTION
N	NORTHING
E	EASTING
MLLW	MEAN LOWER LOW WATER
N.I.P.	NOT IN PACKAGE
P.C.	POINT OF CURVATURE
PHA	PORT OF HOUSTON AUTHORITY
P.T.	POINT OF TANGENCY
RD	REQUIRED DEPTH
RO	REQUIRED OVER DEPTH
RT	RIGHT
SLM	SAN LEON MITIGATION
STA	STATION
TYP	TYPICAL
TOE	CHANNEL TOE



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ENGINEER: Ashley P. Judith

E NO: 112988

DATE: 09-30-2021

ENGINEER: Chester W. Hedderman

E NO: 100209

DATE: 09-30-2021

PROJECT TITLE:

HOUSTON SHIP CHANNEL (HSC)

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

PROJECT 11:
AYPORT (BEACON
5) TO MORGANS
POINT: HSC STA 15+500
TO HSC STA -0+003.94

GENERAL NOTES, LEGEND AND ABBREVIATIONS

[illegible]

DRAWING NO.	
C90-D13-P11-006-GI002	
SHEET NO.	REV. NO.
2	0

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The seal of the Port of Houston Authority (PHA) is a circular emblem. It features a five-pointed star in the center, with the letters 'PHA' superimposed on it. The star and letters are rendered in a stylized, metallic-looking font. Surrounding the central design is a circular border containing the text 'PORT OF HOUSTON AUTHORITY' at the top and 'HOUSTON, TEXAS' at the bottom, separated by small decorative elements. The entire seal is enclosed within a thick, dark border.

CONSULTANT:

APPROVED: _____ DATE _____

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

SHEET TITLE:
PROJECT 11:
BAYPORT (BEACON
76) TO MORGANS
POINT: HSC STA 15+500
TO HSC STA -0+003.94

[illegible]

DRAWING NO.	
C90-D13-P11-006-GI003	
SHEET NO.	REV. NO.
3	0

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NEW M11 BORING COORDINATES		
BORING NO.	NORTHING	EASTING
ECP-1030	13,795,541.07	3,261,318.55
ECP-1031	13,795,829.60	3,261,767.88
ECP-1032	13,796,737.53	3,261,427.26
ECP-1033	13,798,420.14	3,260,785.04
ECP-1034	13,799,316.12	3,260,393.39
ECP-1035	13,800,281.83	3,260,081.66
ECP-1036	13,801,095.48	3,259,738.99
ECP-1037	13,801,903.35	3,259,439.77
ECP-1038	13,798,646.03	3,259,632.82
ECP-1039	13,800,754.04	3,258,991.50
ECP-1040	13,800,138.77	3,257,011.28

**PORT OF HOUSTON
AUTHORITY**

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SEAL:

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P.E NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E NO: 100209
DATE: 09-30-2021

APPROVED: _____
DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

**EXPANSION
CHANNEL
IMPROVEMENT
PROJECT (ECIP)**

SHEET TITLE:
PROJECT 11:
BAYPORT
(BEACON 76) TO
MORGANS POINT
HSC STA 15+500 TO
HSC STA -0+003.94

GEOTECHNICAL INVESTIGATIONS PLAN

[illegible]

DESIGNER:	NM
CADD:	BSC
CHECKER:	NM/AJ
DATE:	DEC. 2020
SCALE:	1" = 2000'

DRAWING NO.

C90-D13-P11-006-B-101	
SHEET NO. 5	REV. NO. 0

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ENGINEER: Ashley P. Judith
P.E NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E NO: 100209
DATE: 09-30-2021

APPROVED: _____
DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:
PROJECT 11:
BAYPORT
(BEACON 76) TO
MORGANS POINT
HSC STA 15+500 TO
HSC STA -0+003.94

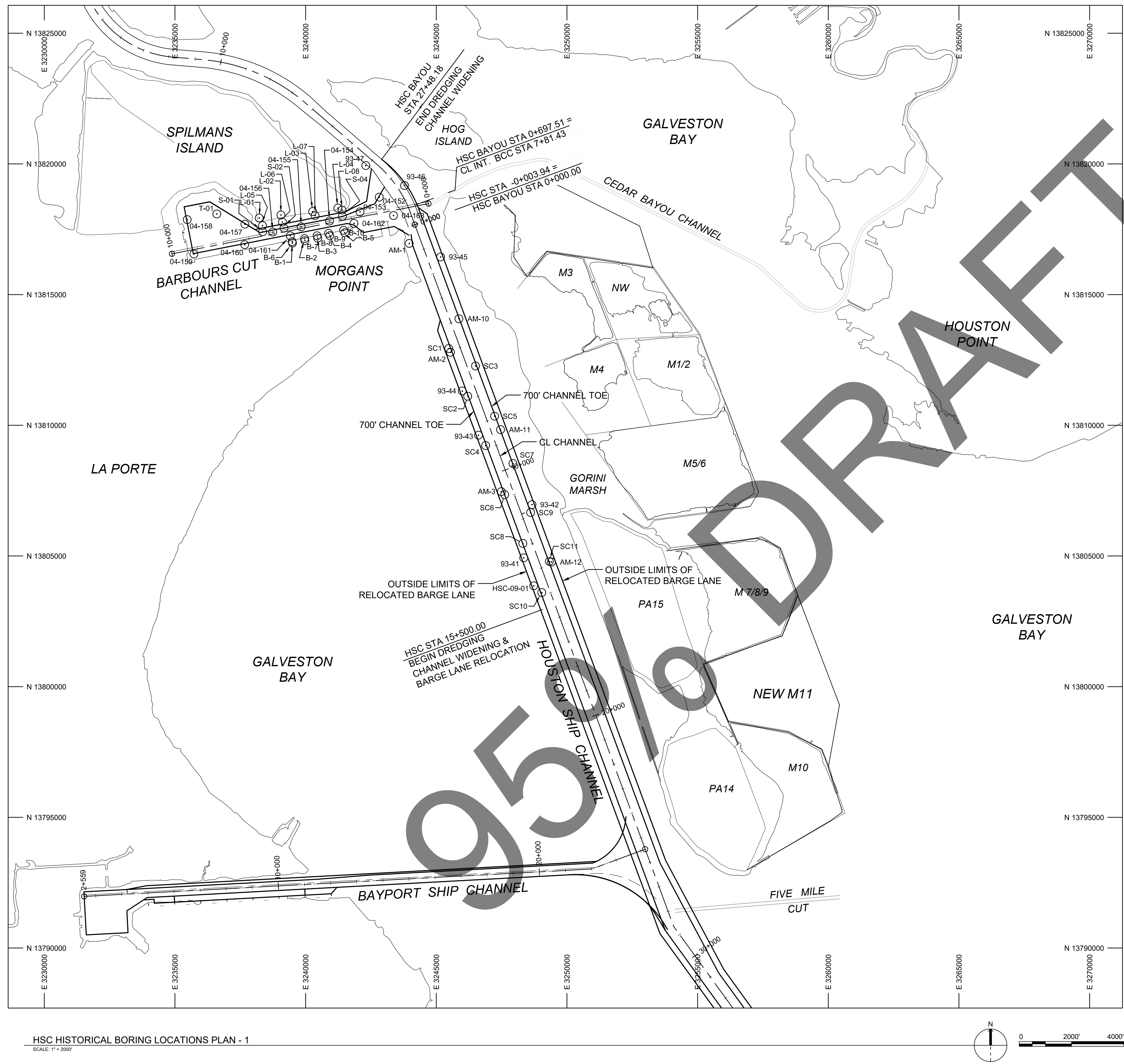
HISTORICAL BORING LOCATIONS PLAN - 1

[illegible]

DESIGNER:	NM
CADD:	BSC
CHECKER:	NM/AJ
DATE:	DEC. 2020
SCALE:	1" = 2000'

DRAWING NO.	
C90-D13-P11-006-B102	
SHEET NO.	REV. NO.
6	0

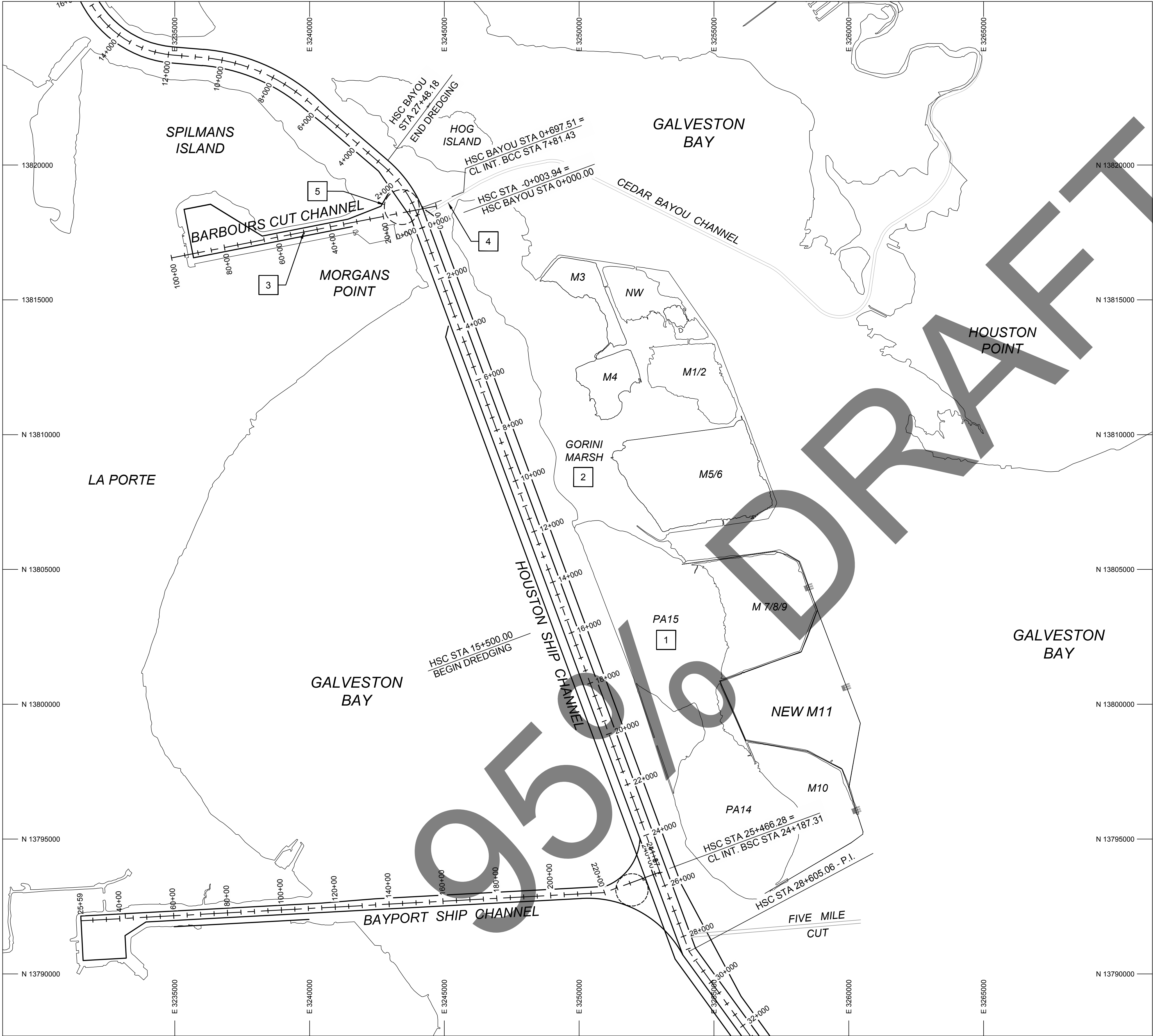
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NOTES:

1. THE HISTORICAL BORINGS SHOWN ARE APPROXIMATE LOCATIONS. REFER TO BORING LOGS FOR FURTHER INFORMATION.
2. NOT ALL HISTORICAL BORINGS ARE SHOWN. ADDITIONAL BORING LOGS ARE INCLUDED BY ATTACHMENT TO THE CONTRACT SPECIFICATIONS.

TIME: 12-09-20 -- 10:34am User: kaur DWG: C:\Projects\60618786 -- Project 11 Design\900 CADD\20-Sheets\C90-D13-P11-006-V-101.dwg



EXISTING SITE CONDITIONS AND CONSTRAINTS PLAN
SCALE: 1" = 2000'



NOTES:

- HORIZONTAL COORDINATES SHOWN ARE REFERENCED TO NAD 83, TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, 4204, U.S. SURVEY FEET.
- VERTICAL DATUM IS MLLW.
- HOUSTON SHIP CHANNEL (HSC) STATIONING REFERS TO CHANNEL CENTERLINE.
- HYDROGRAPHIC SURVEY DATA SOURCES:
 - HSC_MidBay_2019-2020_MLLW.txt*
CONDITION SURVEY, HSC STATION 028+605 TO 078+844 (MIDBAY) CHAMBERS COUNTY, TX DATED 10/28/2019 - 11/19/2019; PERFORMED GAHAGAN & BRYANT ASSOCIATES, INC.
 - HSC_UpperBay_2019-2020_MLLW.txt*
CONDITION SURVEY, HSC STATION -0+003.94 TO 028+605 (UPPER BAY) CHAMBERS AND HARRIS COUNTY, TX; DATED 02/14/2020 - 02/28/2020 PERFORMED BY GAHAGAN & BRYANT ASSOCIATES, INC.
 - BSC_2020Survey_MLLW.txt*
CONDITION SURVEY, BSC STATION 25+58 TO 240+00 CHAMBERS AND HARRIS COUNTY, TX 01/13/2020, 03/02-23/2020, 04/17/2020, 05/21-29/2020, 06/23/2020, AND 07/09-18/2020 GAHAGAN & BRYANT ASSOCIATES, INC.

CONSTRAINTS KEY NOTES:

- | | |
|---|---|
| 1 | ENVIRONMENTAL SENSITIVE AREA - PA15 |
| 2 | ENVIRONMENTAL SENSITIVE AREA GORIMI MARSH |
| 3 | EXISTING NAVIGATION CHANNEL BARBOURS CUT SHIP CHANNEL |
| 4 | EXISTING NAVIGATION CHANNEL CEDAR BAYOU CHANNEL |
| 5 | EXISTING TURNING BASIN BARBOURS CUT CHANNEL |



PORT OF HOUSTON AUTHORITY

CONSULTANT:

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ENGINEER: Ashley P. Judith

P.E. NO: 112988

DATE: 09-30-2021

ENGINEER: Chester W. Hedderman

P.E. NO: 100209

DATE: 09-30-2021

APPROVED:

DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:

HOUSTON SHIP CHANNEL (HSC)

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:

PROJECT 11:
BAYPORT (BEACON 76)
TO MORGANS POINT:
HSC STA 15+500 TO
HSC STA -0+003.94

EXISTING SITE
CONDITIONS AND
CONSTRAINTS PLAN

REV

DATE

DESCRIPTION

DESIGNER: AJ

CADD: RK

CHECKER: CH/SH/MM

DATE: DEC 2020

SCALE: 1" = 2,000'

DRAWING NO.

C90-D13-P11-006-V-101

SHEET NO. 8

REV. NO. 0





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ENGINEER: Ashley P. Judith
P.E. NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E. NO: 100209
DATE: 09-30-2021

APPROVED: _____
DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

HEET TITLE:
PROJECT 11:
BAYPORT (BEACON 76)
TO MORGANS POINT:
HSC STA 15+500 TO
HSC STA -0+003.94

OVERALL DREDGE PLAN AND KEY MAP

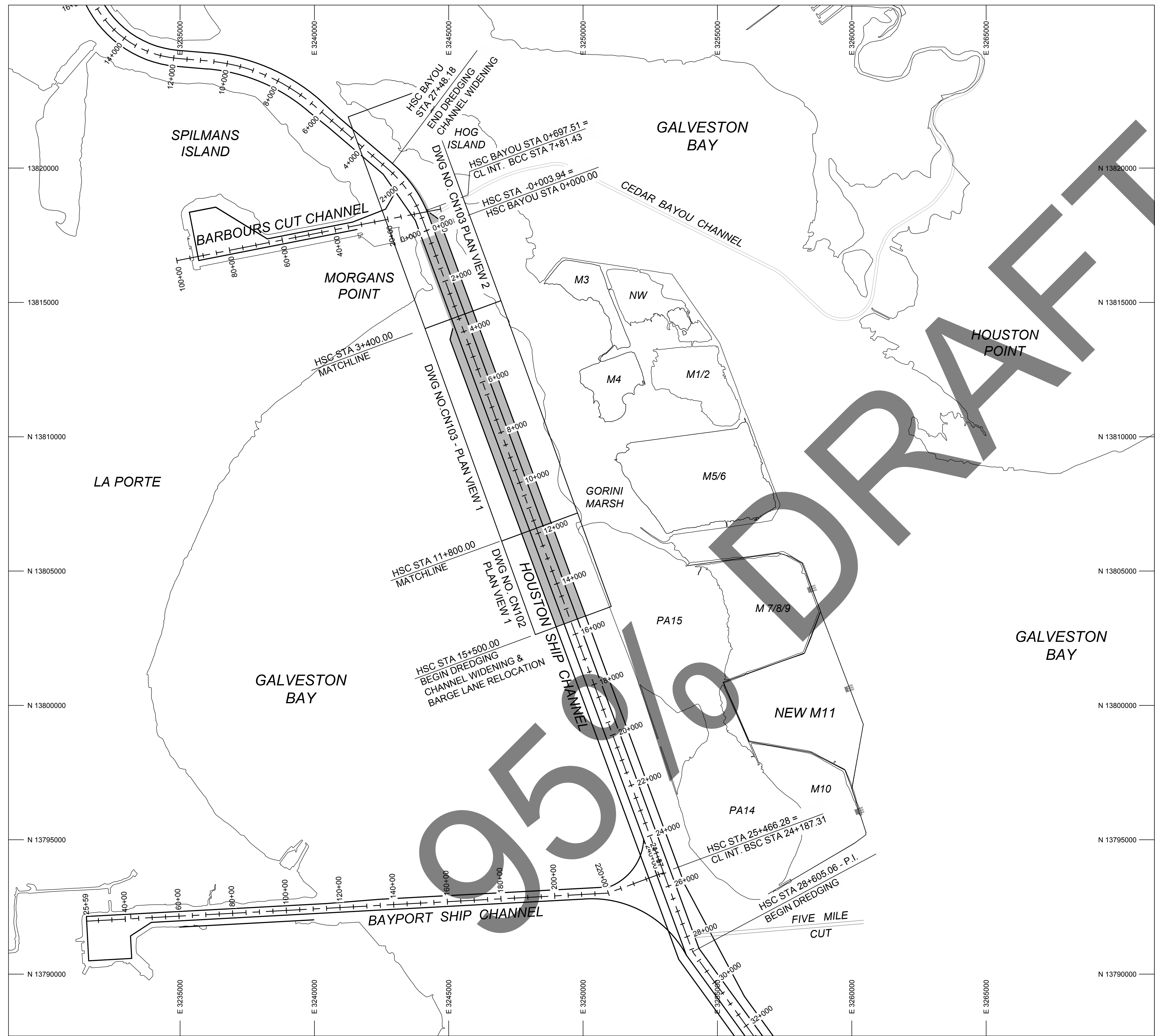
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DESIGNER:	AJ
CADD:	RK
CHECKER:	CH/SH/MM
DATE:	DEC 2020
SCALE:	1" = 2,000'

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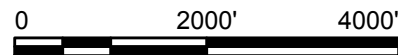
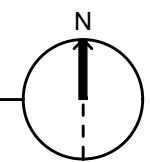
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HSC PROJECT 11: BAYPORT (BEACON 76) TO MORGANS POINT: HSC STA 15+500 TO HSC STA -0+003.94 - OVERALL DREDGE PLAN AND KEY MAP

SCALE: 1" = 2000'



TIME: 12-09-20 - 10:36am User: kaulr DWG: C:\Projects\60618786 - Project 11 Design\900 CADD\20-Sheets\C90-D13-P11-006-CN101.dwg

CONSULTANT:

AL:

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EVEYANCE, SALES OR AS THE BASIS
FOR ISSUANCE OF A PERMIT.

GINFER: Ashley P. Judith

112988

E NO: 112900

TE: 09-30-2021

Chester W. Hedderman

ENGINEER: Chester W. Heddenham

E NO: 100209

09-30-2021

PROVED:

ATE

PORT CONTRACT REPRESENTATIVE
IMAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:

HOUSTON SHIP CHANNEL (HSC)

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

HEET TITLE:

PROJECT 11:
DAYPORT (BEACON 76)
AND MORGANS POINT:
6C STA 15+500 TO
6C STA -0+003.94

**CHANNEL DREDGE
PLAN - 1
HSC STA 15+500.00
TO HSC STA 11+800**

[illegible]

DESIGNER:	AJ
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CADD:	RK
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CADD.	RR
CHECKED	CU (CU / CU)

CHECKER:	CH/SH/MM
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DATE: DEC 2020

DRAWING NO.

[illegible]

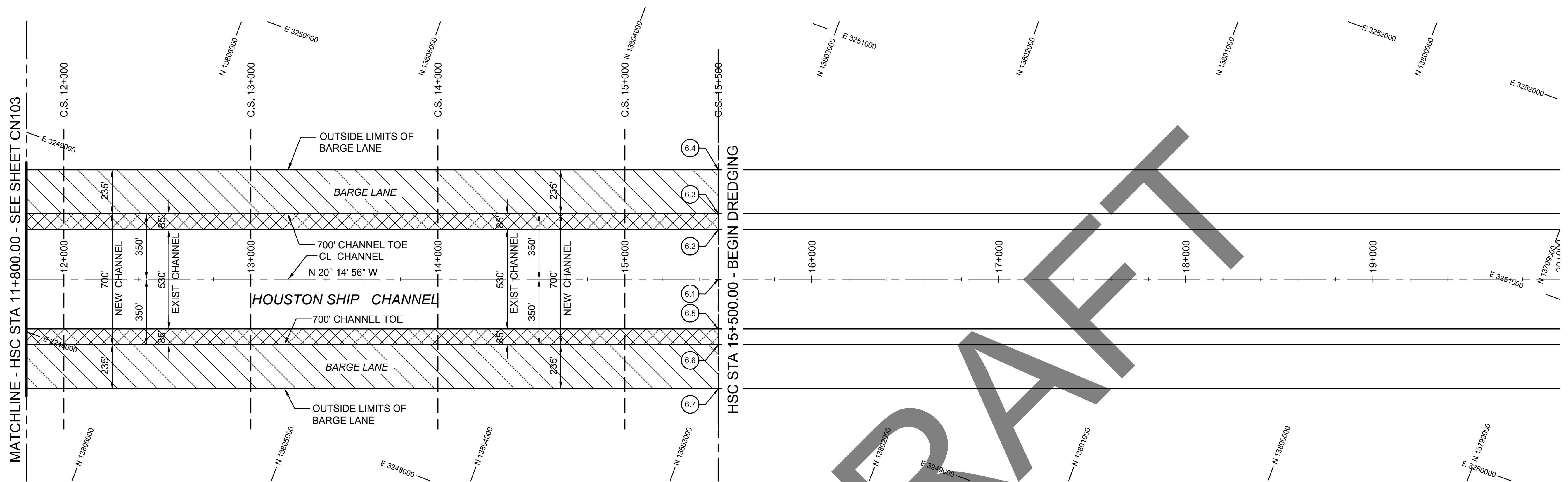
90-D13-P11-006-CN102

SHEET NO.	REV. NO.
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11 9

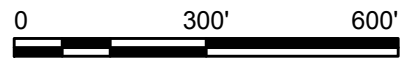
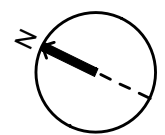
11	0
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DREDGE PLAN VIEW 1 - FROM HSC STA 15+500.00 TO HSC STA 11+800.00

SCALE: 1" = 300'



LEGEND:



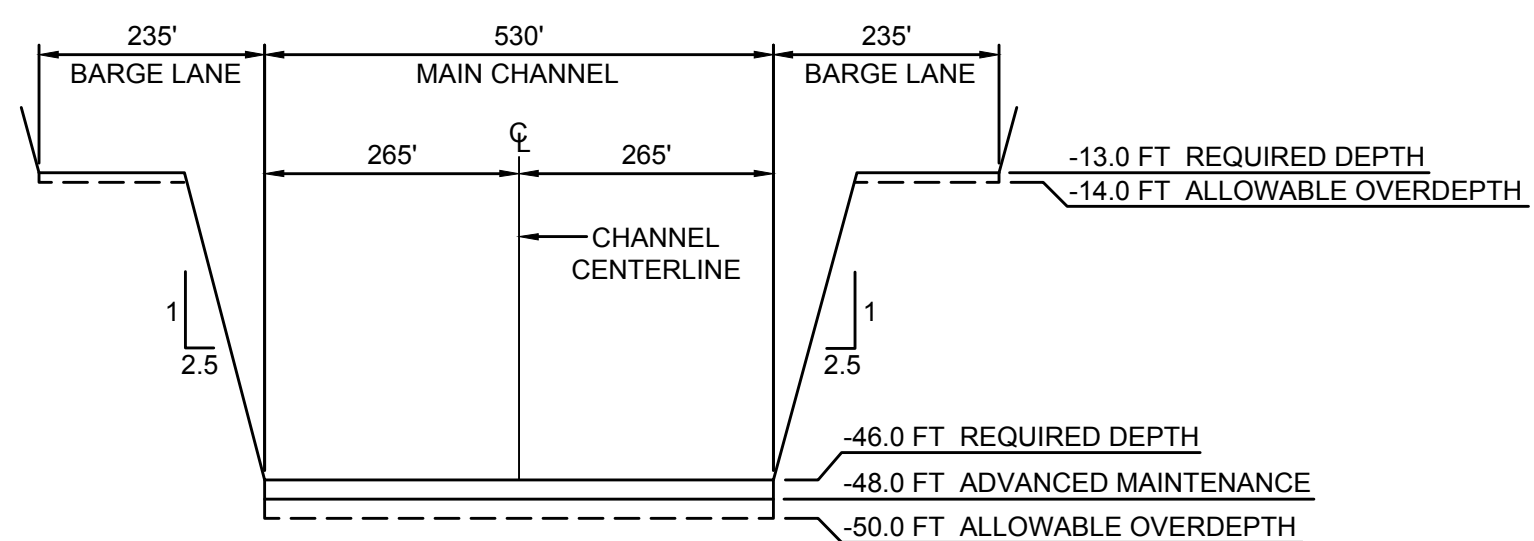
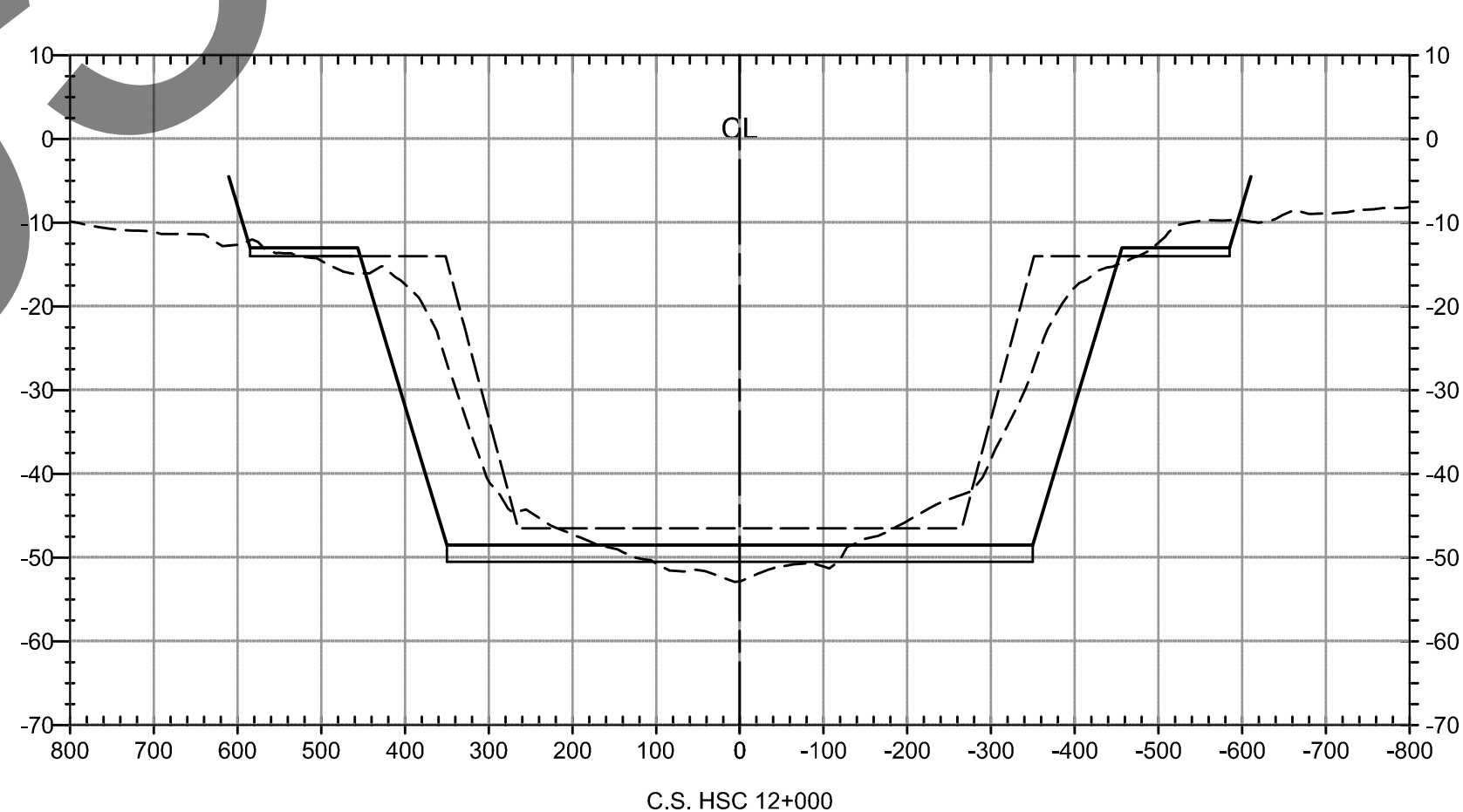
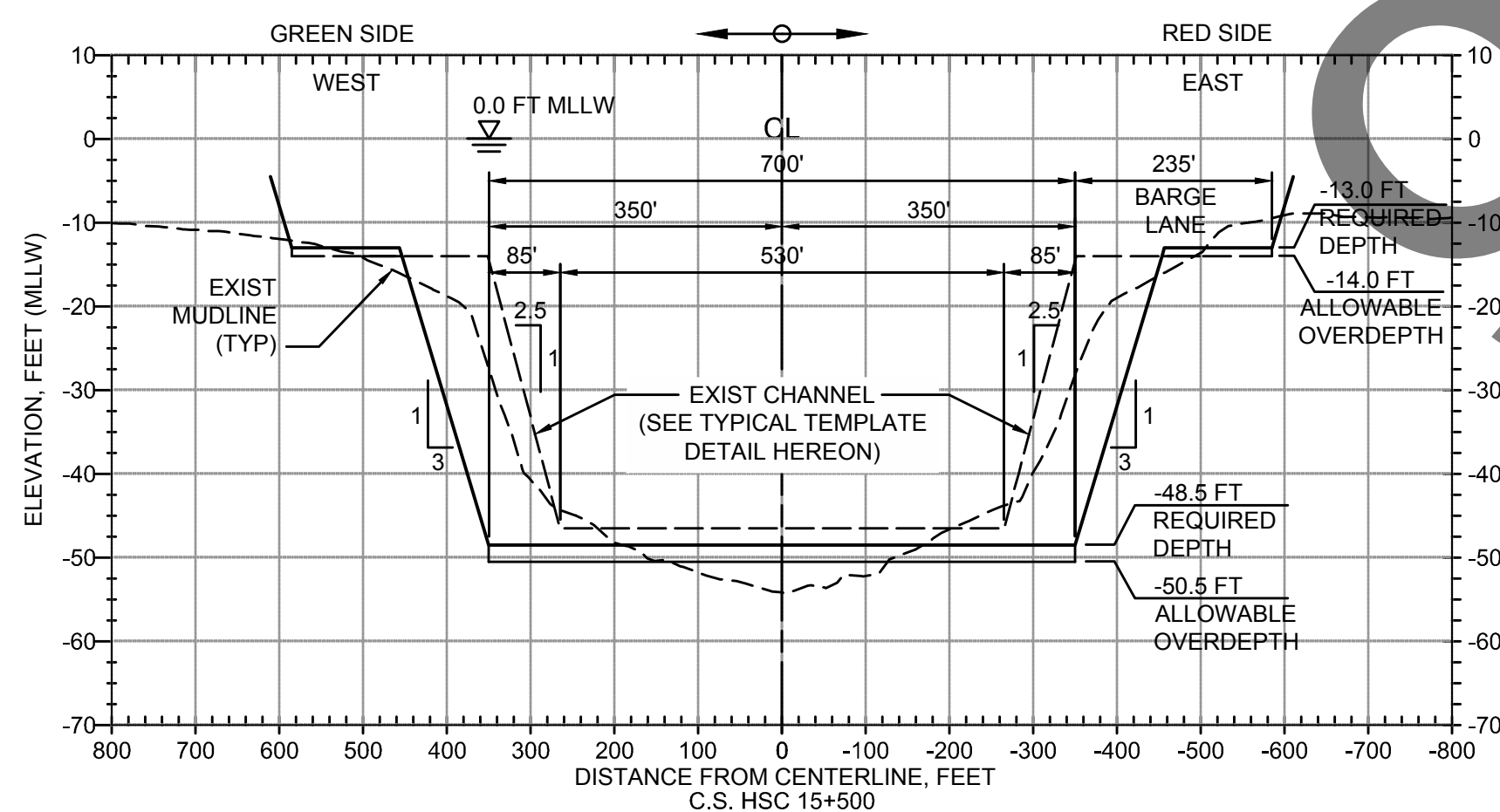
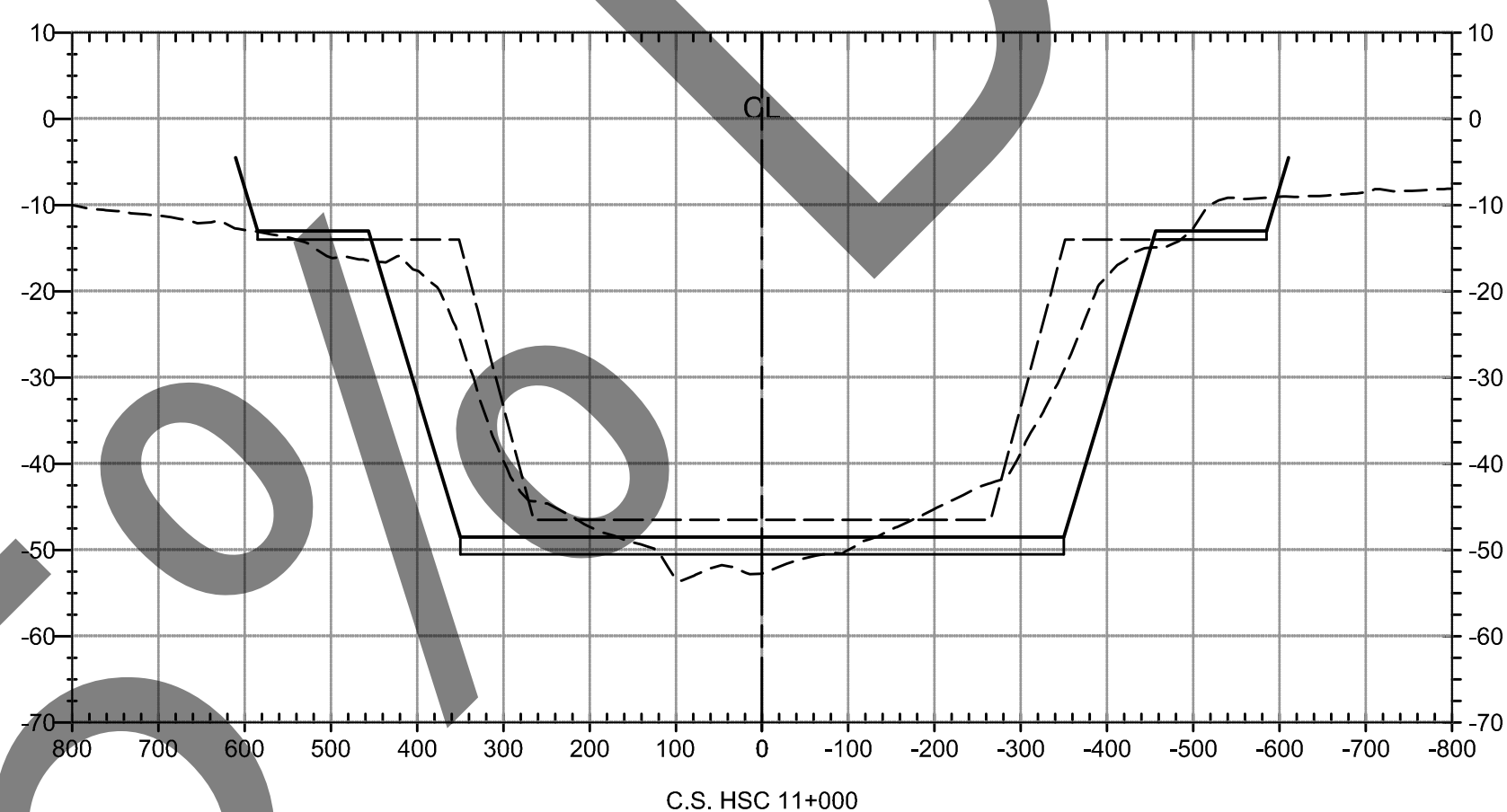
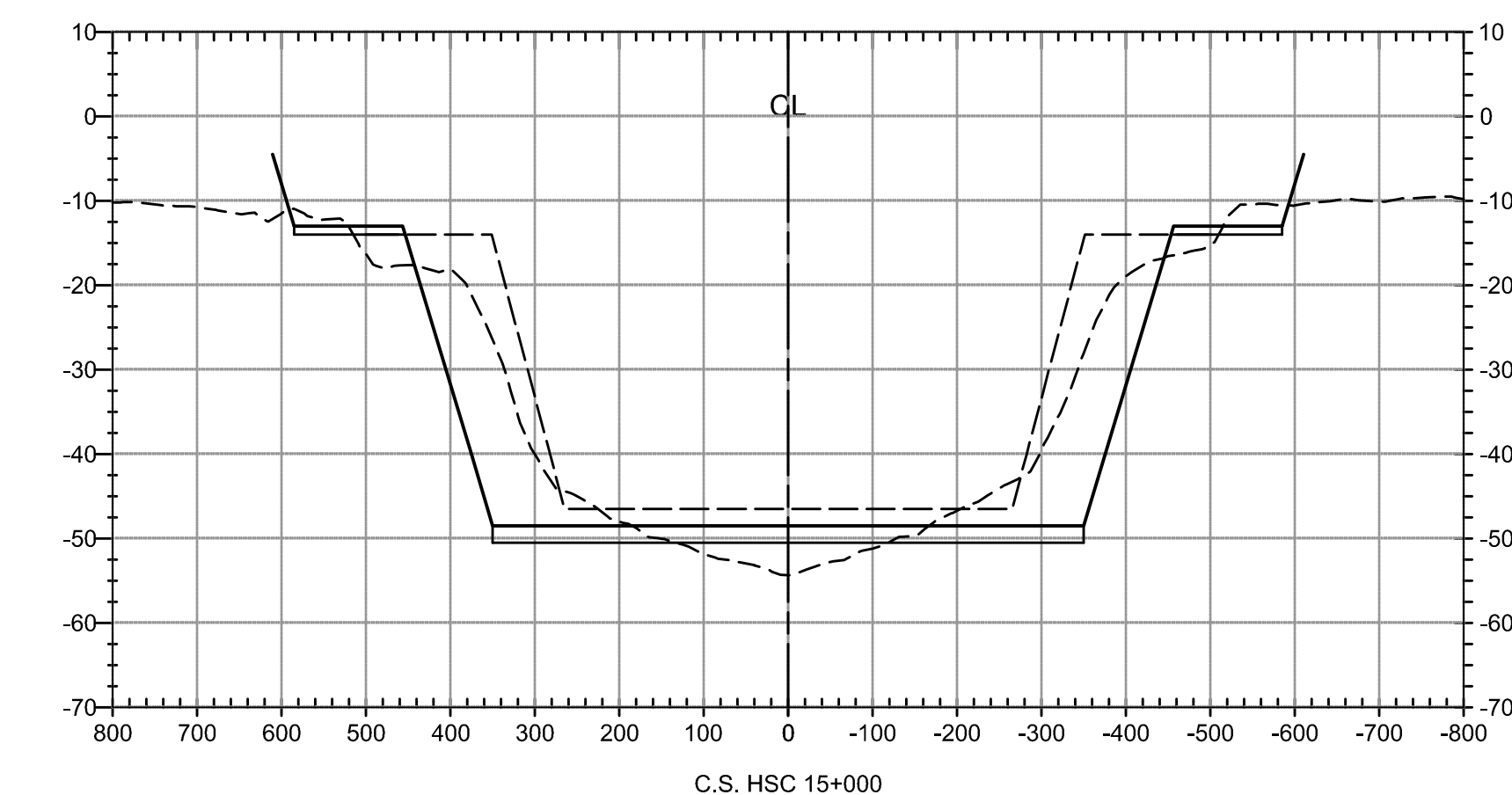
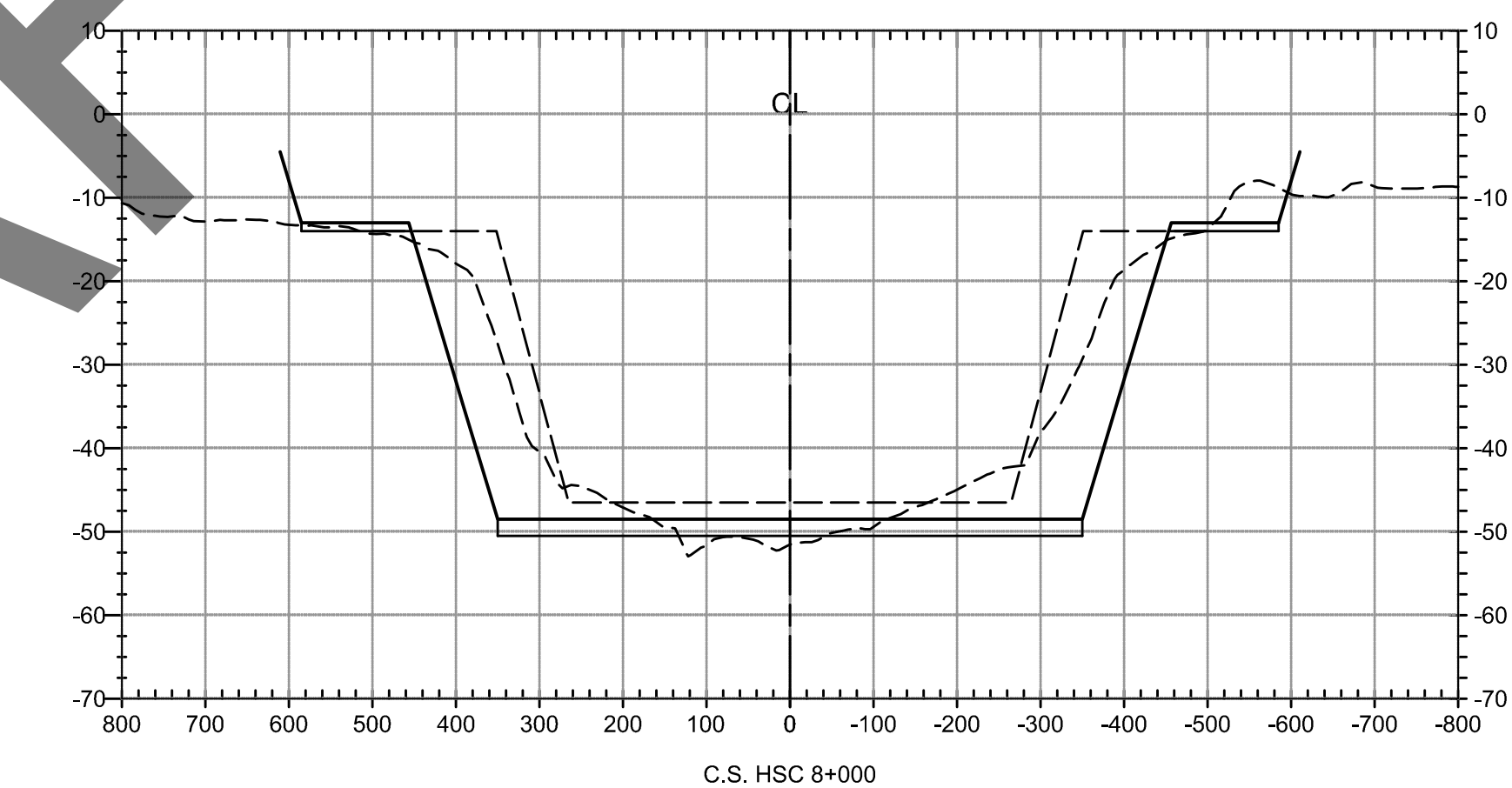
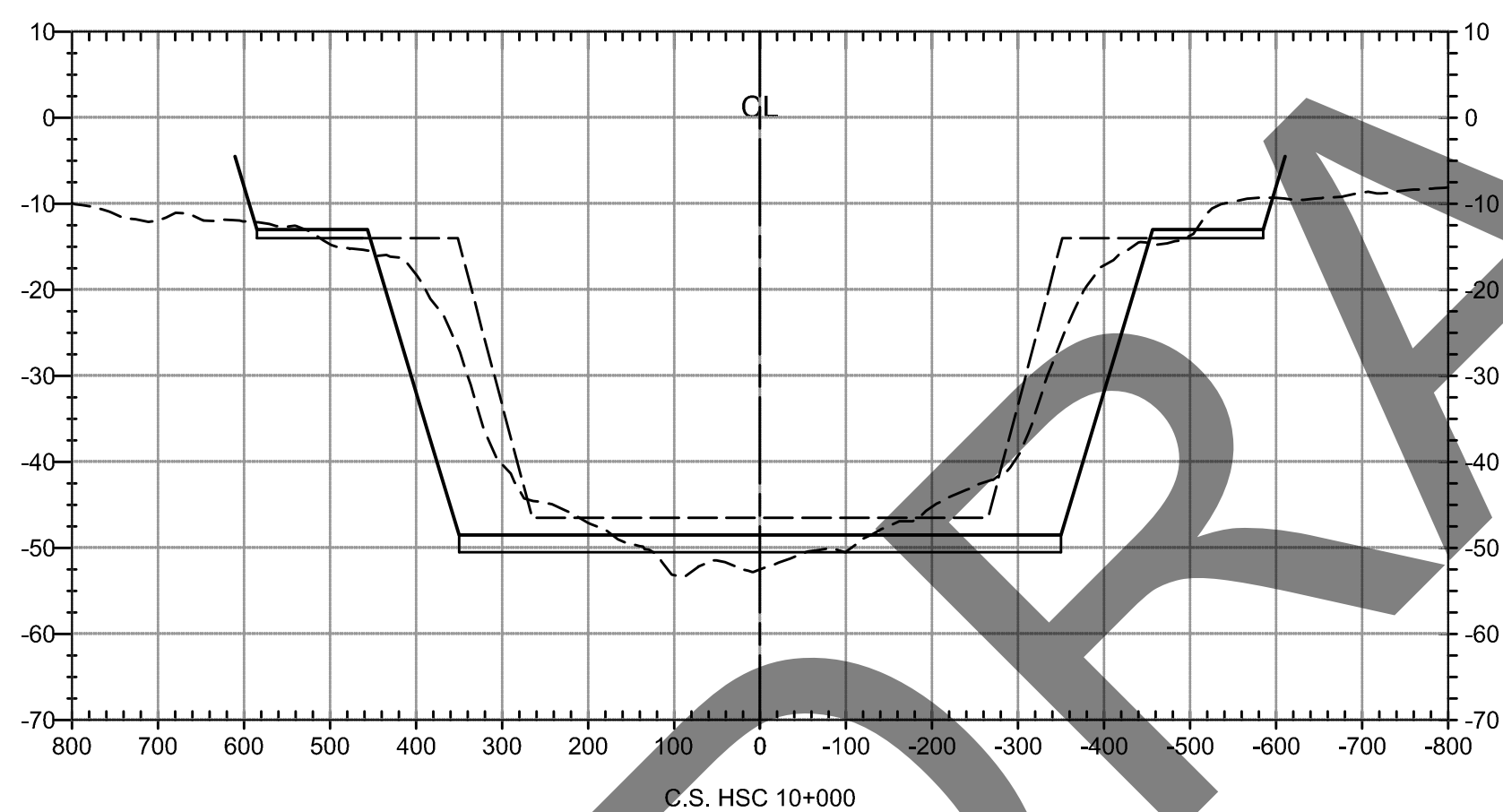
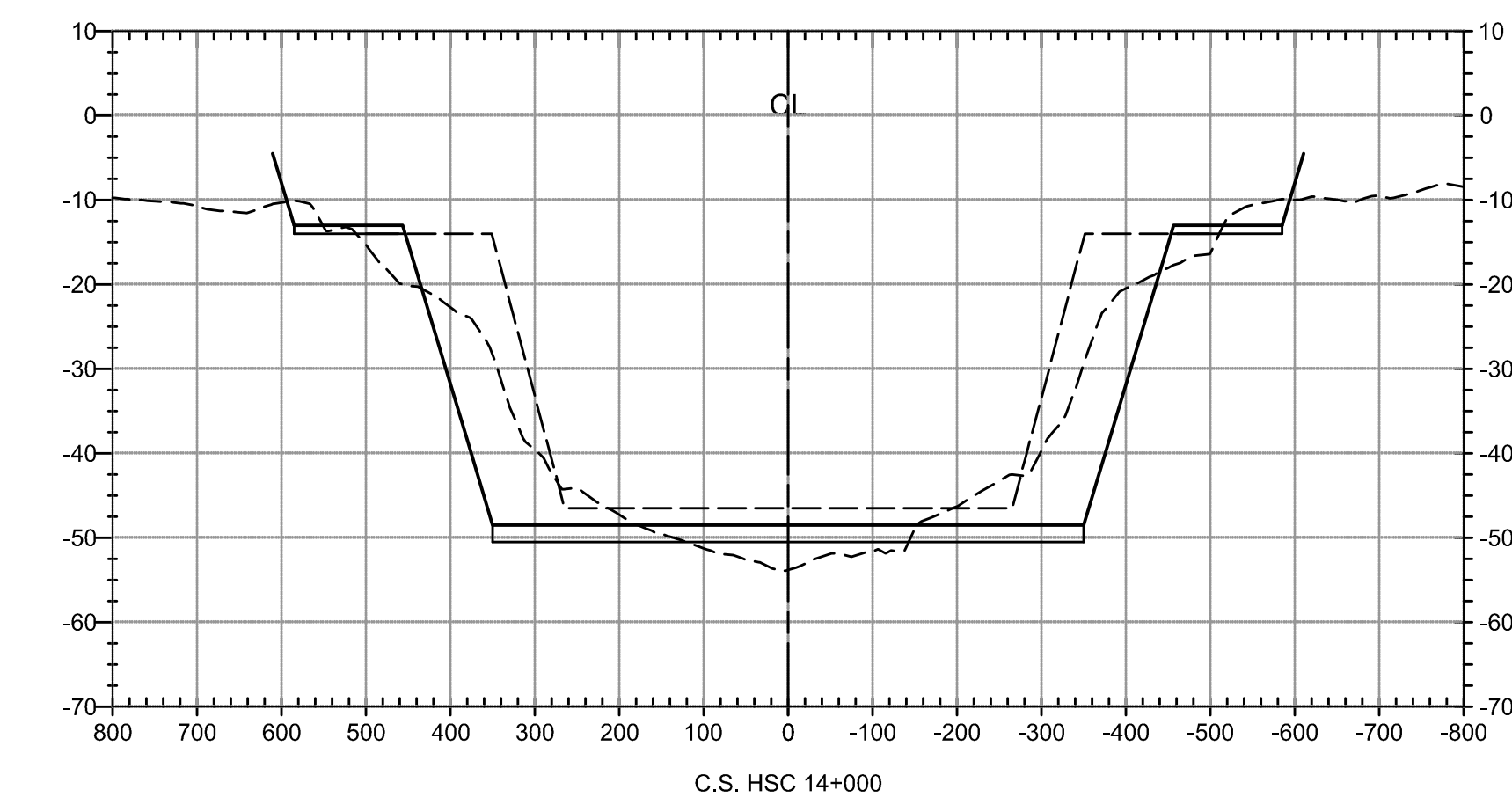
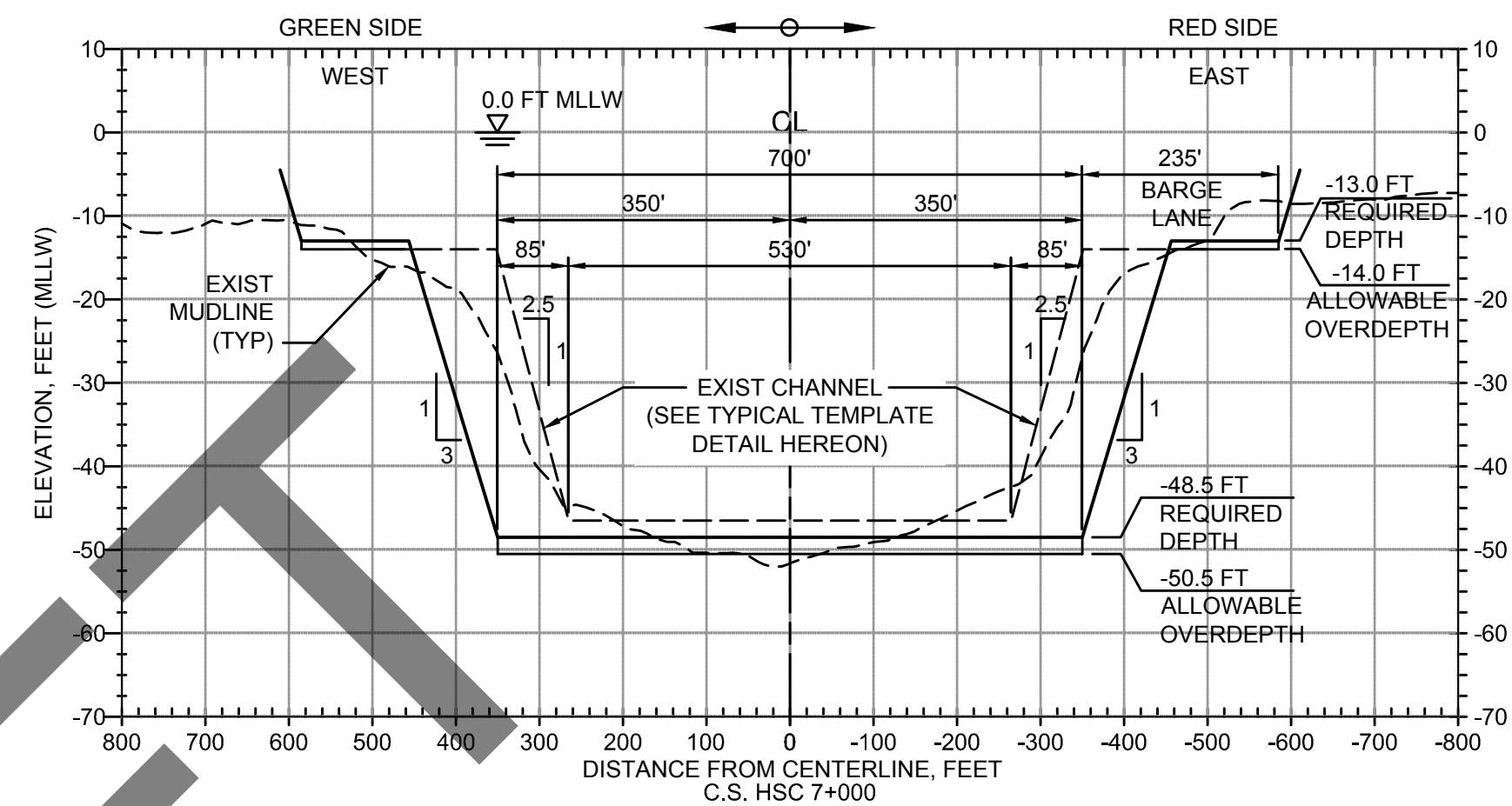
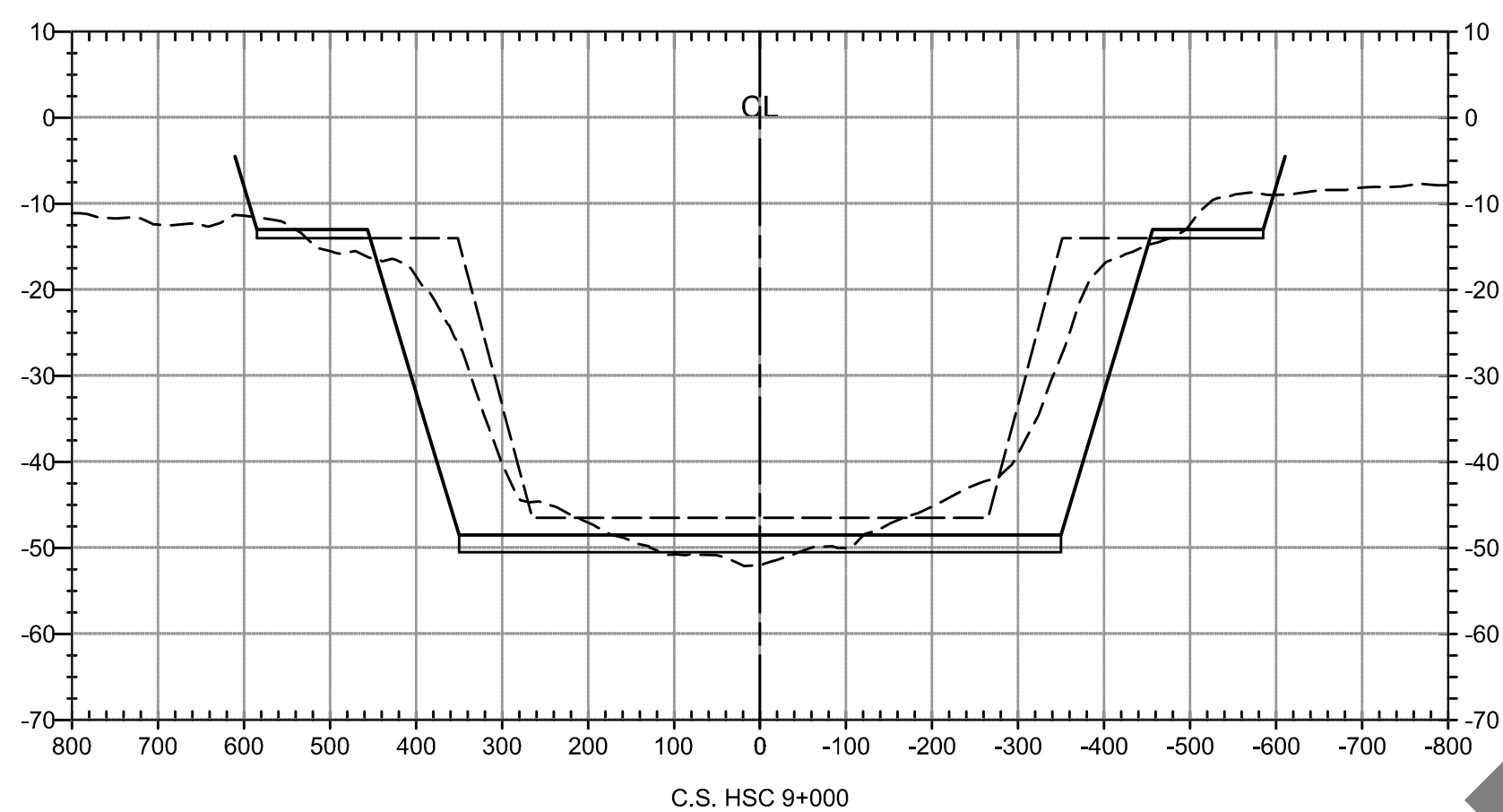
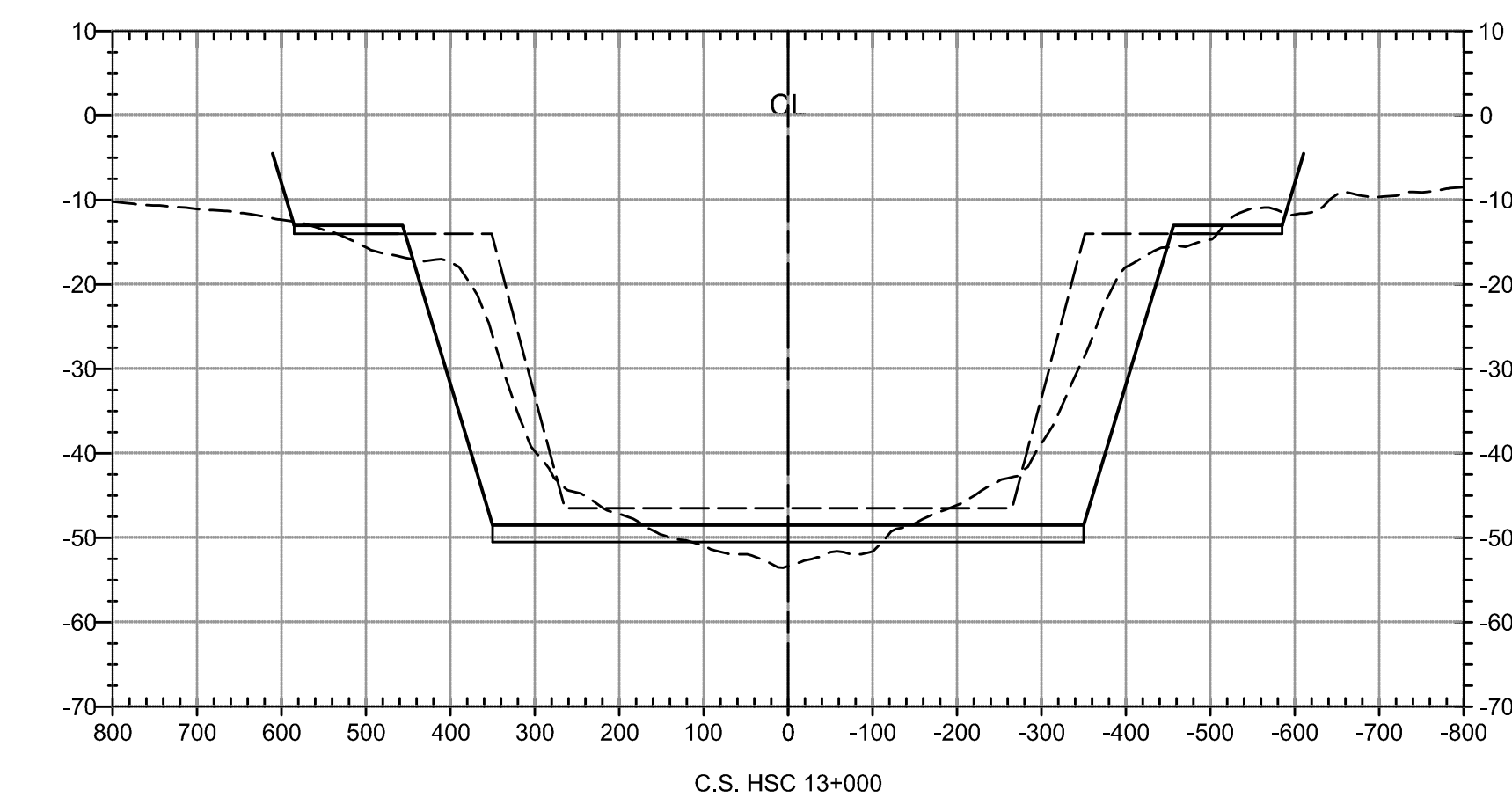
CHANNEL WIDENING DREDGE LIMITS



BARGE RELOCATION DREDGE LIMITS

CHANNEL COORDINATES TABLE 1

NO.	NORTHING	EASTING
6.1	13803130.14	3249543.13
6.2	13803221.86	3249791.76
6.3	13803251.27	3249871.50
6.4	13803332.61	3250091.98
6.5	13803038.42	3249294.51
6.6	13803009.01	3249214.77
6.7	13802927.67	3248994.29

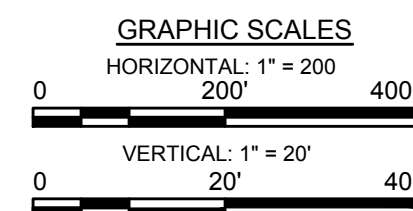


- NOTES:

1. ALL ELEVATIONS SHOWN IN FEET RELATIVE TO MEAN LOWER LOW WATER (MLLW).
2. ALL MATERIAL WITHIN THE REQUIRED DEPTH TEMPLATE MUST BE REMOVED INCLUSIVE OF SLOPE.
3. CROSS SECTIONS CUT FACING UP STATION AND DISPLAYED FACING UP CHANNEL PROCEEDING SOUTH TO NORTH IN SEQUENCE.

2. ALL MATERIAL WITHIN THE REQUIRED DEPTH TEMPLATE MUST BE REMOVED INCLUSIVE OF SLOPE.

3. CROSS SECTIONS CUT FACING UP STATION AND DISPLAYED FACING UP CHANNEL PROCEEDING SOUTH TO NORTH IN SEQUENCE.



**PORT OF HOUSTON
AUTHORITY**

CONSULTANT:

SEAL:

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ENGINEER: Ashley P. Judith
P.E NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E. NO: 100209
DATE: 09-30-2021

APPROVED: _____
DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

**EXPANSION
CHANNEL
IMPROVEMENT
PROJECT (ECIP)**

SHEET TITLE:
PROJECT 11:
BAYPORT (BEACON 76)
TO MORGANS POINT:
HSC STA 15+500 TO
HSC STA -0+003.94

CHANNEL DREDGE
CROSS SECTIONS - 1
HSC BAYOU STA
15+500 TO HSC STA
7+000

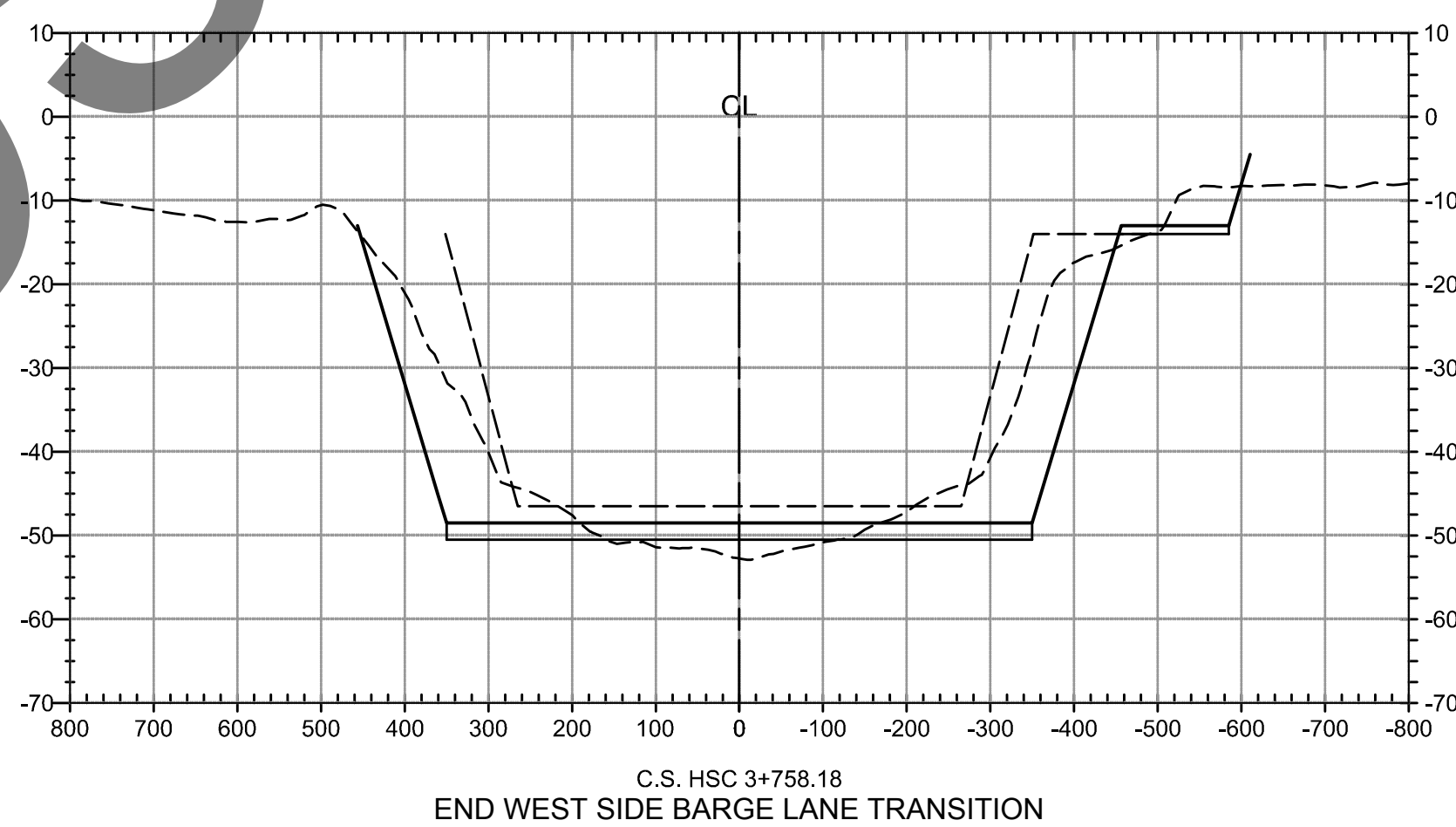
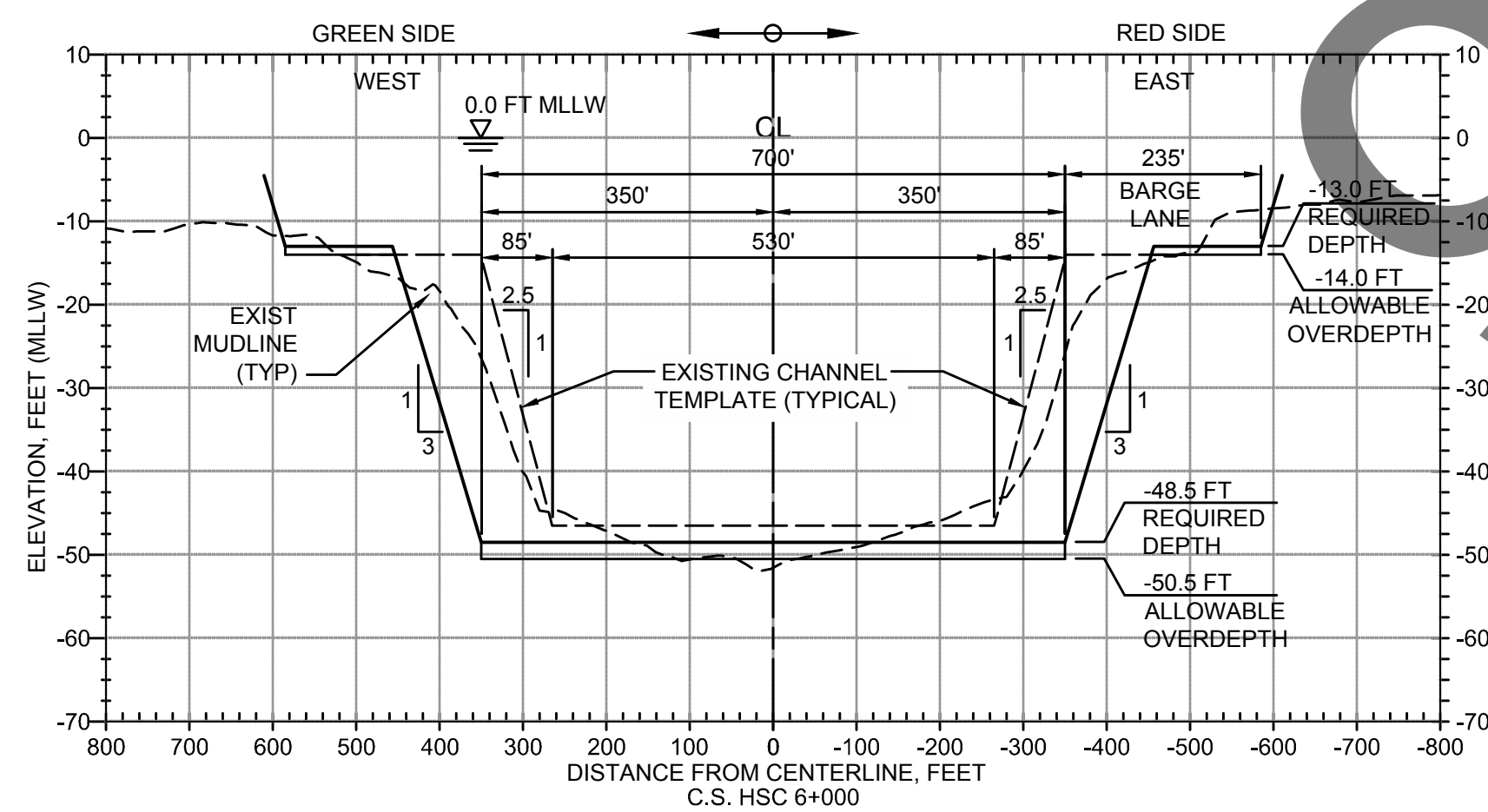
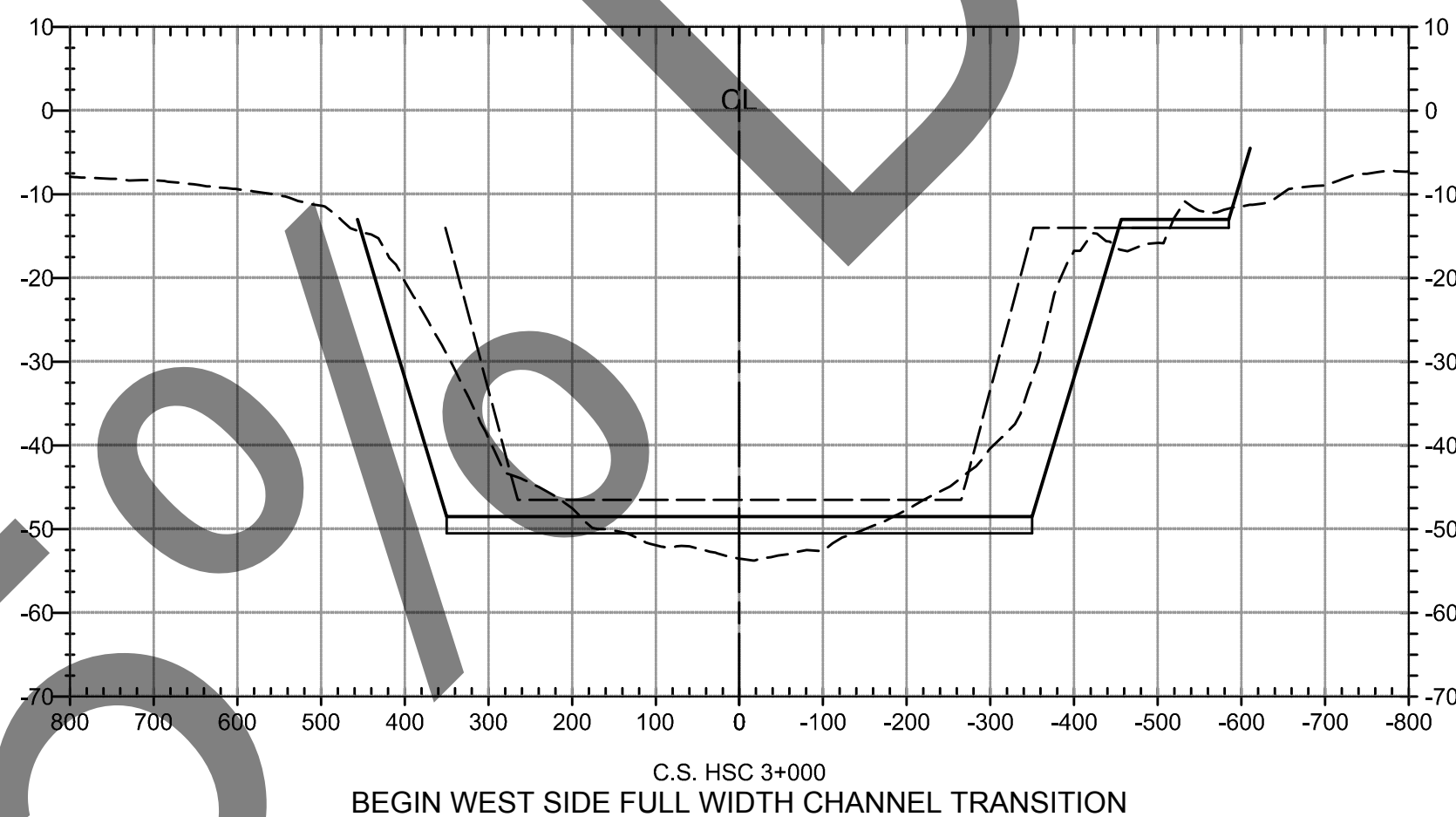
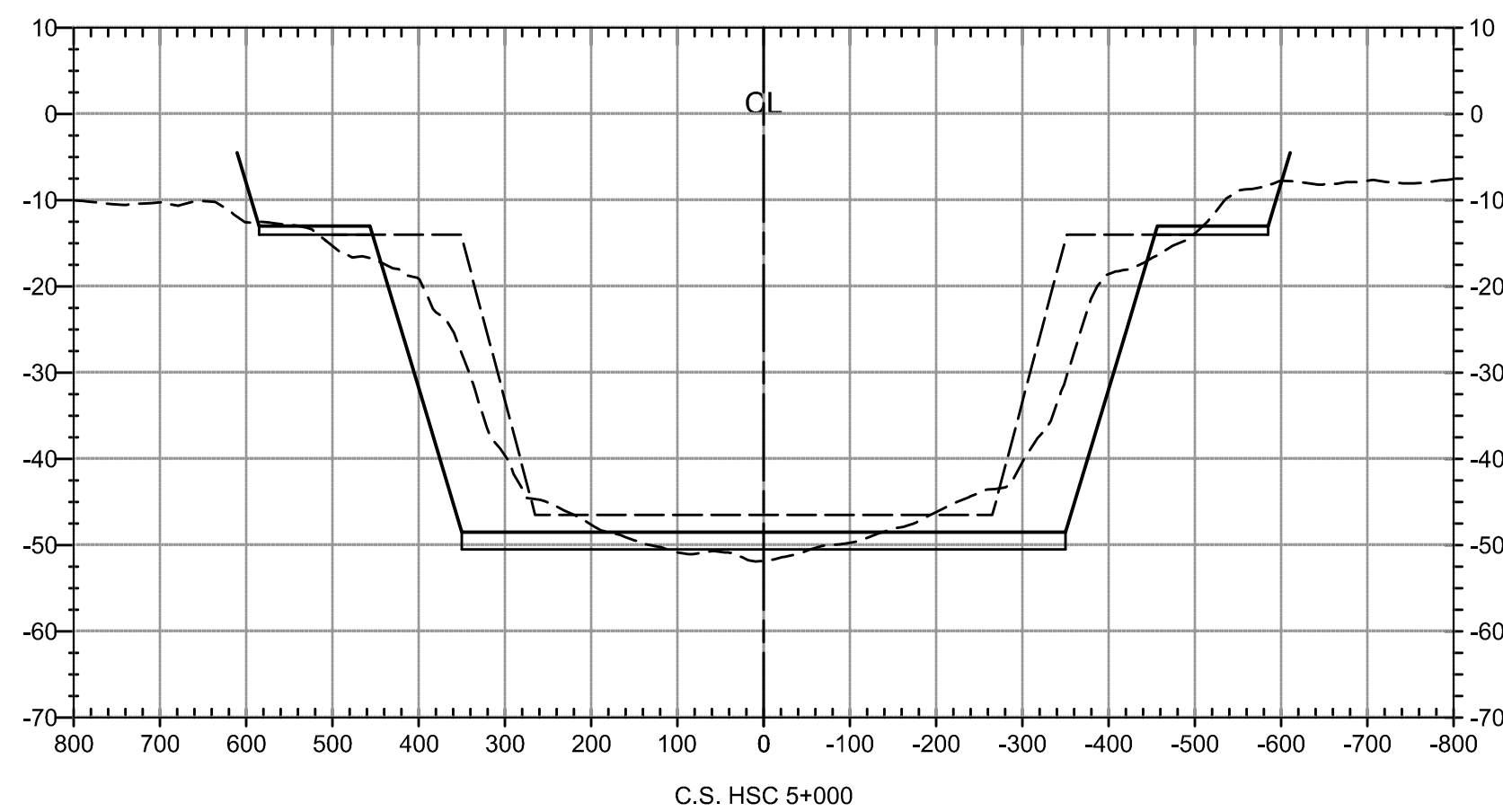
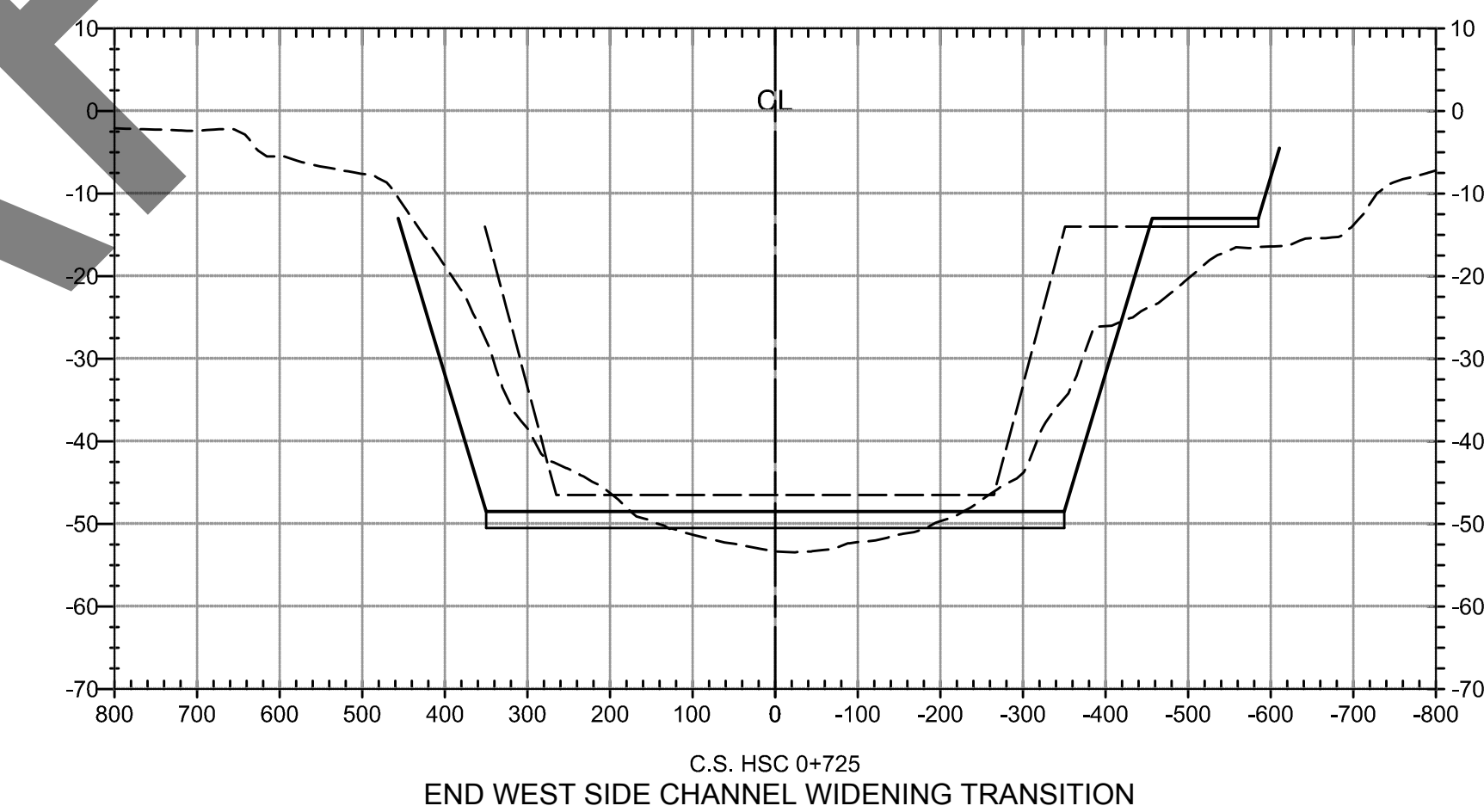
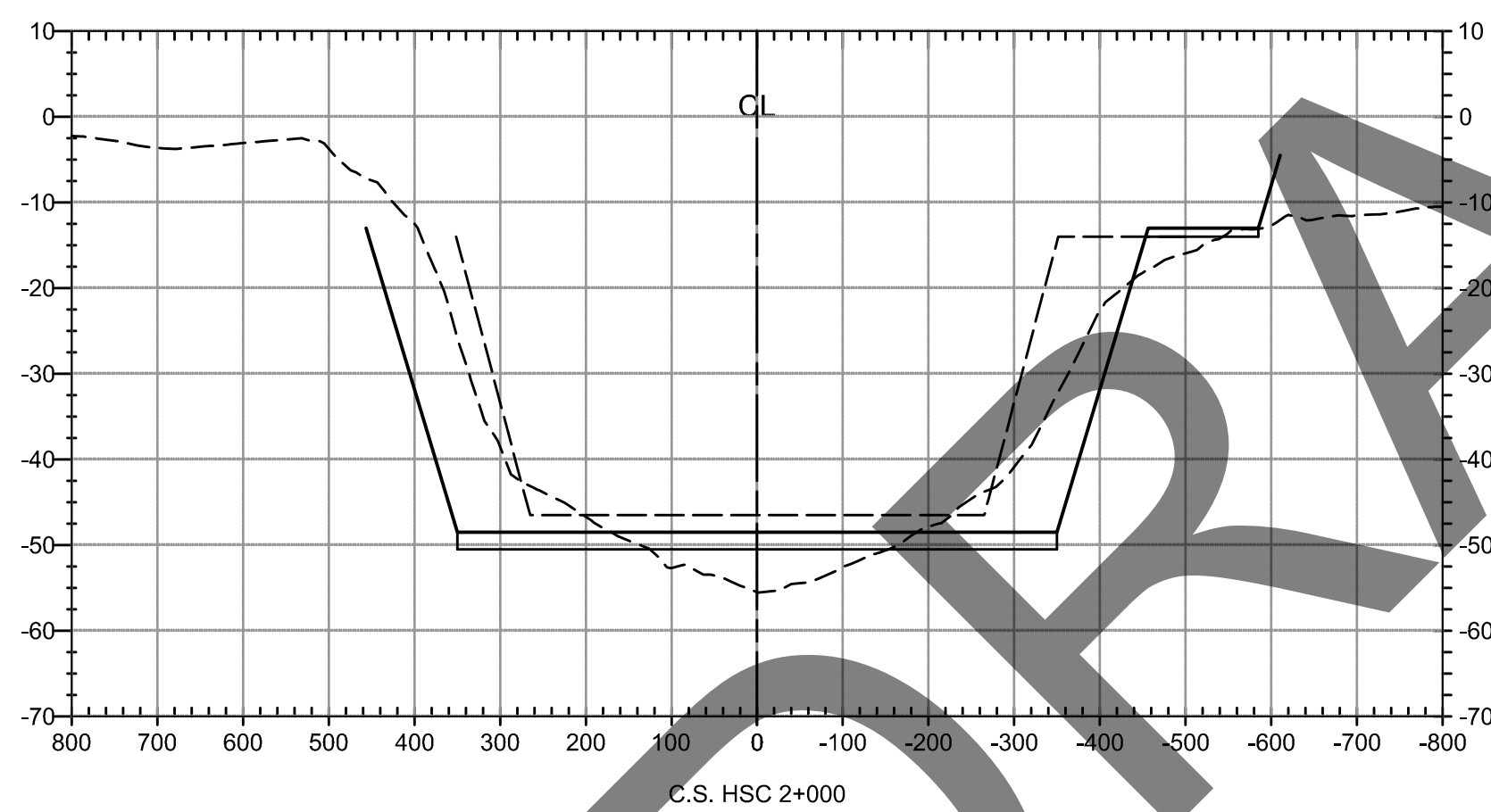
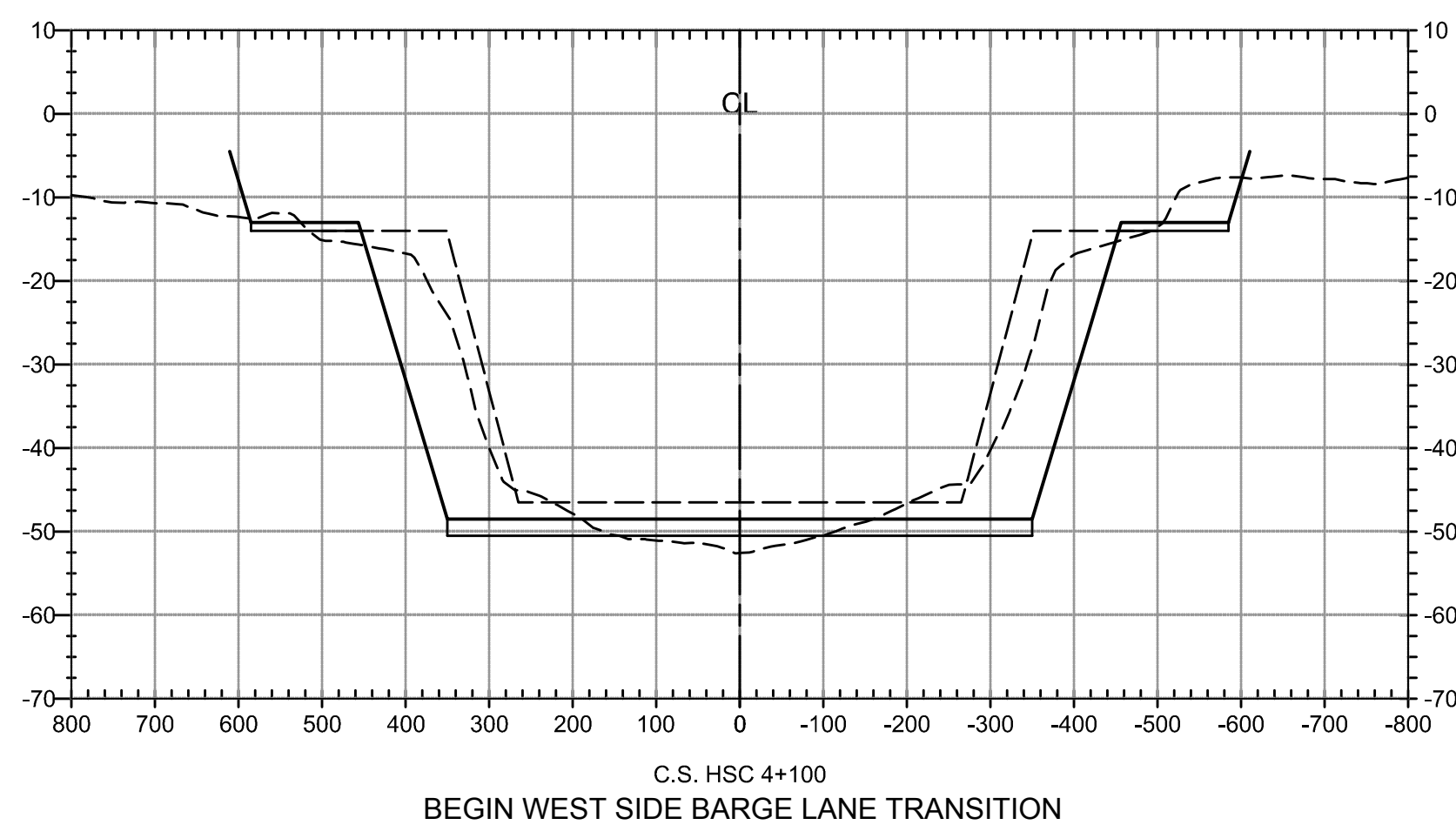
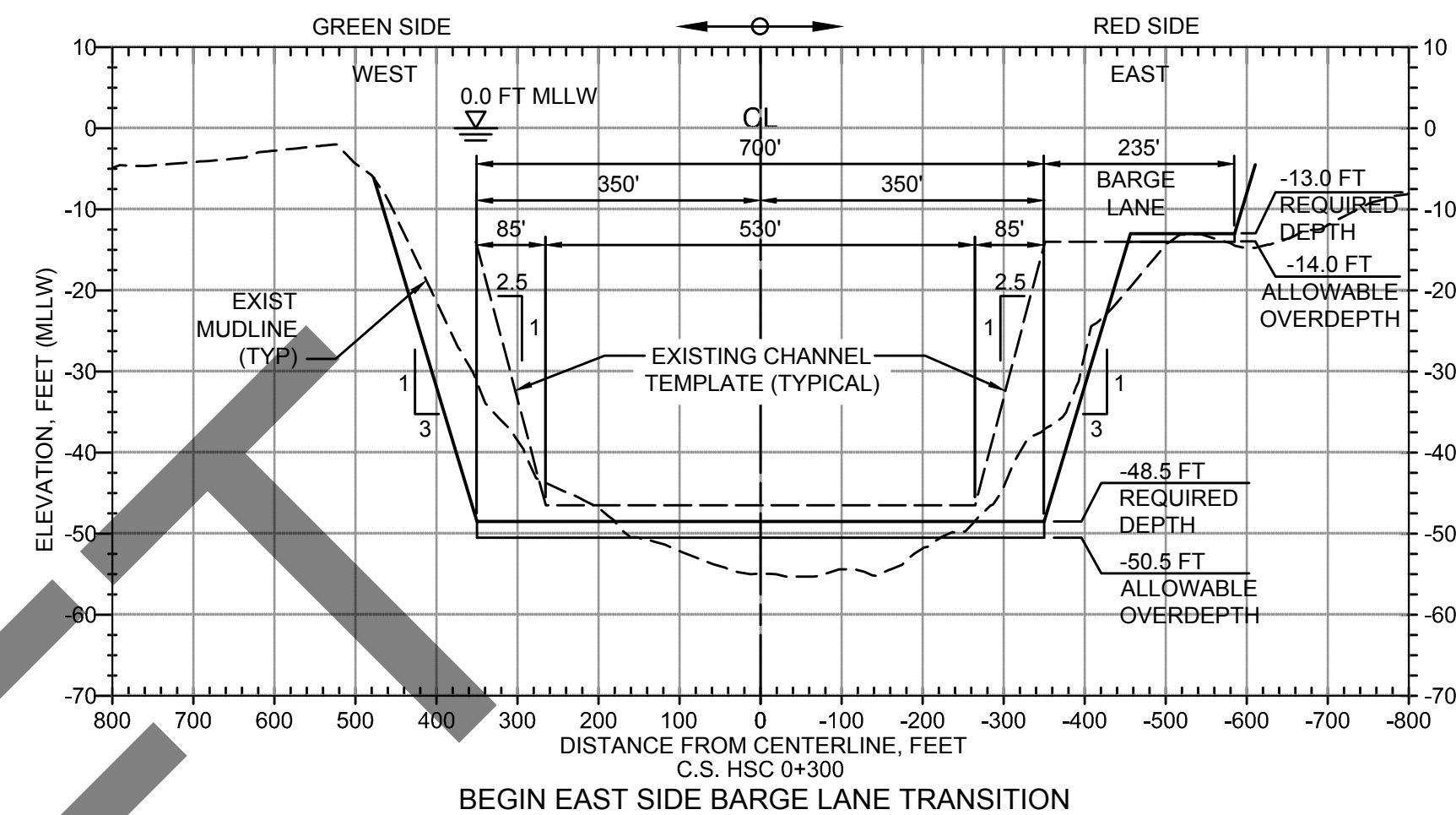
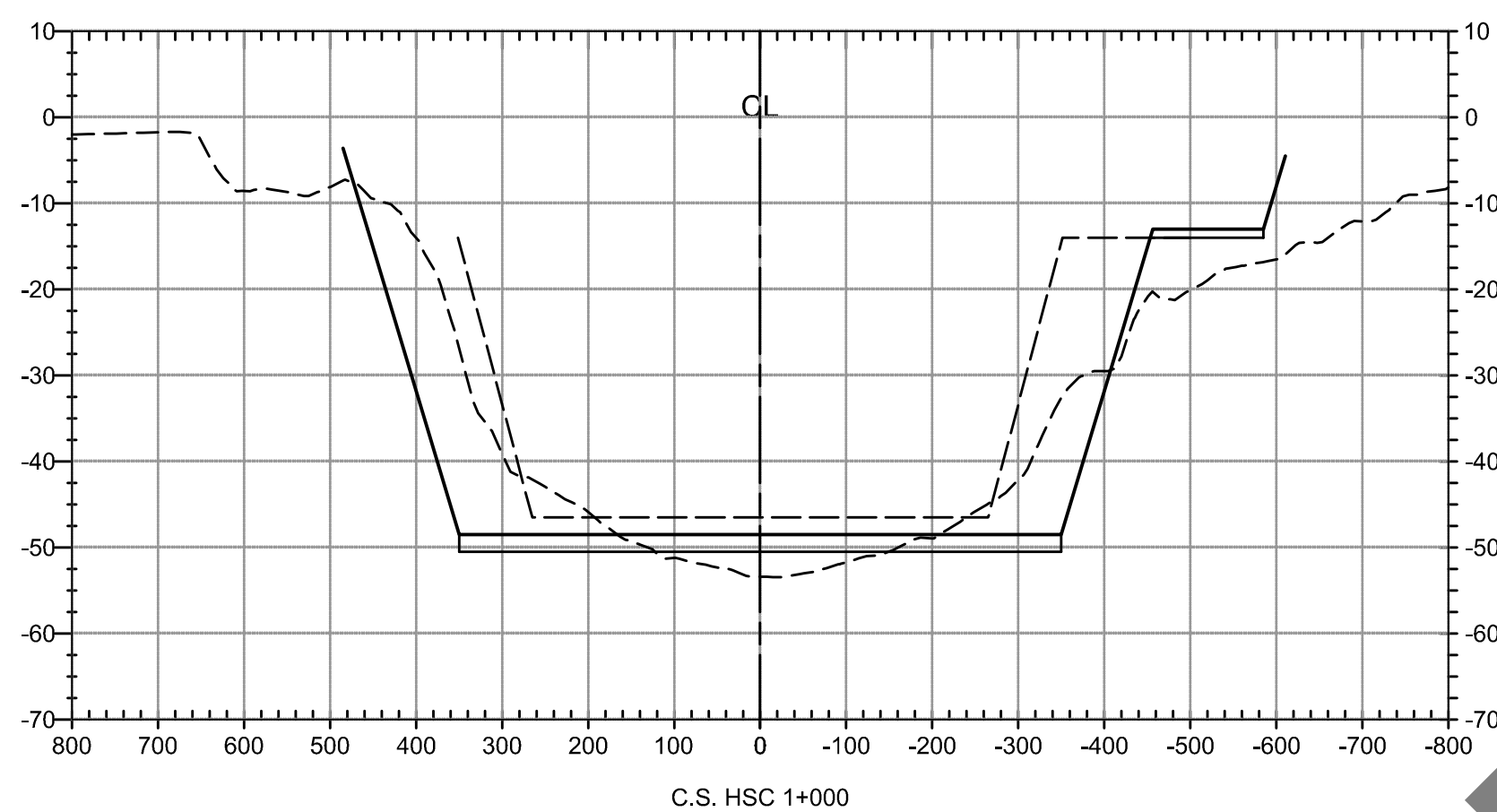
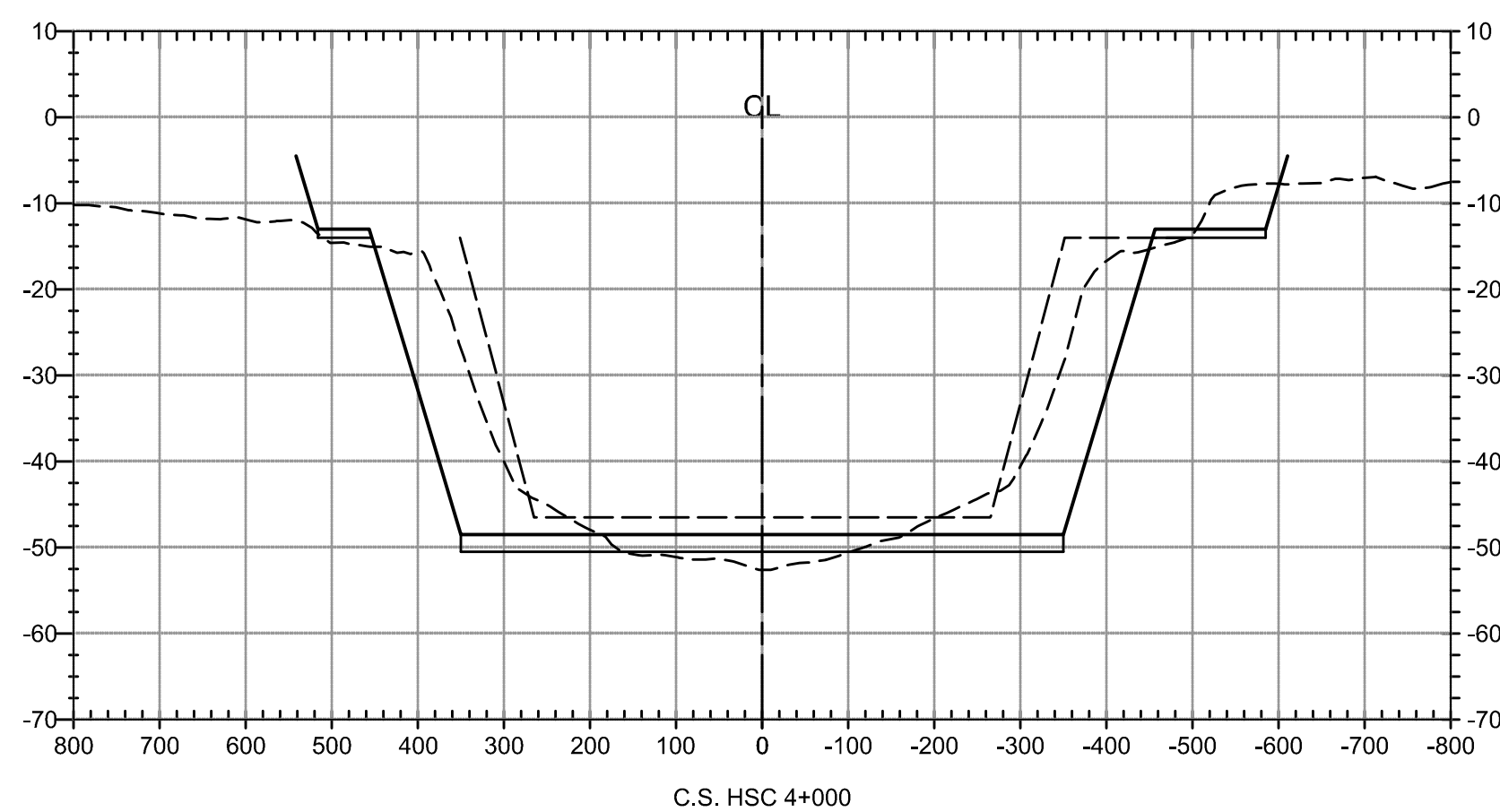
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DESIGNER:	DC
CADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

DRAWING NO.

SHEET NO.	REV. NO.
13	0

95% SUBMITTAL



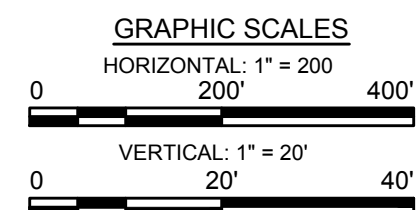
- NOTES:

1. ALL ELEVATIONS SHOWN IN FEET RELATIVE TO MEAN LOWER LOW WATER (MLLW).
2. ALL MATERIAL WITHIN THE REQUIRED DEPTH TEMPLATE MUST BE REMOVED INCLUSIVE OF SLOPE.
3. CROSS SECTIONS CUT FACING UP STATION AND DISPLAYED FACING UP CHANNEL PROCEEDING SOUTH TO NORTH IN SEQUENCE.
4. SEE TYPICAL EXISTING CHANNEL TEMPLATE DETAIL SHOWN ON DWG NO. CN301.

2. ALL MATERIAL WITHIN THE REQUIRED DEPTH TEMPLATE MUST BE REMOVED INCLUSIVE OF SLOPE.

3. CROSS SECTIONS CUT FACING UP STATION AND DISPLAYED FACING UP CHANNEL PROCEEDING SOUTH TO NORTH IN SEQUENCE.

4. SEE TYPICAL EXISTING CHANNEL TEMPLATE DETAIL SHOWN ON DWG NO. CN301.

The seal of the Port of Houston Authority (PHA) is a circular emblem. It features a five-pointed star in the center, with the letters 'PHA' superimposed on it. The star and letters are rendered in a stylized, metallic-looking font. Surrounding the central design is a thick, dark rope-like border. The text 'PORT OF HOUSTON AUTHORITY' is inscribed along the top inner edge of the circle, and 'HOUSTON, TEXAS' is inscribed along the bottom inner edge.PORT OF HOUSTON
AUTHORITY

CONSULTANT:

SEAL:

95% PRELIMINARY

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ENGINEER: Ashley P. Judith
P.E NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E NO: 100209
DATE: 09-30-2021

APPROVED: _____

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

**EXPANSION
CHANNEL
IMPROVEMENT
PROJECT (ECIP)**

SHEET TITLE:
PROJECT 11:
BAYPORT (BEACON 76)
TO MORGANS POINT:
HSC STA 15+500 TO
HSC STA -0+003.94

CHANNEL DREDGE
CROSS SECTIONS - 2
HSC STA 6+000 TO
HSC STA 0+300

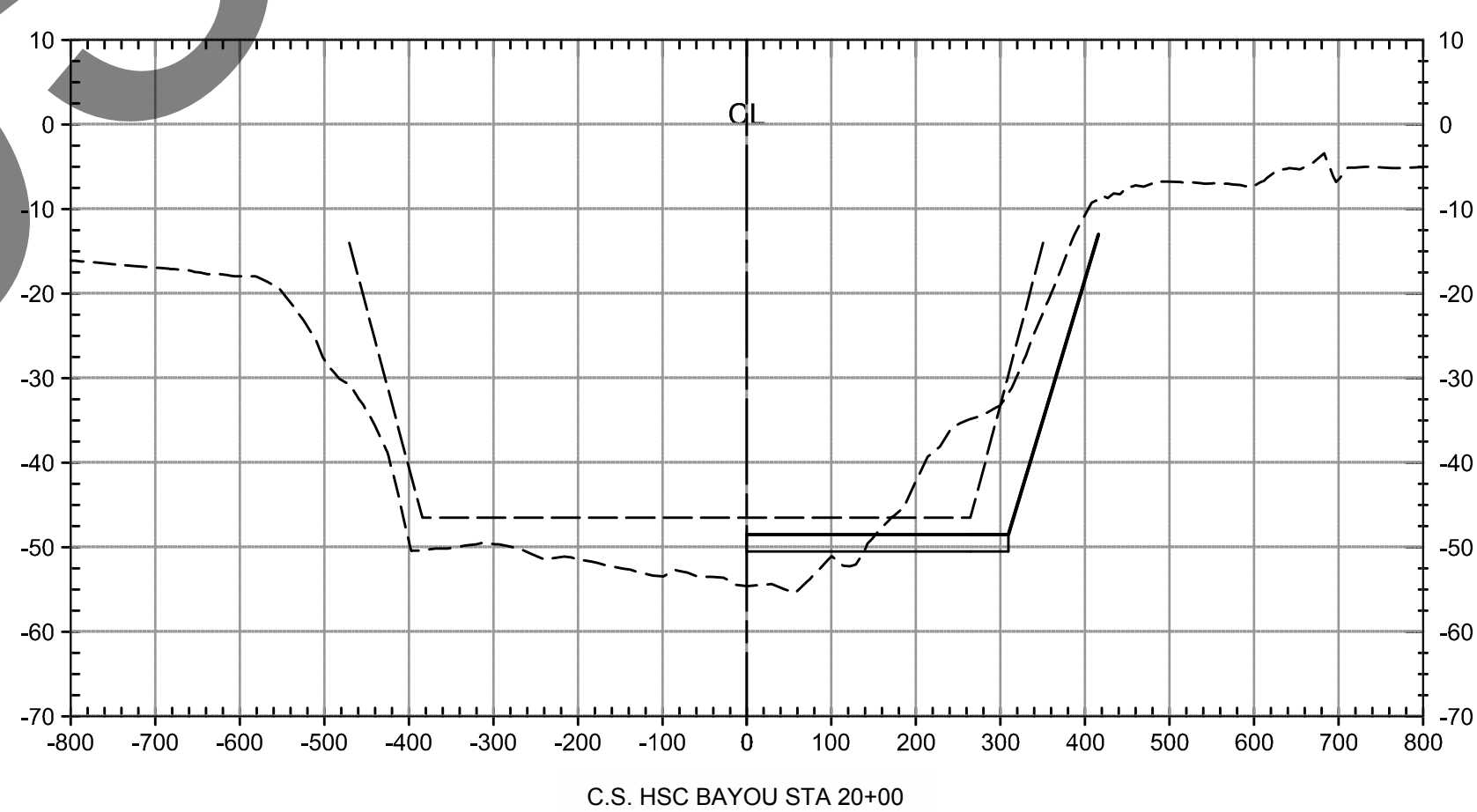
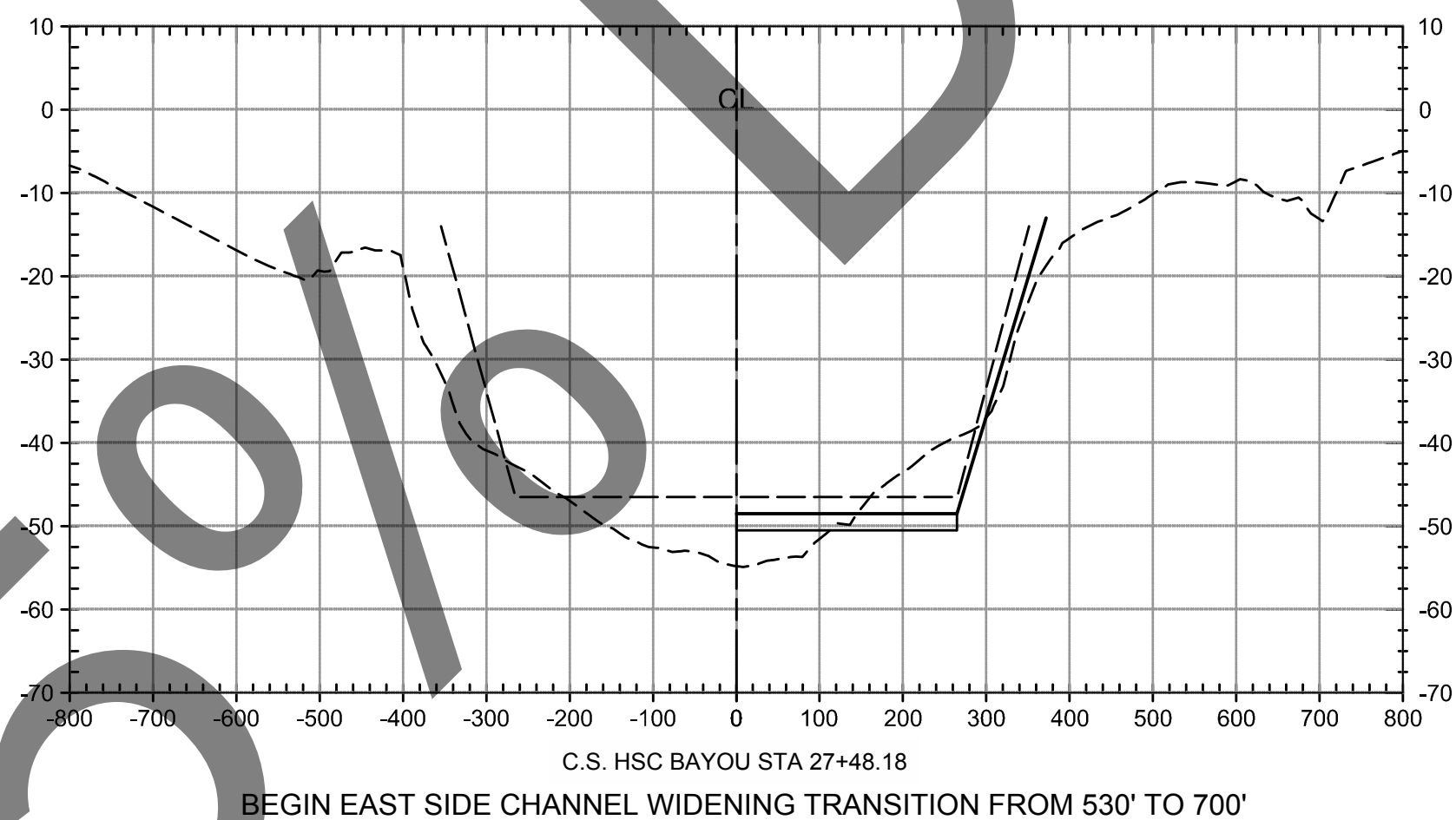
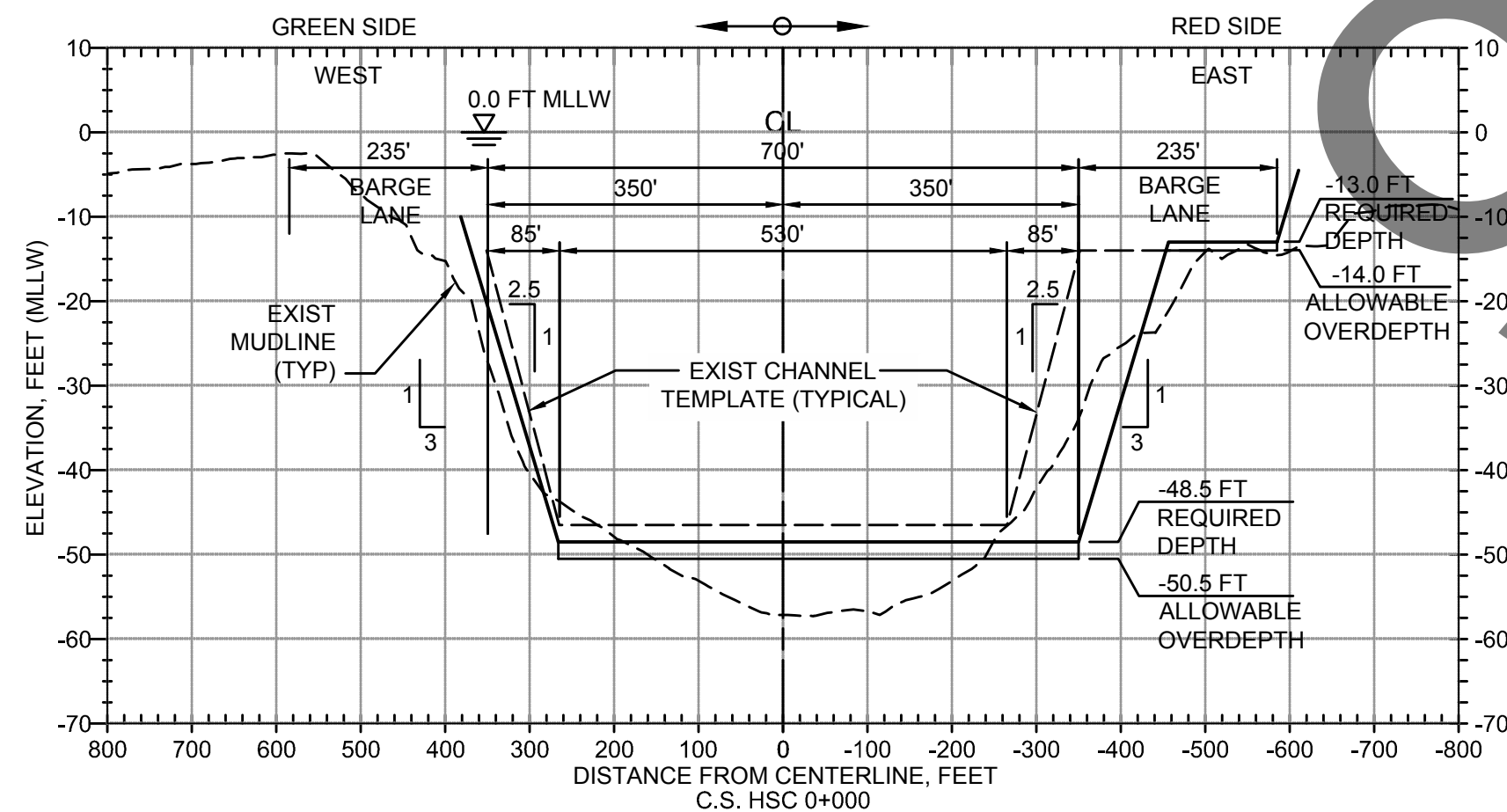
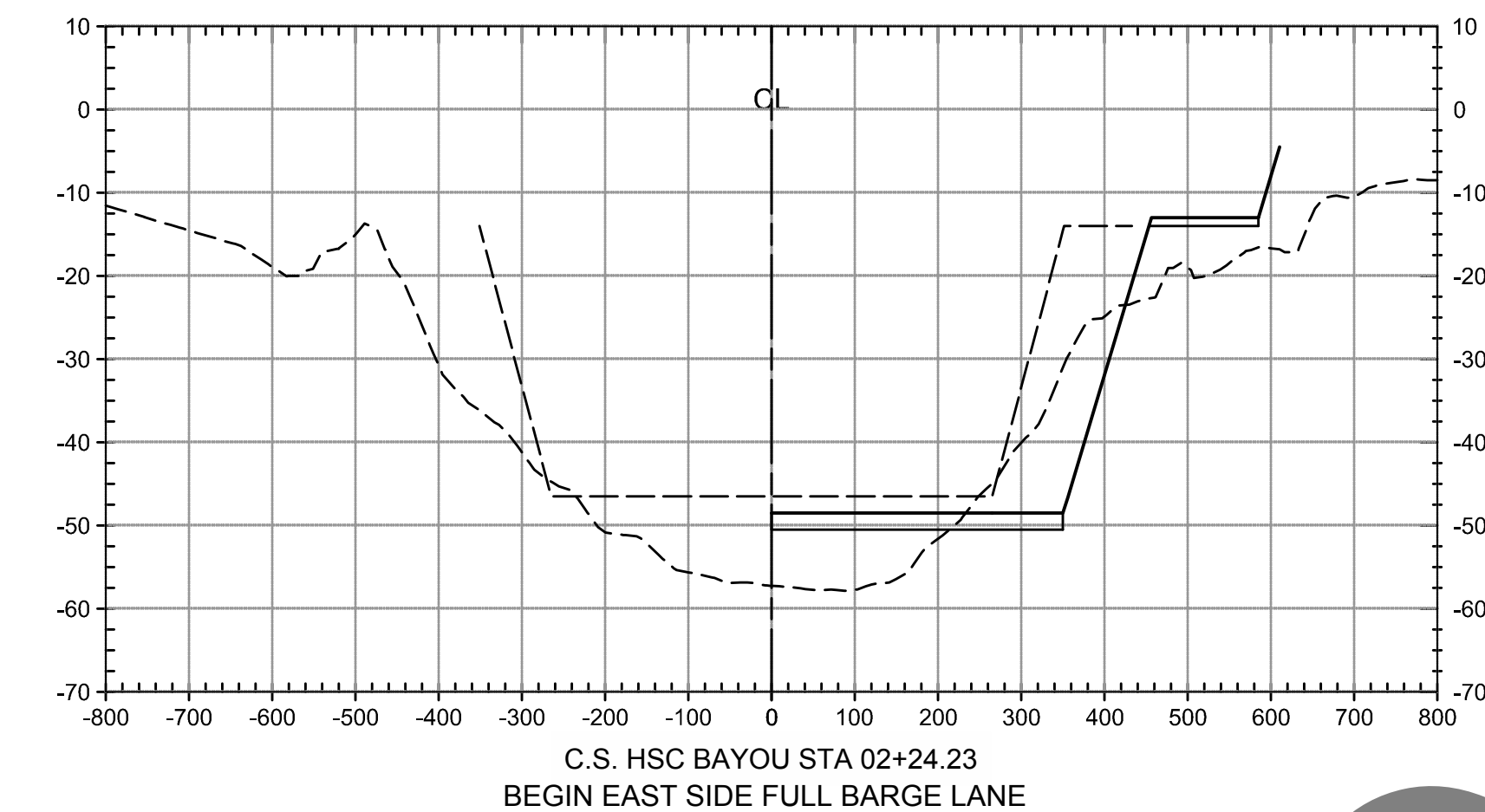
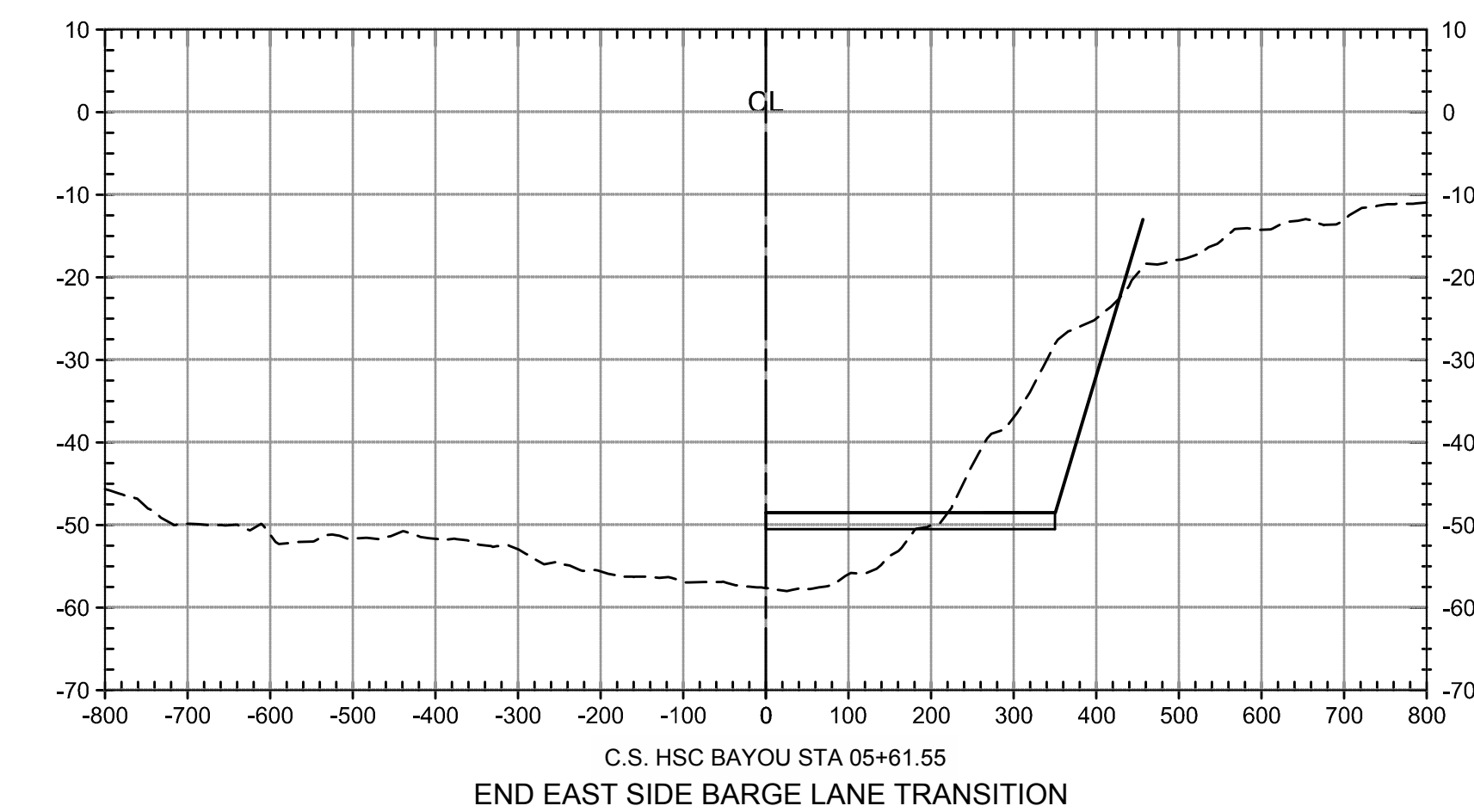
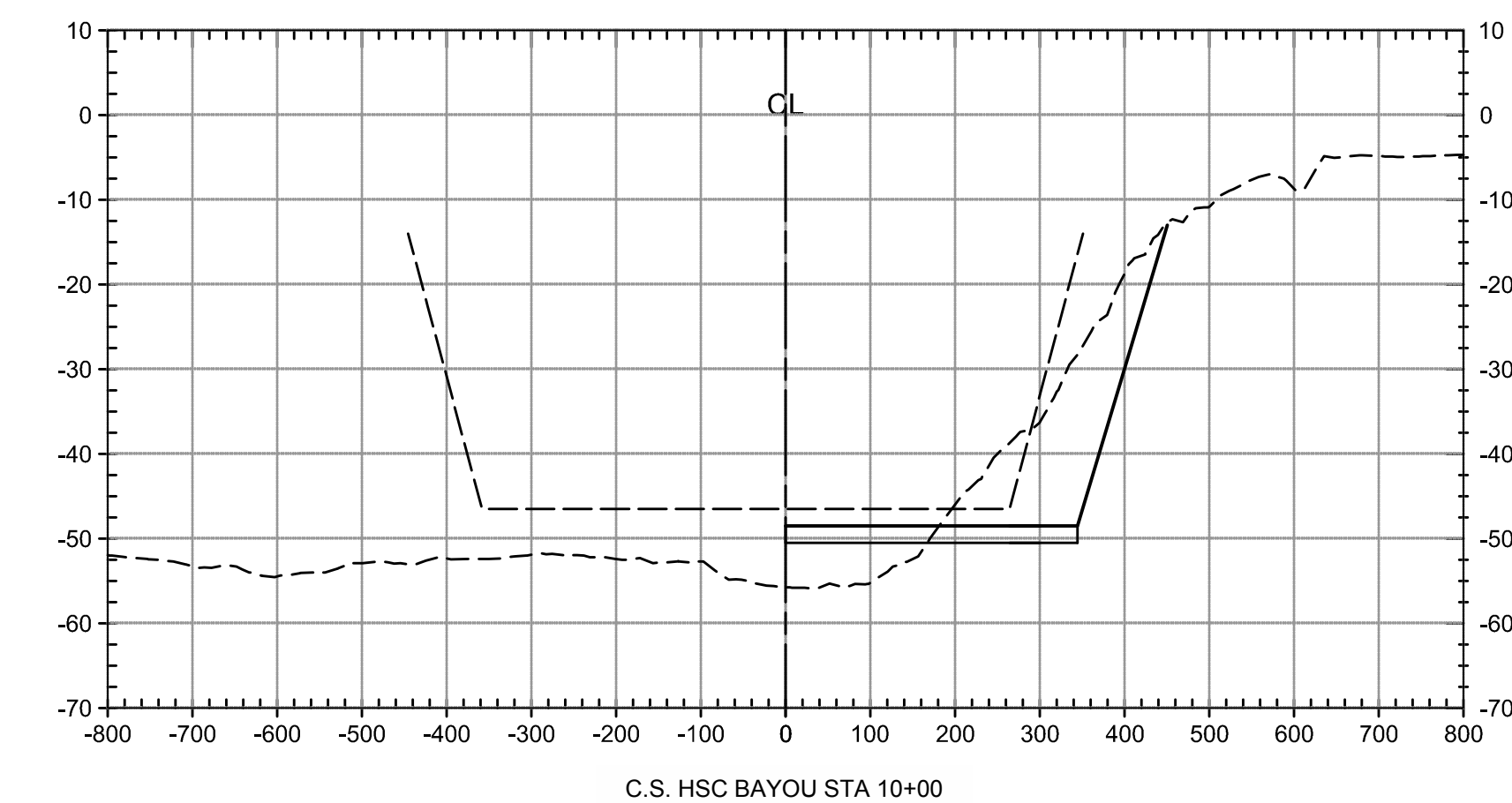
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DESIGNER:	AJ
CADD:	RK
CHECKER:	CH/SH/MM
DATE:	DEC 2020
SCALE:	AS SHOWN

DRAWING NO.

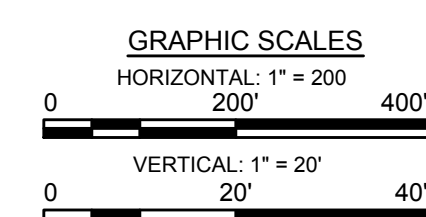
C90-D13-P11-006-CN302	
SHEET NO.	REV. NO.
14	0

95% SUBMITTAL



- NOTES:

1. ALL ELEVATIONS SHOWN IN FEET RELATIVE TO MEAN LOWER LOW WATER (MLLW).
2. ALL MATERIAL WITHIN THE REQUIRED DEPTH TEMPLATE MUST BE REMOVED INCLUSIVE OF SLOPE.
3. CROSS SECTIONS CUT FACING UP STATION AND DISPLAYED FACING UP CHANNEL PROCEEDING SOUTH TO NORTH IN SEQUENCE.
4. SEE TYPICAL EXISTING CHANNEL TEMPLATE DETAIL SHOWN ON DWG NO. CN301.



**PORT OF HOUSTON
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CONSULTANT:

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DATE: 09-30-2021

APPROVED: _____ DATE: _____

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

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**EXPANSION
CHANNEL
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PROJECT (ECIP)**

SHEET TITLE:
PROJECT 11:
BAYPORT (BEACON 76)
TO MORGANS POINT:
HSC STA 20+000 TO
HSC STA -0+003.94

CHANNEL DREDGE
CROSS SECTIONS - 3
HSC STA 0+000 TO
HSC BAYOU STA
27+48.18

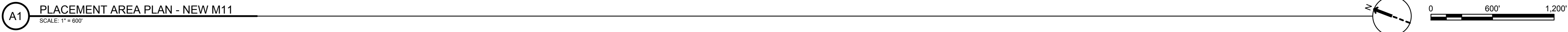
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DESIGNER:	AJ
CADD:	RK
CHECKER:	CH/SH/MM
DATE:	DEC 2020
SCALE:	AS SHOWN

DRAWING NO.
C90-D13-P11-006-CN303

SHEET NO.	REV. NO.
15	0

95% SUBMITTAL



NOTES:

1. CONTOURS DEPICTED ON THIS MAP REPRESENT THE RESULTS OF SURVEYS MADE ON NOVEMBER & DECEMBER 2019 AND CAN ONLY INDICATE THE GENERAL CONDITIONS EXISTING AT THAT TIME.
2. ALL ELEVATIONS ARE IN U.S. SURVEY FEET AND ARE REFERENCED TO MLLW AND ARE BELOW THE REFERENCE PLANE UNLESS PRECEDED BY A PLUS (+) SIGN.



SEAL: _____

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ENGINEER: Ashley P. Judith

P.E. NO: 112988

DATE: 09-30-2021

ENGINEER: Chester W. Hedderman

P.E. NO: 100209

DATE: 09-30-2021

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

**EXPANSION
CHANNEL
IMPROVEMENT
PROJECT (ECIP)**

SHEET TITLE:
PROJECT 11:
BAYPORT TO
MORGANS POINT
HSC STATION 15+500
TO -0+003.94

PLACEMENT AREA
PLAN - NEW M11

[illegible]

DESIGNER:	DC
CADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	1:600'

DRAWING NO.	
C90-D13-P11-006-CE101	
SHEET NO.	REV. NO.
17	0

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ENGINEER: Chester W. Hedderman
P.E. NO: 100209
DATE: 09-30-2021

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR - ENGINEERING
DESIGN & SUPPORT

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

PLACEMENT AREA - NEW M11 - TYPICAL CROSS SECTIONS & DETAILS - 1

DESIGNER:	DC
ADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

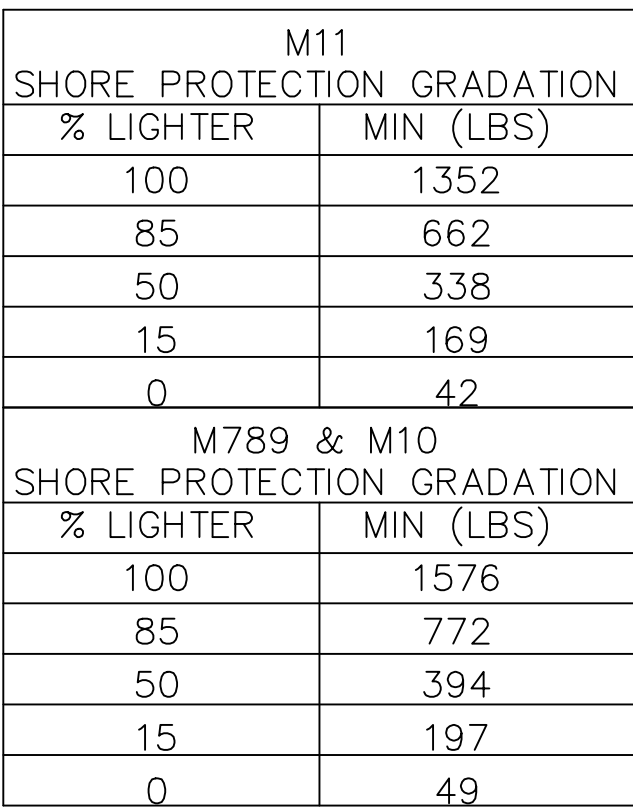
DRAWING NO.	
C90-D13-P11-006-CE301	
SHEET NO.	REV. NO.
19	0

95% SUBMITTAL

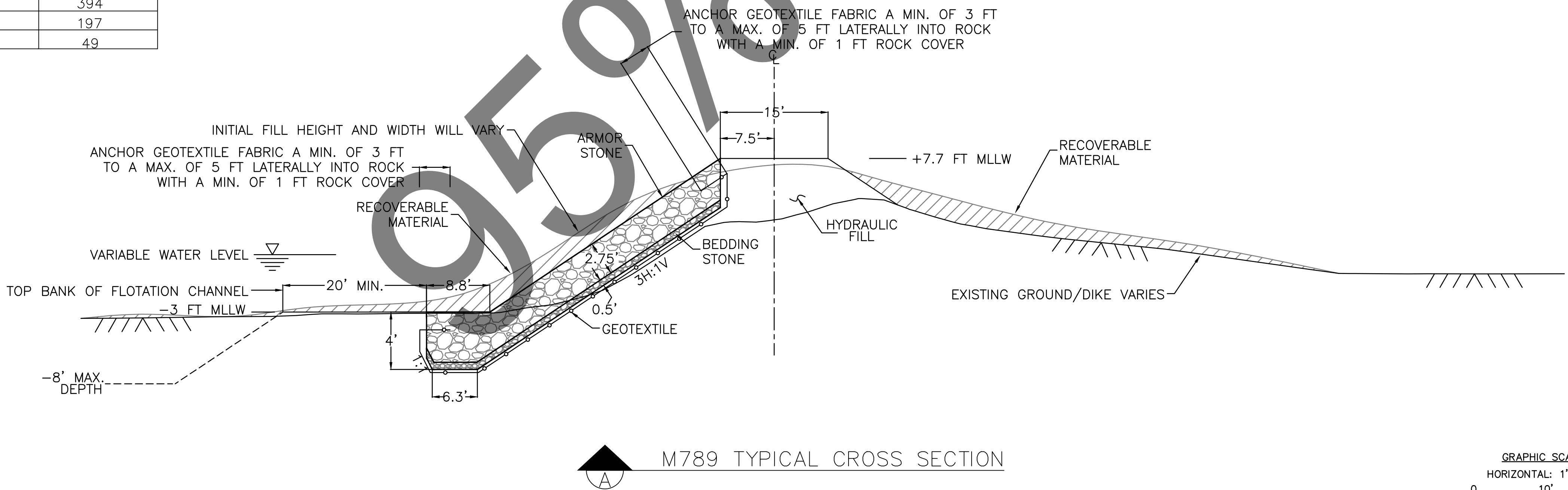
NOTES:

1. ALL ELEVATIONS ARE IN U.S. SURVEY FEET AND REFERENCED TO MLLW.
2. DIKE TEMPLATE TO BE SHAPED AND DRESSED ABOVE ELEVATION -3 FT MLLW.
3. GEOTEXTILE FABRIC SHALL BE IMBEDDED/TIED INTO ROCK 3 FEET TO A MAXIMUM OF 5 FEET Laterally WITH 1-FOOT OF ROCK COVER.

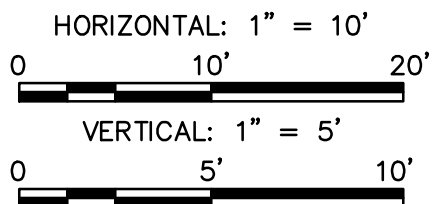
HYD. FILL TYPICAL SECTION: STATIONS 6+367.97 TO 13+293.81



HYD. FILL TYPICAL SECTION: STATIONS 0+000.00 TO 6+367.97



GRAPHIC SCALES





CONSULTANT:
Turner Collie & Braden Inc.
**SAHAGAN & BRYANT
ASSOCIATES, INC**
5444 WESTHEIMER ROAD, SUITE 400
HOUSTON, TEXAS 77056
TUBE NO. F-10788

EAL:

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DATE

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MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

HEET TITLE:
**PROJECT 11:
BAYPORT TO
MORGANS POINT
HSC STATION 15+500
TO -0+003.94**

PLACEMENT AREA - NEW M11 - TYPICAL CROSS SECTIONS & DETAILS - 2

[illegible]

DESIGNER:	DC
CADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

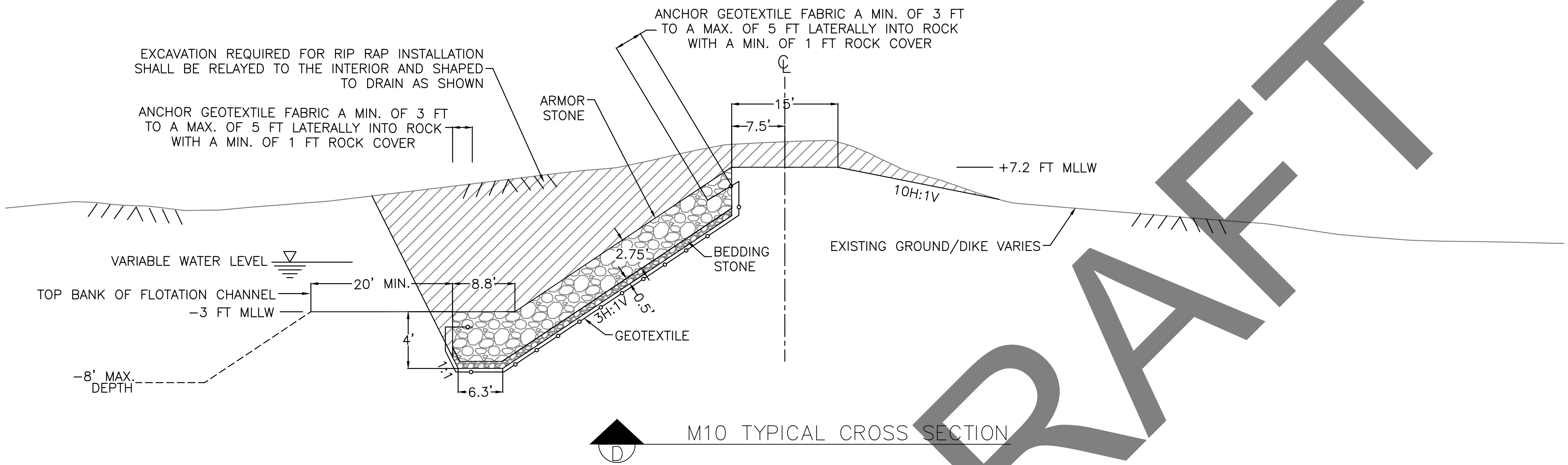
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SHEET NO.	REV. NO.
20	0

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NOTES:

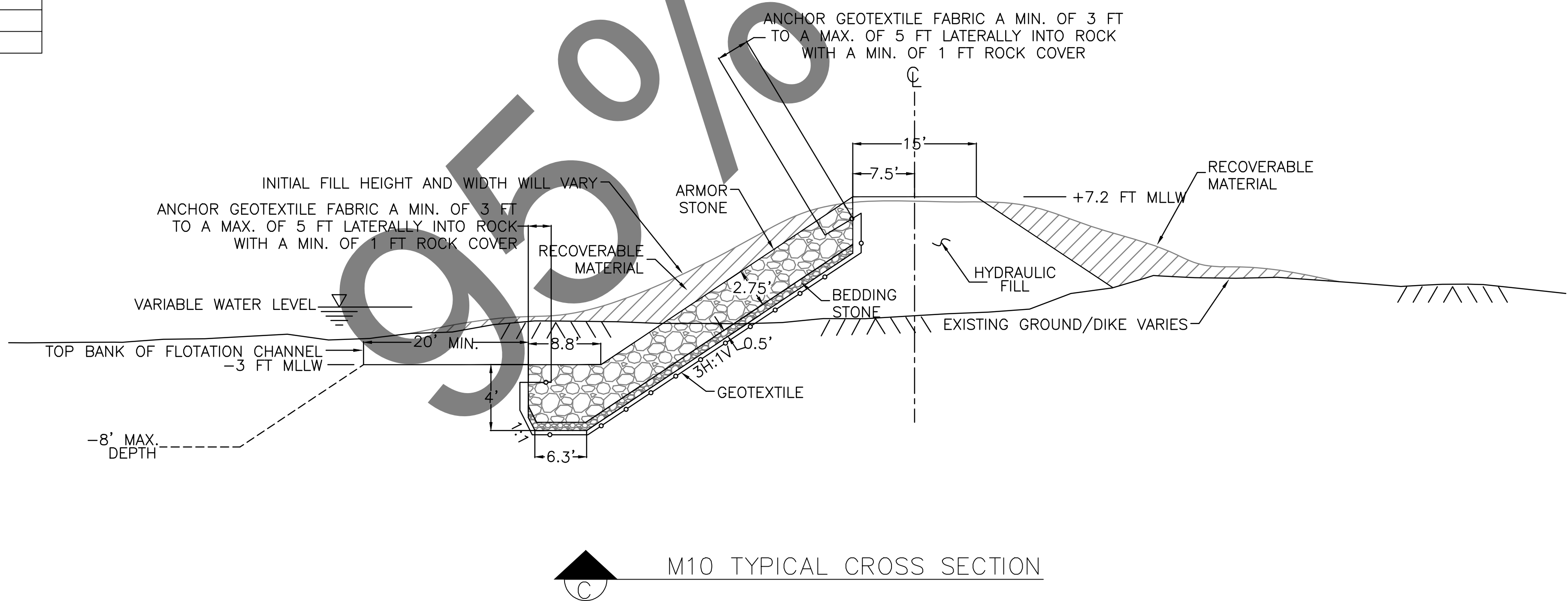
1. ALL ELEVATIONS ARE IN U.S. SURVEY FEET AND REFERENCED TO MLLW.
2. DIKE TEMPLATE TO BE SHAPED AND DRESSED ABOVE ELEVATION -3 FT MLLW.
3. GEOTEXTILE FABRIC SHALL BE IMBEDDED/TIED INTO ROCK 3 FEET TO A MAXIMUM 5 FEET LATALLY WITH 1-FOOT OF ROCK COVER.

MECH. CONSTRUCTION TYPICAL SECTION: STATIONS 15+106.54 TO 19+350.78



M789 & M10 SHORE PROTECTION GRADATION	
% LIGHTER	MIN (LBS)
100	1576
85	772
50	394
15	197
0	49

HYD. FILL TYPICAL SECTION: STATIONS 13+293.81 TO 15+106.54



GRAPHIC SCALES

HORIZONTAL: 1" = 20'

VERTICAL: 1" = 5'

5'



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DATE: 09-30-2021

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)
EXPANSION
CHANNEL
IMPROVEMENT
PROJECT (ECIP)**

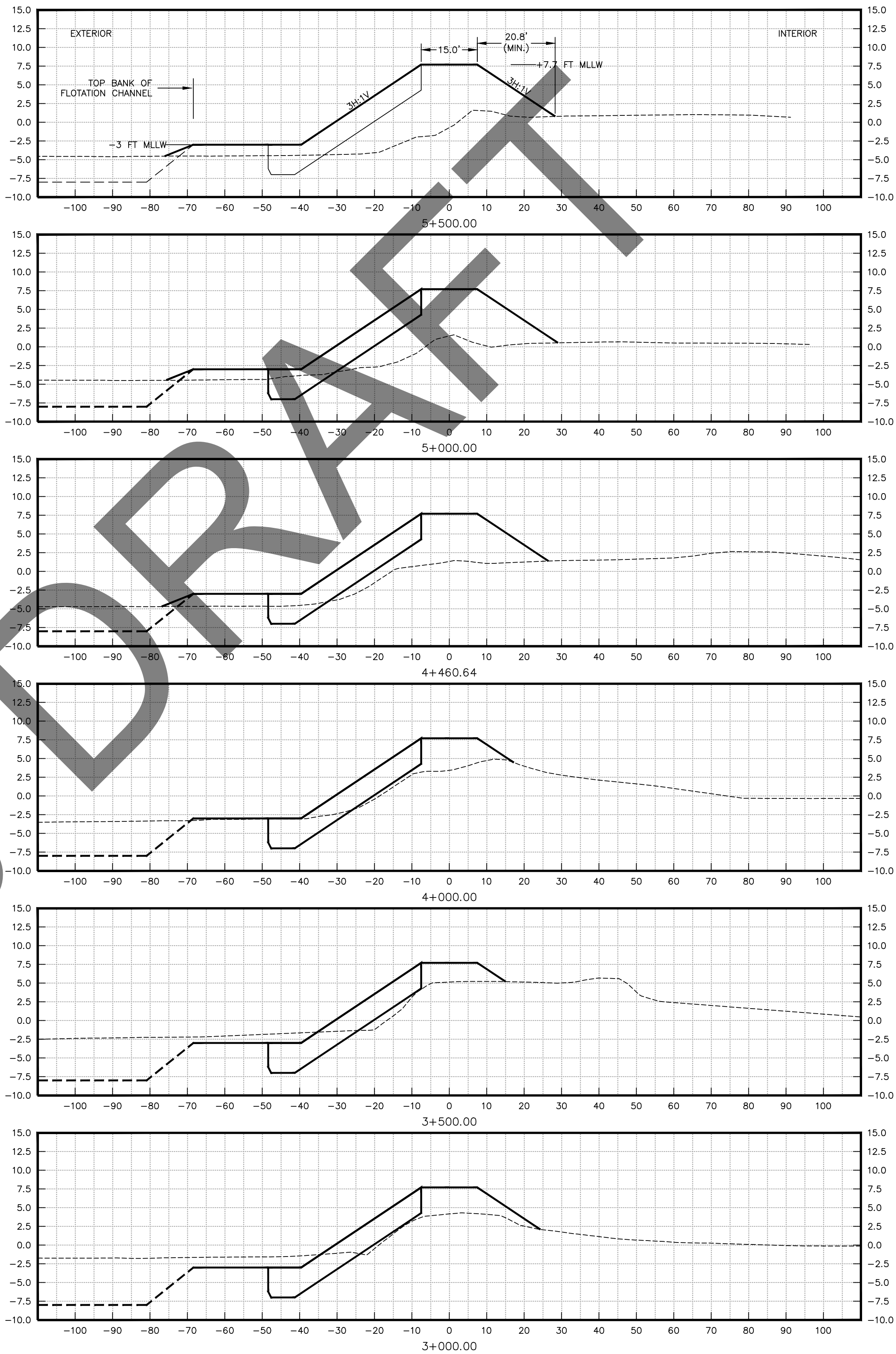
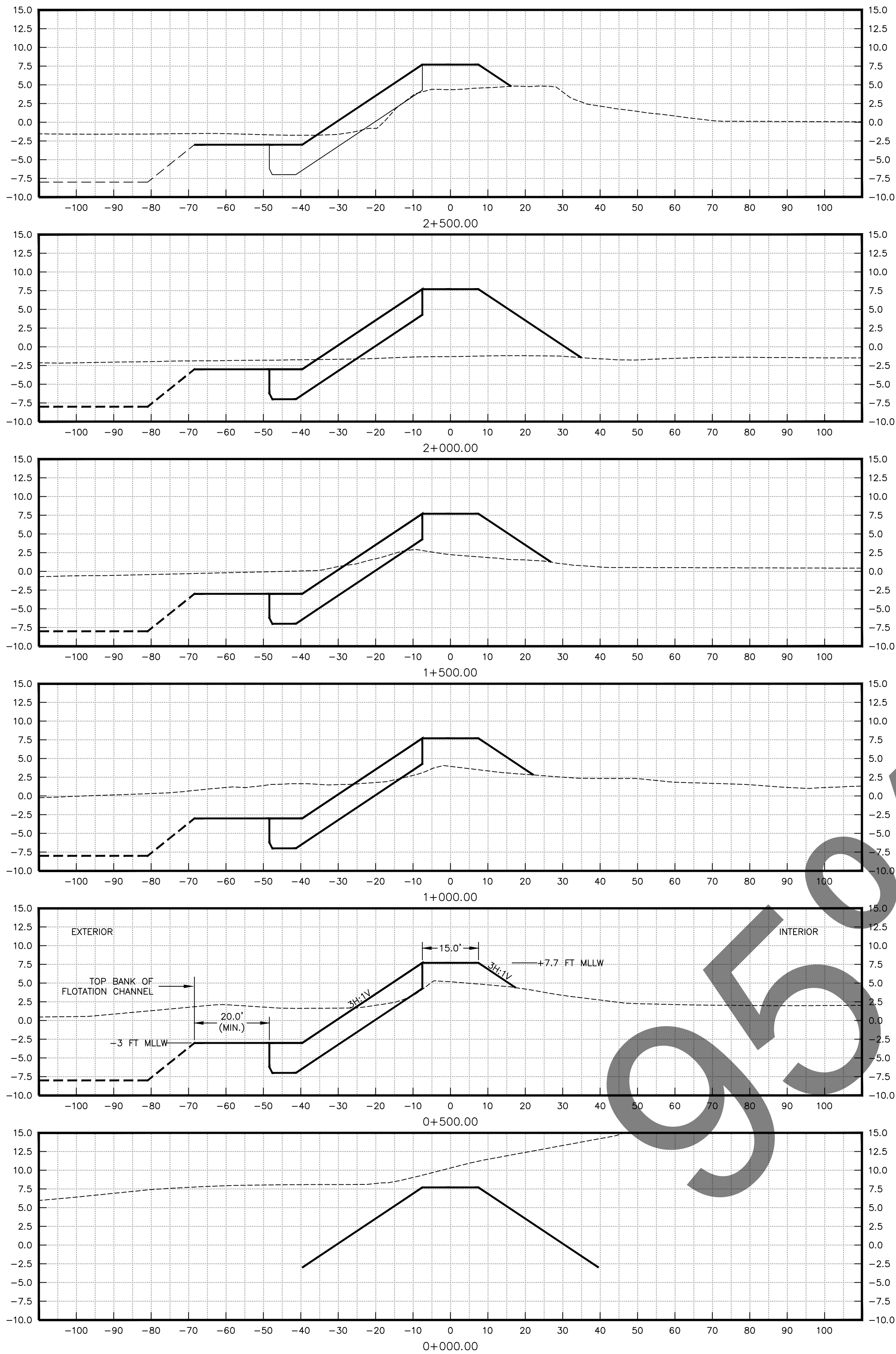
PLACEMENT AREA -
NEW M11 - CROSS
SECTION - 1

[illegible]

DESIGNER:	DC
CADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

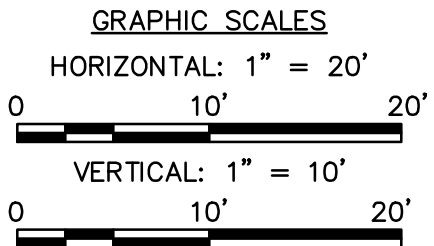
DRAWING NO.	
C90-D13-P11-006-CE303	
SHEET NO.	REV. NO.
21	0

95% SUBMITTAL



NOTES:

1. ALL ELEVATIONS ARE IN U.S. SURVEY FEET AND REFERENCED TO MLLW.
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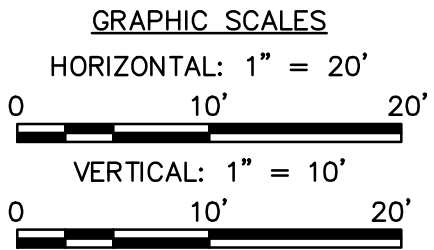
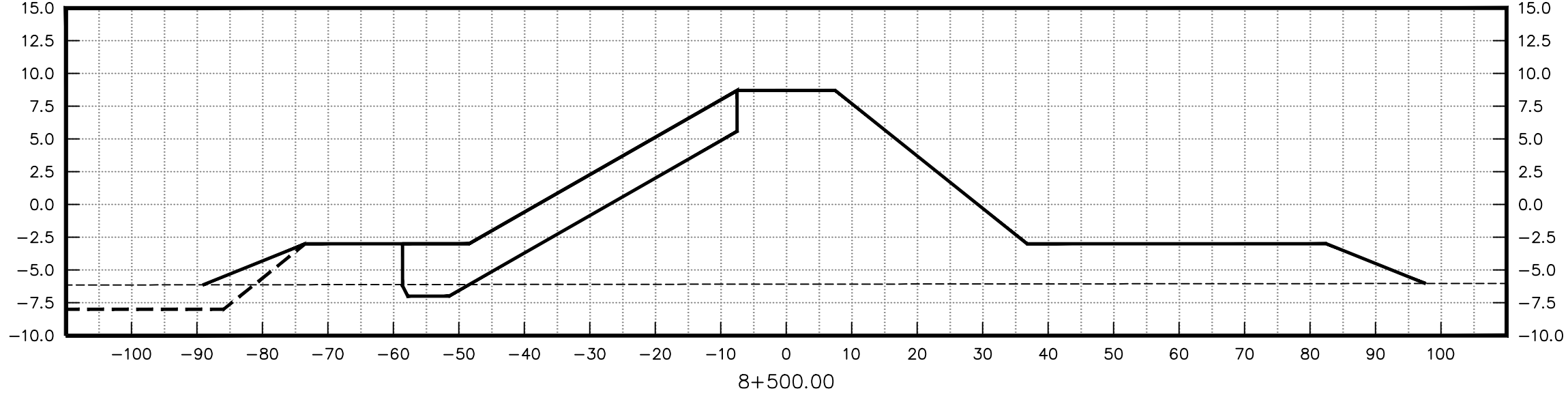
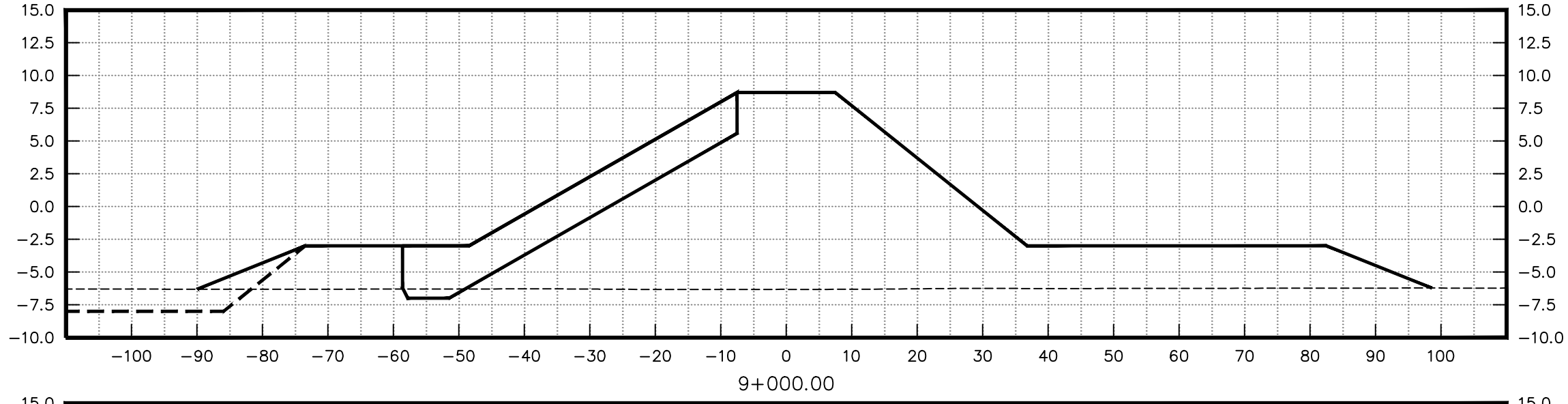
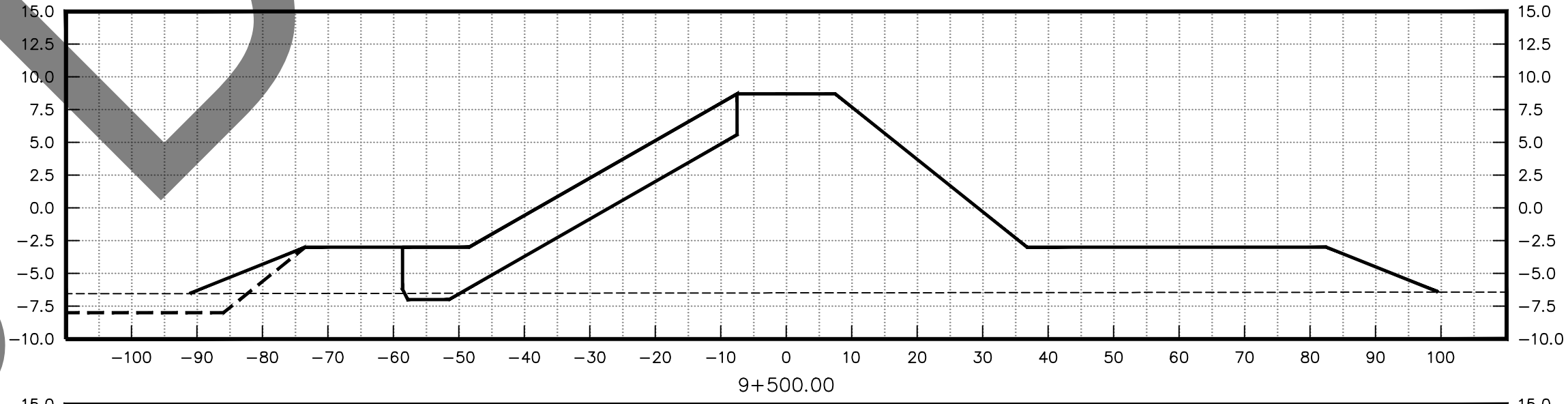
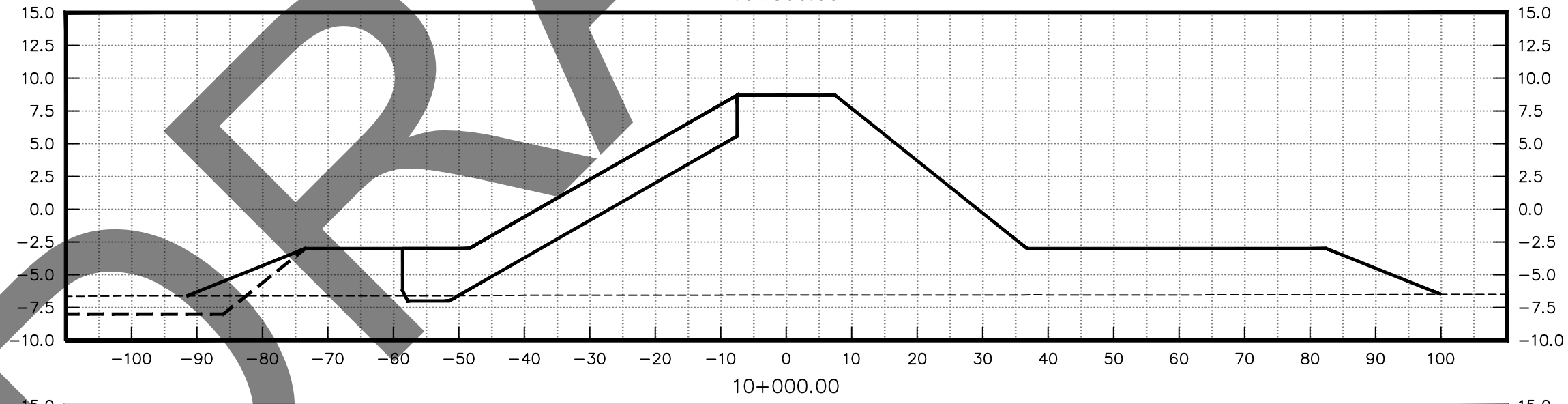
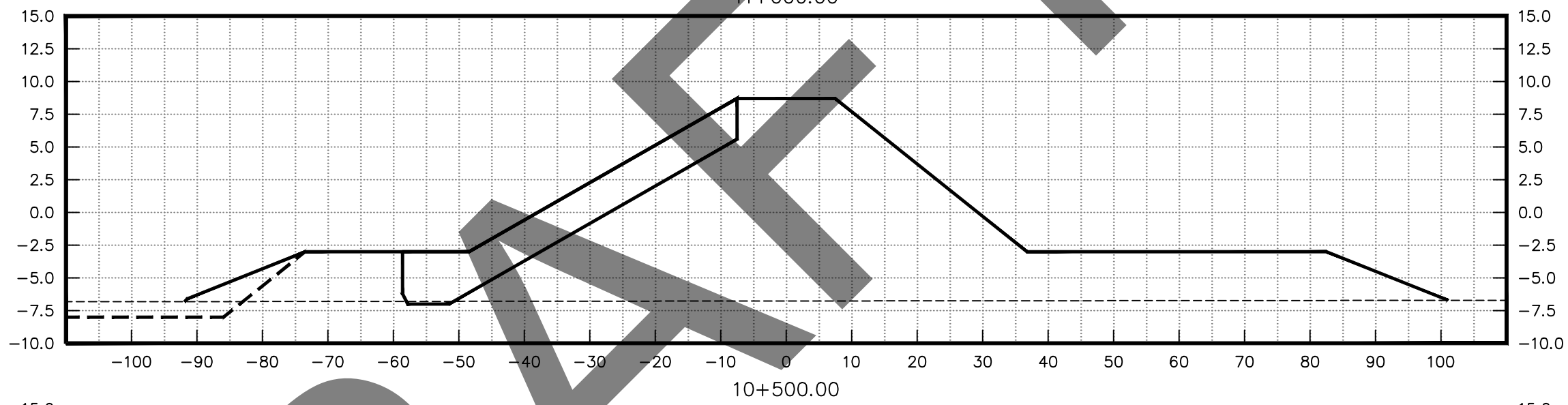
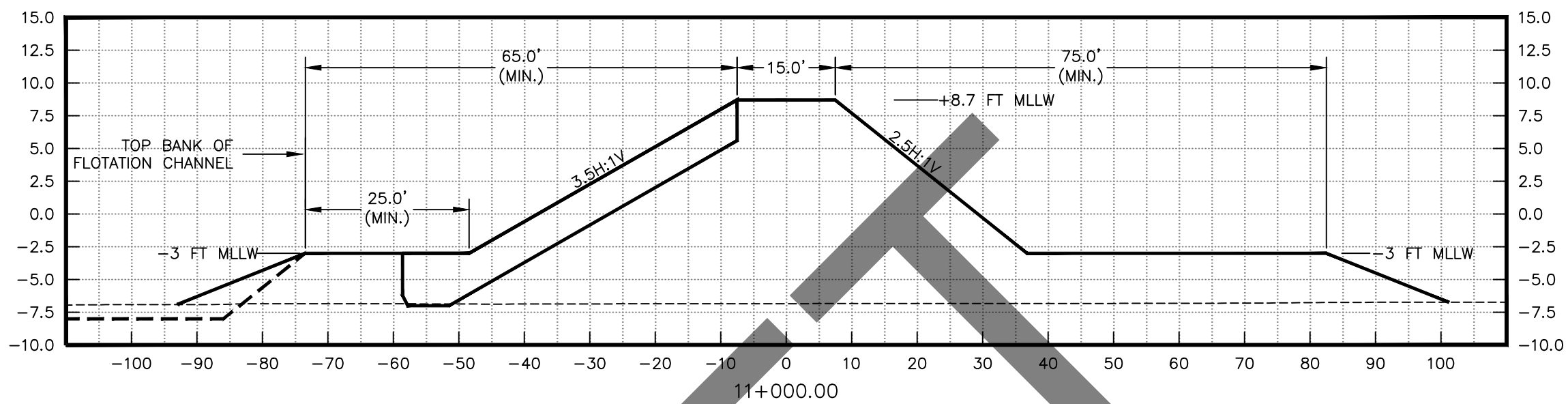
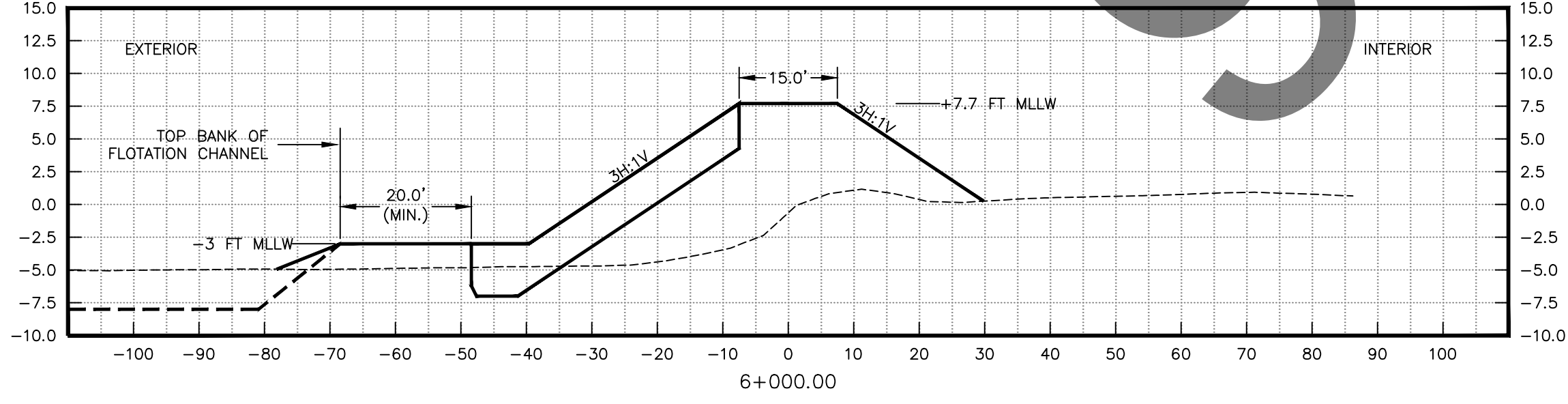
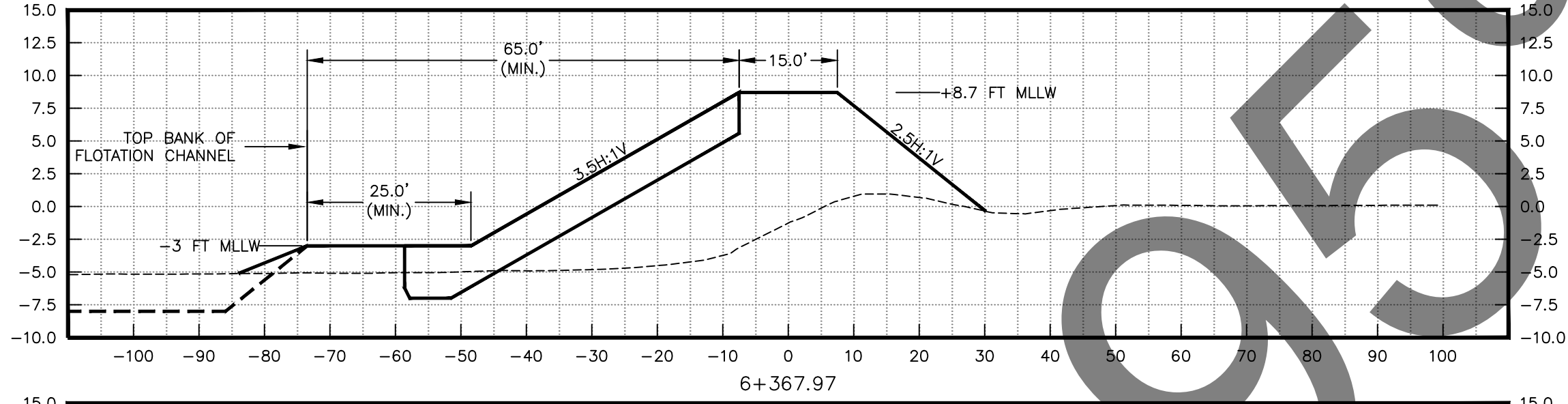
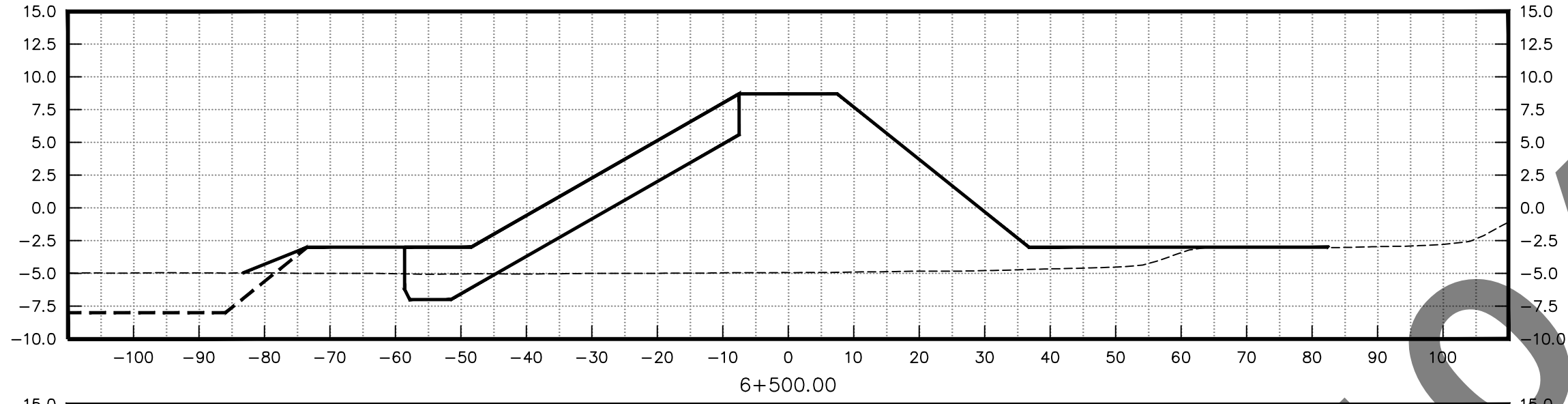
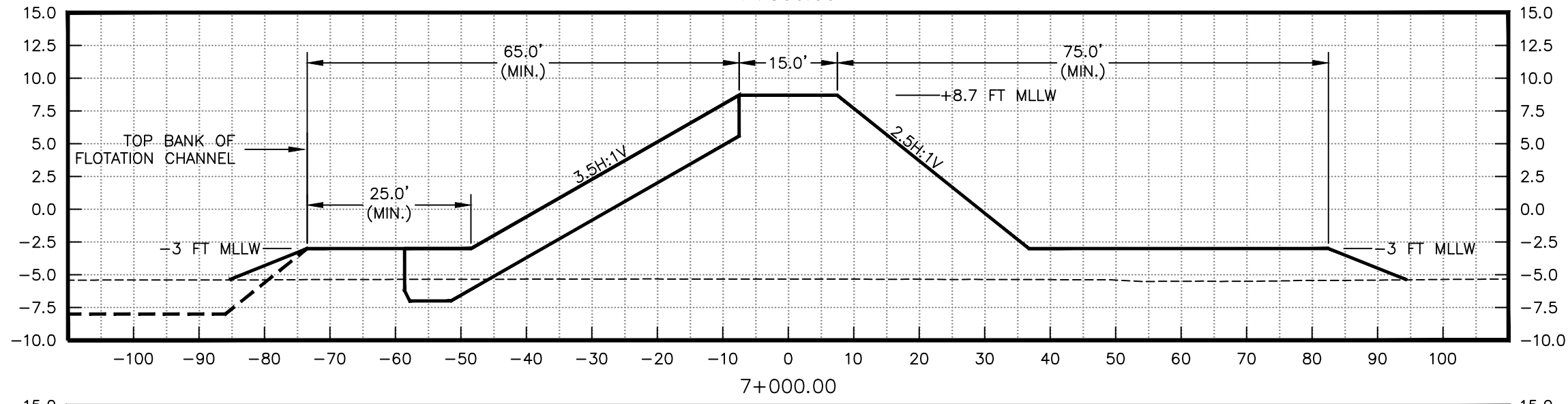
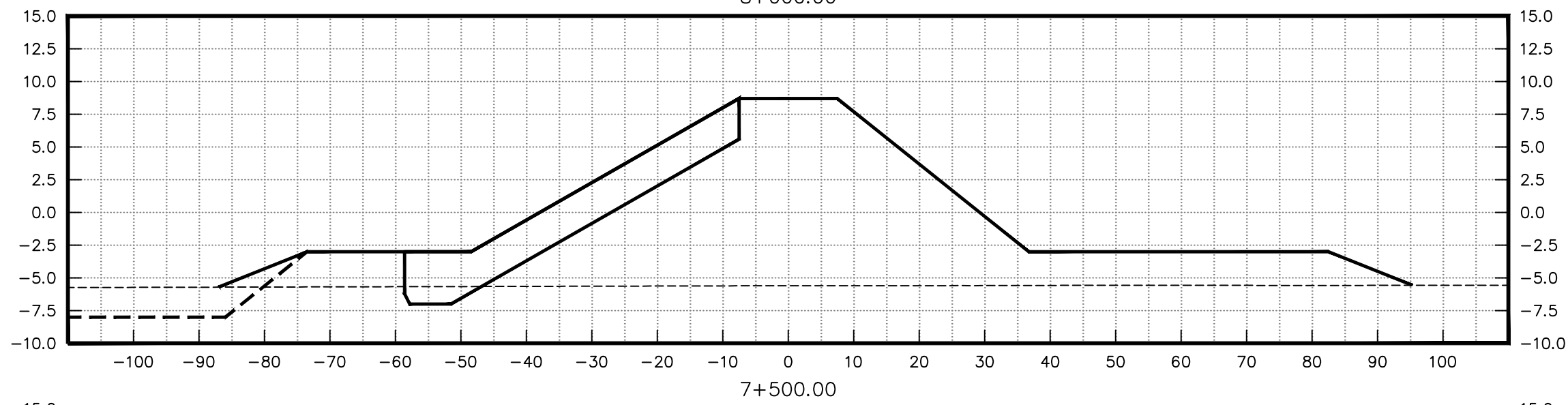
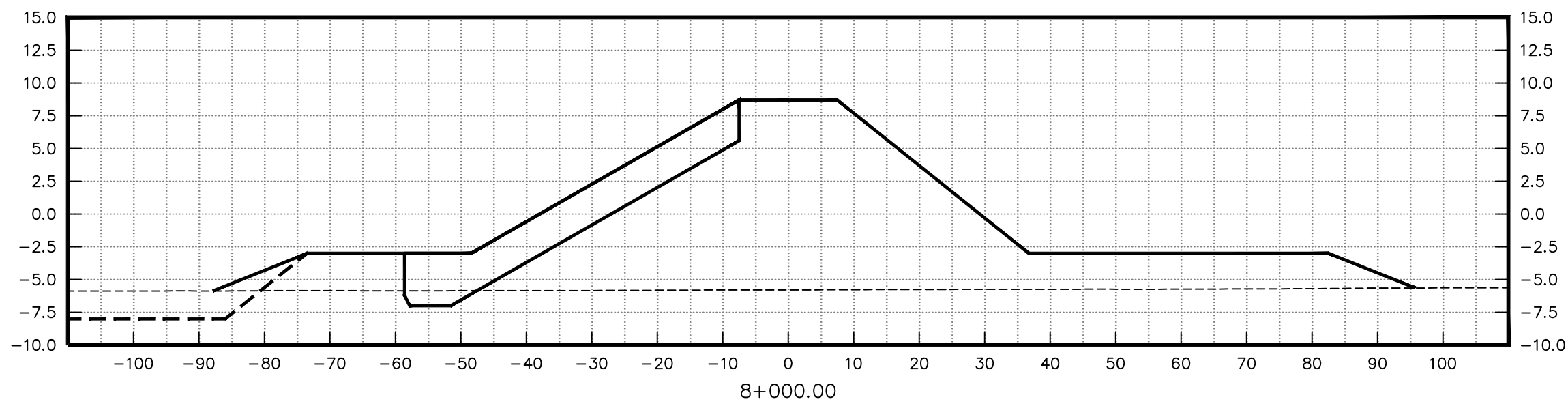


**CAHAGAN & BRYANT
ASSOCIATES, INC**
5444 WESTHEIMER ROAD, SUITE 400
HOUSTON, TEXAS 77056
TBP# NO. F-10788

CC-0 CODING FILE

NOTES:

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[illegible]



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TBP# 10. F-10788

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APPROVED: _____
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DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:
PROJECT 11:
BAYPORT TO
MORGANS POINT
HSC STATION 15+500
TO -0+003.94

**PLACEMENT AREA -
NEW M11 - CROSS
SECTION - 3**

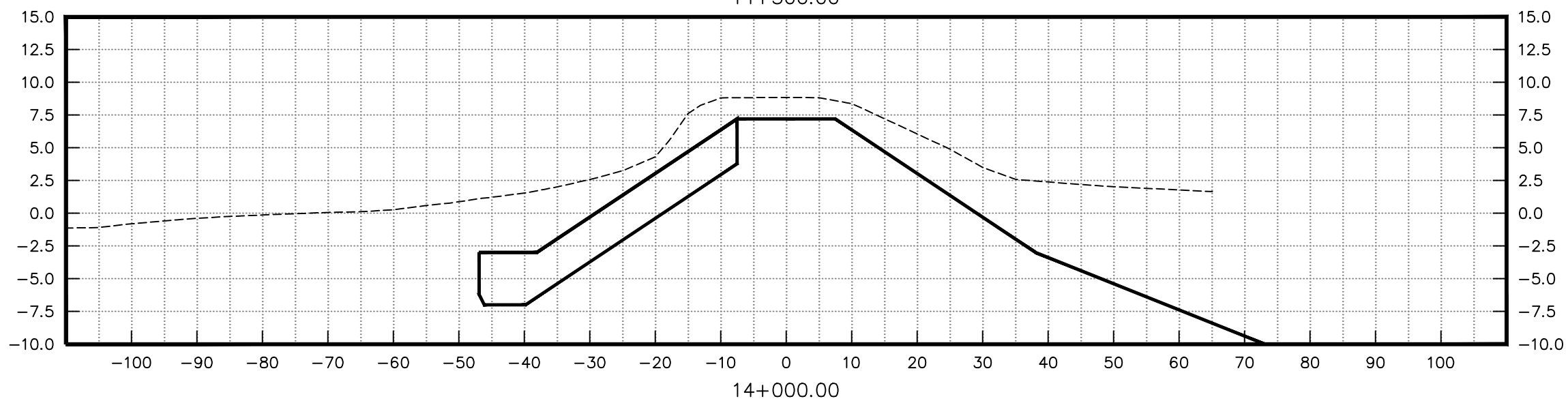
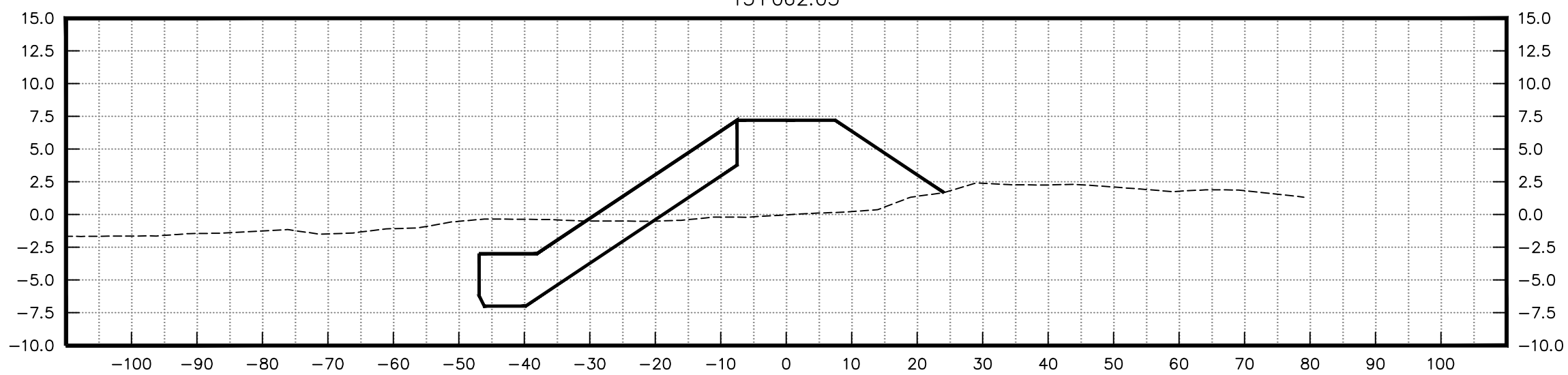
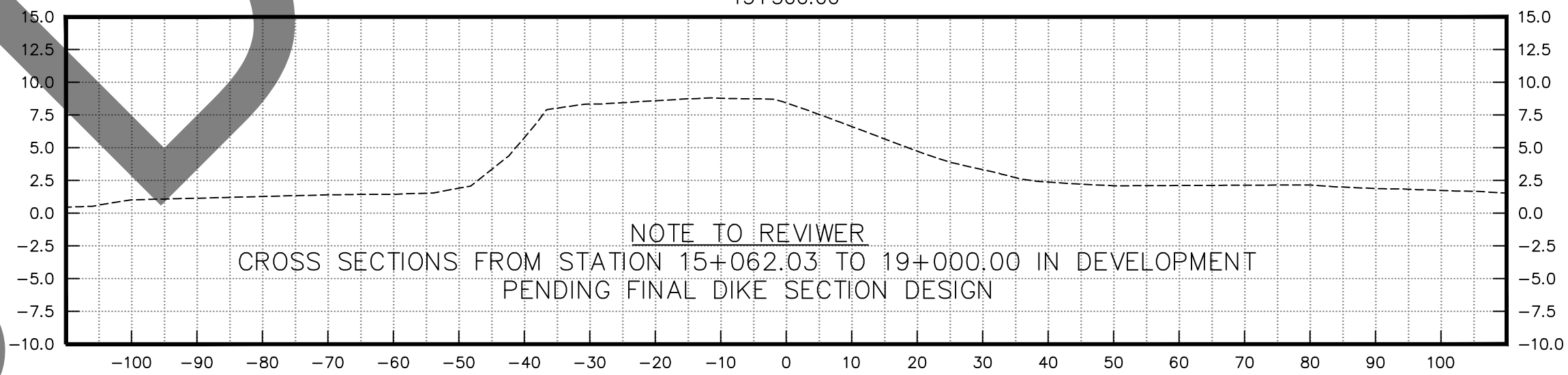
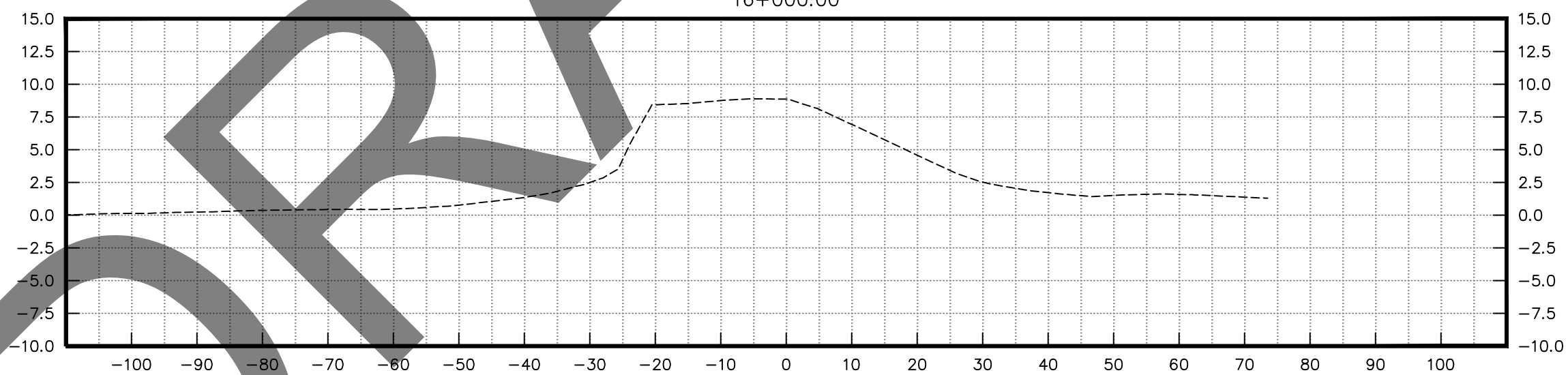
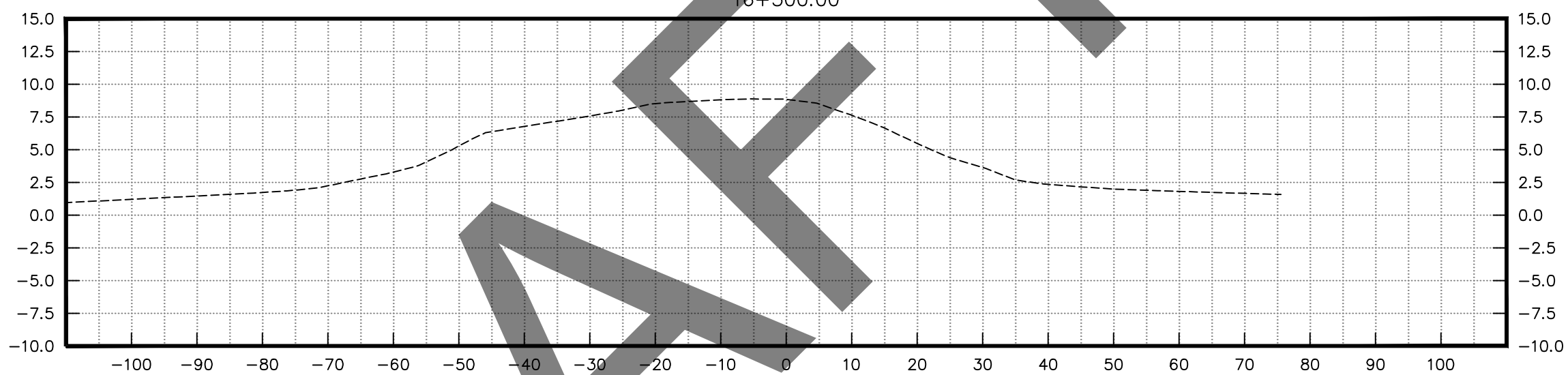
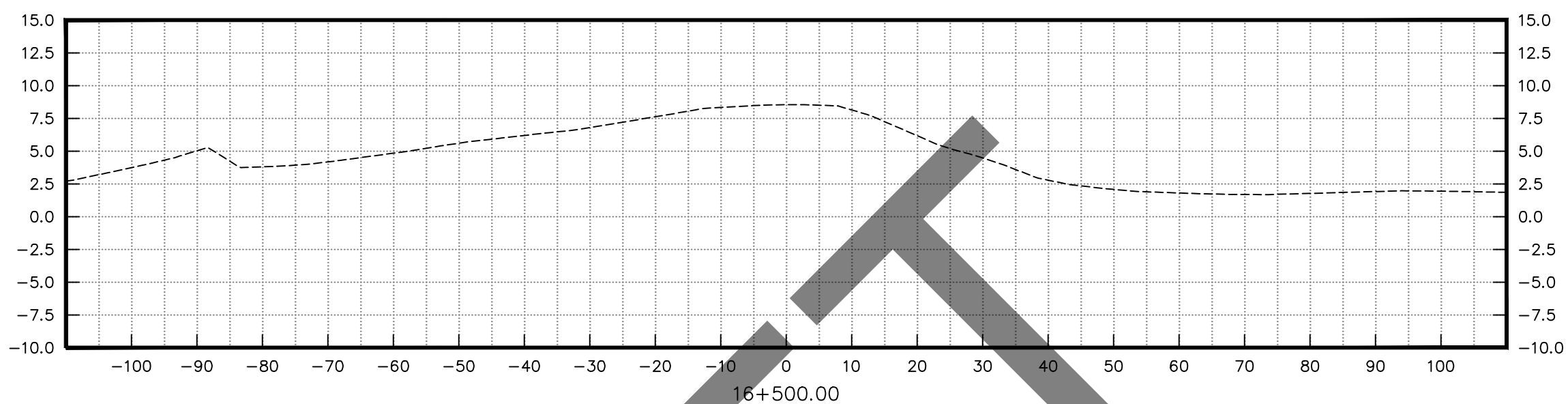
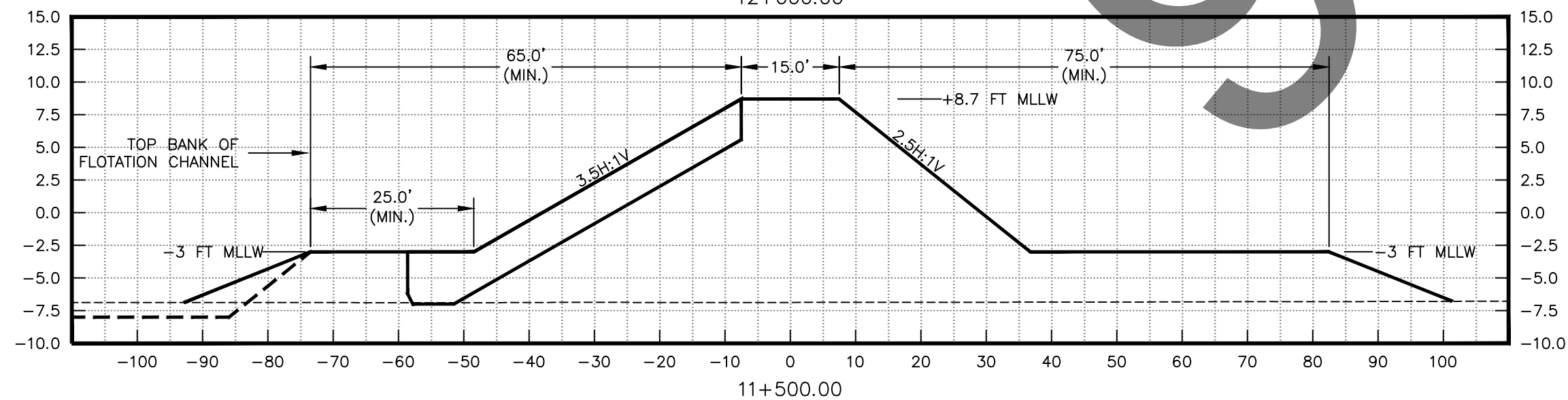
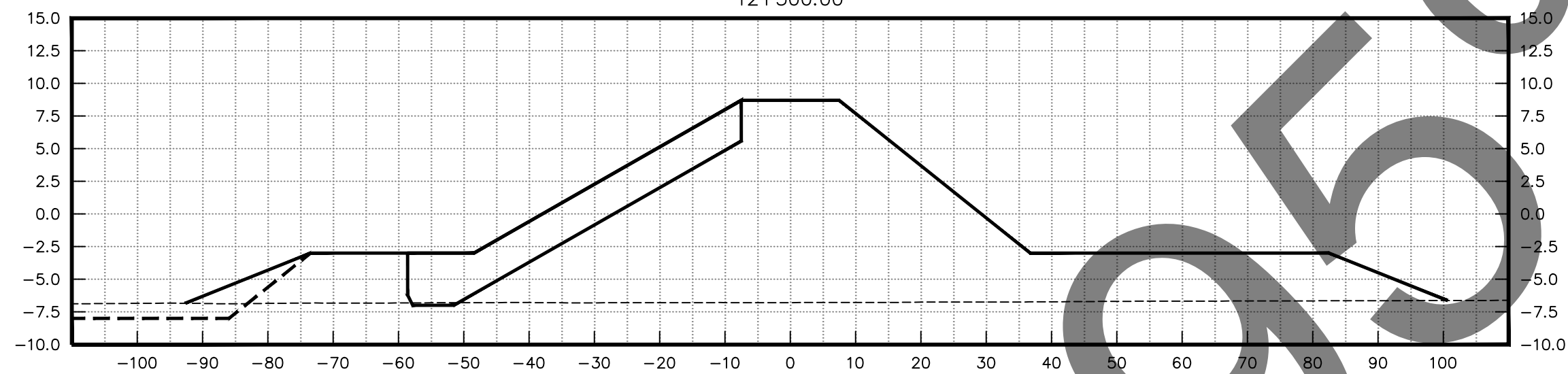
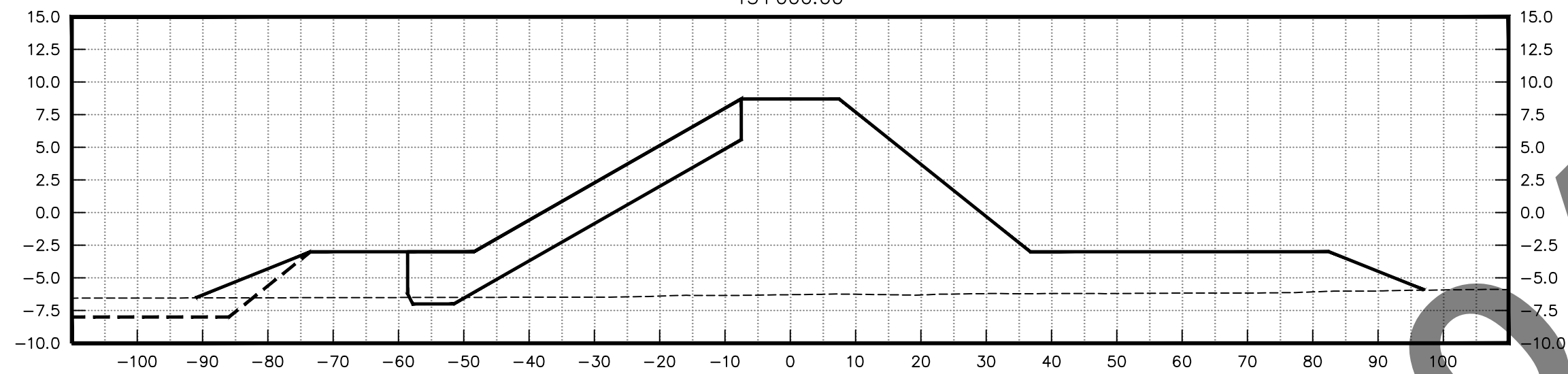
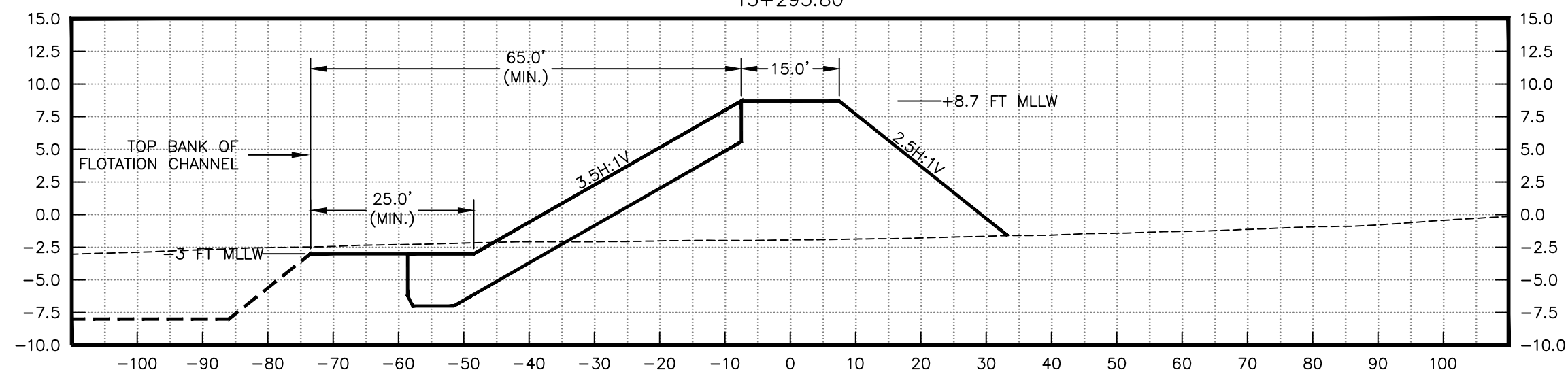
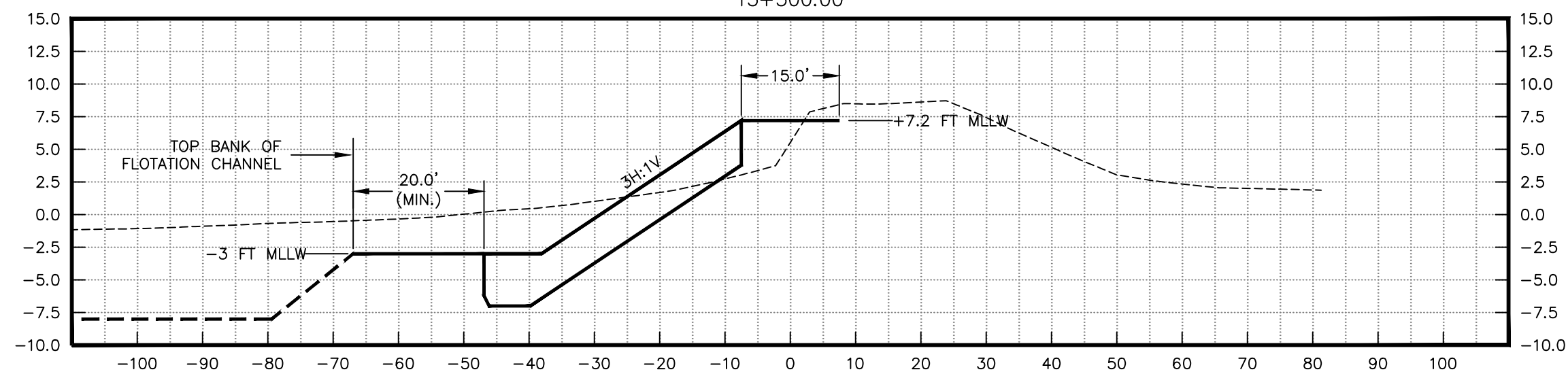
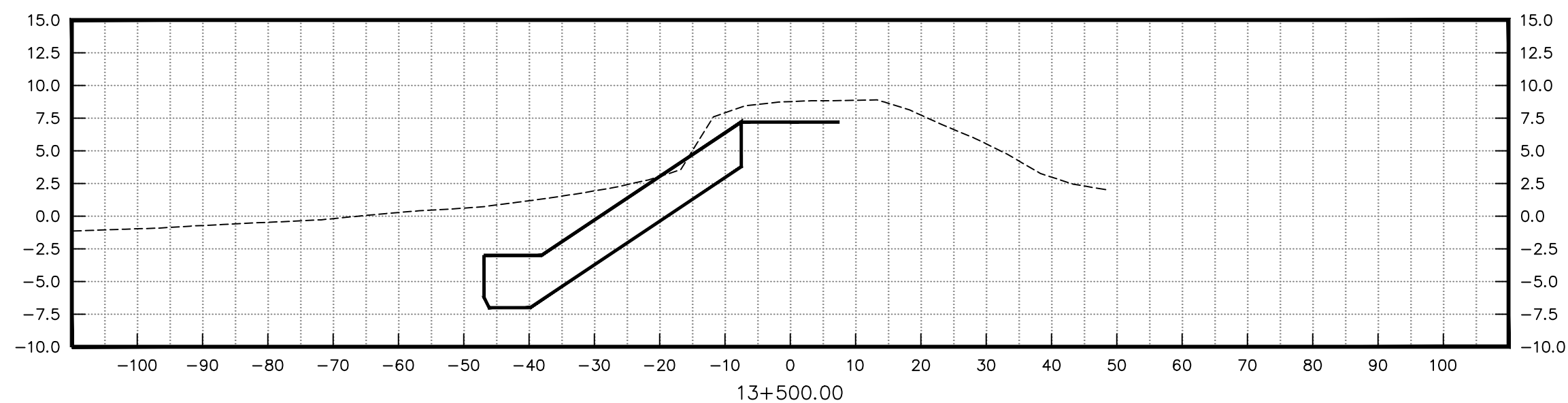
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DESIGNER:	DC
ADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

DRAWING NO.

SHEET NO.	REV. NO.
23	0

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GRAPHIC SCALES

HORIZONTAL: 1" = 20'



0 10' 20'

VERTICAL: 1" = 10'



0 10' 20'



**PORT OF HOUSTON
AUTHORITY**

CONSULTANT:
Turner Collie & Braden Inc.
CAHAGAN & BRYANT
ASSOCIATES, INC
5444 WESTHEIMER ROAD, SUITE 400
HOUSTON, TEXAS 77056
TBPE NO. F-10788

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ENGINEER: Ashley P. Judith
P.E NO: 112988
DATE: 09-30-2021

ENGINEER: Chester W. Hedderman
P.E. NO: 100209
DATE: 09-30-2021

APPROVED: _____
DATE

PORT CONTRACT REPRESENTATIVE
MANAGING DIRECTOR – ENGINEERING
DESIGN & SUPPORT

PROJECT TITLE:
**HOUSTON SHIP
CHANNEL (HSC)**

EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:
**PROJECT 11:
BAYPORT TO
MORGANS POINT:
HSC STATION 15+500
TO -0+003.94**

PLACEMENT AREA -
NEW M11 - CROSS
SECTION - 4

[illegible]

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ADD:	RK
CHECKER:	NK/SH
DATE:	DEC 2020
SCALE:	AS SHOWN

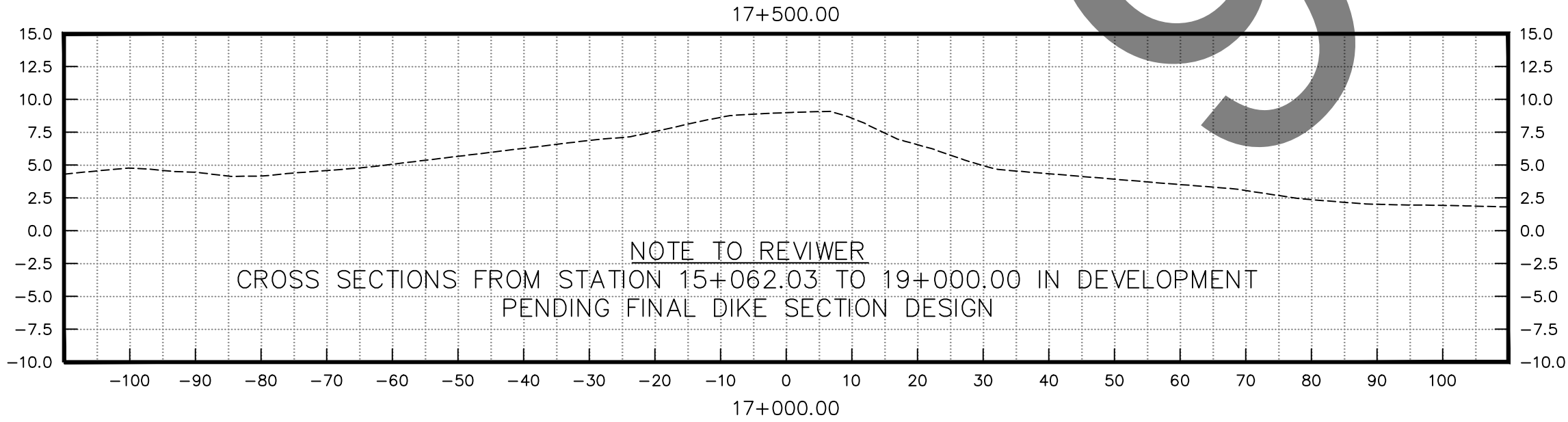
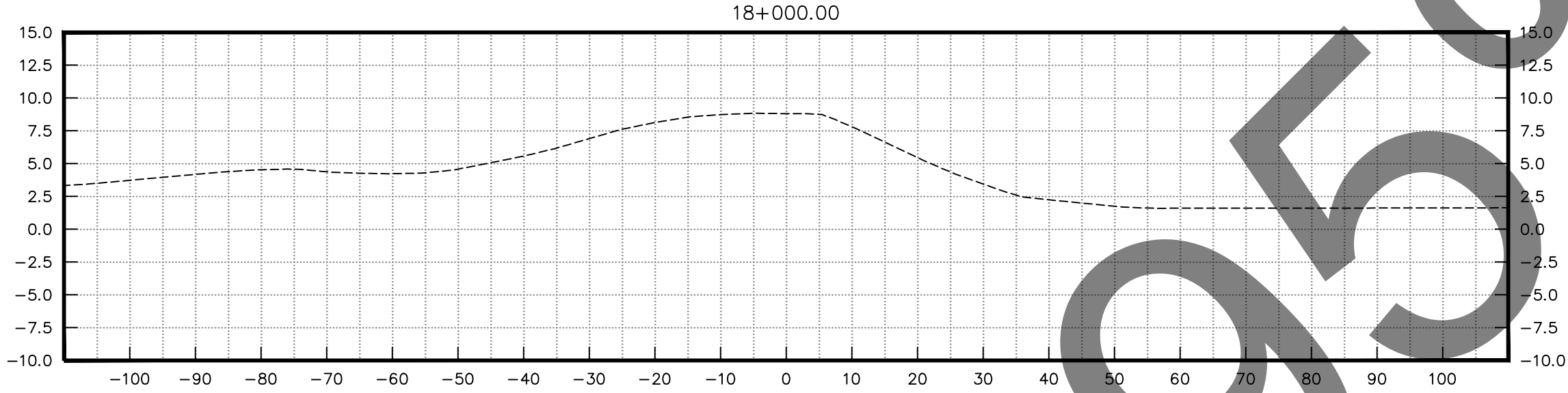
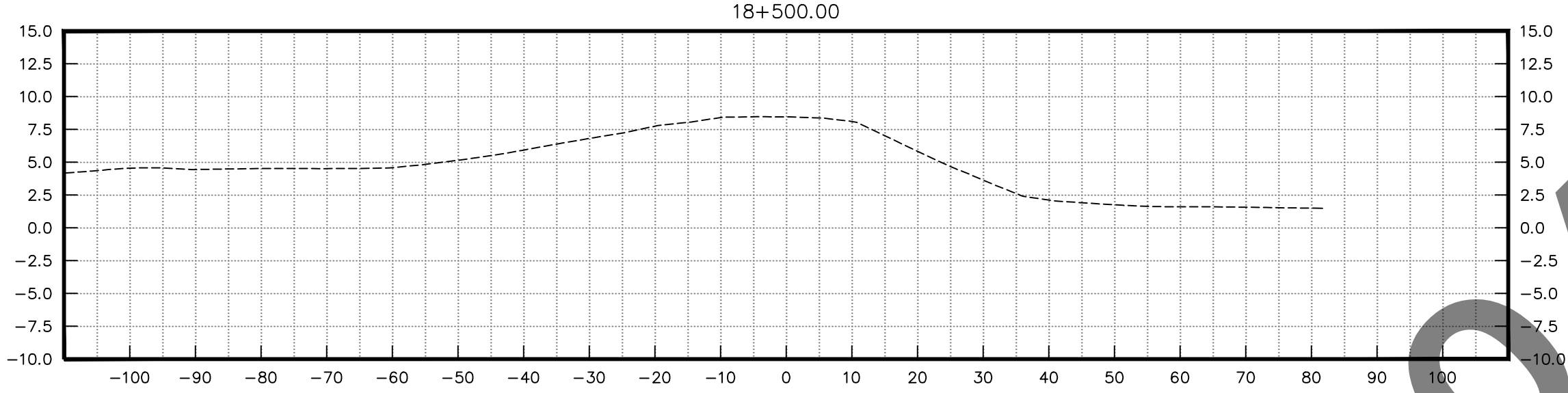
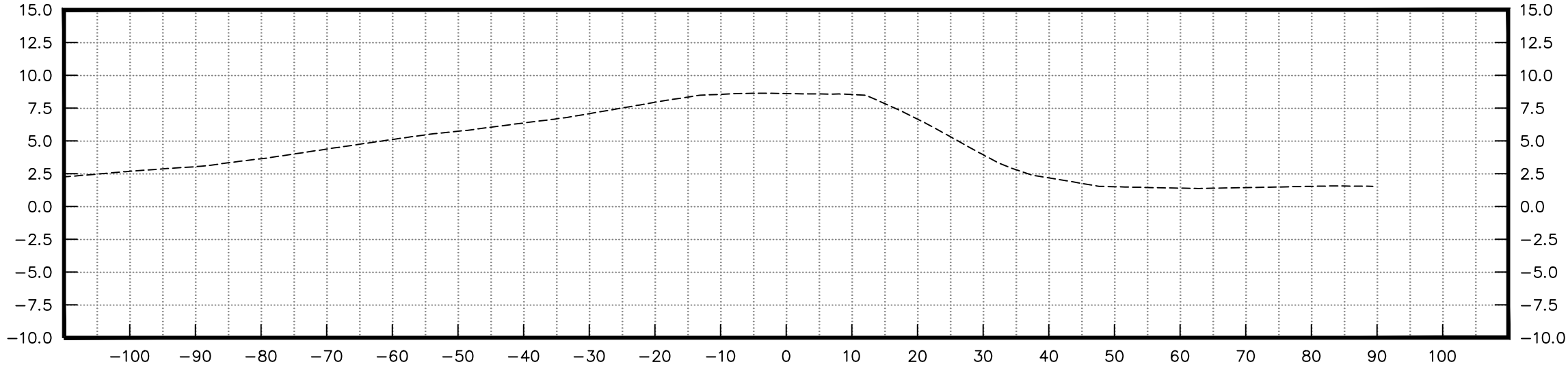
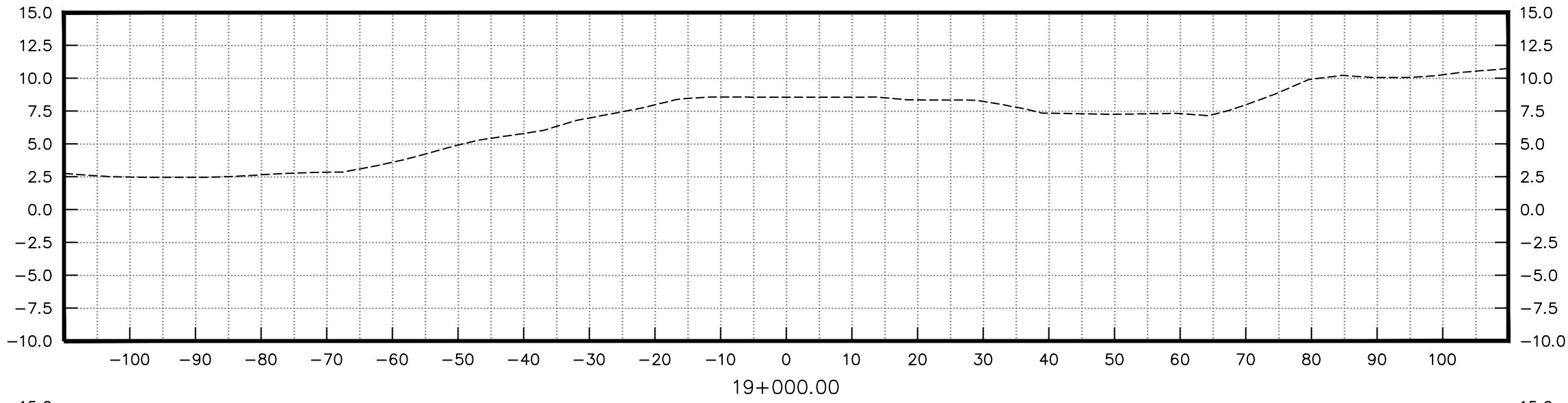
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SHEET NO.	REV. NO.
24	0

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NOTE TO REVIEWER
CROSS SECTIONS FROM STATION 15+062.03 TO 19+000.00 IN DEVELOPMENT
PENDING FINAL DIKE SECTION DESIGN



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SHEET TITLE:
**PROJECT 11:
BAYPORT (BEACON
76) TO MORGANS
POINT: HSC STA
20+000 TO HSC STA
-0+003.94**

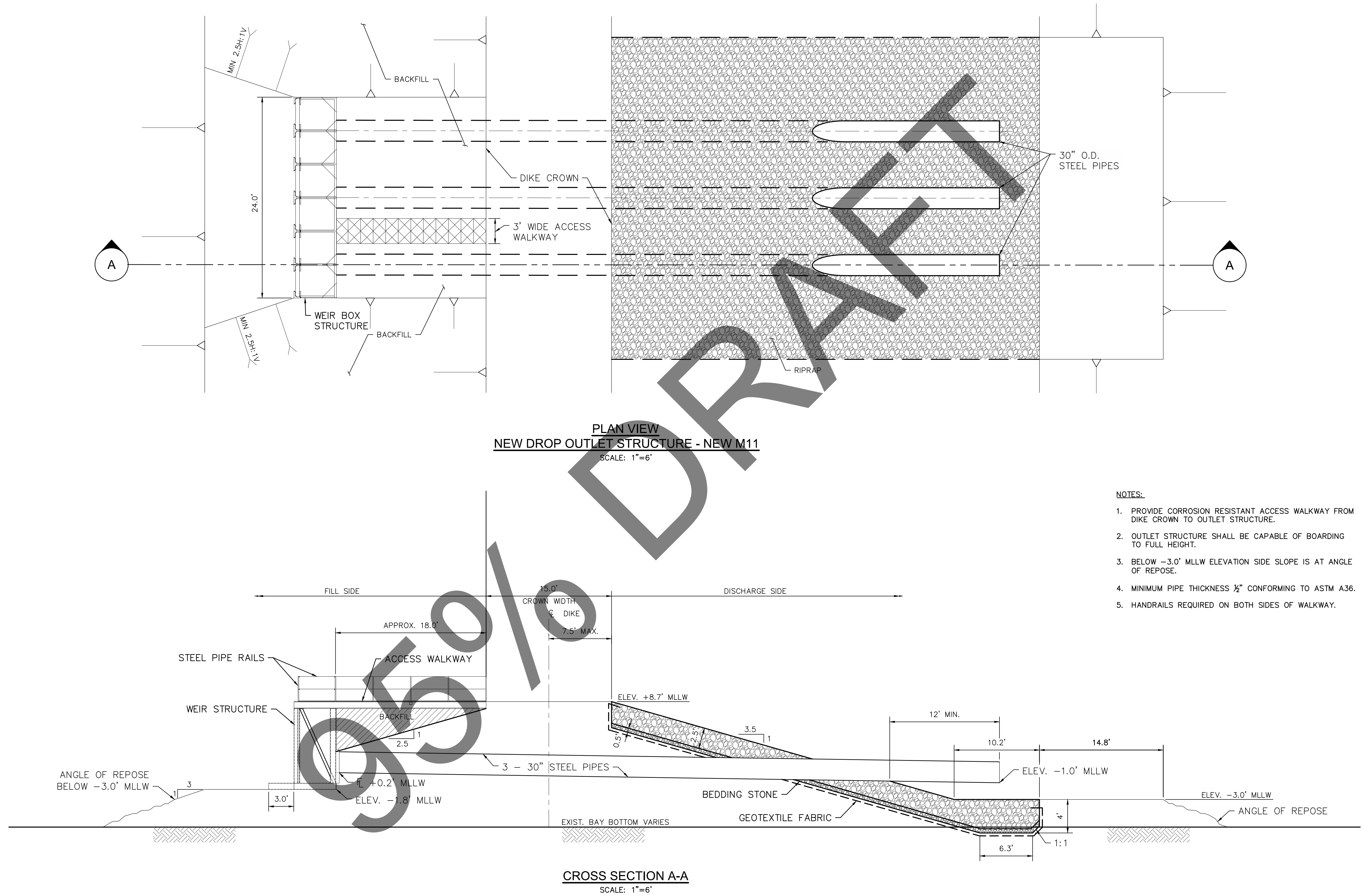
**NEW DROP OUTLET
STRUCTURE - NEW
M11**

[illegible]

DESIGNER:	MM
CADD:	BSC
CHECKER:	MM / PT
DATE:	DEC. 2020
SCALE:	1" = 6'

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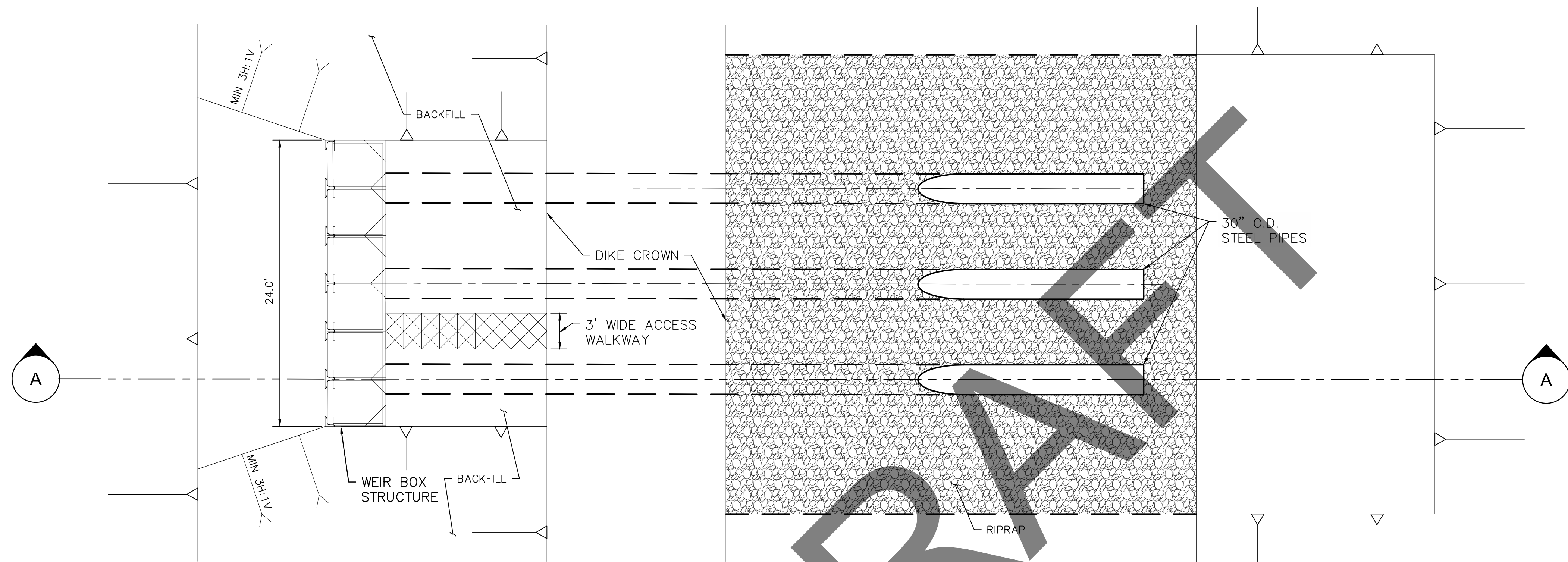
NEW DROP OUTLET STRUCTURE - M10

[illegible]

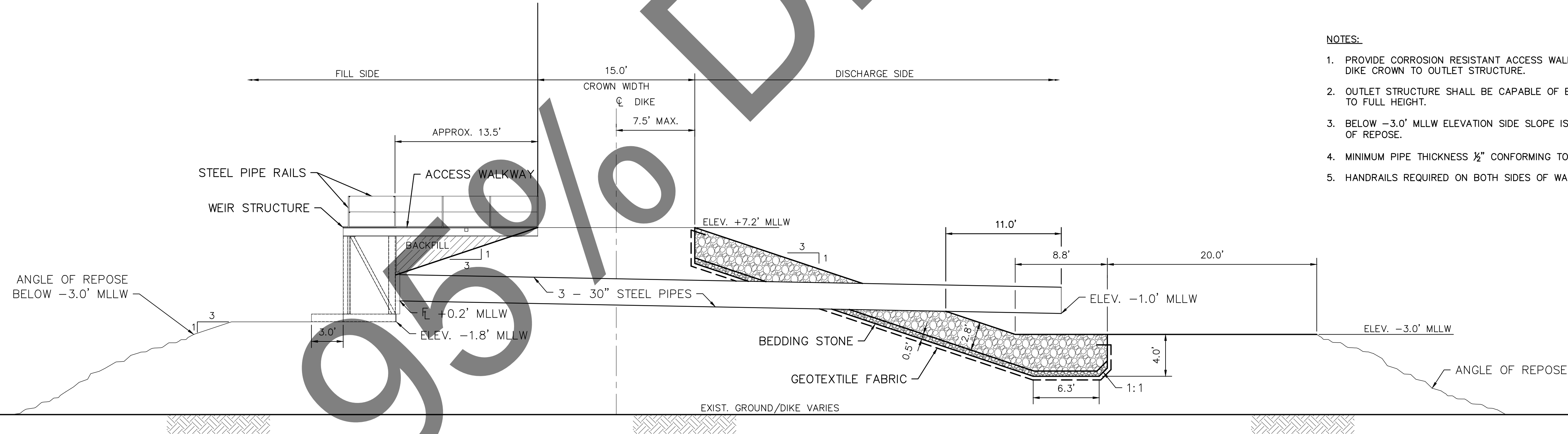
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CADD:	BSC
CHECKER:	MM / PT
DATE:	DEC. 2020
SCALE:	1" = 6'

DRAWING NO.	
C90-D13-P11-006-S-102	
SHEET NO.	REV. NO.
26	0

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PLAN VIEW
NEW DROP OUTLET STRUCTURE - M10
SCALE: 1"=6'



CROSS SECTION A-A
SCALE: 1"=6'

- NOTES:
1. PROVIDE CORROSION RESISTANT ACCESS WALKWAY FROM DIKE CROWN TO OUTLET STRUCTURE.
 2. OUTLET STRUCTURE SHALL BE CAPABLE OF BOARDING TO FULL HEIGHT.
 3. BELOW $-3.0'$ MLLW ELEVATION SIDE SLOPE IS AT ANGLE OF REPOSE.
 4. MINIMUM PIPE THICKNESS $\frac{1}{2}"$ CONFORMING TO ASTM A36.
 5. HANDRAILS REQUIRED ON BOTH SIDES OF WALKWAY.

TIME: 12-09-20 - 10:55am User: beverly.carriere DWG: D:\60618786 - Project 11 Design\900 CADD\20-Sheets\C90-D13-P11-006-S-102.dwg



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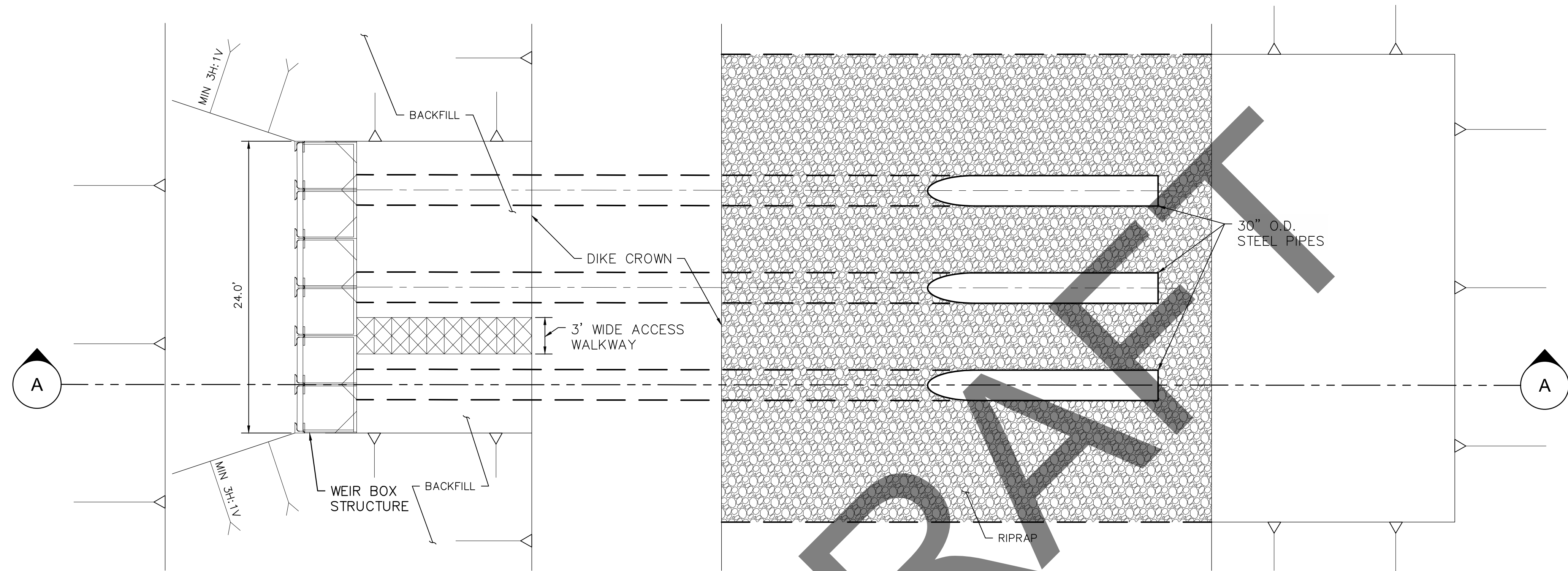
NEW DROP OUTLET STRUCTURE - M7/8/9

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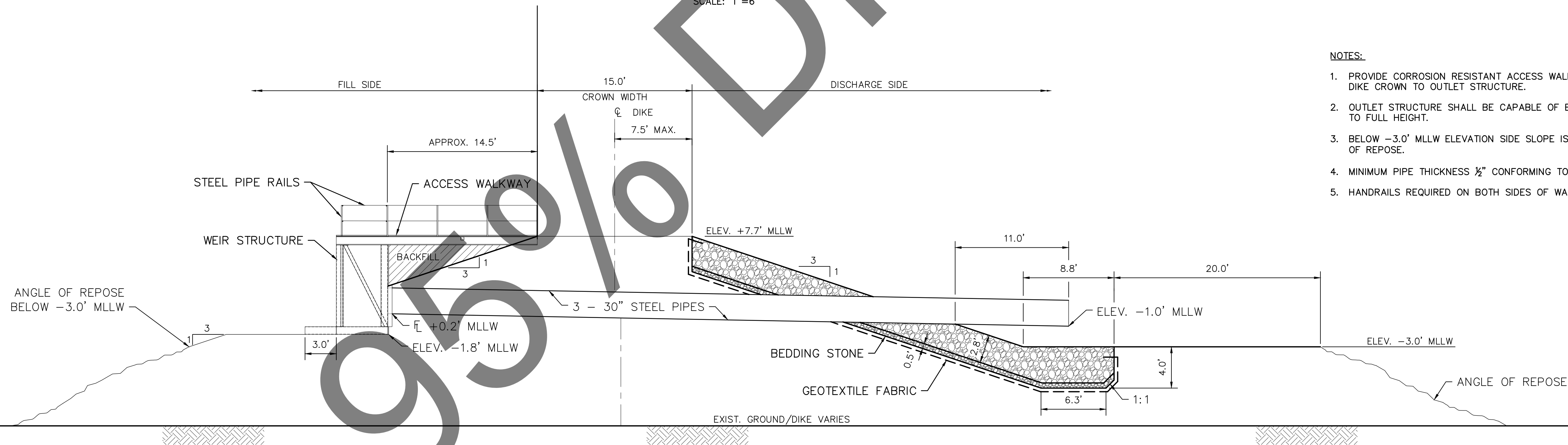
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CHECKER:	MM / PT
DATE:	DEC. 2020
SCALE:	1" = 6'

DRAWING NO.	
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SHEET NO.	REV. NO.
27	0

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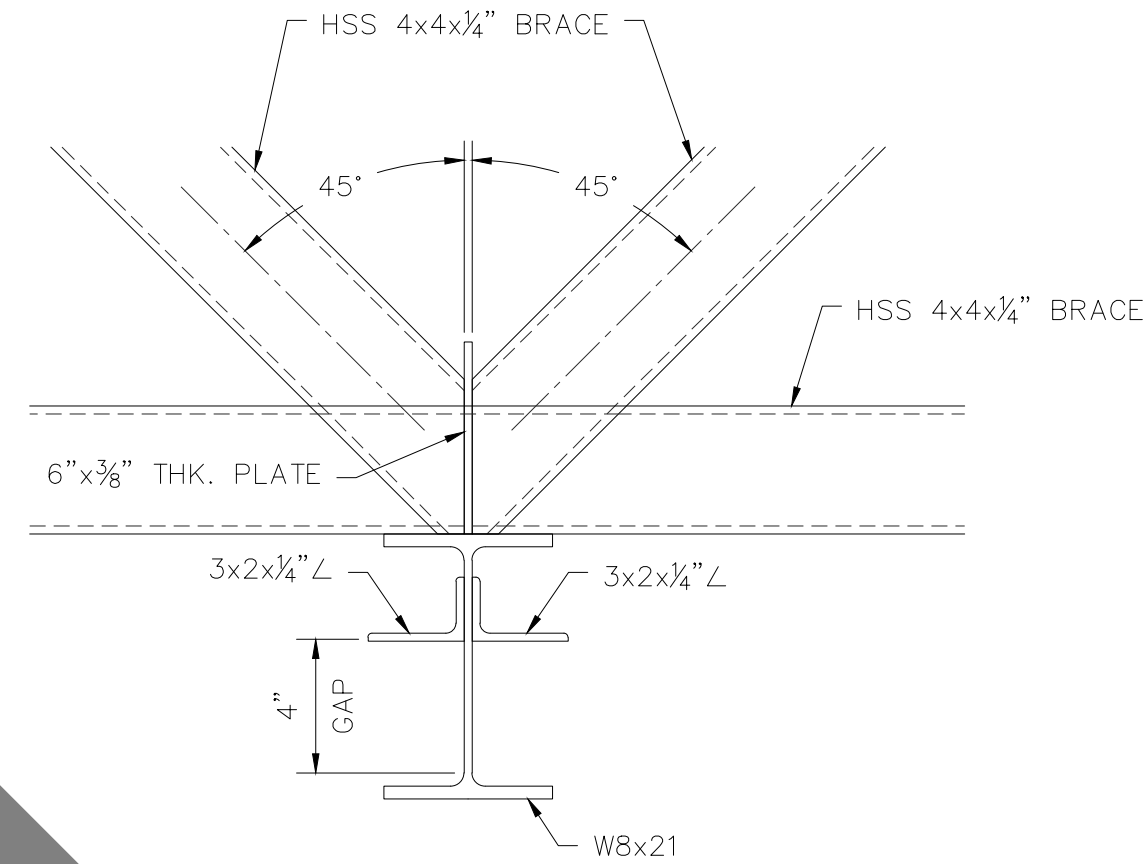
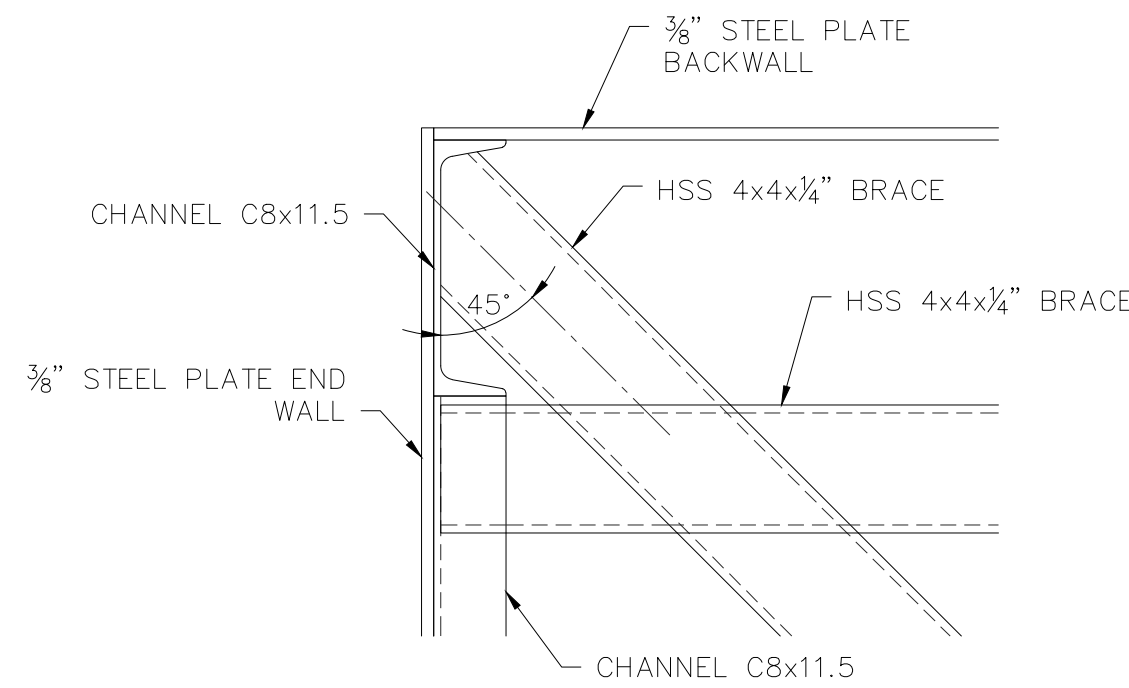
PLAN VIEW
NEW DROP OUTLET STRUCTURE - M7/8/9
SCALE: 1"=6'



CROSS SECTION A-A
SCALE: 1"=6'

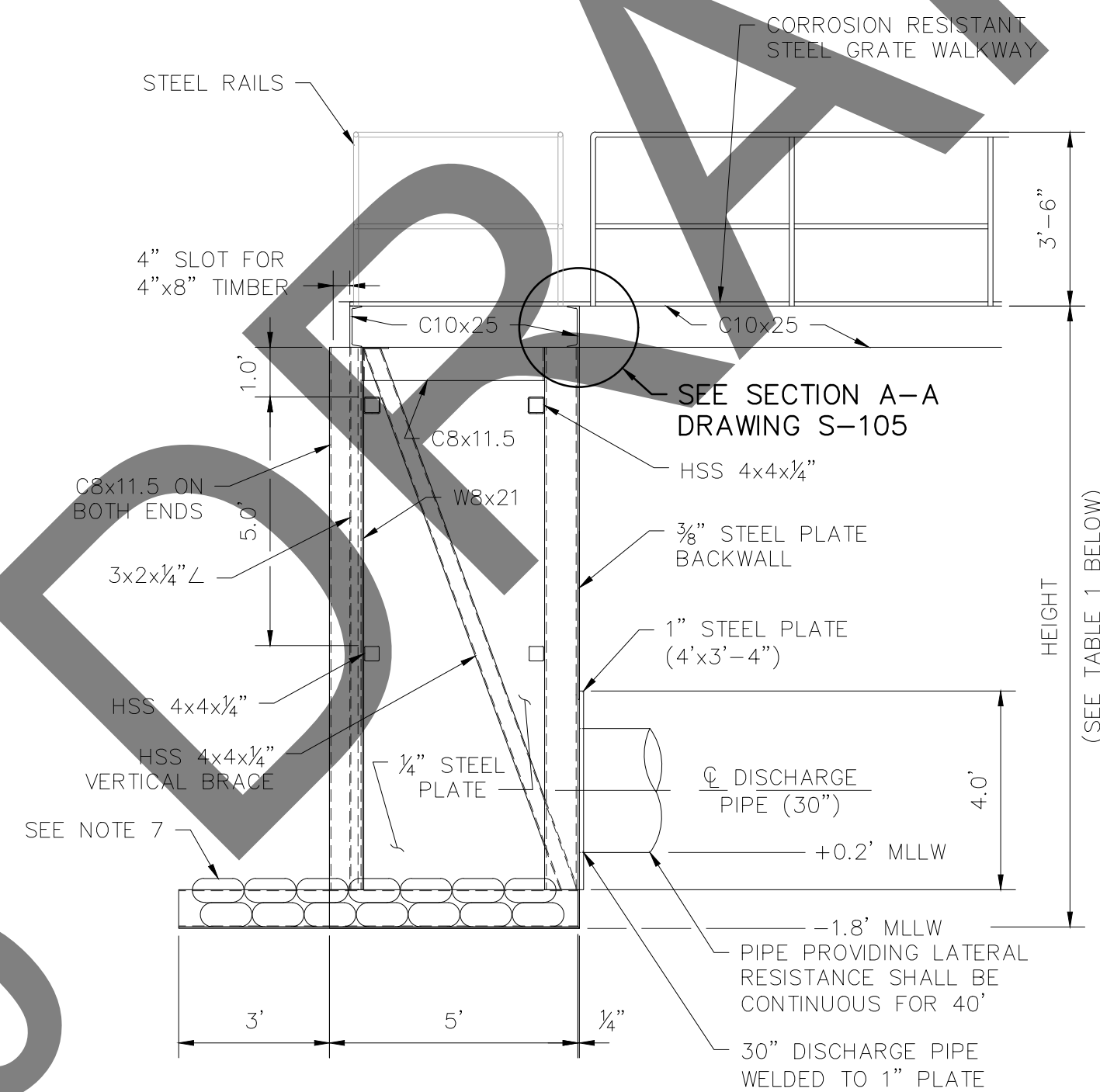
- NOTES:**
1. PROVIDE CORROSION RESISTANT ACCESS WALKWAY FROM DIKE CROWN TO OUTLET STRUCTURE.
 2. OUTLET STRUCTURE SHALL BE CAPABLE OF BOARDING TO FULL HEIGHT.
 3. BELOW $-3.0'$ MLLW ELEVATION SIDE SLOPE IS AT ANGLE OF REPOSE.
 4. MINIMUM PIPE THICKNESS $\frac{1}{2}"$ CONFORMING TO ASTM A36.
 5. HANDRAILS REQUIRED ON BOTH SIDES OF WALKWAY.

TIME: 12-09-20 - 10:55am User: beverly.carriere DWG: D:\60618786 - Project 11 Design\900 CADD\20-Sheets\C90-D13-P11-006-S-103.dwg



DETAIL A
SCALE: N.T.S.

DETAIL B
SCALE: N.T.S.



SIDE VIEW
TYPICAL WEIR/PIPE UNIT

SCALE: N.T.S.

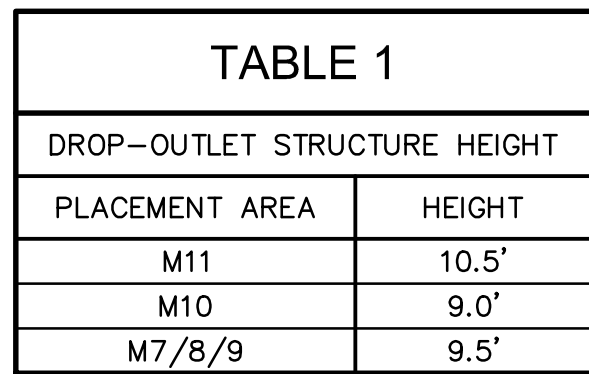


TABLE 1

DROP-OUTLET STRUCTURE HEIGHT	
PLACEMENT AREA	HEIGHT
M11	10.5'
M10	9.0'
M7/8/9	9.5'

1. DURING CONSTRUCTION, CONTRACTOR SHALL BALLAST/ANCHOR THE STRUCTURE TO MAINTAIN ELEVATION.
2. OUTLET STRUCTURES AND WALKWAYS SHALL BE MAINTAINED IN A SAFE AND USABLE CONDITION.
3. FOR COMPACTION REQ. AROUND OUTLET STRUCTURES, REFER TO SPECIFICATIONS.
4. ALL WELDING SHALL BE FULL PENETRATION BUTT WELD IN CONFORMANCE WITH AMERICAN SOCIETY STRUCTURAL WELDING CODE.
5. GRATE TO BE GALVANIZED WELDED STEEL GRATING AND CONSIST OF 1 1/4"x3/8" RECTANGULAR BEARING BARS SPACED AT 13/16" CENTERS AND CROSS BARS WELDED AT 4" CENTERS. END BANDING BARS OF 1 1/2"x3/8" ARE TO BE WELDED TO THE ENDS OF EVERY BEARING BAR. THE TOP SURFACE OF THE BEARING BARS ARE TO BE SERRATED FOR SLIP RESISTANCE. THE GRATING IS TO BE WELDED TO THE SUPPORTING MEMBERS AS SHOWN ON THE PLANS. THE GRATING MATERIAL IS TO MEET THE REQUIREMENTS OF ASTM A1011/A1011M AND ASTM 510.
6. CONTRACTOR TO TEMPORARILY BRACE STRUCTURE AS NEEDED FOR TRANSPORT AND INSTALLATION.
7. PROVIDE CEMENT BAGS 1 FT. THICK CONTINUOUSLY ALONG BOTTOM OF STRUCTURE AS SHOWN.
8. MINIMUM PIPE THICKNESS 1/2" CONFORMING TO ASTM A36.
9. HANDRAILS ARE REQUIRED AT ENDS OF BOX STRUCTURE, IN ADDITION TO FRONT AND REAR.
10. FOR PAINTING AND COATING REQ., REFER TO SPECIFICATIONS.

1. LIVE LOAD = 50 PSF.
2. ALLOWABLE BEARING PRESSURE FOR WALKWAY = 650 PSF.
3. ALLOWABLE BEARING PRESSURE FOR WEIR STRUCTURE = 230 PSF.
4. EQUIVALENT FLUID PRESSURE OF DREDGE MATERIAL = 89 PSF/FT.
5. EQUIVALENT FLUID PRESSURE OF DIKE ABOVE WATER TABLE = 19 PSF/FT.
6. EQUIVALENT FLUID PRESSURE OF DIKE BELOW WATER TABLE = 81 PSF/FT.

The seal of the Port of Houston Authority (PHA) is a circular emblem. It features a central five-pointed star with the letters 'PHA' superimposed on it. The star and letters are rendered in a stylized, metallic-looking font. Surrounding this central element is a thick, dark circular border. Within this border, the words 'PORT OF HOUSTON AUTHORITY' are inscribed in a serif font along the top arc, and 'HOUSTON, TEXAS' is inscribed along the bottom arc. The entire seal is set against a white background.

**PORT OF HOUSTON
AUTHORITY**

CONSULTANT:

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P.E NO: 112988

DATE: 09-30-2021

ENGINEER, Chester W. Hedderman

RE NO: 100209

DATE: 09-30-2021

APPROVED: _____

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MANAGING DIRECTOR - ENGINEERING
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EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)

SHEET TITLE:
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BAYPORT (BEACON
76) TO MORGANS
POINT: HSC STA
20+000 TO HSC STA
-0+003.94

NEW DROP OUTLET STRUCTURE DETAILS - 1

[illegible]

DESIGNER:	MM
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CADD:	BSC
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CHECKER:	MM / PT
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DATE:	DEC. 2020
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SCALE:	AS NOTED
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DRAWING NO.

C00 D10 D11 00C C 104

C90 D13-F 11-000-3-104

SHEET NO. REV. NO.

28	0
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[illegible]

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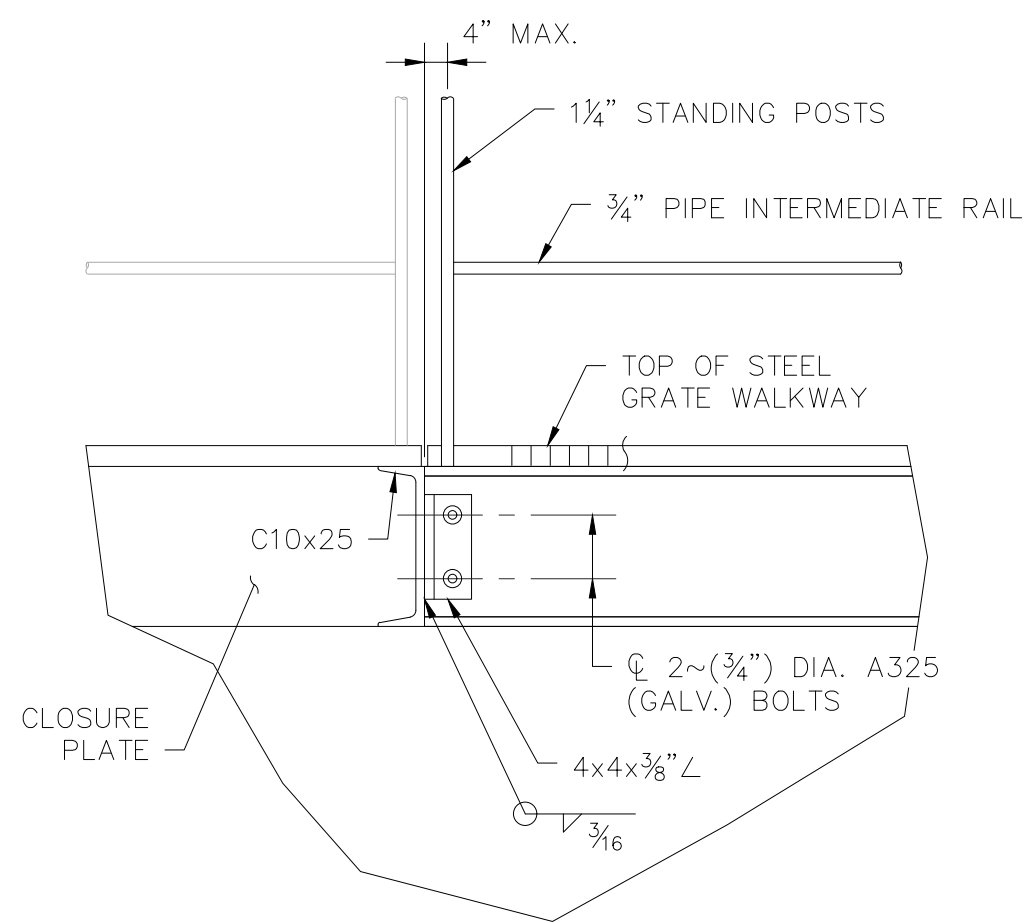
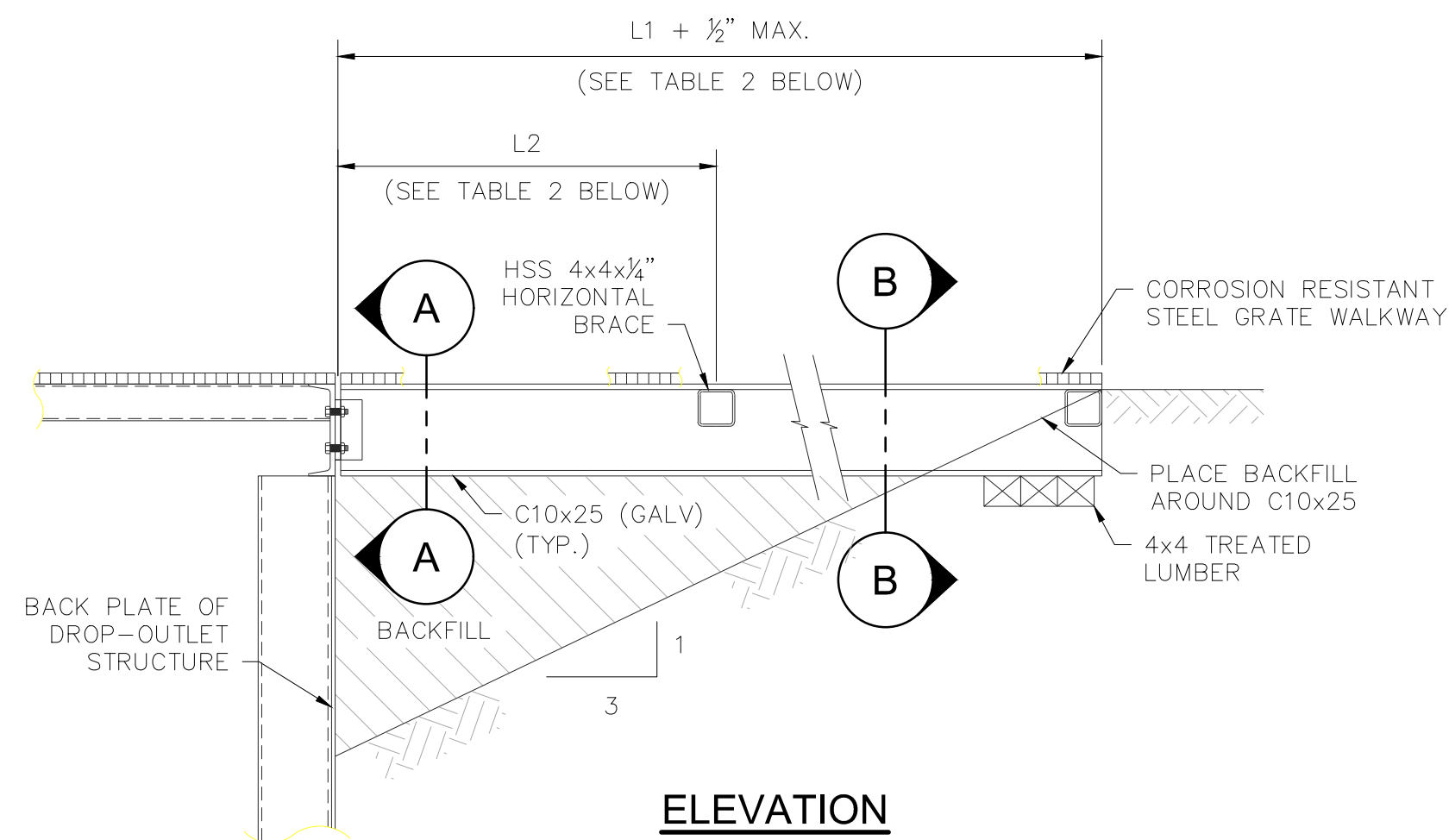
NEW DROP OUTLET STRUCTURE DETAILS - 2

[illegible]

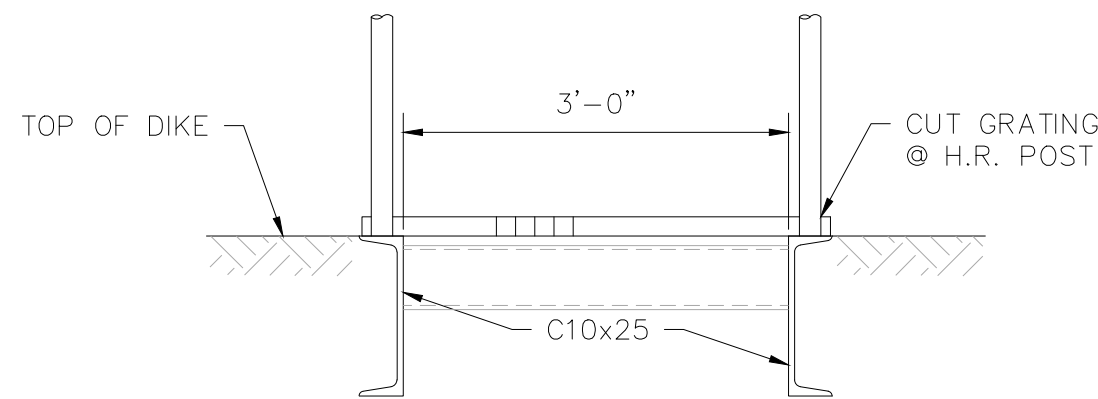
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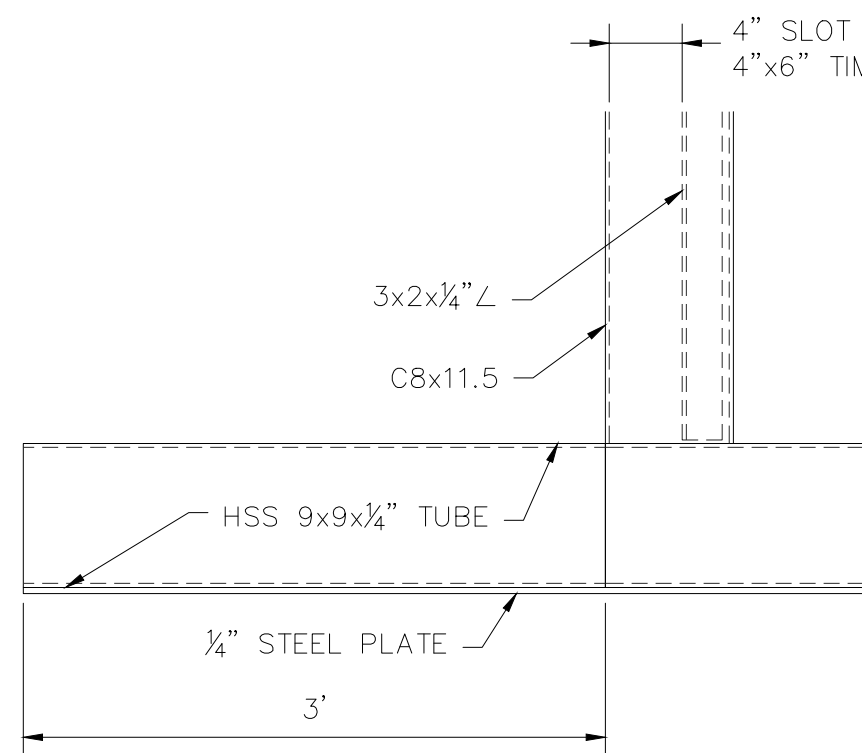
SECTION A-A



SECTION B-B

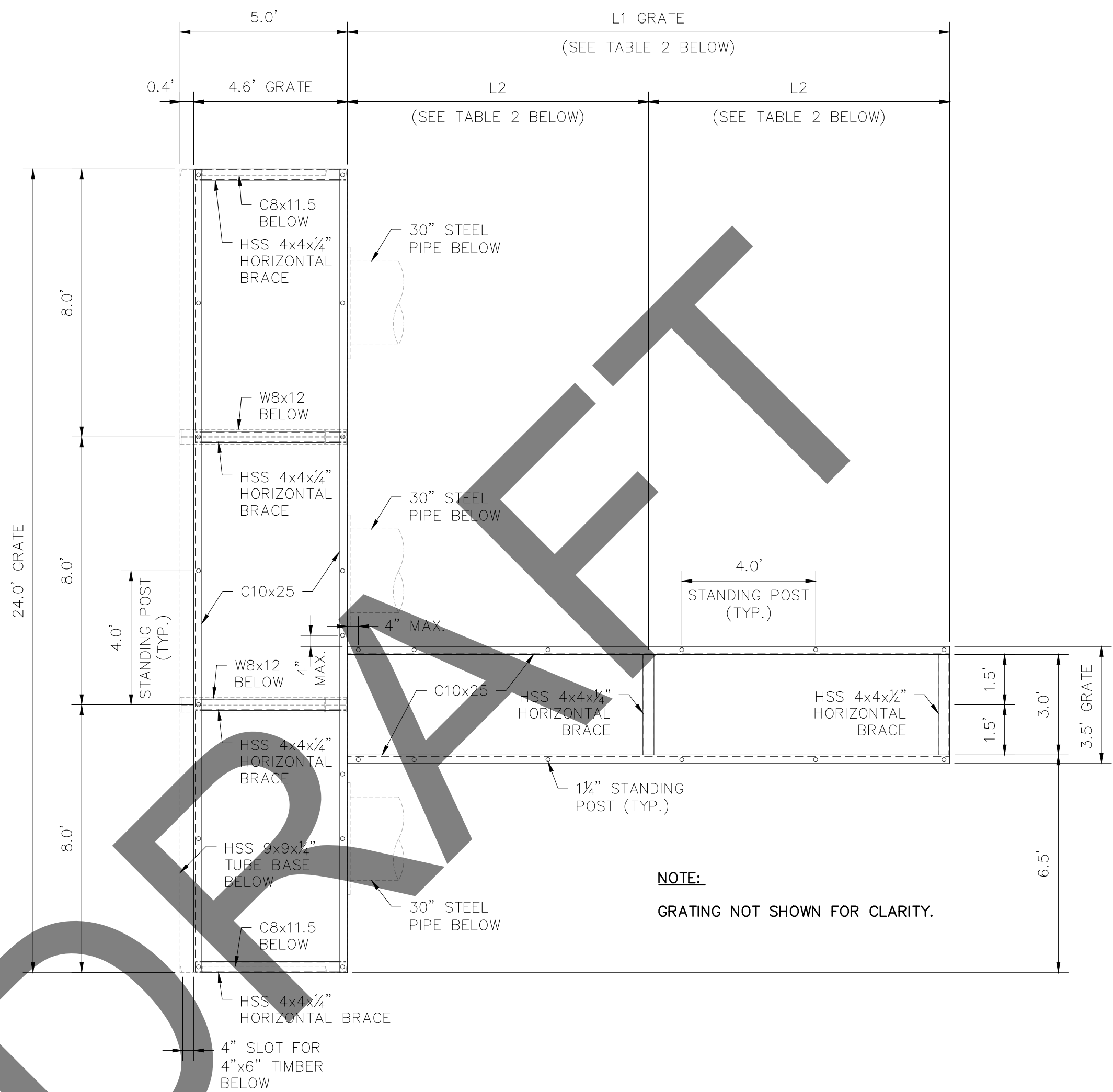
WALKWAY AT DROP OUTLET STRUCTURE

SCALE: N.T.S.



FRONT PLATE EXTENSION DETAIL

SCALE: N.T.S.



NOTE:
GRATING NOT SHOWN FOR CLARITY.

TOP VIEW
ACCESS WALKWAY AND GRATE OVER
DROP OUTLET STRUCTURE

SCALE: 1"=3'

TABLE 2		
ACCESS WALKWAY BRACING		
PLACEMENT AREA	L1	L2
M11	18.0'	9.0'
M10	13.5'	6.75'
M7/8/9	14.5'	7.25'

NOTE:
FOR STRUCTURAL NOTES, SEE DRAWING S-102

TIME: 12-09-20 - 10:57am User: beverly.carriere DWG: D:\60618786 - Project 11 Design\900 CADD\20-Sheets\C90-D13-P11-006-S-104.dwg

TECHNICAL SPECIFICATIONS
FOR
HOUSTON SHIP CHANNEL (HSC)
EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP)
PROJECT 11: BAYPORT (BEACON 76) TO MORGANS POINT
HSC STA 15+500 TO HSC STA -0+003.94

Submitted by:

The Joint Venture
Texas Engineering Firm F-10788
5444 Westheimer Suite 200
Houston, Texas 77056

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LIST OF APPENDICES TO THE TECHNICAL SPECIFICATIONS

Appendix A: Probings Logs, Location Table, and Maps

Appendix B: Boring Logs

Appendix C: Coast Chart No. 204 Galveston Bay, Texas

Appendix D: NOAA Chart 11327

1 GENERAL INFORMATION

1.1 GENERAL

Administration and performance of the work shall be subject to the General Conditions, Special Conditions, the project drawings and these Technical Specifications. Should it be discovered that information within these Technical Specifications conflicts with the General Conditions and/or Special Conditions, or the drawings, the Port Authority and Engineer shall be notified immediately. Additional and/or supplemental requirements shown herein shall not be considered as conflicting.

1.2 PROJECT DESCRIPTION

This project consists of work as part of the Houston Ship Channel Expansion Channel Improvement Project, as described in this section.

1.2.1 HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT

This segment of the Houston Ship Channel Expansion Channel Improvement Project encompasses dredging of the Houston Ship Channel (HSC) from approximate Station 15+500 to approximate Station -0+003.94 and includes a transition back to the existing channel toe between HSC Bayou Station 00+00 to 27+48.18. New work (NW) dredging will widen the existing 530-foot wide channel equally on each side by 85 feet to provide a new overall channel width of 700 feet, as shown on the Plans. Barge lanes will be replaced in-kind to their existing dimensions to the outside of the channel widening as shown on the Plans. Depending on shoaling, maintenance dredging may be awarded as an option pay item and shall occur within the existing federal channel template for HSC Station 15+500 to Station -0+003.94, referred to as "HSC Maintenance Dredging" within these Technical Specifications, and shall be excavated and placed within PA15 as shown on the Plans. Maintenance dredging of the HSC shall be performed prior to new work dredging and will be measured separately for payment.

New work dredging of the HSC shall be performed to the lines and grades on the Plans. The existing 530-foot wide template was created with a 3H:1V slope (maintained at 2.5H:1V) beginning at the authorized depth of minus 46.5 feet mean lower low water (MLLW) with 2 feet of advance maintenance and 2 feet of allowable overdepth. The new work template shall have a 3H:1V slope beginning at the required depth of minus 48.5 feet MLLW, with 2 feet of allowable overdepth. New work materials from the channel widening, relocation of the barge lanes, and transition back to existing toe as shown on the Plans will be used to rehabilitate existing marsh cell dikes and construct a new marsh cell dike at Atkinson Island.

For the purposes of these Technical Specifications, marsh cell dikes at Atkinson Island shall be referred as follows:

1. New Atkinson Island Marsh Cell 11 – **M11**
2. Rehabilitate Existing Atkinson Island Marsh Cells 7/8/9 – **M7/8/9**

3. Rehabilitate Existing Atkinson Island Marsh Cell 10 – **M10**

Dredged new work material shall be used to construct M11 by building an approximate 1.3-mile dike connecting the existing M7/8/9 and M10 placement areas. M11 placement area is located east of the HSC and east of M10. Construction includes hydraulic placement of dredged material to provide for the minimum lines and grades shown on the Plans to construct the perimeter dike, and installation of one (1) new drop-outlet structures. Rock shore protection shall be placed along the length of the exterior side of the dike.

Dredged new work material shall additionally be transported and placed along the existing northern and eastern dikes of M7/8/9 and eastern dike of M10 for the purposes of rehabilitating the perimeter dikes to the lines and grades shown on the Plans. The southern side perimeter dike of M10 shall be rehabilitated using materials excavated from areas adjacent to the existing dike by mechanical means. M7/8/9 and M10 placement areas are located east of the HSC and adjacent to Atkinson Island, and west of the proposed M11 placement area. Rock shore protection shall be placed along the exterior of the rehabilitated dikes. Additional work includes excavation of the Gorini Marsh Circulation Channel as shown in the Plans after completion of the hydraulic rehabilitation of the dikes.

For the purposes of these Technical Specifications, New Work Hydraulic Dredging Houston Ship Channel Station 15+500 to -0+003.94 and HSC Bayou Station 00+00 to 27+48.18 shall be referred to as NW Dredging HSC to M11, NW Dredging HSC to M10 and NW Dredging HSC to M7/8/9.

The work herein consists of furnishing all labor, materials, tools, equipment, plant, supplies, superintendence, insurance, incidentals, and other services necessary or required, and performing all excavation, transportation, and placement of dredged, or otherwise excavated material, into the designated placement areas to the lines and grades shown on the Plans.

1.3 DREDGE PLANT

Dredge, attendant plant and equipment shall be capable of working in exposed marine environments that are prone to potential rough sea conditions. The dredge proposed for use shall be complete with all necessary materials, supplies (including fuel, power, and water), labor, and have the capacity of an average production rate of 15,000 cubic yards of new work dredging per day.

In addition, at the Port's discretion, the bidder may be required to show to the satisfaction of the Port of Houston Authority that the bidder has the necessary experience, ability, and financial resources to perform the work in a satisfactory manner and within the time stipulated, and has had experience in marine construction works involving the dredging of hard new work materials, or of dredging materials of a more complex nature as to be dredged under this contract. Maintenance dredging contracts are not considered projects similar in nature or complexity.

1.4 REFERENCES

- Federal, State, and local laws, rules and regulations governing the disposal of materials and wastes in navigable waters including approval of the appropriate Texas Commission on Environmental Quality for the discharge of any materials and wastes in the navigable waters within its jurisdiction and including the provisions of 33 U.S.C. 1342.
- Refuse Act (33 U.S.C. 407) (Section 12, of the River and Harbor Act of 1988)
- Federal, State and local rules and regulations governing the control of air pollutants (30 T.A.C. 116) including those governing the burning of debris or wastes (30 T.A.C 111).
- General Regulations of the Department of the Army and of the Coast Guard governing lights and day signals for vessels working on wrecks, dredges, and vessels engaged in laying cables or pipes or in submarine or bank protection operations
- Federal Migratory Bird Treaty Act and the Endangered Species Act of 1973.

1.5 TECHNICAL DEFINITIONS

Clearing: Clearing shall mean the removal and appropriate disposal of all above ground and below ground vegetation, debris, and other items existing in designated areas to be cleared.

Contractor: The term Contractor means the licensed independent contractor appointed by the PHA and named in the Contract agreement and is the party responsible for the work.

Demobilization: The term demobilization shall include the work in connection with demobilization of the plant and equipment utilized to perform work under the various bid items and include the cost to remove pipelines to and at the placement area(s) (where applicable). The Contract price shall include transportation and all other costs incidental for the removal of the plant and equipment from the work sites.

Dike: This term shall mean the earth fill portions of the existing or new dike structures and all other fills within the limits of the dike system, including rock armor and geotechnical/geotextile membranes.

Embankment: The term embankment shall mean the earth fill portions of the work or other fills related to the work, and all other fills within the limits of the work.

Engineer: The Engineer shall mean the engineer or engineers, or the firm, or firms, employed to provide professional engineering services. The Engineer is the Port Authority's Design Consultant, for matters concerning the work as defined in the Contract Documents.

Excavation: Excavation shall mean the removal of material to the lines and grades shown in the Plans and specified in the Technical Specifications herein.

Final Grade: Final grade shall mean the surveyed constructed lines and elevations after completion of final shaping and grading.

Final Shaping and Grading: This term shall mean the work necessary to construct the dike or embankment to the required template, within allowable tolerances.

Gross Retention Rate: The gross retention rate is the sum of the actual quantity of fill measured within the limits of the survey divided by the gross quantity of material dredged for a particular dike reach.

Grubbing: Grubbing shall mean the removal and appropriate disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Grubbing shall include the back filling of holes created from the removal of said materials.

Hydraulic Fill: Hydraulic fill shall mean the initial placement of hydraulically dredged materials. The initial placement quantity of hydraulic fill shall provide sufficient material to accomplish final shaping and grading of the constructed dikes or embankments to the required lines and grades as shown in the Plans.

Limits of Recovery: For the work on this Contract, this term will be used to refer to the limits of depth and distance from the newly constructed dikes, within which material shown by cross-sections after hydraulic placement of the borrow excavation can be recovered during shaping and grading, to construct the dike to Final Grade. The bottom limit of recovery shall be the preconstruction grade or bay bottom prior to placement of materials, as determined from the preconstruction survey. The horizontal distance limit shall be determined by the Contractor, and approved by the Engineer, as to the distance between the intersection of the hydraulically placed material with that of the preconstruction grade or bay bottom.

Maintenance Dredging: The term maintenance dredging shall mean the removal of material above the existing (pre-project) channel design template and shoaled material that accumulates within the newly constructed channel template.

Mean Lower Low Water: Mean Lower Low Water (MLLW) is the vertical tidal datum used by the United States Army Corps of Engineers (USACE) Southwest Galveston District. USACE provided datum conversions by reach are provided on the Plans.

Mechanical Fill: Mechanical fill shall mean any material excavated from borrow areas within or adjacent to the placement areas and placed using mechanical means and methods including, but not limited to, excavators, draglines, dozers, loaders, dump trucks, or other non-waterborne machinery.

Mobilization: The term mobilization shall include the work in connection with mobilization of the plant, equipment, and personnel necessary to perform the work under various bid items and include the cost to place and handle pipelines to and at the placement area(s). The Contract price will include

transportation and other costs incidental to delivery of the plant and other equipment to the general work area in condition ready for operation.

Net Retention Rate: The net retention rate is the neat-line fill quantity, in cubic yards, within the fill template divided by the gross quantity of in situ material dredged for a particular dike reach.

New Work Dredging: The term new work dredging shall mean removal of material not classified as maintenance material within the new work dredging template as shown on the Plans and described herein.

New Work Materials: New work materials are defined as predominantly virgin materials and may consist of: soft silts and muds; soft, firm, stiff, very stiff, hard, lean and fat clays; fine to coarse and loose to very dense sands; silty sands; calcareous nodules; rock; and shell; as generally represented on the boring logs provided in Appendix B.

Permit: The term permit shall mean all permits obtained by the Port Authority and shall include the USACE permit and any other permits required for work, whether obtained by the Port Authority or the Contractor.

P.I.'s, P.C.'s, and P.T.'s: These terms shall mean points of intersection, points of curvature (i.e. the beginning of a curve), and points of tangency (i.e. the end point of a curve), respectively.

Pipeline Management: The term pipeline management shall include the work in connection with laying, removing and handling of dredge pipelines, maintenance of pipelines during construction, final cleanup of pipeline routes utilized to perform the work under various bid items. The Contract price will include transportation and all other costs incidental to delivery of the pipelines to the general work area in condition ready for operation.

Plans: The Plans shall mean the drawings as defined in the **General Conditions Section 1.21**.

Port Authority: The Port of Houston Authority of Harris County, Texas is a political subdivision of the State of Texas. The terms "Port", "Port Houston", "Port of Houston", "Port of Houston Authority", "PHA" and "Port Authority" are synonymous with the Port of Houston Authority of Harris County, Texas. The Port Authority is independent and not a part of the government of Harris County, Texas or the City of Houston.

Recoverable Material: Satisfactory material retained within the limits of recovery.

Retention Dike: The term retention dike shall mean a ridge of hydraulically or mechanically constructed material to control the flow of hydraulically placed material.

Seeding and Fertilizing: Work consists of preparing seedbeds, furnishing and placing seeds and fertilizer, and other operations necessary for the permanent establishment of a warm season perennial grass and forb mix from seed.

Shoaled Materials: The term shoaled materials shall mean the material that accumulates over time above the previously dredged surface, consisting of mostly silts, clays, sands, and shells. This includes accretion of materials due to the dredging process and weather-related shoaling.

Site Preparation and Earthwork: The term site preparation and earthwork shall include all or a portion of the following: stripping, clearing, and grubbing of the site; degrading the existing dike and construction of training retention dikes.

Stripping: The term stripping shall mean the removal and appropriate disposal of crops, weeds, grass, and other vegetative materials from the ground surface and/or topsoil.

1.6 AUXILIARY EQUIPMENT DEFINITIONS

Crawler-Type Tractors: Crawler-type tractors used for spreading and compacting shall weigh not less than 30,000 pounds, shall exert a unit tread pressure of not less than 5 pounds per square inch, and shall not be operated at a speed exceeding 5 miles per hour.

Hydraulic Dredge: Characterized by the use of a centrifugal pump to dredge sediment and transport it, in a liquid slurry form, to a discharge area.

Miscellaneous Equipment: Scarifiers, draglines, disks, excavators, motorized graders, spreaders, and other low ground pressure equipment shall be suitable for construction of hydraulic fill. Trucks, scrapers, and other types of earth-hauling equipment, if used, shall be suitable for construction. Matting, if used or required, shall be of sufficient size, quantity, and strength for the types of equipment that will work from or cross over the mats and for the types of foundation on which matting will be placed upon during the period of construction that the matting is used. Additional equipment used to facilitate movement of the dredge pipes to place hydraulic fill, construction of training retention dikes to maximize retention of hydraulic fill, and grading and shaping of hydraulic fill, shall be of suitable horsepower, track configuration, tread pressure, blade size, bucket size, and other attachments where applicable, to accommodate the varying types of terrain and foundation conditions where work will be performed.

Spillbarge: The Contractor may also have a "spill barge" to place the hydraulically dredged material in the open water placement areas. The Contractor shall have an electronic positioning system onboard.

Transport Vessel: Barges used to transport dredged, fill, shell or rock material

1.7 SPECIAL SCHEDULING REQUIREMENTS

1.7.1 ORDER OF WORK

The Contractor's order of work shall be based on the following order of work. The Contractor shall determine its means and methods for conducting the work and shall maintain a five nautical mile distance from all other dredges operating within the HSC, Bayport Ship Channel (BSC) and Barbour's Cut Channel (BCC). Alternative sequencing may be submitted in writing and approved by the PHA.

1. HSC Maintenance Dredging (Option 1), if awarded
2. NW Dredging HSC to M10
3. NW Dredging HSC to M11
4. NW Dredging HSC to M7/8/9
5. Mechanical Construction at M10
6. Gorini Marsh Circulation Channel

The Contractor may accomplish mechanical construction of M10 concurrently with all other portions of the work listed above.

The order of work shall be in accordance with Technical Specification Section 6 and Section 7.

1.8 PERMITS

The Contractor shall comply with all applicable permits and/or other obligations required by law.

1.8.1 CONTRACTOR OBTAINED PERMITS

Any necessary permits not provided by the Port Authority shall be the responsibility of the Contractor as described in Technical Specifications Section 5. The Contractor shall make application for and pay for any necessary permit fees, temporary or permanent utility interruption(s) and/or relocation fees, transportation, and temporary staging areas at no direct cost to the PHA.

1.9 WORK ACCORDANCE

All work shall be accomplished in accordance with the Contract Documents, including these Technical Specifications, the Plans, appendices, and other parts of the Contract Documents. Any changes made by the Contractor to these Technical Specifications or appendices therein, or variances in construction from the work defined in the Contract Documents, without written authorization by the Engineer, shall become the express responsibility of the Contractor at its own risk and cost.

1.10 LOCAL CONDITIONS AND SITE PHYSICAL DATA

Information furnished herein is for the Contractor's reference. However, it is expressly understood that the PHA and Engineer are not responsible for any interpretation or conclusion drawn by the Contractor. The Port Authority and Engineer are also not responsible for any lack of information herein pertaining to physical conditions at the site. Likewise, the Port Authority and Engineer will not be responsible for any information provided to the Contractor by any information agency or other party. The Contractor shall make every effort possible to familiarize itself with, and research, the conditions and operational impacts.

1.10.1 SUBSURFACE MATERIAL AND GENERAL SITE CONDITIONS

The material to be removed is composed of new work, maintenance and shoaled materials. Geotechnical investigations including probings and core borings, to analyze the character of materials to be removed, and the material characteristics at the placement areas, have been conducted by the Port Authority and the results of these investigations are included with these Technical Specifications as Appendix A and Appendix B. The Contractor is expected to examine these Technical Specifications, Plans, and the site, and after research and investigation, decide for itself the character, quality, and quantity of the material to be dredged and the characteristics, whether surface, subsurface, or otherwise, at the placement areas. The Contractor is expressly encouraged to perform its own research and investigations to determine the character of materials and satisfy itself as to the means and methods required to perform the work herein specified. The Engineer shall be immediately notified of any site conditions that may adversely affect the performance of the work.

1.10.2 DEBRIS

Other materials including, but not necessarily limited to, scrap rope, wire cable, scrap metal, anchors, anchor chains, timbers, snags, stumps, fiberglass, metal, piles, buoys, buoy anchors, or other rubbish or other obstructive materials encountered during dredging activities shall be disposed of in accordance with any and all applicable Federal, State, or local requirements. The Contractor shall expect debris to be encountered. No separate payment shall be made for removal and disposal of debris. Magnetometer investigations have been conducted by the Port Authority and the results of these investigations are shown in the Plans. Magnetometer data provided in the Plans is for informational purposes only and shall not be considered as the basis of determination for the presence or non-presence of debris or other obstructions. The Contractor shall perform its own investigations and satisfy itself in determining the presence of debris or other obstructions at its sole risk and cost. The costs for debris removal, disposal, downtime, or damages resulting therefrom shall be included in the Contract unit price for dredging.

1.10.3 TIDAL CONDITIONS

Under ordinary conditions, the mean tidal range is approximately 1.1-feet and the diurnal tidal range is approximately 1.3 feet as determined by the NOAA tide station at Morgan's Point, TX. The height of the water level is largely dependent on the force, direction, and duration of the wind. Larger seasonal tidal events shall be anticipated and expected by the Contractor.

1.10.4 MARINE CONDITIONS

Strong currents and rough sea conditions may at times exist in and adjacent to the work locations. The Contractor should familiarize itself with the daily and extreme conditions that could influence safety and work operations throughout the duration of this work. Impact and rework of partially completed work components due to marine conditions shall not be just cause for increased compensation. Information on water conditions at the site may be found on the NOAA Tides and Currents website <http://tidesandcurrents.noaa.gov> for the Morgan's Point, TX tide gauge, Station ID 8770613, which is near the Project vicinity.

1.10.5 VESSEL WAKE

Commercial, leisure and other watercrafts use all the waters in the vicinity of the areas to be dredged, both during the day and night, and effects can be observed at the dredging and placement areas. Passage from large or fast-moving vessel traffic can cause high vessel wakes and vessel induced waves and currents. The Contractor shall take measures as it deems appropriate to ensure against damages to the work or itself resulting from vessel wakes and vessel induced waves and currents. Effects from vessel wakes and vessel induced waves and currents shall not be just cause for increased compensation or allowable downtime due to mechanical failure resulting from vessel wakes or vessel induced waves and currents.

Channel traffic may consist of, but not necessarily limited to, deep draft ships, tugs, tows consisting of a tug with one or more barges, small boats of various sizes, sailboats, recreational and commercial fishing vessels and ferries. The Contractor shall be mindful of channel traffic when transporting personnel, equipment and supplies to and from the work site. The Houston Ship Channel is an area of very high vessel traffic and high vessel traffic shall be considered by the Contractor when developing the dredging sequence, dredge plant configurations and laydown areas and pipeline routes (where applicable).

1.10.6 GROUNDWATER

Subsurface groundwater conditions and elevations may change. Changes in groundwater elevations shall not be just cause for increased compensation.

1.10.7 WEATHER CONDITIONS

The site may be affected by tropical storms and hurricanes primarily from, but not necessarily limited to, June through November, and by stormy and/or rainy weather, including severe thunderstorms, during any time of the year. The Contractor shall be responsible for obtaining information concerning rain, wind, and water level conditions that could influence safety and work operations. A list of publications containing climatological and meteorological observations and data for the site is provided below. Other publications or information sources are available in addition to the following:

- Monthly climate summary provided by the National Oceanic and Atmospheric Administration (NOAA)

- National Weather Service Forecast Office

1.11 PRESERVATION OF PUBLIC AND PRIVATE PROPERTY

The Contractor shall preserve and protect the existing informational and directional signs, facilities, station markers, mile markers, mooring piles and other items which have been established along either bank of the channel within the reaches of the dredging operations specified herein except as described in Subsection 1.12.2 of these Technical Specifications.

Fences, roads, ditches, private or public grounds, and other structures or improvements damaged as a result of the Contractor's operations shall be repaired or rebuilt by the Contractor at its expense. The areas used by the Contractor in laying and maintaining dredge pipelines shall be restored to the same or better condition as existed prior to commencement of the work. All damages by or as a result of the Contractor's operations, either to surface or subsurface structures, shall be repaired or replaced by the Contractor at its sole risk and cost.

1.12 NAVIGATION

1.12.1 OBSTRUCTION OF CHANNEL

The Port Authority will not undertake to keep the channel free from vessels or other obstructions, except to the extent of such regulations, if any, as may be prescribed by the Secretary of the Army, in accordance with the provisions of Section 7 of the River and Harbor Act approved 8 August 1917. The Contractor shall conduct the work using methods that will obstruct navigation as little as possible, and if the Contractor's plant does obstruct the channel and makes the passage of commercial vessels difficult or endangers them, said plant shall be promptly moved on the approach of a vessel as far as may be necessary to afford safe passage. At no time shall floating pipelines cross a navigable channel. If floating line is utilized when dredging, it shall be required to be moved during the passage of ship traffic. Upon completion of the work, the Contractor shall promptly remove its plant, including dredge pipelines, ranges, buoys, piles, and other marks placed by it under this Contract.

1.12.2 TEMPORARY REMOVAL OF AIDS TO NAVIGATION

As a result of the work, existing informational and directional signs, facilities, station markers, mile markers, mooring piles, and other Aids to Navigation (ATONs) which have been established along either bank of the channel, within the reaches of the dredging operations specified herein may require relocation. The United States Coast Guard (USCG) will facilitate all ATON removal and replacement. The Contractor shall work and coordinate with the USCG to enable a smooth operation of all ATON relocation. The Contractor shall contact the Port Authority and USCG at least twenty-one (21) days prior to the removal and relocation of existing aids to navigation. The Contractor shall submit a VTSA Channel Obstruction request and/or a Notice to Mariners as may be required by the USCG.

1.12.3 BRIDGE-TO-BRIDGE RADIOTELEPHONE EQUIPMENT

Dredges and self-propelled attendant floating plant shall be radiotelephone equipped to comply with the provisions of the Vessel Bridge-to-Bridge Radiotelephone Act (Public Law 92-63). This will require, as a minimum, the radiotelephone equipment capable of transmitting and receiving on 156.65 MHz and 156.8MHz (Channel 13 and Channel 16, respectively). Tugs and tenders will be considered towing vessels within the meaning of the Act.

1.12.4 LOOKOUTS AND RADIO COMMUNICATIONS

When working in a federal channel, the Contractor shall have a dedicated lookout person posted in the dredge control room at all times to visually monitor the movement of vessels around the dredge plant and to perform radio communications with company floating plant and to deliver passing arrangements with other commercial, fishing, and recreational vessels. The lookout shall be competent in the English language, the U.S. Coast Guard and Federal Communications Commission radio communications procedures and requirements and trained in the Vessel Bridge to Bridge Radiotelephone Act. The lookout shall maintain up to the minute information on the status of each company workboat as well as approaching vessels and will communicate this information as required to prevent collisions and shall comply with all requirements of the Houston-Galveston Vessel Traffic Service (VTS) area as outlined in Technical Specifications Section 1 Subsection 1.12.6. Each company workboat shall check in with the lookout when arriving at the dredge and shall receive radio clearance from the lookout before departing the dredge. FAILURE TO COMPLY WITH THIS REQUIREMENT WILL BE CONSIDERED A VIOLATION OF THE SAFETY PROTOCOL ESTABLISHED HEREIN. PURSUANT TO THE DIRECTION OF THE PORT AUTHORITY, THE CONTRACTOR MAY BE REQUIRED TO CEASE OPERATIONS UNTIL THIS PROVISION IS COMPLIED WITH. ANY SUSPENSION, DELAY OR INTERRUPTION OF WORK ARISING FROM NON-COMPLIANCE OF THIS PROVISION SHALL NOT CONSTITUTE A BREACH OF THIS CONTRACT AND SHALL NOT ENTITLE THE CONTRACTOR TO ANY PRICE ADJUSTMENT UNDER THE CONTRACT CLAUSE ENTITLED TERMINATION AND SUSPENSION OR ANY OTHER MANNER UNDER THIS CONTRACT.

1.12.5 SIGNAL LIGHTS

The Contractor shall display signal lights and conduct its operations in accordance with the general regulations of the Department of the Army and the U.S. Coast Guard. These general regulations govern lights and day signals on towing vessels with tows, vessels working on wrecks, dredges, vessels engaged in laying cables or pipe, dredge pipelines, vessels of more than 65 feet in length moored or anchored in a fairway or channel, and floating plants working in navigable channels, as set forth in Commandant U.S. Coast Guard August 2014 Navigation Rules and Regulations Handbook, or 33 Code of Federal Regulations 81 Appendix A (International) and 33 Code of Federal Regulations 84 through 89 (inland) as applicable.

1.12.6 HOUSTON-GALVESTON VESSEL TRAFFIC SERVICE AREA

The Contractor shall comply with the following requirements while operating within the Houston-Galveston Vessel Traffic Service (VTS) area.

1.12.6.1 GENERAL

When a dredge or floating plant is to be operated within the U.S. Coast Guard Houston-Galveston Vessel Traffic Service (VTS) Area, the master shall furnish the Vessel Traffic Center the following report at least 30 minutes prior to beginning operations:

- Location of intended operation
- Description of intended operation including channel obstructions
- Configuration of pipelines
- Termination point of pipelines
- Time required to re-open channel or move for vessel traffic
- Operating impairments, including VHF-FM radios
- Names of the assist boats being used
- Traffic considerations required, for example: slow bell, no meeting or overtaking, and advance notice requirements.
- Point of contact phone numbers and VHF-FM radio working frequencies

1.12.6.2 REPORT CHANGES

The master of the dredge or floating plant shall immediately notify the VTC of changes to the above report and at the completion of operations.

1.12.6.3 VESSEL TRAFFIC SERVICE LOCATION

The Houston-Galveston VTS Area consists of the navigable channels between the Galveston Entrance Channel Buoy 1 and the Houston Turning Basin, Galveston Channel, Texas City Channel, Bayport Ship Channel (BSC), Barbour's Cut Channel (BCC), the Gulf Intracoastal Waterway, and Galveston-Freeport Cutoff from mile 346 to mile 352.

1.12.6.4 COMMUNICATIONS

Communications with the Vessel Traffic Center, call sign "HOUSTON TRAFFIC," shall be accomplished via VHF-FM Channel 12. The Traffic Center guards both Channel 12 and Channel 13 on a 24-hour basis.

1.12.6.5 OPERATIONS

The master of a dredge or floating plant shall be aware of and comply with the provisions of the Order Relating to Lightering and Bunkering Operations and Multiple Vessel Moorings and will notify the Houston-Galveston VTS when refueling operations are to be conducted.

1.12.7 DREDGE POSITIONING

The Port Authority may elect to install GPS tracking units and/or cameras onboard the dredge(s). Units will be installed and maintained by the Port Authority. Access to the vessel and electrical power shall be provided by the Contractor to allow installation, maintenance, and removal of the tracking units by the Port Authority. The GPS tracking units are the property of the Port Authority and will be removed by the Port Authority prior to dredge demobilization.

1.12.8 AUTOMATIC IDENTIFICATION SYSTEM (AIS)

A Class "A" Automatic Identification System (AIS) in accordance with the Code of Federal Regulations (CFR) title 33, CFR 164.46, as amended, is required for all dredges and self-propelled floating plant used on this contract.

1.13 VARIATIONS IN ESTIMATED QUANTITIES

New work dredging quantities have been determined for the Houston Ship Channel Expansion Channel Improvement Project and no significant variation in quantity is anticipated for new work dredging pay items.

Maintenance dredging quantities for the HSC have been estimated. Estimated shoaling rates are described in Section 6 Subsection 6.3.1 of these Technical Specifications. The Contractor shall make itself familiar with the anticipated work and shoaling rates and shall consider these conditions in its proposal and schedule.

On these pay items and others where the quantity of a pay item in this Contract is an estimated quantity and where the actual quantity of material within the required dredging limits varies more than 15% above or below the stated estimated quantity, an equitable adjustment in the Contract unit price shall be made upon demand of either party. The equitable adjustment will be based upon an increase or decrease in costs due solely to the variations above 115% or below 85% of the estimated quantity within the required dredging limits. Equitable adjustments shall be coordinated between the Contractor and the Port Authority, and only executed by change order.

Prior to performing work where a quantity variation above 115% or below 85% is determined to exist, the Contractor shall notify the Engineer in writing within three days of discovering or anticipating such condition. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request in writing, an extension of time, to be received by the Engineer within ten (10) days from the beginning of the delay, or within such further period as may be granted by the Port Authority before the date of final settlement of the Contract. Upon receipt of a written request for an extension, the Engineer shall ascertain the facts and make an adjustment for extending the Contract time.

1.14 UNAUTHORIZED PLACEMENT OF MATERIAL

1.14.1 MISPLACED MATERIAL

Excavated material that is deposited at locations other than in places designated or approved will not be paid for, and the Contractor may be required to remove the misplaced excavated material and deposit it where directed by the Engineer at no cost to the Port Authority.

1.14.2 DEBRIS AND DISPOSAL

During the progress of the work, the Contractor shall not discard worn out discharge pipe, wire rope, scrap metal, timbers, or other rubbish or obstructive material into the placement areas or within or along the banks of any waterbody. This material, together with scrap, rope, wire cable, piles, pipe, or other obstructive material shall be disposed of by the Contractor at locations in accordance with any and all applicable Federal, State, or local requirements.

1.15 HOLD HARMLESS AND INDEMNIFICATION

The PHA and Engineer shall not be liable or responsible for, and the Contractor shall indemnify and hold harmless the Engineer from and against any and all claims and damages of every kind, for injury to or death of any person or persons, and from damage to or loss of property arising out of or attributed directly, or indirectly, to any work, or other activity conducted at the site, performed by the Contractor. This indemnity and hold harmless provision shall not be limited by the specification of insurance coverage required to be maintained by the Contractor. The Contractor further agrees to obtain, in writing, from its contractors, subcontractors, and consultants the same indemnity and agreement to hold harmless as stated above. This requirement is supplemental to other requirements found in the Contract Documents (see **Section 11.08 of the General Conditions**).

1.16 USE OF PORT AUTHORITY PREMISES AND WORK AREA CONDITIONS

1.16.1 CONTRACTOR FACILITIES

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas approved by the Port Authority. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Port Authority. The Contractor shall fuel and lubricate equipment in a manner that protects against spills and evaporation, and the Contractor shall provide containment for fuel and liquid chemical storage tanks to contain the tank contents in the event of a leak or spill. **Refer to the General Conditions for further guidance.**

1.16.2 SANITARY FACILITIES

Sanitary sewage services will not be furnished by the Port Authority. The Contractor shall provide and maintain in neat, sanitary condition toilets and other necessary accommodations for employees' use to comply with the regulations of the State Department of Health or other jurisdictions.

1.16.3 SITE MAINTENANCE

Trash or debris shall not be allowed to accumulate on the work areas. The Contractor shall clean the entire area of any litter resulting from the Contractor's operations on a daily basis. The Contractor shall maintain the premises as clean and presentable, as good construction practices allow at all times.

1.16.4 EXCLUSION OF THE PUBLIC

The Contractor will be permitted to exclude the public from the work areas in the immediate vicinity of its dredging, transporting, and disposal operations. Enforcement shall be the Contractor's responsibility at no cost to the Port Authority. Should enforcement be required, it shall be coordinated with local enforcement agencies, and notification shall be provided to the Port Authority in the event of such occurrence.

1.17 FIRE PROTECTION

The Contractor shall take stringent precautions against fire. Open fires are not allowed unless approved in writing by the Port Authority.

1.18 STANDBY TIME PROVISIONS

At any time during the Contract performance period, the Port Authority may terminate the Contract for unforeseen causes. However, in lieu of terminating the Contract, the Port Authority may opt to issue a temporary "stop work order" and activate standby time provisions. The Port Authority reserves the right to activate, or not to activate, standby time provisions as it deems appropriate **in accordance with the General Conditions.**

1.19 ACCESS AND STAGING

The Port Authority may provide staging areas at Morgan's Point and Bayport for the Contractor's use for the duration of the contract subject to lease or easement. The Contractor may elect to use the Morgan's Point or Bayport staging areas, or others to be provided by the Contractor but shall at all times provide safe access and staging for all work including, but not limited to, surveying, dredging, and the transportation and disposal of dredged materials. The Contractor shall be responsible for maintaining staging and access necessary for its equipment and plant to and from the site, mooring area, and placement area. The Contractor shall ascertain the environmental conditions that can affect the access such as climate, winds, current, waves, depths, shoaling, and scouring tendencies. The Contractor shall be responsible for providing access to the site for their employees as well as the Port Authority and/or the Engineer and other Port Authority authorized representative(s) when requested, to include daily inspection of the dredge area and placement sites, at no additional cost to the Port Authority. The Contractor shall be responsible for obtaining all necessary permissions for use of landing areas to load and offload its crews. The Contractor shall be responsible for following any and all permit requirements or conditions regarding pipelines and pipeline routes, as well as any other permit or regulatory requirements regarding material transport or personnel transport. No separate payment shall be made for site access or staging areas.

1.19.1 CONSTRUCTION OFFICE

The Contractor shall provide for the duration of the Contract, office space of not less than 480 square feet for the exclusive use of Port Authority personnel. The office shall be secured in place using tie downs capable of withstanding winds up to 75 miles per hour. The office shall have as a minimum one dedicated office space suitable for two persons; one restroom with toilet, hand sink, and towel dispenser; and one conference area. The facility shall be located as close to the Contractor's onsite project office as possible. Windows shall be provided with interior blinds. A paved parking area for a minimum of three vehicles shall be provided. If the construction office is located at a remote site, the parking area shall be enclosed within a 6-foot chain link security type fence. The fence gate shall have a minimum opening of 16 feet. A personnel gate shall also be provided and shall have a minimum opening of 4 feet.

As a minimum, the Contractor shall provide one line to provide local 911 and long-distance service, one line for an all-in-one printer, copier capable of copying and printing on 11x17 paper, and two internet connections. In addition, the Contractor shall provide electric power, sewer, gas, lighting, phone, and hot and cold running water, air-conditioning, heating, bottled drinking water with electric cooler, disposable drinking cups, coffee maker, microwave oven, refrigerator, one exterior mud scraper, one coat rack, two 3 foot by 5 foot desks, two free standing four drawer file cabinets, eight padded chairs, one 4-foot by 8-foot conference table, three waste cans, three sets of keys to the entry doors, closets, desks, and security gate. Desks and file cabinets shall be lockable. Smoke detectors and fire extinguishers shall be provided to meet OSHA requirements. The Contractor shall also provide weekly janitorial services to include replenishing toilet paper and paper towels, and trash removal from the site. Items are to be in like-new serviceable condition and subject to approval by the Port Authority. All items listed above that are furnished by the Contractor shall remain the property of the Contractor when the project is completed. **This section supersedes Section 4.29 of the General Conditions.**

1.19.2 CONSTRUCTION SITE TRANSPORTATION

The Contractor shall provide timely transportation service upon request of the PHA capable of carrying 4 people and equipment.

1.20 PROTECTION OF EXISTING WATERWAYS

The Contractor shall conduct its operations in such a manner that material or other debris are not deposited in existing channels or other areas adjacent to the site. Should the Contractor, during the progress of the construction, lose, dump, throw overboard, sink, or misplace any material, plant, machinery or appliance, the Contractor shall recover and remove the same with the utmost dispatch. The Contractor shall give immediate notice to the Port Authority, with description and location of such obstructions, until the same are removed. Should the Contractor refuse, neglect, or delay compliance with the above requirements, such obstructions may be removed by the Port Authority, and the cost of such removal may be deducted from any money due or to become due to the Contractor, or may be recovered under its bond. The liability of the Contractor for the removal of a vessel wrecked or sunk

without fault or negligence shall be limited to that provided in Sections 15, 19, and 20 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C 410 et seq).

1.21 ADJACENT PROPERTY AND STRUCTURES

The Contractor is notified that construction may occur adjacent to active public recreational facilities, private property, and environmentally sensitive areas. The Contractor is hereby notified that adverse working conditions may exist, and the necessary allowances and precautions shall be made to avoid damaging public and private property and sensitive environmental resources. The Contractor shall take extreme care when dredging adjacent to structures. Any damage to structures as a result of the Contractor's negligence will result in suspension of dredging and require prompt repair at the Contractor's expense as a prerequisite to the resumption to dredging. Unauthorized damage to any existing utilities, building facilities, structures, or plant life shall be repaired by the Contractor at no cost to the Port Authority.

1.22 SURFACE AND SUBSURFACE STRUCTURES, PIPELINES AND UTILITIES WITHIN THE WORK AREAS

The Plans show the locations of all known structures pertinent to the work. The locations of surface and subsurface features shown on the Plans are not exact. Locations of underground pipelines and utilities have not been field verified by the PHA. The Contractor is notified that uncharted and/or incorrectly chartered pipelines and/or underwater obstructions may be present within and adjacent to the work areas.

The Contractor shall be responsible for verifying the locations and depths of all utility crossings and shall take precautions against damages which might result from its operations, especially the dropping of dredge spuds and/or anchors into the channel bottom, in the vicinity of utility crossings. Coordination with the Owners is described in Section 2 Subsection 2.5.2.2. If any damage occurs as a result of its operations, the Contractor will be required to suspend dredging until the damage is repaired to the satisfaction of the Owner. Costs of such repairs and downtime of the dredge and attendant plant shall be at the Contractor's expense.

THE CONTRACTOR SHALL CALL THE TEXAS ONE CALL SYSTEM (811) A MINIMUM OF 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION (DIGGING, DREDGING, JETTING, ETC.) OR ANY DEMOLITION ACTIVITY. PIPELINE SAFETY, AND THE PROTECTION OF PIPELINES OR OTHER UTILITIES, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

The Engineer and Port Authority assumes no responsibility or liability for failure to show any or all pipelines, utilities, structures, or other obstructions on the Plans or to show them in their exact location. Failure to show and/or show correctly will not be considered sufficient basis for claims or for additional compensation for extra work in any manner whatsoever, unless the obstruction encountered is such as to necessitate substantial changes in the lines or grades, or requires the building of special work for which no provision is made. It is assumed that the Contractor has thoroughly inspected the site, is

informed as to the correct location of surface and subsurface structures, and has considered and allowed for all foreseeable incidental work due to variable subsurface conditions, whether such conditions and such work are fully and properly described in the Contract Documents or not. Minor changes and variations of the work specified and shown on the drawings shall be expected by the Contractor and allowed for as incidental to the satisfactory completion of a whole and functioning work or improvement.

1.23 WEEKLY PROGRESS MEETINGS AND MINUTES

The Contractor shall attend weekly progress meetings with the Engineer at the site or an appropriate meeting place set forth by the Engineer to discuss the schedule of work, construction concerns, coordination issues, or other topics that may be of mutual interest. The Contractor shall provide minutes of all weekly meetings to the Engineer within 48 hours of the meeting.

1.24 QUALITY CONTROL INSPECTIONS

The Contractor shall conduct daily quality control inspections of the construction activities for compliance with the Contract requirements and record the information as specified herein. A copy of the records of quality control inspections, as well as corrective action taken, shall be filed daily and submitted as directed. The daily quality control reports shall be submitted on an approved daily quality control report form. Retention rate monitoring information for hydraulic fill construction shall be submitted on an approved retention rate spreadsheet. Required survey information and plots of the surveys shall be attached to the daily quality control reports and retention rate spreadsheets.

The Contractor shall inspect for compliance with Contract requirements and record the inspection of operations including, but not limited to the items specified within this Section. A copy of the records of the compliance inspections, tests, and corrective action taken shall be submitted with the daily quality control report (Technical Specifications Section 2 Subsection 2.6.4).

END OF SECTION

2 SUBMITTALS AND SUBMITTAL REQUIREMENTS

2.1 GENERAL

The Contractor is responsible for providing all Contractor required submittals outlined in the Contract Documents and additional submittals requested by the Engineer. The submittals listed herein are additional to other submittals required within the General Conditions of the Contract Documents. The Engineer may request submittals in addition to those specified. Units of weights and measures used on all submittals are to be the same as those used in the Contract Documents. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with Contract requirements.

2.2 SUBMITTAL PROCEDURES

All submittals shall be transmitted to the Engineer in accordance with the following:

- The number of copies of submittals required for each item shall be the one original hardcopy and digital PDF, plus the number of additional copies that the Contractor desires for its own use.
- The Contractor must double-check and sign all submittals before forwarding them for review and action by the Engineer.
- The Engineer will review the submittal data. If there are no exceptions taken to the submittal, the original and three copies will be retained by the Engineer. All remaining copies will be returned to the Contractor. The Contractor must keep one copy at the site at all times.
- If further action is required by the Contractor, the Engineer will retain one copy of the submittal data and return all remaining copies to the Contractor.
- Any and all costs, direct or indirect, incurred by the Engineer in reviewing submittals in excess of two times shall be charged a minimum of \$500 to the Contractor and deducted from the total price for the work. If, in the opinion of the Engineer the review of submittals becomes excessive, a fee greater than listed herein shall be charged to the Contractor on a time and materials basis.
- The Engineer's acceptance of shop drawings and/or any aspects of the work shall not act to transfer the Contractor's responsibility for, nor relieve the Contractor from the performance of any of the Contractor's duties set forth in the Contract Documents.

2.3 SUBMITTALS AFTER AWARD

The items listed below are required within fourteen (14) days of Contract award.

2.3.1 SAFETY PLAN

Submit no later than fourteen (14) days within award of the Contract a safety plan. The safety plan shall be consistent with the requirements of the General Conditions. The plan shall additionally be in conformance with the following unless otherwise specified in the General Conditions:

- OSHA Safety and Health Standards 29 CFR 1910 (General Industry), US Department of Labor, Occupational Safety and Health Administration. Hereafter referred to as "29 CFR 1910". Available by calling (513)533-8236.
- OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response, Interim Final Rule, U.S. Department of Labor, Occupational Safety and Health Administration, December 1986. Hereafter referred to as "29 CFR 1910.120".
- OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), US Department of Labor, Occupational Safety and Health Administration, 1985. Hereafter referred to as "29 CFR 1926".
- Standard Operating Safety Guidelines, USEPA, Environmental Response Branch, Hazardous Response Support Division, Office of Emergency and Remedial Response, November 1984. Hereafter referred to as "EPA Guidelines".
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (MHSA), US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health (NIOSH), October 1985.
- EM 385-1-1 US Army Corps of Engineers Safety and Health Requirements Manual

** The Contractor is responsible for ensuring compliance with the latest revisions of the above referenced documents.*

2.3.2 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall comply with the provisions of EM 385-1-1. All paragraph and subparagraph elements in EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan" shall be covered. If the Contractor is a currently accepted participant in the Dredging Contractors of America (DCA) and United States Army Corps of Engineers (USACE) Dredging Safety Management Program (DSMP), as determined by the DCA and USACE Joint Committee, and holds a current valid Certificate of Compliance for both the Contractor Program and the Dredge(s) to be used to perform the work required under this contract, the Contractor may, in lieu of the submission of an Accident Prevention Plan (APP):

- Make available for review, upon request, the Contractor's current Safety Management System (SMS) documentation
- Submit to the Engineer the current valid Company Certificate of Compliance for its SMS

- Submit the current dredge(s) Certificate of Compliance based on third party audit
- Submit for review and acceptance, site specific addenda to the SMS as specified in the solicitation

2.3.2.1 SEVERE WEATHER PLAN

As part of the APP, a severe weather plan must be developed for floating plant, boats or other marine activities that could be endangered by severe weather (including but not limited to sudden and locally severe weather, storms, high winds, hurricanes, and flood). Plans must be made for removing or securing plant and evacuation of personnel in emergencies. This plan will meet the requirements of EM 385-1-1 Section 19.A.03 and 01.E. In the event of a severe storm warning, the Contractor must:

- Secure outside equipment and material and place materials that could be damaged in protected areas.
- Check surrounding area, including roof for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

2.3.3 QUALITY CONTROL PLAN

Submit no later than fourteen (14) days within award of the Contract a quality control plan to ensure the work complies with the Contract Documents. Include, as a minimum, the following to cover all operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

- A description of the quality control organization, including a chart showing lines of authority and acknowledgment
- The names, responsibilities, and authorities of each person on the quality control organization chart
- Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors
- Reporting procedures, including quality control report forms and a retention rate spreadsheet for approval

2.3.3.1 QUALITY CONTROL DAILY REPORT FORM

A quality control daily report form, containing blanks for required information shall be developed by the Contractor for use during this Contract and approved by the Engineer. A copy of the daily quality control report form shall be submitted with the quality control plan, no later than fourteen (14) days within award of the Contract, for approval.

2.3.3.2 MATERIAL RETENTION TRACKING FOR HYDRAULIC FILL

A retention rate spreadsheet, programmed to make appropriate calculations, shall be set up in Microsoft Excel 2003, or later, with the following column headings which are required for retention rate monitoring and reporting: Date; End Stations of Dike Constructed within the last 24 hours; End Stations of Dike Constructed to Date; Dike Cross Section Station; Neat Line Cross Section Area computed to the original bottom (cubic yards per linear foot of dike); Actual Cross Sectional Area, as placed by the dredge expressed in cubic yards per linear foot of dike; Over-placement Ratio; Actual Average End Area; Distance; Volume Between Cross Sections; Cumulative Dike Volume as placed by the dredge; Quantity of Cross Sectional Area retained in the Acceptance Template; Gross Dredging Between Stations; Gross Dredging to Date (cubic yards and cubic yards per linear foot of dike); Gross Dredging (last 24 hours in cubic yards and cubic yards per linear foot of dike); Gross Retention Rate; Net Retention Rate; and Over-placement or Under-placement Quantity and Acceptance (check). A copy of the retention rate spreadsheet shall be submitted along with the quality control plan no later than fourteen (14) days within award of the Contract for approval.

2.4 PRECONSTRUCTION CONFERENCE SUBMITTALS

The items listed below are required prior to the time of the preconstruction conference as described.

2.4.1 CONTACTS AND QUALIFICATIONS

The following is required at least fourteen (14) days prior to the preconstruction conference:

- Name(s) of the person(s) designated as Project Superintendent(s).
- List of all subcontractors and major material/equipment suppliers that the Contractor and subcontractors propose to use. This list shall include correct names, mailing addresses, email addresses, and phone numbers.
- List of names and titles of Contractor's representatives authorized to sign contractual documents and payment requisitions.
- List of names, qualifications, and licenses of all licensed crafts required by the Contract Documents.
- List of names, qualifications, and licenses of the qualified Texas licensed Registered Professional Land Surveyor (RPLS) or Professional Engineer (PE) in charge of surveys

2.4.2 WORK PLAN AND SCHEDULE OF WORK

Fourteen (14) days prior to the preconstruction conference, the Contractor shall provide a detailed work plan for the Work described in these Technical Specifications as part of the Houston Ship Channel Expansion Channel Improvement Project including lists of equipment to be utilized, name(s) of dredge(s) to be used, estimated quantities and Schedule of Work. Equipment shall include, but not be limited to, all plant(s), vessels, vessel-tracking systems, and other equipment for each phase of work. The schedule

of work shall indicate, at a minimum, the start of work, start of excavation and placement, construction period, and completion of all work. The schedules shall be in bar-chart form that indicates all work tasks, differentiates critical path work tasks from non-critical path tasks, and shows the beginning and ending dates for each critical and non-critical path work task. Schedule updates shall be transmitted along with monthly pay requests as outlined in **Special Condition Part ##**.

The Project construction time is as outlined in **Special Condition Part 10**. The Contractor shall inform the Engineer if additional time is required. The work plan and schedule of work shall become part of the Contract and shall be incorporated into the Contract Documents.

2.4.2.1 STAGING AREA PLAN

The Contractor shall include for approval a staging area plan, detailing the location(s) and method of anchoring/securing all floating plant and dredge pipelines or pipeline rafts. The plan shall include a plot drawing detailing the following at minimum:

- Equipment type and dimensions
- Distance from the current authorized federal channel limits to the proposed staging area
- Proposed staging area XY-coordinates provide in State Plane Coordinates as outlined in Technical Specifications Section 4 Subsection 4.4.
- Size and quantity of anchors used to secure equipment, if any
- Size and length of cable/rope used for anchors and/or lashing equipment together
- Location and type of signal lights as required per Technical Specification Section 1.12.5.

2.4.2.2 DREDGE PIPELINE ROUTE PLAN

The Contractor shall include for approval a dredge pipeline route plan, detailing the locations and method of placement of all dredge discharge pipelines for each phase of work. The project configurations may require the discharge pipelines to cross navigable waters; therefore, the plans shall include the method by which the pipelines will be placed to avoid impedance of commercial and recreational marine traffic. Should the Contractor wish to excavate below the design template to provide for a dredge pipeline corridor or trench across the HSC, the Contractor shall request such in writing for approval by the PHA. The Contractor's written request shall include the location, approximate width(s) and elevation(s), means and methods, and placement of removed materials. Pipeline routes shall be chosen in a manner that provides minimal impact to the environment. The Contractor shall prepare the dredge pipeline route plans in accordance with the order of work to ensure that the new work materials can be utilized to complete the hydraulic fill construction in accordance with Section 6 and 7 of these Technical Specifications.

2.4.2.3 SITE PREPARATION AND EARTHWORK PLAN

The Contractor shall include its means and methods for performing all work in Technical Specifications Section 7 Subsection 7.4. The plans shall detail the proposed means and methods the Contractor will use to meet the minimum requirements of the work, while complying with these Technical Specifications.

The site preparation and earthwork plan for the Houston Ship Channel Expansion Channel Improvement Project shall include, but not necessarily be limited to, the following:

- A complete list of plant and equipment, with accompanying specification information to be used for the work at M7/8/9, M10 and M11 placement areas.
- Means and methods for stripping, clearing, and grubbing M7/8/9 and M10.
- Means and methods for dewatering (if necessary) and preparation for construction of drop-outlet structures at M7/8/9, M10 and M11.
- Phasing and methods used for creation of interior dike breaches at M7/8/9 and M10 as shown on the Plans.
- Estimated start and completion dates for all site preparation and earthwork activities.

2.4.2.4 PIPELINE AND UTILITIES CROSSING PLAN

The Contractor shall include for approval a pipeline crossing plan at each pipeline and utility crossing to be submitted to the Engineer and Owner. The plan shall contain the following at minimum:

- Emergency measures to be taken in the event of an accident
- Methodology for work that occurs within 500 feet of a utility or pipeline. Work includes, but is not limited to dredging, anchoring/spudding of dredge and auxiliary equipment and submerged dredge pipeline operations
- Estimated start and completion date for work in the vicinity of the utility or pipeline
- The utility or pipeline type/description, owner and owner contact information

2.4.2.5 HYDRAULIC FILL PLAN

The Contractor shall include its means and methods for placement and shaping of the hydraulically placed new work dredge materials to the required lines and grades shown in the Plans for each phase of work. The plan shall detail the proposed means and methods the Contractor will use to meet the minimum requirements of the work, while complying with these Technical Specifications. The plans shall include, but not necessarily be limited to, the following:

- The phasing and methodology to be used for construction of the hydraulic fill dikes including discharge pipeline placements, with sketches when applicable, and techniques to maximize use of available satisfactory material.
- Approximate channel stations and elevations between which the material to be dredged is used to construct the hydraulic fill dikes at the placement areas along with the estimated material quantities to be dredged.

- Estimated start and completion dates for construction of the hydraulic fill dikes.
- Proposed pipeline routes for the different sequencing of dredge fill placement and hydraulic fill dikes.
- A complete list of plant and equipment, with accompanying specification information to be used for the work.
- A brief outline of quality and environmental control measures to be used during hydraulic fill.
- A brief description of the proposed execution of required monitoring of the initial hydraulic fill placement. The description shall include details on how the monitoring information will be used by the Contractor to monitor and control placement of the hydraulic fill, to achieve the specified requirements to place and shape sufficient hydraulic material to the required lines and grades along the areas shown. The description shall include details and calculations to be made during the work to assess the production rate throughout the work, and a description of the format the Contractor will use to report the hydraulic fill dike construction progress during the hydraulic fill placement and shaping.
- The Contractor shall provide the estimated rate of construction per 1,000-foot section expressed as cubic yards per linear foot of dike.
- The Contractor shall include details in the Hydraulic Fill Plan regarding the proposed technique and equipment to be used to accomplish the required control of discharge. The method used to place the hydraulic fill shall maximize the use of the materials for hydraulic fill dike construction and minimize waste of satisfactory materials.

2.4.2.6 MECHANICAL FILL PLAN

For the M10 mechanically constructed dike, a Mechanical Fill Plan shall be submitted prior to the start of construction and shall include a description of the materials, equipment, construction techniques, sequences, and procedures for the mechanical excavation for dike materials, dewatering of mechanically excavated materials as needed, transport of material to fill locations, cut and fill work, estimated material quantities to be excavated and other specific information specified herein.

2.4.2.7 SHORE PROTECTION SUBMITTALS

As part of the work plan and schedule of work, the Contractor shall submit the following for review:

2.4.2.7.1 STONE WORK PLAN AND SCHEDULE

The Contractor shall submit a stone work plan and schedule that describes the equipment, stockpiling, loading and unloading, transportation, placement methods, and sequences planned to be used in stone placement. This plan shall also include quality control procedures and a list of the major pieces of equipment that are to be used for performing the stone work. This plan and schedule shall be submitted

for review prior to shipment of the stone. The Contractor shall not commence stone work until the plan and schedule have been reviewed and incorporated into the overall construction and progress schedule.

2.4.2.7.2 STONE QUALITY

Before stone is produced from a source for completion of the work under this contract, the source of stone shall be approved. Stone source documentation including certificates that demonstrate compliance with the stone quality and gradation shall be submitted a minimum of fourteen (14) days before the stone is required in the work. Approval of a stone source shall not be construed as a waiver of the right of the Port Authority to require the Contractor to furnish stone that complies as specified herein. Materials produced from localized areas, zones, or strata will be rejected when these materials do not comply as specified herein.

2.4.2.8 GEOTEXTILES SUBMITTALS

As part of the work plan and schedule of work, the Contractor shall submit its means and methods for installing geotextile fabric and shall submit at least two geotextile pins, 3-foot by 3-foot geotextile fabric samples, and a certificate of compliance for the geotextile attesting that the geotextile meets the chemical, physical, and manufacturing requirements specified herein. Engineer approval is required for all submittals.

2.4.2.9 SURVEY PLAN

As part of the work plan and schedule of work, the Contractor shall provide a written description of methods and equipment to be used for construction surveys as well as the appropriate quality control and quality assurance (QA/QC) procedures to be applied for this task. For topographic surveying, the plans shall detail the means, methods, and equipment that the Contractor proposes to use for review and approval by the Engineer. The Contractor shall prepare similar plans for hydrographic construction surveys of the dredging progress. The plans shall document an approach that is appropriate for precise hydrographic surveying in soft soils. Refer to Technical Specifications Section 4 for information regarding surveying QA/QC standards.

2.4.2.10 SEEDING AND FERTILIZING SUBMITTALS

As part of the work plan and schedule of work, the Contractor shall submit its means and methods for seeding and fertilizing including certifications of compliance for seeding and fertilizing that attests that the seed and fertilizer meet the requirements of the Technical Specifications.

2.4.2.11 DROP-OUTLET STRUCTURE CONSTRUCTION PLAN

As part of the work plan and schedule of work, the Contractor shall submit its means and methods for removal of two (2) existing drop-outlet structures at M789 and removal of two (2) existing drop-outlet structures at M10. The work plan and schedule of work shall also include means and methods for construction of one (1) new drop-outlet structures at M11, one (1) new drop-outlet structure at M789 and one (1) new drop-outlet structure at M10 to meet the requirements of the work, while complying with these Technical Specifications. The plans shall include, but not necessarily be limited to a

description of the materials, equipment, construction techniques, sequences, and procedures for borrow excavation of adjacent dikes, moisture control, and transport of materials to the placement areas and other specific information specified herein.

2.4.3 OBSTRUCTION DEMOLITION PLAN

The Contractor shall prepare and submit for approval by the Engineer, an Obstruction Demolition Plan. The Obstruction Demolition Plan under this Part is supplemental to other submittals required by the Contract. As part of the Obstruction Demolition Plan, the Contractor shall define the means and methods by which it shall perform the Work covered under this Part and develop and implement a waste management program in accordance with ASTM E 1609 and as specified. The Plan shall demonstrate how the quantity of obstructions removed or cut shall be documented, verified, and the information of same supplied to the Engineer. The Contractor shall take a pro-active, responsible role in the management of demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. The Contractor shall be responsible for instructing workers and overseeing and documenting results of the Obstruction Demolition Plan. Demolition waste includes products of demolition or removal and other materials generated during the construction process. In the management of waste, consideration shall be given to recycling, and the availability of viable markets, the condition of the material, and the ability to provide the material in suitable condition and in a quantity acceptable to available markets. The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Where required, the Contractor shall obtain necessary permits for firms and facilities used for recycling, reuse, and disposal, to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Work.

2.4.4 ENVIRONMENTAL PROTECTION PLAN

Fourteen (14) calendar days prior to the preconstruction conference, the Contractor shall submit in writing an environmental protection plan for each project conforming to the requirements of the General Conditions and these Technical Specifications. Approval of the Contractor's plans will not relieve the Contractor of its responsibility for adequate and continuing control of pollutants and other environmental protection measures. The environmental protection plans shall include, but not be limited to, the following:

- Methods for protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection (i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historic, archeological, and cultural resources).
- Procedures to be implemented to provide the required environmental protection, including best management practices (BMP) that would be utilized, to the maximum extent practicable, to

avoid project construction impacts, and to comply with the applicable laws and regulations. The Contractor shall provide written assurance that immediate corrective action will be taken to prevent pollution of the environment due to accident, natural causes, or failure to follow the procedures set out in accordance with the environmental protection plan.

- Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossing, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.
- Methods of protecting surface and ground water during construction activities.
- Descriptions of the methods and measures associated with the use and storage of fuel and hazardous materials and for the prevention of spills, including oil spills (i.e., ground cover, containment, absorbent, etc.)
- Work area plans showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. The plan should include measures for marking the limit.

The environmental protection plans shall also address specific measures and information requested to be submitted in Technical Specifications Section 5, including Sections 5.3 Air Quality and 5.4 Fish and Wildlife Resources. The Contractor shall train its personnel in the elements of the environmental protection plans.

2.4.5 SPILL CONTINGENCY PLAN

Fourteen (14) calendar days prior to the preconstruction conference, the Contractor shall provide and maintain an effective spill contingency plan, for each project, that complies with the requirements of the **General Conditions Section 3.11 Spill Prevention Plan** and these Technical Specifications and meets all applicable local, State, and Federal regulations, including but not limited to, the U.S. Environmental Protection Agency (EPA) Oil Pollution Regulations, 40 CODE OF FEDERAL REGULATIONS 112, EM 385-1-1 and other state regulations as applicable. The plan shall not only account for the release of chemicals or petroleum products hazardous to the environment but shall also monitor the placement of dredged materials during all operations. At a minimum, the Contractor's spill contingency plan shall include the following:

- 24 hour per day monitoring at disposal area during dredging operations with monitoring personnel in radio contact with the dredge
- Have on-hand the names and telephone numbers of (1) companies having portable hydraulic dredges or vacuum pumps ready to clean any misplaced dredge material released from the placement area and (2) companies having silt curtains for containing any misplaced dredge material from the placement area

- Cease dredging operations in the event of a spill
- Immediate notification of the Engineer upon the occurrence of a spill
- Submission of a clean-up plan within 24 hours to the Engineer
- Responsibility list for all clean-up operations

2.4.6 VOLATILE ORGANIC COMPOUNDS (VOC) COMPLIANCE PLAN

Contractors are required to comply with the applicable specifications of the General Conditions, as well as the local, state, and federal volatile organic compound (VOC) laws and regulations and shall have an acceptable VOC compliance plan for each project. The Contractor shall submit their VOC plans fourteen (14) days prior to the preconstruction conference. The plans shall demonstrate that the use of paints, solvents, adhesives, and cleaners comply with local VOC laws and regulations governing VOC materials, and that all required permits have been obtained or will be obtained prior to starting work involving VOCs, in the air quality district in which the work will be performed. An acceptable compliance plan shall contain, as a minimum, a listing of each materials subject to restrictions in the air quality management district in question, the rule governing its use, a description of the actions which the Contractor will take, a description of the actions which the Contractor will use to comply with the laws and regulations, and any changes in the status of compliance during the life of the Contract. Alternatively, if no materials are subject to the restrictions of the air quality management district where the work will be performed, or if there are no restrictions, the VOC compliance plan shall so state.

2.5 PRECONSTRUCTION SUBMITTALS

This section applies to the submittals required prior to commencement of the work.

2.5.1 SURVEY CONTROL CHECKS

Project control monumentation has been provided by the Engineer. The Contractor shall perform preconstruction survey control checks on the provided project control monumentation and provide the results to the Engineer. Any discrepancy from the published values shall be immediately brought to the attention of the Engineer, prior to use of the project control monumentation for work.

2.5.2 NOTIFICATION OF INTENTION TO DREDGE

2.5.2.1 USACE AND USCG

The Contractor shall notify the Galveston District Area Engineer, of the U.S. Army Corps Of Engineers, Galveston District Northern Area Office, 12000 Aerospace Avenue, Houston, TX 77034 and the U.S. Coast Guard, in writing and electronically, at least ten (10) days prior to commencement of dredging operations, the location or locations at which a dredge or dredges will be placed on the site so that a Notice to Mariners can be issued by the U.S. Coast Guard. Documentation of notice shall be submitted to the Engineer prior to the commencement of dredging.

2.5.2.2 PIPELINES AND UTILITIES

The Contractor shall notify and coordinate work with pipeline companies at least ten (10) days before performing any portion of the work near the pipelines in the vicinity of the work areas.

The following pipelines, as shown on the Plans, may be near or within the horizontal limits of work.

Table 2-1 : Pipelines Near the Project Area

Utility of Structure	Approximate Station	Reported Approximate Channel Crossing Elevation MLLW (ft)	Name and Owner Contact Info
Houston Ship Channel			
24" Crude Oil P/L	124+246.26	-99.00	Genesis Energy, LP Robert Findley 281-793-6656 robert.findley@genlp.com
(2) Abandoned Natural Gas P/Ls	114+761.52 114+761.52	Unknown Unknown	Houston Oil & Mineral Co.
16" Natural Gas P/L	112+128.37	-112.90	Williams Companies, Inc. Jerry Knight 985-798-5917 Jerry.Knight@williams.com
18" Natural Gas P/L	90+406.35	-81.20	Kinder Morgan, Inc. Oscar Zapata 713-420-4654 Oscar_Zapata@kindermorgan.com
24" Carbon Dioxide P/L	88+810.00	-92.00	Denbury, Inc. Billy Shoen 281-996-7251 billy.shoen@denbury.com
24" Natural Gas P/L	80+969.04	-83.00	Energy Transfer Partners (Florida Gas Transmission Co., LLC) Nicholas Gordon 713-989-2816 NICHOLAS.GORDON@energytransfer.com

10" Abandoned Natural Gas P/L	67+086.95	Unknown	Davis Petroleum Corporation/Yuma Kate Hubackova kateh@yumacompanies.com
8" Abandoned Natural Gas P/L	63+581.94	-50.00	Davis Petroleum Corporation/Yuma Kate Hubackova kateh@yumacompanies.com
10.75" Abandoned Natural Gas P/L	57+600.00	-55.00	Layton Energy
10" Abandoned Natural Gas P/L	18+600.56	-49.00	Davis Petroleum Corporation/Yuma Kate Hubackova kateh@yumacompanies.com
Atkinson Island Marsh Complex			
4.5" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
6.63" Natural Gas P/L	Atkinson Island	N/A	Torrent Oil LLC
6.63" Crude Oil Offshore P/L	Atkinson Island	N/A	Torrent Oil LLC
4.5" Crude Oil P/L	Atkinson Island	N/A	Torrent Oil LLC
3.5" Natural Gas FWS P/L	Atkinson Island	N/A	Torrent Oil LLC
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
6.63" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company

2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
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2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
4.5" Natural Gas FWS P/L	Atkinson Island	N/A	Davis Petroleum Corporation
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company

2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
6.63" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
4.5" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
4.5" Abandoned Crude FWS P/L	Atkinson Island	N/A	Marlin Energy Southwest GP, LLC
3.5" Natural Gas FWS P/L	Atkinson Island	N/A	Torrent Oil LLC
3.5" Crude FWS P/L	Atkinson Island	N/A	Torrent Oil LLC
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company

2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company
2.38" Natural Gas P/L	Atkinson Island	N/A	Cedar Point Oil Company

EVERY EFFORT HAS BEEN MADE TO GIVE ALL PERTINENT DETAILS ON THE LOCATION OF THE PIPELINES. THE DATA FURNISHED ON THE PLANS ARE BELIEVED TO BE SUBSTANTIALLY CORRECT. HOWEVER, THE EXACT LOCATIONS MAY VARY FROM THAT SHOWN. THEREFORE, THE CONTRACTOR SHALL COORDINATE AND COOPERATE WITH THE RESPECTIVE OWNERS TO ESTABLISH THE ACTUAL POSITION OF THE PIPELINES. THE U.S. ARMY CORPS OF ENGINEERS PERMITS OF THE RESPECTIVE PIPELINES AND PREVIOUS SURVEYS ARE AVAILABLE IN THE HOUSTON AREA OFFICE.

THE FOLLOWING IS FURNISHED FOR INFORMATION PURPOSES FOR VERIFYING PIPELINE OWNERSHIPS:

- Texas811 1-800-344-8377

2.6 CONSTRUCTION SUBMITTALS AND NOTICES

This section applies to the submittals required immediately before and during construction.

2.6.1 NOTIFICATION PRIOR TO COMMENCEMENT OF SURVEYING FOR MEASUREMENT AND PAYMENT AND FINAL ACCEPTANCE

The Port Authority shall conduct all BD, interim AD surveys, and final acceptance surveys for measurement and payment and acceptance within the dredge areas

The Contractor shall conduct all other surveys as outlined in Technical Specifications Section 4. The Contractor shall notify the Engineer in writing at least three (3) days prior to the commencement of surveying activities for measurement and payment so that the Engineer may have the opportunity to accompany the survey crew and witness the surveying activities. Surveys for interim measurement and payment shall be conducted in the presence of the Engineer.

2.6.2 PRE-DREDGE HAZARD AND PIPELINE SURVEY

The Contractor shall submit the results of their pre-dredge hazard and pipeline survey (see Technical Specifications Section 4 Subsection 4.8 **Error! Reference source not found.**) to the Engineer a minimum of fourteen (14) days before commencement of work. Submittals shall include hard copy plan-view

drawings as well as electronic copies of the drawings (in both .DWG and .PDF format), all field notes, and the final data set. Electronic submittals shall be provided on CD or DVD.

All survey data shall be referenced to the project datum as shown in these Technical Specifications and Plans. The pre-dredge hazard and pipeline survey plots shall be signed and sealed in accordance with Technical Specifications Section 4 Subsection 4.3.1 and shall legibly and clearly display the following information:

- Project name
- Contractor's name
- RPLS or PE seal, signature, and business affiliation
- Date(s) surveys were performed
- Layout of work including locations and descriptions of survey control
- Vertical and horizontal datums
- Sheet names and numbers
- Drawing scale(s)
- Possible anomalies and/or possible pipelines or utilities

Results of the pre-dredge hazard and pipeline survey shall include a summary of findings, interpretation of any located anomalies and considerations for dredging, staging and anchoring of equipment and laying of submerged pipeline.

2.6.3 BARGE DISPLACEMENT TABLES

The Contractor shall submit barge displacement tables required for stone measurement as outlined in Technical Specifications Section 3 Subsection 3.5.2.

2.6.4 DAILY QUALITY CONTROL REPORTS

The Contractor shall supply daily quality control reports to document construction progress and ensure compliance with Contract Documents for each project under this Contract. The daily quality control reports shall start on the first day after date of acknowledgement of Notice to Proceed and end on the last day of demobilization for each project and shall be furnished to the Engineer by 2:00 PM the following day. The daily quality control report shall be filled out every day, regardless of whether any portion of the work is accomplished and regardless of whether requested by the Engineer.

All compliance and quality control inspections will be recorded on the daily quality control reports for each project including, but not limited to, the specific items required in each technical section of the

Contract Documents. Daily quality control reports shall include a description of the work completed each day including, but not limited to, the operating hours of equipment and personnel, estimated quantity of material dredged and placed, surveys conducted, water quality tests conducted if required, shoreline protection installation progress, stone tests, drop-outlet structure installation progress, weather observed, times and reasons for work stoppages and/or delays, any permit related issues or problems in compliance with the permit or other laws, corrective actions taken, and personnel and visitors on site. Copies of the dredge logs or leverman's logs, fueling and maintenance logs for the dredge and boosters as applicable, and barge displacement measurement logs as applicable shall be included with the daily quality control report. Additional components of the daily quality control report are described in the following subsections.

The daily quality control report shall be in the approved format (see Technical Specifications Section 2 Subsection 2.3.3.1) and shall include the approved retention rate spreadsheet for reporting fill progress (see Technical Specifications Section 2 Subsection 2.3.3.2).

Failure to provide daily quality control reports to the Engineer shall result in delay of payments to the Contractor until the daily quality control reports are received.

2.6.4.1 REPORT OF ENVIRONMENTAL ISSUES

The Contractor shall submit, as specified, logs and final summary report of sightings and incidents with endangered species and other environmental issues. Environmental issues shall be submitted with the daily quality control report.

2.6.4.2 MATERIAL TRANSPORTATION AND DISPOSAL FEES

Logs or records, including receipts or tickets, for material transportation, disposal fees, and the like shall be provided with the daily quality control report.

2.6.4.3 DIKE FILL PROGRESS

The daily quality control report shall include a description of the control of discharge and a discussion of prior and ongoing placement activities during the previous 24 hours, to include the items specified below:

- Date
- Station and offset boundaries of dredging for the last 24 hours
- Gross and credited dredging quantity for the last 24 hours
- Gross and credited dredging quantity to date
- Placement of dike fill:

- Stripping, clearing and grubbing of the existing dike templates is performed prior to dike rehabilitation;
- Construction to lines and grades shown
- Misplaced materials - monitoring and removal if required
- Linear footage of dike constructed, quantity of satisfactory material utilized, and estimated quantity of remaining satisfactory material required for dike construction
- Drainage of ponded water, as required between hydraulically placed fill and dikes
- End stations/locations of initial placement and final shaping and grading for the last 24 hours
- End stations/locations of initial placement and final shaping and grading to date
- Dewatering of mechanically excavated materials for M10 dike construction
- Control of discharge and other comments

The Contractor shall use the approved retention rate spreadsheet to report fill progress (see Technical Specifications Section 2 Subsection 2.3.3.2).

2.6.4.4 MONITORING OF DIKE FILL

Monitoring of the dike fill shall be made based on Contractor quality control cross section surveys, taken as specified herein. Quantity calculations required for completing the retention rate spreadsheet shall be made for each 24-hour period. The required report information and entries to the spreadsheet shall be recorded daily. In areas where surveys indicate the quantity of material within the dike template is less than the amount required to construct the required dike template, the Contractor shall place additional material and perform additional surveys to verify the material quantity is within the specified tolerance and a note of this shall be made on the daily quality control report. Placing additional material is at the Contractor's expense.

2.6.4.5 SHORE PROTECTION INSTALLATION PROGRESS

A copy of the records of daily inspections, tests, surveys, and corrective actions taken shall be submitted as part of the daily quality control report. The report shall include a description of the stone placement and a discussion of prior and ongoing placement activities during the previous 24 hours including the quantity of each stone material placed to date for each site.

2.6.4.6 DREDGE DATA

A dredge data spreadsheet shall be set up in Microsoft Excel 2003 or later, with appropriate column headings as required for dredge data monitoring and reporting as outlined in the US Army Corps of Engineers National Dredge Quality Management (DQM) Program. The intent is to provide the same

dredge monitoring data as required by the DQM in an Excel format to the Port Authority. The DQM Specifications can be found on the US Army Corps of Engineers website <https://dqm.usace.army.mil/Default.aspx>. The Contractor shall reference the following DQM Specifications as applicable for the Work described within these Technical Specifications:

- Section 35 20 23.33 for Pipeline Hydraulic Dredge
- Section 35 20 23.23 for Hopper Dredge
- Section 35 20 23.13 for Scow – Monitoring Profile

A copy of the dredge data spreadsheet shall be submitted along with the quality control plan no later than fourteen (14) days within award of the Contract for approval.

2.6.5 SUBMITTAL OF REPORTS

Daily quality control reports shall be submitted in both hard copy and electronic form as directed. A copy of the completed retention rate spreadsheet shall be attached to the daily quality control report on the Thursday of each week, or as directed. Additionally, on the Thursday of each week or as often as directed, the Contractor shall send the retention rate spreadsheet to an email distribution list that will be provided at the preconstruction conference.

2.6.6 SURVEY SUBMITTALS

The Contractor shall provide daily to the Engineer, all survey data collected by the Contractor during its performance of the work including daily dredging and topographic surveys, volumes placed and retained (as part of the daily quality control report), quantity of geotextile, stone installed, and survey plots. Surveys shall be conducted in accordance with Section 4 of the Technical Specifications. In addition, the Contractor shall furnish the copies of all field notes and all other records relating to the survey or to the layout of the work to the Engineer. The Contractor shall retain copies of all such material furnished to the Engineer. Survey submittals shall be submitted electronically in accordance with these Technical Specifications.

2.6.6.1 SURVEY PLOTS

All surveys shall be in the form of plan-view and cross-section plots every 50 feet unless stated otherwise within the Contract Documents. The graphical format shall consist of cross sections at scales not smaller than 1-inch equals 50 feet Horizontal and 1-inch equals 10 feet Vertical so that each section can be presented on 8-1/2 by 11-inch paper. Plots shall be prepared in AutoCAD (no later than Version 2017 software). All survey data shall be referenced to the Project datum as shown in these Technical Specifications and Plans. All plots shall legibly and clearly display the following information:

- Project name
- Name of party responsible for survey
 - Surveys submitted by the Contractor shall have the Contractor's name displayed.

- Surveys by the Port Authority shall have the name of the responsible Engineer or Surveyor displayed in addition to the Port Authority.
- RPLS or PE seal, signature, and business affiliation (where applicable)
- Date(s) surveys were performed
- Layout of work including locations and descriptions of survey control
- Vertical and horizontal datums
- Sheet names and numbers
- Drawing scale(s)

All survey plots shall comprise a well-organized, stand-alone set of drawings that do not include any outdated or superseded information that may have been previously submitted. Plots for the dredge, fill and shore protection installation areas shall include the following:

- Plan sheets clearly documenting locations, limits, and dimensions of completed work and locations where cross sections were taken.
- Cross-sections providing an overlay of initial and final survey transects superimposed with specified templates and tolerances. Drawing scales shall be such that the cross sections and templates are clearly discernible.
- As work progresses, plots documenting completed work shall be submitted with requests for progress payments. In addition, upon completion of all work, a final, complete set of survey plots shall be submitted to document “as-built” conditions of the work. This final submittal shall be a comprehensive, stand-alone set of drawings, not an assembly of individual drawings that were previously submitted with progress pay requests.

2.6.6.2 ELECTRONIC SURVEY SUBMITTALS

In addition to plots, all survey transmittals shall include digital data on a labeled removable media device such as a USB flash drive, CD or DVD. Electronic submittal via email and/or an online file transfer service shall be allowed subject to approval by the Engineer. Digital data shall include the following:

- A submittal log documenting surveys submitted to date with descriptors for survey dates and locations
- Survey plots in AutoCAD format
- Survey plots in PDF format

- ASCII files containing northing, easting, elevation, and descriptor for each survey point both raw and corrected data points
- All survey field notes

2.6.7 DROP-OUTLET STRUCTURE SUBMITTALS

2.6.7.1 SHOP DRAWINGS

The Contractor shall submit for approval by the Engineer, the following Shop Drawings at a minimum:

Structure
Steel Railings and Handrails
Grating
Steel Drainage Pipes

The detail drawings shall include all fixings, including but not limited to bolts, screws, clips, length and type of welds and welding procedure specifications to be used at each weld location.

2.6.7.2 MATERIALS

Certificates of compliance from suppliers which demonstrate compliance with the applicable specification shall be submitted for structural steel, effluent pipes, lumber, lumber treatment, paint and galvanizing.

2.6.7.3 BEST MANAGEMENT PRACTICES FOR TREATED WOOD

The producer of the treated wood products shall provide certification that WWPI 08, Best Management practices (BMP) for the use of Treated Wood in Aquatic Environments were utilized, including a written description and appropriate documentation of the BMP used.

2.7 POST CONSTRUCTION SUBMITTALS AND NOTICES

2.7.1 RECORD DRAWINGS

The Contractor shall maintain, on a separate set of the Plans, a record of all changes made during construction. The Contractor shall be responsible for keeping these records and neatly noting with colored pencil or ink all changes. These "Record Drawings" shall be turned over to the Engineer at the completion of the project. Final payment will not be made until "Record Drawings" have been received and accepted by the Engineer.

2.7.2 POST-DREDGE PIPELINE SURVEY

The Contractor shall submit the results of their post-dredge pipeline survey (see Technical Specifications Section 4 Section 4.8) to the Engineer before final payment for demobilization can be made. Submittals shall include hard copy plan-view drawings as well as electronic copies of the drawings (in both .DWG

and .PDF format), all field notes, and the final data set. Electronic submittals shall be provided on CD or DVD.

All survey data shall be referenced to the project datum as shown in these Technical Specifications and Plans. The post-dredge hazard survey plots shall be signed and sealed in accordance with Technical Specifications Section 4 Subsection 4.3.1 and shall legibly and clearly display the following information:

- Project name
- Contractor's name
- RPLS or PE seal, signature, and business affiliation
- Date(s) surveys were performed
- Layout of work including locations and descriptions of survey control
- Vertical and horizontal datums
- Sheet names and numbers
- Drawing scale(s)
- Possible anomalies and/or possible pipelines or equipment left by the Contractor

Any submerged pipelines or other Contractor equipment must be removed before final payment for demobilization can be made.

2.7.3 OBSTRUCTION DEMOLITION SURVEY

The Contractor shall submit the results of their obstruction demolition survey (see Technical Specifications Section 4 Section 4.13) to the Engineer before final payment for HSC Existing Structure Demolition/Removal can be made. Submittals shall include hard copy plan-view drawings as well as electronic copies of the drawings (in both .DWG and .PDF format), all field notes, and the final data set. Electronic submittals shall be provided on CD or DVD.

All survey data shall be referenced to the project datum as shown in these Technical Specifications and Plans. The obstruction demolition survey plots shall be signed and sealed in accordance with Technical Specifications Section 4 Subsection 4.3.1 and shall legibly and clearly display the following information:

- Project name
- Contractor's name
- RPLS or PE seal, signature, and business affiliation

- Date(s) surveys were performed
- Layout of work including locations and descriptions of survey control
- Vertical and horizontal datums
- Sheet names and numbers
- Drawing scale(s)
- Possible piles, debris, equipment or other obstructions left by the Contractor

Any submerged piles or obstructions left above the post-project seabed or Contractor equipment must be removed before final payment for HSC Existing Structure Demolition/Removal can be made.

2.7.4 FINAL SUBMITTALS

At the time of Contractor's request for final acceptance, the Contractor shall provide to the Engineer the following material, which the Contractor shall have accumulated and retained during the course of work:

- Final "as-built" construction drawings, provided in both PDF and AutoCAD 2017 or earlier formats, showing at minimum the following information:
 - All information shown on the Plans and a record of all completed work, deviations, modifications, or changes from those drawings, however minor, which may have been incorporated into the work.
 - Before and after dredging channel section surveys.
 - Plan plot of dredge area, including gross and net yards dredged distinguished by dates of dredging and reach of channel dredged.
 - Plan plots of disposal locations used, including gross yardage and tonnage of rock placed at each site
 - Period of disposal placement for each disposal site utilized.
 - Dredge discharge pipeline locations (discharge coordinates).
 - Dredge pipeline crossing corridors, including gross yards excavated (if performed)
 - Access corridors utilized, including notation of floatation dredging and disposal (if floatation excavation is performed).
 - Vertical control utilized including any applicable conversions.

- Plan plot of required disposal area surveys covering the full extent of material placed within each disposal site used.
- Utility locations as verified by owners, including station, C/L and/or edge of cut XY-coordinates, and minimum elevations
- XY-coordinates of drop-outlet structures constructed
- One set of all Project submittals and any equipment and material warranties/guarantees as provided by all appropriate suppliers or manufacturers.
- One set of “Record Drawings” showing all revisions to the original Contract Documents. Drawings shall also show routing of underground outside utilities and conduits with actual dimensions from buildings or other known landmarks where applicable.
- Any and all other documents, keys, manuals, etc. required by the Contract Documents.

2.7.5 APPLICATION FOR FINAL PAYMENT

After the Contractor has completed corrections as mutually agreeable to the Engineer and Contractor and has delivered any required daily quality control reports, hydrographic or topographic construction surveys, water quality reports if required, data requests, guarantees, bonds, certificates of inspection, marked-up record documents, or other documents as required, and has completed demobilization, the Contractor may submit the application for final payment to the Engineer for submittal to the Port Authority.

END OF SECTION

3 MEASUREMENT AND PAYMENT

The following sections encompass the bid items required for the work covered by the Contract price.

3.1 LUMP SUM PAYMENT ITEMS

3.1.1 MOBILIZATION AND DEMOBILIZATION – NEW WORK HYDRAULIC DREDGING

3.1.1.1 GENERAL

Mobilization and demobilization shall include the costs in connection with mobilization and demobilization of the plant necessary to perform work under the various bid items for hydraulic dredging and placement. The Contract price shall include transportation and other costs incidental to delivery of the plant and other equipment, and pipelines, to the general work area in condition ready for safe operations and, after the completion of the work, for removal of the plant and equipment from the work sites.

The Port Authority may require the Contractor to furnish cost data to justify this portion of the bid if the Port Authority believes that the Contractor's bid for this item does not bear a reasonable relationship to the cost of the work in this Contract. Failure to justify such price to the satisfaction of the Port Authority will result in a payment determined by the Port Authority.

3.1.1.2 MEASUREMENT

This shall not be measured for payment.

3.1.1.3 PAYMENT

Payment for mobilization and demobilization shall be made in accordance with **Section 9 Payment for Mobilization and Demobilization of the Special Conditions.**

3.1.2 GORINI MARSH CIRCULATION CHANNEL

3.1.2.1 GENERAL

This item shall include the costs necessary to excavate and restore circulation to the Gorini Marsh as indicated on the Plans and specified in Technical Specifications Section 6 Subsection 6.2.3.

3.1.2.2 MEASUREMENT

Measurement for Gorini Marsh Circulation Channel shall be made for the completed circulation channel meeting the minimum lines and grades as shown in the Plans and within these Technical Specifications.

3.1.2.3 PAYMENT

Payment shall be made at the Contract lump sum. No progress payments shall be made for Gorini Marsh Circulation Channel.

3.2 UNIT PRICE PAYMENT ITEMS

3.2.1 NEW WORK HYDRAULIC DREDGING – HSC STATIONS 15+500 TO -0+003.94 TO M10

3.2.1.1 GENERAL

This item shall mean the Contract unit price for new work dredging between HSC Stations 15+500 to -0+003.94 and HSC Bayou Stations 00+00 to 27+48.18 (channel widening and bend easing) and relocation of the existing barge lanes outside the channel as shown on the Plans, with materials used to construct M10 hydraulic fill dike as specified in Section 6 and 7 of the Technical Specifications.

3.2.1.2 MEASUREMENT

This item shall be measured for payment by cubic yard of in-place material removed within the lines and grades of the prescribed templates as shown on the Plans and measured by Before Dredge (BD) and After Dredge (AD) survey comparison in accordance with Section 4 of the Technical Specifications. The channel dredging shall be measured by reaches in accordance with Table 6-2: HSC Acceptance Sections.

3.2.1.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.2 NEW WORK HYDRAULIC DREDGING – HSC STATIONS 15+500 TO -0+003.94 TO M11

3.2.2.1 GENERAL

This item shall mean the Contract unit price for new work dredging between HSC Stations 15+500 to -0+003.94 and HSC Bayou Stations 00+00 to 27+48.18 (channel widening and bend easing) and relocation of the existing barge lanes outside the channel as shown on the Plans, with materials used to construct M11 hydraulic fill dike as specified in Section 6 and 7 of the Technical Specifications.

3.2.2.2 MEASUREMENT

This item shall be measured for payment by cubic yard of in-place material removed within the lines and grades of the prescribed templates as shown on the Plans and measured by BD and AD survey comparison in accordance with Section 4 of the Technical Specifications. The channel dredging shall be measured by reaches in accordance with Table 6-2: HSC Acceptance Sections.

3.2.2.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.3 NEW WORK HYDRAULIC DREDGING - HSC STATIONS 15+500 TO -0+003.94 TO M7/8/9

3.2.3.1 GENERAL

This item shall mean the Contract unit price for new work dredging between HSC Stations 15+500 to -0+003.94 and HSC Bayou Station 00+00 to 27+48.18 (channel widening) and relocation of the existing barge lanes outside the channel as shown on the Plans, with materials used to rehabilitate M7/8/9 dike with hydraulic fill as specified in Section 6 and 7 of the Technical Specifications.

3.2.3.2 MEASUREMENT

This item shall be measured for payment by cubic yard of in-place material removed within the lines and grades of the prescribed templates as shown on the Plans and measured by BD and AD survey comparison in accordance with Section 4 of the Technical Specifications. The channel dredging shall be measured by reaches in accordance with Table 6-2: HSC Acceptance Sections.

3.2.3.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.4 FINAL SHAPING AND GRADING - M10 HYDRAULIC FILL DIKE

3.2.4.1 GENERAL

The Contract price per linear foot of final shaping and grading of M10 perimeter dike shall include constructing and maintaining hydraulic fill, including placing and compacting fill material, erosion control, final shaping and grading of material and any other related work for constructing M10 perimeter dike as specified in Section 7 of the Technical Specifications.

3.2.4.2 MEASUREMENT

Final shaping and grading shall be measured for payment at the Contract unit price per linear foot for "Final Shaping and Grading - M10 Hydraulic Fill Dike" meeting the required lines and grades shown on the Plans. Material placed shall be measured along the centerline of the new dike to include completed dike that meets specified acceptance requirements as verified by before and after placement surveys.

3.2.4.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.5 FINAL SHAPING AND GRADING - M11 HYDRAULIC FILL DIKE

3.2.5.1 GENERAL

The Contract price per linear foot of final shaping and grading of M11 perimeter dike shall include constructing and maintaining hydraulic fill, including placing and compacting fill material, erosion control, final shaping and grading of material and any other related work for constructing M11 perimeter dike as specified in Section 7 of the Technical Specifications.

3.2.5.2 MEASUREMENT

Final shaping and grading shall be measured for payment at the Contract unit price per linear foot for "Final Shaping and Grading - M11 Hydraulic Fill Dike" meeting the required lines and grades shown on the Plans. Material placed shall be measured along the centerline of the new dike to include completed dike that meets specified acceptance requirements as verified by before and after placement surveys.

3.2.5.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.6 FINAL SHAPING AND GRADING - M7/8/9 HYDRAULIC FILL DIKE

3.2.6.1 GENERAL

The Contract price per linear foot of final shaping and grading of M7/8/9 perimeter dike rehabilitation shall include constructing and maintaining hydraulic fill, including placing and compacting fill material, erosion control, final shaping and grading of material and any other related work for rehabilitating and constructing M7/8/9 perimeter dike as specified in Section 7 of the Technical Specifications.

3.2.6.2 MEASUREMENT

Final shaping and grading shall be measured for payment at the Contract unit price per linear foot for "Final Shaping and Grading - M7/8/9 Hydraulic Fill Dike" meeting the required lines and grades shown on the Plans. Material placed shall be measured along the centerline of the new dike to include completed dike that meets specified acceptance requirements as verified by before and after placement surveys.

3.2.6.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.7 FINAL SHAPING AND GRADING - M10 MECHANICAL FILL DIKE

3.2.7.1 GENERAL

The Contract price per linear foot of final shaping and grading of M10 perimeter dike rehabilitation shall include constructing and maintaining mechanical fill, including excavating of borrow materials, placing and compacting fill material, erosion control, final shaping and grading of material and any other related work for rehabilitating and constructing M10 perimeter dike as specified in Section 7 of the Technical Specifications.

3.2.7.2 MEASUREMENT

Final shaping and grading shall be measured for payment at the Contract unit price per linear foot for "Final Shaping and Grading - M10 Mechanical Fill Dike" meeting the required lines and grades shown on the Plans. Material placed shall be measured along the centerline of the new dike to include completed dike that meets specified acceptance requirements as verified by before and after placement surveys.

3.2.7.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.8 SHORE PROTECTION - M11

3.2.8.1 GENERAL

The Contract unit price per ton of shore protection placed shall include placement of stone shore protection and geotextile fabric at the placement area. The costs for sampling and testing of stone shall be included in the applicable contract unit price for Shore Protection - M11.

3.2.8.2 MEASUREMENT

Shore protection as shown shall be measured by the short ton placed for payment by truck weight tickets or the barge displacement method, see Technical Specification Section 3.4 "Stone Measurement". Where a loss of material due to removing, stockpiling, relocating, re-installing or hauling is possible, the Engineer shall have the discretion to require re-measurement prior to placement. Each truck or barge load shall only be comprised of one type of stone gradation.

Geotextiles will not be measured for payment but shall be considered incidental to the cost per ton of stone.

3.2.8.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.9 SHORE PROTECTION – M10

3.2.9.1 GENERAL

The Contract unit price per ton of shore protection placed shall include placement of stone shore protection and geotextile fabric at the placement area. The costs for sampling and testing of stone shall be included in the applicable contract unit price for Shore Protection - M10.

3.2.9.2 MEASUREMENT

Shore protection as shown shall be measured by the short ton placed for payment by truck weight tickets or the barge displacement method, see Technical Specification Section 3.4 “Stone Measurement”. Where a loss of material due to removing, stockpiling, relocating, re-installing or hauling is possible, the Engineer shall have the discretion to require re-measurement prior to placement. Each truck or barge load shall only be comprised of one type of stone gradation.

Geotextiles will not be measured for payment but shall be considered incidental to the cost per ton of stone.

3.2.9.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.10 SHORE PROTECTION – M7/8/9

3.2.10.1 GENERAL

The Contract unit price per ton of shore protection placed shall include placement of stone shore protection and geotextile fabric at the placement area. The costs for sampling and testing of stone shall be included in the applicable contract unit price for Shore Protection – M7/8/9.

3.2.10.2 MEASUREMENT

Shore protection as shown shall be measured by the short ton placed for payment by truck weight tickets or the barge displacement method, see Technical Specification Section 3.4 “Stone Measurement”. Where a loss of material due to removing, stockpiling, relocating, re-installing or hauling is possible, the Engineer shall have the discretion to require re-measurement prior to placement. Each truck or barge load shall only be comprised of one type of stone gradation.

Geotextiles will not be measured for payment but shall be considered incidental to the cost per ton of stone.

3.2.10.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.11 EXISTING DROP-OUTLET STRUCTURE REMOVAL

3.2.11.1 GENERAL

The Contract price per each removed drop-outlet structure shall include all plant, labor, equipment and any other related work for removing the existing drop-outlet structures as specified in Section 7 Subsection 7.4.3.2 of these Technical Specifications. Costs for removal from the site and disposal of removed materials from M789 and M10 shall be incidental to the cost of the Work. No separate measurement or payment shall be made for removal and disposal of materials from the site.

3.2.11.2 MEASUREMENT

Measurement for existing drop-outlet structure removal from M789 and M10 shall be made per each drop-outlet structure removed in accordance with the specifications.

3.2.11.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.12 NEW DROP-OUTLET STRUCTURE – M11

3.2.12.1 GENERAL

The Contract price per completed drop-outlet structure installed at M11 shall include all plant, labor, material, equipment and any other related work for constructing one (1) new drop-outlet structures at M11 as specified in Section 10 of the Technical Specifications.

3.2.12.2 MEASUREMENT

Measurement for drop-outlet structures at M11 shall be made per each installed drop-outlet structure in accordance with the specifications.

3.2.12.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.13 NEW DROP-OUTLET STRUCTURE – M10

3.2.13.1 GENERAL

The Contract price per completed drop-outlet structure installed at M10 shall include all plant, labor, material, equipment and any other related work for constructing one (1) new drop-outlet structures at M10 as specified in Section 10 of the Technical Specifications.

3.2.13.2 MEASUREMENT

Measurement for drop-outlet structures at M10 shall be made per each installed drop-outlet structure in accordance with the specifications.

3.2.13.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.14 NEW DROP-OUTLET STRUCTURE – M7/8/9

3.2.14.1 GENERAL

The Contract price per completed drop-outlet structure installed at M7/8/9 shall include all plant, labor, material, equipment and any other related work for constructing one (1) new drop-outlet structures at M7/8/9 as specified in Section 10 of the Technical Specifications.

3.2.14.2 MEASUREMENT

Measurement for drop-outlet structures at M7/8/9 shall be made per each installed drop-outlet structure in accordance with the specifications.

3.2.14.3 PAYMENT

Payment shall be made at the Contract unit price. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance of this item.

3.2.15 SEEDING AND FERTILIZING – M11 DIKES

3.2.15.1 GENERAL

The Contract price per acre for this work shall include seeding and fertilizing of the dike crown and interior and exterior slopes, as specified in Section 9 of the Technical Specifications.

3.2.15.2 MEASUREMENT

This item shall be measured by the acreage of dike seeded and fertilized, and exhibiting growth at a period of thirty (30) to forty-five (45) days in accordance with Part 9 of the Technical Specifications.

3.2.15.3 PAYMENT

Payment shall be made at the Contract unit price per acre of dike seeded and fertilized and accepted by the Engineer.

3.2.16 SEEDING AND FERTILIZING – M10 DIKES

3.2.16.1 GENERAL

The Contract price per acre for this work shall include seeding and fertilizing of the dike crown and interior and exterior slopes, as specified in Section 4 of these Technical Specifications.

3.2.16.2 MEASUREMENT

This item shall be measured by the acreage of dike seeded and fertilized, and exhibiting growth at a period of thirty (30) to forty-five (45) days in accordance with Section 9 of these Technical Specifications.

3.2.16.3 PAYMENT

Payment shall be made at the Contract unit price per acre of dike seeded and fertilized and accepted by the Engineer.

3.2.17 SEEDING AND FERTILIZING – M7/8/9 DIKES

3.2.17.1 GENERAL

The Contract price per acre for this work shall include seeding and fertilizing of the dike crown and interior and exterior slopes, as specified in Section 9 of these Technical Specifications.

3.2.17.2 MEASUREMENT

This item shall be measured by the acreage of dike seeded and fertilized, and exhibiting growth at a period of thirty (30) to forty-five (45) days in accordance with Section 9 of these Technical Specifications.

3.2.17.3 PAYMENT

Payment shall be made at the Contract unit price per acre of dike seeded and fertilized and accepted by the Engineer.

3.2.18 HYDRAULIC DREDGING STANDBY TIME

3.2.18.1 GENERAL

The Contract unit price per hour for hydraulic dredging standby time shall include the costs due to work stoppages as directed by the Port Authority.

During the standby period, the Contractor shall man the total dredge plant with necessary crew to return to productive dredging upon authorization from the Port Authority, as well as to ascertain the security of the plant and to maintain the operations of those systems of the plant that are essentially required to be operated. During periods of standby, the Contractor shall maintain lookouts and radio communications as required in Technical Specifications Section 1 Subsection 1.12.4. When in standby status, the total dredge plant or portion thereof shall not be moved from the approved location of standby unless directed. Standby time shall be monitored closely and entered separately on the daily dredge reports which are part of the quality control system. The report shall indicate chargeable standby time for the day and cumulative standby time.

3.2.18.2 MEASUREMENT

Standby Time shall be measured and paid for to the nearest 10 minutes at the rate specified for this bid item. The total amount of chargeable standby incurred for each day shall be annotated on the Contractor's daily report and is subject to verification by the Port Authority and/or Engineer.

3.2.18.3 PAYMENT

Payment for standby time shall be made at the Contract unit price per hour for Hydraulic Dredging Standby Time, which will include the standby hours required per the direction of the Port Authority. No separate payment shall be made for standby or down time incurred while dredging without authorization from the Port Authority. Delay time for ancillary maintenance or repairs beyond the necessary time to alleviate the delay as determined by the Port Authority shall not be included. Nor shall the necessary time to perform the work as described in Section 10 of these Technical Specifications be included, if required.

3.3 OPTION 1

3.3.1 MAINTENANCE DREDGING – PIPELINE MANAGEMENT TO PA15

3.3.1.1 GENERAL

Pipeline management to PA15 will include the costs in connection with laying, removing and handling of pipelines, maintenance of pipelines during construction, final cleanup of pipeline routes and any other related work for the HSC maintenance work. Pipelines include submerged pipelines, floating pipelines, HDPE pipelines, shore pipelines, risers and any additional type of pipeline used in the hydraulic discharge of material process.

3.3.1.2 MEASUREMENT

This shall be measured by Lump Sum.

3.3.1.3 PAYMENT

Payment will be made at the Contract price as follows:

1. Up to 60% will be available for payment after commencement of dredging operations.
2. The remaining 40% will be paid upon completion of final cleanup of all pipeline routes as confirmed by the required post-dredge pipeline survey in accordance with Technical Specifications Section 4 Subsection 4.9.

3.3.2 MAINTENANCE DREDGING – HSC STATIONS 15+500 TO -0+003.94

3.3.2.1 GENERAL

This item shall mean the Contract unit price for maintenance dredging between HSC Stations 15+500 to -0+003.94 as shown on the Plans, and shall include the removal and placement of the material as specified in Section 6 of these Technical Specifications.

3.3.2.2 MEASUREMENT

This item shall be measured for payment by cubic yard of in-place material removed within the lines and grades of the prescribed templates as shown on the Plans and measured by BD and AD survey comparison in accordance with Section 4 of these Technical Specifications.

3.3.2.3 PAYMENT

Payment shall be made at the Contract unit price. Payment will not be made for material taken from beyond the limits as shown in the Plans. Progress payments shall be made in accordance with the Special Conditions based upon actual quantity of work performed less 5% retainage by the Port Authority per monthly estimate for Contract payment until final acceptance.

3.4 OPTION 2

3.4.1 HSC EXISTING STRUCTURE REMOVAL MOBILIZATION AND DEMOBILIZATION

3.4.1.1 GENERAL

The Contract fixed price for mobilization shall include the costs in connection with mobilization of the plant necessary to perform Work defined in Technical Specification Section 10, HSC Existing Structure Demolition/Removal. The Contract price shall include transportation and other costs incidental to delivery of the plant and other equipment to the general work area in condition ready for operation.

Demobilization shall include the costs in connection with demobilization of the plant utilized to perform Work under this item. The Contract price shall include transportation and other costs incidental to removal of the plant and equipment from the work areas.

The Port Authority may require the Contractor to furnish cost data to justify this portion of the bid if the Port Authority believes that the Contractor's bid for this item does not bear a reasonable relationship to the cost of the work in this Contract. Failure to justify such price to the satisfaction of the Port Authority shall result in a payment determined by the Port Authority.

3.4.1.2 MEASUREMENT

This item shall not be measured for payment.

3.4.1.3 PAYMENT

Payment for mobilization and demobilization shall be made in accordance with Section 9 Payment for Mobilization and Demobilization of the Special Conditions.

3.4.2 HSC EXISTING STRUCTURE DEMOLITION/REMOVAL

3.4.2.1 GENERAL

The Contract price for HSC Existing Structure Demolition/Removal shall include all costs associated with removal of the existing structure(s) to widen the HSC to the design lines and grades shown on the Plans. Costs for removal from the work areas and disposal of removed material/debris from the HSC shall be incidental to the cost of the Work. No separate measurement or payment shall be made for removal and disposal of materials and debris from the work areas.

No separate measurement or payment shall be made for removal and disposal of additional debris encountered and removed during the course of the Work after acceptance of this pay item has been mutually agreed upon between the PHA and Contractor.

3.4.2.2 MEASUREMENT

HSC Existing Structure Demolition/Removal shall be measured and paid for to the nearest half day at the rate specified for this bid item.

3.4.2.3 PAYMENT

Payment for this item shall be made at the Contract unit price per day of demolition. No progress payments shall be made.

3.5 STONE MEASUREMENT

3.5.1 TRUCK WEIGHT TICKET METHOD

Stone shall be measured in short tons of 2,000 pounds each. Truck weight tickets from a certified scale will be accepted for determination of the weight of material placed in the finished section. To determine the load, measurements will be taken before each truck is loaded and directly after it is loaded with acceptable material.

3.5.2 BARGE DISPLACEMENT METHOD

Stone shall be measured in short tons of 2,000 pounds each. Barge displacement measurements will be accepted for determination of the weight of material placed in the finished section. The barge shall be gauged at a protected location near the site as approved. Each barge shall be fitted by the Contractor, at Contractor's expense, with gages graduated either to inches or tenths of a foot, located either inside or outside of the hull, as directed, and attached solidly to the hull. These gages shall be located near each end of the vessel on opposite sides with two (2) additional gages amid ship. If located inside the hull, provision shall be made for the free passage of the outside water to a transparent tube placed, or capable of being placed, in contact with the gage. If located outside upon wooden hulls, the gages shall be protected by solid fenders or recessed into the planking, or if upon steel hulls, the gage marks may be placed directly on the plates and identified by punch marks. Gages shall be placed so that their zeros are below water when the vessel is in its normal trim, light, and free from water. In lieu of the gages in the interior of the barge, the Contractor may, at Contractor's discretion, provide an equal number of wells for determining the amount of the load. Wells shall be located as specified for interior gages and shall be constructed as approved.

Forward and Aft Displacements due to load, shall not differ more than 10% from their mean for the determination of tonnage of each barge load of stone ready for placement. In determining the tonnage of a cargo, the change in gage readings due to discharge of the cargo will be used.

The barges shall be fitted for the work sufficiently ahead of time to enable the Engineer to measure them accurately before work is started. The Contractor shall be required, at Contractor's expense, to

take the necessary measurements to prepare the barge displacement tables. The Contractor shall pump the water from the barges when so directed, but no pumping of a barge shall be done between the time it is gauged loaded and light to determine the amount of a barge load.

Repairs or additions made to the barges during the progress of the work shall be promptly reported to the Engineer. During the progress of the work, when the Engineer deems it advisable or necessary, each barge shall be re-measured at the expense of the Contractor and under the supervision of the Engineer. No barge shall be used that is not in a seaworthy condition or that leaks excessively. The barges used shall be so constructed that when loaded they do not bend or warp, making the gages unreliable.

To determine the load, measurements shall be taken immediately before a barge starts to its point of unloading and immediately after it returns from that point. The gages will be read by the Engineer and the Contractor is invited to be present when the readings are taken. Disagreements on the part of the Contractor as to the weight of the material shall be submitted in writing within three (3) days of their occurrence. To ensure the use of the proper weight of surrounding water in calculating the weight of material from the barge gage readings, the Port Authority will take hydrometer measurements alongside each barge when it is gauged loaded and light.

END OF SECTION

4 SURVEYING

4.1 SCOPE OF WORK

Surveys shall be performed in accordance with these Technical Specifications. All surveys shall be submitted in the format(s) required in accordance with Technical Specifications Section 2 Subsection 2.6.6 and as described herein.

4.1.1 DREDGING SURVEYS

The Port Authority shall conduct BD surveys, interim AD surveys for progress payment, AD surveys for dredging section acceptance, and AD surveys for final acceptance. The data derived from dredging surveys shall be used in computing the quantities of work performed and the actual construction completed and in place. For progress payments, the Port Authority shall make the computations based on the AD surveys for progress payment to determine percentages of completion and cubic yardage applicable for payment. All raw survey data and edited/processed data used for purposes of acceptance and dredging quantity computations shall be made available to the Contractor upon request.

The Contractor shall provide its own dredging surveys for itself as required to complete the Work and supply the required submittals as described in these Technical Specifications.

4.1.2 PLACEMENT AREA SURVEYS

4.1.2.1 Dike Fill Surveys

The Contractor shall conduct all hydraulic and mechanical fill placement area surveys of the dikes for preconstruction, interim construction for progress payment, final shaping and grading, and shore protection and final acceptance (as defined in Technical Specifications Section 4 Subsection 4.12). The Contractor shall notify the Engineer a minimum of three (3) days prior to performing these surveys so that the Engineer may be present at his/her discretion.

The Contractor shall also conduct its own daily construction surveying required during performance of the work.

Promptly upon completing a survey, the Contractor shall furnish copies of all field notes and all other records relating to the survey or to the layout of the work to the Engineer. The Contractor shall retain copies of all such material furnished to the Engineer.

4.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. Army Corps of Engineers Publications / Engineering Manuals:

- EM 1110-2-1003 Hydrographic Surveying

- EM 1110-1-1002 Survey Markers and Monumentation
- EM 1110-1- 1003 NAVSTAR Global Positioning System Surveys
- EM 1110-1-1005 Engineering and Design: Control and Topographic Surveying

4.3 QUALITY ASSURANCE/QUALITY CONTROL STANDARDS

Surveys shall follow the quality assurance/quality control standards and methods set forth in EM 1110-2-1003, EM 1110-1-1002, EM 1110-1- 1003, EM 1110-1-1005, and these Technical Specifications.

4.3.1 TEXAS LICENSED REGISTERED PROFESSIONAL LAND SURVEYOR OR ENGINEER

Contractor surveys required to be signed and sealed shall be signed and sealed by a Contractor supplied, qualified, third-party Texas licensed Registered Professional Land Surveyor (RPLS) or Professional Engineer (PE).

Prior to commencing surveying activities, the Contractor shall provide the name of the qualified RPLS or PE to be used on the project. If a PE is used for the survey work, said PE shall have documented experience and responsible charge of surveys of the same type being performed under this Contract, and the documentation of the PE's experience shall be provided to the Engineer prior to conducting the work. The Engineer reserves the right to approve or disapprove of the Contractor's RPLS or PE.

4.3.2 REAL TIME KINEMATIC (RTK) GLOBAL POSITIONING SYSTEMS

All control, topographic, and hydrographic surveys shall be conducted using RTK GPS and the horizontal and vertical control shown on the Plans. The Contractor is responsible for providing all applicable RTK equipment for surveying and dredging operations.

The Contractor's RTK GPS base station shall be located less than 10 kilometers from the location(s) of work. The Port Authority shall have the option to use the Contractor's RTK GPS base station for all channel hydrographic surveys and other surveys in relation to the work, as applicable.

4.4 PROJECT DATUM

The Project vertical datum shall be referenced to Mean Lower Low Water (MLLW). Datum relationships between MLLW and geodetic datums vary between the work areas and are shown on the Plans. Horizontal positions shall be referenced to NAD83 U.S. State Plane Texas South Central Zone (4204). All units shall be U.S. survey feet.

4.5 SURVEY CONTROL

The Contractor shall use the survey control monumentation shown on the Plans.

4.6 SURVEY ACCURACY

GPS-based survey systems shall not be used without establishing a local RTK GPS base station referenced to the project control monumentation. Required survey accuracies are provided below.

Table 4-1: Survey Accuracies

Type of Survey	Minimum Horizontal Accuracy for All Survey Equipment	Minimum Vertical Accuracy for All Survey Equipment
Control Survey	< 0.2 foot	< 0.1 foot
Topographic	Within (+/-) 1 Foot	Within (+/-) 0.2 feet
Hydrographic	Within (+/-) 1 Foot	Within (+/-) 0.2 feet

4.7 LAYOUT OF WORK

All baselines, temporary benchmarks, and survey control shall be established and maintained by the Contractor for the duration of work. The Contractor shall also be responsible for all measurements that may be required for the execution of the work to the lines and grades specified in the Contract Documents. If such marks are destroyed by the Contractor through the Contractor's negligence prior to their authorized removal, they shall be replaced by the Contractor at its own expense.

Temporary benchmarks and controls established by the Contractor to layout the work and to perform the surveys shall be verified on a weekly basis, at a minimum. Ground control and temporary benchmarks established by the Contractor shall be in conformance with EM 1110-1-1002.

The Contractor shall perform its own daily construction surveying as required to complete the work in this Contract to the required lines and grades shown in the Plans. The Contractor shall lay out its work from the gages, coordinates, distances, stationing, ranges, and control shown in the Plans, and shall be responsible for the measurements in connection therewith. The Contractor shall furnish, at its expense, stakes, templates, platforms, equipment, range markers, and labor as may be required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Engineer. The Contractor shall also be responsible for maintaining and preserving the stakes and other marks established by the Engineer, as applicable, until authorized to remove them. If these marks are destroyed by the Contractor or through its negligence before their removal is authorized, they may be replaced by the Engineer at its discretion. The expense of replacement will be deducted from the amounts due, or to become due, to the Contractor.

4.8 PRE-DREDGE HAZARD AND PIPELINE SURVEY

Prior to commencing dredging, staging of equipment, or laying of submerged pipelines, the Contractor shall perform a pre-dredge hazard and pipeline survey.

The Contractor shall conduct a magnetometer and sidescan survey over the entire area to be dredged, proposed equipment staging and laydown areas, and pipeline routes to placement area(s), and at the full extents of placement areas to encompass all area where work will be performed and equipment will be staged. The survey shall extend a minimum of 125 feet to either side of the proposed pipeline route(s). The pre-dredge hazard and pipeline survey shall be at the Contractor's expense. Changes to pipeline routes submitted in the Contractor's Dredge Pipeline Route Plan shall require additional

magnetometer and sidescan surveys at no additional cost to the Port Authority. Planned scope of the pre-dredge hazard and pipeline survey shall be included in the Survey Plan.

The Contractor shall provide the pre-dredge hazard and pipeline survey to the Engineer in accordance with Section 2 Subsection 2.6.2 of these Technical Specifications.

Survey deliverables for the pre-dredge hazard and pipeline survey shall be signed and sealed in accordance with Section 4 Subsection 4.3.1 of these Technical Specifications.

4.9 POST-DREDGE PIPELINE SURVEY

After demobilization, the Contractor shall conduct magnetometer and sidescan surveys of all pipeline routes to confirm the removal of submerged pipelines. Post-dredge pipeline surveys will be at the Contractor's expense. Pipe that is detected, where not found to exist prior to work as compared to the pre-dredge hazard and pipeline survey, shall be removed by the Contractor at its expense.

The Contractor shall issue copies of the post-dredge pipeline survey to the Engineer in accordance with Section 2 Subsection 2.7.2 of these Technical Specifications.

Survey deliverables for the post-dredge pipeline survey shall be signed and sealed in accordance with Section 4 Subsection 4.3.1 of these Technical Specifications.

4.10 DREDGING SURVEYS

4.10.1 SURVEY REQUIREMENTS

4.10.1.1 PORT AUTHORITY SURVEYS

Hydrographic surveys performed by the Port Authority will be accomplished with the use of a survey vessel having an automated acquisition system. Horizontal positions and vertical elevations will be determined by the use of an inertially-aided RTK Global Positioning System referenced to the project control. Soundings will be obtained by using a multibeam echosounder system operating nominally at 240 kHz unless otherwise approved by the Engineer. Position and depth data will be collected using Hypack Hysweep software. Multibeam survey data will be binned to a 3-foot by 3-foot cell using the "average depth" of all depths within the cell as the representative cell depth. The horizontal location of the representative cell depth will be the cell center or centroid. Surveys will be performed in accordance with these Technical Specifications and EM 1110-2-1003.

Quantities shall be determined using the Average-End-Area method, using cross-sections on 100-foot spacing plus at P.I.'s, P.C.'s, and P.T.'s as applicable. Engineer approval and acceptance of acceptance sections shall be based on review and approval by the Engineer of the cross-sections as well as at all areas in between the cross-sections as shown from the full multibeam dataset.

4.10.1.2 CONTRACTOR SURVEYS

As stated in Technical Specifications Section 4 Subsection 4.1.1, the Contractor shall provide its own dredging surveys for itself as required to complete the Work and supply the required submittals as described in Section 2 Subsection 2.6.6 of these Technical Specifications.

Contractor dredging surveys shall be performed in accordance with Section 4 Subsections 4.2 through 4.7 of these Technical Specifications. At a minimum, Contractor dredging surveys shall be performed in a methodology commensurate with the requirements specified in Technical Specifications Section 4 Subsection 4.10.1.1 above, unless otherwise approved by the Engineer.

4.10.2 SUMMARY OF DREDGING SURVEYS

Refer to Table 4-2 for a general summary of required dredging surveys.

Table 4-2: Summary of Channel Surveys

Survey	Intended Purpose	Survey Schedule	Type	Completed By
BD Surveys	To verify existing conditions and document pre-dredging grades and volumes	Prior to commencement of dredging	Multibeam	Port Authority
Contractor Dredging Surveys	Channel surveys conducted by the Contractor to measure its own construction progress and compliance	Daily (as safety and weather allows)	Minimum of Single Beam	Contractor
Interim AD Surveys for Progress Payment	Channel surveys performed to monitor dredging and to determine quantities for payment and percentage completion of work performed during pay period	Approximately, but not more frequently than, once per week	Multibeam	Port Authority
AD Surveys for Dredging Section Acceptance	Channel surveys performed to determine that the dredging template within an acceptance section has been dredged to the required lines and grades.	Upon request of Contractor to have an acceptance section accepted, subject to provisions of Technical Specifications Subsection 4.10.6	Multibeam	Port Authority
AD Surveys for Final Acceptance	To document final dredging locations/depths over the project limits (all sections), to verify that no dredging or placement has occurred	Upon request of Contractor, subject to provisions of Technical Specifications Subsection 4.10.7	Multibeam	Port Authority

	outside of specified limits, and that the dredging template has been dredged to the minimum required lines and grades			
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4.10.3 BD SURVEYS

Prior to dredging, a BD survey shall be performed over the entire dredge limits. The Port Authority shall be notified, in writing, twenty-eight (28) days in advance of the Contractor's intent to commence dredging so that a before dredge (BD) survey can be performed by the Port Authority. Results of the BD survey shall be provided to the Contractor at least seven (7) days prior to commencement of dredging.

4.10.4 CONTRACTOR DREDGING SURVEYS

Contractor dredging surveys shall be performed by the Contractor to monitor dredging progress and compliance. Contractor dredging surveys shall be supplied and used by the Contractor to assist in the required daily reports in accordance with Technical Specifications Section 2 Subsection 2.6.4. Contractor dredging surveys shall be performed on a daily basis as dredging occurs and as safety and weather allows.

4.10.5 INTERIM AD SURVEYS FOR PROGRESS PAYMENT

Interim AD surveys shall be performed by the Port Authority to monitor dredging progress and to determine percentage completion and material quantities for progress payment purposes. Progress payments shall be made in accordance with, and at a frequency defined within, the General Conditions. Interim AD surveys for progress payment shall be made within a given pay period as required to capture and quantify the actual quantity of materials removed as measured back to the BD survey.

4.10.6 AD SURVEYS FOR DREDGING SECTION ACCEPTANCE

Upon completion of acceptance sections, an AD survey for dredging section acceptance shall be performed within the acceptance section limits to verify that the dredging template has been dredged to the lines and grades required. The Contractor shall request that the Port Authority perform a survey under this specification when the dredging is completed. The Contractor shall provide seven days (7 days) advance notice of its intent to request an AD survey for dredging section acceptance. The Contractor will be notified when soundings are to be made. When a section is found to be in a satisfactory condition after examination by the Port Authority, it will be accepted.

Acceptance: Satisfactory condition is determined when survey plots show no depths above the required contract depth

If any shoals, lumps, or other lack of Contract depth be disclosed by this examination, the Contractor will be required to remove same at its sole cost and expense. But, if shown by previous Port Authority survey that the location was previously dredged to or below the required lines and grades shown on the

plans and the areas are small and form no material obstruction to navigation as determined by the Port Authority, the removal of such shoal may be waived at the discretion of the Port Authority.

Should the Port Authority be unable to accomplish a required survey because the area is not cleared of Contractor equipment, or should re-survey be necessary because of incomplete work, the cost of the survey party and equipment for each additional survey day required shall be chargeable to the Contractor at the rate of \$5,000 per day, in addition to any liquidated damages that may be imposed in accordance with the General or Special Conditions.

Final acceptance of the section and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud or obvious error, and the acceptance of a completed section shall not change the time of payment of the retained percentages of the whole or any part of the work.

4.10.7 AD SURVEY FOR FINAL ACCEPTANCE

~~Upon completion of dredging, a final AD survey for final acceptance shall be performed over the entire dredge limits to verify that the dredging template has been dredged to the minimum lines and grades required. The Contractor shall request that the Port Authority perform an AD survey for final acceptance when the dredging is completed. The Contractor shall provide seven days (7 days) advance notice of its intent to request a final acceptance survey.~~

~~If any shoals, lumps, or other lack of Contract depth be disclosed by this examination, the Contractor will be required to remove same at its sole cost and expense, but if the bottom is soft and the shoal areas are small and form no material obstruction to navigation, the removal of such shoal may be waived at the discretion of the Port Authority. The Contractor will be notified when soundings are to be made. When the area is found to be in a satisfactory condition by the Port Authority, it will be finally accepted. Should the Port Authority be unable to accomplish a required survey because the area is not cleared of Contractor equipment, or should re-survey be necessary because of incomplete work, the cost of the survey party and equipment for each additional survey day required shall be chargeable to the Contractor at the rate of \$5,000 per day, in addition to any liquidated damages that may be imposed in accordance with the General or Special Conditions. Final acceptance of the work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud or obvious error, and the acceptance of the work shall not change the time of payment of the retained percentages of the whole or any part of the work.~~

4.11 DIKE FILL SURVEYS

4.11.1 SURVEY REQUIREMENTS

4.11.1.1 CONTRACTOR SURVEYS

Hydrographic surveys under this section shall be accomplished with the use of a survey vessel having an automated acquisition system. Horizontal positions and vertical elevations will be determined by the use

of an inertially-aided RTK Global Positioning System providing accurate attitude, heading, heave, position, and velocity data and which is referenced to project control. Soundings will be obtained by using a single beam sonar system operating nominally at 200 kHz. Surveys will be performed in accordance with these specifications and EM 1110-2-1003.

Cross-sections shall be taken at 50-foot intervals on even stations along the design template alignment(s) as well as at all P.I.'s, P.C.'s, and P.T.'s.

The distance between elevation readings shall not be more than 10 feet, with additional readings at breakpoints or abrupt changes in grade. Cross-sections and collected data shall extend a minimum of 20 feet beyond the intersection of the outer limits of hydraulic or mechanical fill and the preconstruction bottom.

4.11.2 SUMMARY OF DIKE FILL SURVEYS

Refer to Table 4-3 for a general summary of the surveys.

Table 4-3: Summary of Dike Fill Surveys

Survey	Intended Purpose	Survey Schedule	Conducted By
Preconstruction Survey*	To verify the existing condition prior to commencement of work	No greater than 30 days prior to commencement of work	Contractor
Initial Fill Surveys	To determine in-place fill quantities, retention rates, etc. during construction	Daily upon filling sections as safety and weather allows	Contractor
Final Shaping and Grading Surveys*	To ensure the fill meets the required lines and grades for interim measurement and payment	Prior to installation of stone and at minimum 500-foot sections on dikes	Contractor
* Indicates survey required to be signed and sealed in accordance with Technical Specifications Section 4.3.1			

4.11.3 PRECONSTRUCTION SURVEYS

Prior to performing any work at the site, the Contractor shall perform a preconstruction survey of the placement areas. The Contractor shall notify the Engineer a minimum of three (3) days prior to conducting the preconstruction survey, so that the Engineer may witness the work. Promptly upon completion of the survey, the Contractor shall provide all required survey submittals to the Engineer.

4.11.4 INITIAL FILL SURVEYS

During the course of construction, the Contractor shall perform initial fill surveys on a daily basis to monitor construction. Initial fill surveys will be used to determine the quantity of material placed within the design templates, track material retainages, and ensure compliance with the Contract Documents.

Initial fill surveys shall encompass the previous day's construction to the maximum extents practicable and shall be taken as soon as practicable for each phase of dike construction and rehabilitation. Initial fill surveys of dikes shall be taken after the placement of each 50 feet of fill material at a minimum.

The survey deliverables, including volumes placed and retained, shall be submitted with the daily quality control report.

4.11.5 FINAL SHAPING AND GRADING SURVEYS

Final shaping and grading surveys will be used to determine the acceptance of final shaping and grading of the completed design templates prior to installation of stone. Surveys of the final shaping and grading shall be performed by the Contractor. Promptly upon completion of the survey, the Contractor shall provide all required survey submittals to the Engineer. Final shaping and grading surveys shall be used by the Port Authority to determine interim measurement and payment of the completed design templates.

The final shaping and grading surveys shall be performed no greater than 30 days prior to post excavation and grading surveys as required in Technical Specifications Section 4 Subsection 4.12.2.

4.12 SHORE PROTECTION SURVEYS

4.12.1 SURVEY REQUIREMENTS

4.12.1.1 CONTRACTOR SURVEYS

The Contractor shall conduct a post excavation and grading survey, interim construction surveys, and a final acceptance survey for shore protection installation and the completed placement areas. The Contractor shall additionally provide its own construction surveys as necessary to complete the work of the Contract.

Cross-sections shall be taken at 50-foot intervals on even stations along the design template alignment(s) as well as at all P.I.'s, P.C.'s, and P.T.'s.

The distance between elevation readings shall not be more than 10 feet, with additional readings at breakpoints or abrupt changes in grade. Cross-sections and collected data shall extend a minimum of 50 feet from the outside toe of stone along the exterior, and 20 feet beyond the interior limits of hydraulic or mechanical fill where applicable.

4.12.2 SUMMARY OF STONE SHORE PROTECTION SURVEYS

Refer to Table 4-4 for a general summary of the surveys.

Table 4-4: Summary of Shore Protection Surveys

Survey	Intended Purpose	Survey Schedule	Conducted By
Post-Excavation and Grading Survey	To verify existing conditions upon completion of excavation and/or shaping and grading for stone shore protection installation	After completion of excavation and/or shaping and grading and prior to geotextile and stone installation	Contractor
Interim Construction Surveys	To ensure the stone installation meets requirements of these Technical Specifications	Daily during stone installation	Contractor
Final Acceptance Survey*	To provide for final acceptance of the completed placement area work	Upon completion of stone installation and any and all remaining placement area shaping and grading and/or repairs	Contractor
* Indicates survey required to be signed and sealed in accordance with Technical Specification Paragraph 4.3.1			

4.12.3 POST-EXCAVATION AND SHAPING AND GRADING SURVEY

The post-excavation and shaping and grading survey shall be performed by the Contractor and shall be taken after excavation and shaping and grading, but prior to installation of geotextile and stone.

4.12.4 INTERIM CONSTRUCTION SURVEYS

Interim construction surveys shall be performed by the Contractor and shall be taken during stone installation. The surveys shall encompass the previous day's construction to the maximum extent practicable.

The results of the surveys shall be submitted with the daily quality control report.

4.12.5 FINAL ACCEPTANCE SURVEY

The final acceptance survey shall be performed by the Contractor and shall be taken after stone shore protection installation, as well as any remaining or required shaping and grading of the placement area(s), is complete.

The final acceptance survey shall be submitted within five (5) calendar days of data collection.

Final acceptance of the whole or a part of the work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud or obvious error, and the acceptance of a completed section shall not change the time of payment of the retained percentages of the whole or any part of the work.

If any features not in conformance to the lines and grades shown on the Plans be disclosed by this examination, the Contractor will be required to repair the deficiencies at no additional cost to the Port Authority. The Contractor or its authorized representative will be notified when surveys are to be made. When the area is found to be in a satisfactory condition by the Port Authority, it will be finally accepted. The Engineer reserves the right to check surveys during any phase of construction. If discrepancies are found between the Contractor's surveys and surveys performed by the Engineer, the surveys performed by the Engineer shall govern.

4.13 OBSTRUCTION DEMOLITION SURVEY

Upon completion of the Work in Section 10 of the Technical Specifications and at its sole expense, the Contractor shall perform, or shall subcontract to be performed, a sidescan survey which shall be conducted over the demolition area to demonstrate that the obstructions have been completely removed or cut off below the post-project (AD) sea bed, and that the obstruction demolition area is clear of debris resulting from the Work. The sidescan survey shall be signed and sealed by a RPLS or a PE licensed to practice in Texas. The sidescan survey shall be furnished to the Engineer upon its completion for approval as described in Technical Specifications Section 2 Subsection 2.7.3.

END OF SECTION

5 ENVIRONMENTAL PROTECTION

5.1 GENERAL REQUIREMENTS

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine its activities to areas defined by these Technical Specifications and Plans. Environmental protection shall be as stated in the following subparagraphs.

5.1.1 CONSTRUCTION AUTHORITY

The Contractor shall comply with all provisions contained in the permits. Where dimensions or configurations conflict between the Contract Documents and the permit drawings, the dimensions or configurations shown on the Contract Documents shall govern. If as defined in the permits, any laws, rules, regulations or ordinances conflict with the Contract Documents, then such laws, rules, regulations, or ordinances shall govern instead of the Contract Documents, except in such cases where the Contract Documents exceed them in quality of materials or labor, then the Contract Documents shall be followed. Any conflicts between the permit and the Contract Documents shall be immediately brought to the attention of the Engineer prior to the commencement of work. It shall be expressly understood that the Port and Engineer shall not be responsible for such conflicts.

5.1.2 PROTECTION OF LAND RESOURCES

Prior to the beginning of construction, the Contractor shall identify the land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without special direction from the Port Authority. Ropes, cables, or guys shall not be fastened to or attached to trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources as follows. Trees, shrubs, vines, grasses, land forms, and other landscape features identified by the Port Authority to be preserved for removal by others shall be clearly identified by marking, fencing, or wrapping with boards, or other approved techniques.

The Contractor shall clean up areas used for construction, including staging areas, on a regular basis.

The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Restoration shall be in accordance with the Environmental Protection Plan(s) submitted for approval. This work will be accomplished at the Contractor's expense.

5.1.3 LOCATION OF FIELD OFFICES, STORAGE, AND OTHER CONTRACTOR FACILITIES

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in approved areas. Temporary movement or relocation of Contractor facilities shall be made only on approval.

5.1.4 TEMPORARY EXCAVATIONS AND EMBANKMENTS

Temporary excavations and embankments for plant or work areas shall be controlled to protect adjacent areas from despoilment.

5.1.5 PLACEMENT OF SOLID WASTES

Solid wastes, excluding clearing debris, shall be placed in containers which are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination.

5.1.6 PLACEMENT OF SOLID WASTE BY REMOVAL FROM PORT AUTHORITY PROPERTY

The Contractor shall transport solid waste off Port Authority property and dispose it in compliance with federal, state, and local requirements for solid waste placement.

5.1.7 PLACEMENT OF DISCARDED MATERIALS

Discarded materials, other than those which can be included in the solid waste category, will be handled as directed.

5.1.8 SANITATION FACILITIES

The Contractor shall provide and operate sanitation facilities that will adequately treat or dispose sanitary wastes in conformance with Federal, State, and local health regulations.

5.1.9 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

5.2 TURBIDITY AND WATER QUALITY

The Contractor shall conduct its dredging and disposal operations in a manner to minimize turbidity and shall conform to all water sampling and water quality standards prescribed herein. Plant downtime to meet the water quality standards or to make dike or pipeline repairs will be at no cost to the Port Authority on a basis for time extension.

If maintenance dredging is performed by award of Option 1, the effluent from each spillway and the corresponding receiving water shall be sampled at least daily by the Contractor. When the effluent density exceeds 300 mg/L more than the corresponding density of the receiving body of water, the Contractor shall immediately provide additional ponding capacity by raising the spillway invert, as necessary, or shall discontinue dredge placement operations into the placement area until the effluent density returns to the acceptable 300 mg/L differential. The minimum frequency of sampling at the weir shall be increased when the effluent density increases or nears the maximum specified limit. Base samples of the receiving body of water shall be taken upstream or opposite to the direction of tidal flow where the discharge effluent enters adjacent bodies of water such as the BCC, BSC or HSC. The Contractor shall submit test results and spillbox operations with the daily quality control report.

5.2.1 SAMPLES

Each sample at the weir shall be made up by partially filling, without overflow, a 1 quart container with the mixture flowing over the weir at not less than three different places in the length of the weir and combining the mixture in a bucket or other suitable container submerged to a depth of not over 2 feet. When settled solids are not present in the weir sample, the density shall be determined by the hydrometer method. When settled solids are present in the weir sample, the density shall be determined by both the hydrometer method and the weight-volume method.

5.2.2 HYDROMETER METHOD

When the hydrometer method is used for density determination, an approved hydrometer, graduated to read in grams/liter of suspension shall be used. The water sample shall be thoroughly mixed and transferred to a 1,000 ml laboratory cylinder and the hydrometer used as specified by the manufacturer.

5.2.3 WEIGHT-VOLUME METHOD

When the weight-volume method is used for density determination, the total sample shall be measured to obtain volume in liters and weight in grams. Measurements shall be made with a 1,000 ml laboratory cylinder and a scale or balance capable of weighing the sample and cylinder to the nearest gram. The unit weight shall then be obtained by dividing the total weight in grams by the total volume in liters.

5.2.4 COMPLIANCE INSPECTION

The Port Authority may take its own samples at any time to assure compliance with these Technical Specifications. The Contractor shall provide assistance necessary to the Port Authority and shall construct and maintain a hand railed walkway from the dike to each spillway and along the entire weir length when in use.

5.2.5 RECORDS

A copy of the records of inspections and tests, as well as records of corrective action taken, shall be submitted as directed.

5.3 AIR QUALITY

5.3.1 GENERAL REQUIREMENTS

The Contractor shall keep construction activities under surveillance, management, and control to minimize pollution of air resources. Activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the State of Texas Clean Air Act implemented in 1967, and the Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained for the construction operations and activities specified herein. The measures below shall be implemented to control air pollution by the construction activities included in the contract.

5.3.1.1 PARTICULATES

Dust particles, aerosols, and gaseous byproducts from construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be constantly controlled, including weekends, holidays, and hours when work is not in progress.

5.3.1.2 HYDROCARBONS AND CARBON MONOXIDE EMISSIONS

Hydrocarbon and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits, and in accordance with the applicable engine emission standards.

5.3.1.3 ODORS

Odors shall be constantly controlled for construction activities, processing, and preparation of materials.

5.3.2 COMMITMENTS FOR GENERAL CONFORMITY

As part of its commitments under the Federal permitting process and General Conformity Rules related to air quality, the PHA has identified several measures it will implement or require during the procurement of services under this solicitation.

- The Contractor must assess whether it is eligible to apply for Texas Emission Reduction Plan (TERP) grants related to upgrades of equipment for the reduction of emissions, and whether there is equipment within its fleets that can take advantage of upgrade or replacement under this program. This is not a requirement to apply for the program and secure a grant before award. It is only a requirement to verify eligibility and whether advantage of the program can be taken and is meant as a means of encouragement to become familiar with and use the program. The following provides where basic information on TERP can be found:
 - TERP has a variety of programs addressing various types of mobile and stationary emissions sources, described at the following website:
 - <http://www.tceq.texas.gov/airquality/terp>
 - The specific program anticipated to be most related to Contractors performing work under this solicitation is the Emissions Reduction Incentive Grants (ERIG), which addresses several categories of sources including non-road equipment (e.g. construction equipment), and marine vessels. Links for information on this program are available through the website listed above.
 - Lists of projects awarded grant funding for the last grant cycle are available at the website listed above for your information
- Proof of assessment will consist of a one page or less description of the following information:
 - What TERP programs the Contractor reviewed for eligibility

- A description of the types of current equipment (e.g. excavator, dump truck, tender barge etc.) the Contractor anticipates can be eligible for upgrade or replacement based on the requirements of the program.
 - If no equipment is identified as potentially eligible, describe reasons why, such as equipment is too new or already meets highest current emissions standards, all equipment is sub-contracted or rented etc.
- The Contractor shall exercise air quality best management practices as much as is practicable, including the following:
 - Coordinate and stage support and auxiliary equipment (tugs, tenders, shoreside earthmoving equipment) that will work alongside dredges to minimize idling
 - Inspect and maintain seals to hatches, filling ports, etc. used for fuel storage and refueling.
 - Ensure engine turbochargers are properly maintained to prevent fouling, speed drop, and temperature drops
 - Conduct any soot blowing necessary to prevent exhaust stack buildup away from shore if possible.
 - Consider the use of lower engine speeds or “slow steaming” if feasible to reduce fuel consumption
 - Conduct any required clearing, grubbing, cutting of vegetation under moist or wet conditions to minimize particulate and dust generation.
- The Contractor shall use ultra-low-sulfur diesel (ULSD) fuel in marine vessels where technically and logistically feasible. Marine diesel fuel already must meet the ULSD fuel standard of 15 parts-per-million (ppm) sulfur content and is being phased in within the region. The Contractor shall locate vendors and determine whether ULSD is available and logistically feasible to use for its vessels, whether owned or rented. The Contractor shall identify whether vessels proposed for work under this solicitation can use ULSD fuel. To demonstrate consideration of ULSD use and feasibility, the Contractor shall provide a statement in one page or less describing whether vessels proposed for work under this solicitation can use ULSD fuel, and if so, the potential vendors it has located.
- The Contractor shall disclose to the Port Authority whether any of the marine vessels being used for work under this contract has been inspected by the U.S. Coast Guard (USCG), and whether that inspection covered the protocols for Annex VI of the International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978, known as Marine

Pollution (MARPOL) 73/78, regarding the proper maintenance and operation of engines and their emissions controls. If so, the Contractor shall provide proof of the appropriate USCG inspection certification for compliance with MARPOL 73/78 Annex VI. Inspected vessels that did not receive certification may not be used for work under this contract until deficiencies that prevented certification are corrected.

5.4 FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife. The Contractor will take all appropriate measures to comply with wildlife resource protection laws. Some specific considerations for work under this solicitation are as follows:

5.4.1 MIGRATORY BIRD TREATY ACT (MBTA)

Galveston Bay and the Houston metropolitan region are in the major flyway for migration of bird species protected by the MBTA. These bird species use a wide variety of habitats present in the region as temporary stopover habitat on their way north or south. Primary nesting season extends generally from early April to mid-July, and at maximum from February 1st to September 1st. The Contractor must observe the requirements of the MBTA to avoid the taking of migratory birds, their eggs, parts, and nests.

5.4.2 ENDANGERED SPECIES ACT (ESA)

The Contractor should be aware of the potential for the presence of federally listed species in the project area, and precautions and notifications to make, in case they are encountered. Five species of sea turtles that frequent the Gulf of Mexico may use inland bays such as Galveston Bay for foraging, with Kemp's Ridley sea turtle, loggerhead sea turtle, and green sea turtle, most likely to use Galveston Bay waters. Piping plover (*Charadrius melodus*), occasionally has been known to utilize mud flats found adjacent to or within HSC placement areas. The Port Authority has agreed to the implementation of the National Marine Fisheries Service's Sea Turtle and Smalltooth Sawfish Construction Conditions. In accordance with these conditions, the Contractor shall cease operation of any moving equipment immediately if Endangered Species Act listed species are seen within a 100 yard radius of the active daily construction/ dredging operation or vessel movement, all appropriate precautions shall be implemented to facilitate its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or manta ray is seen within a 50-foot radius of the equipment. Equipment and activities shall not resume until the protected species has departed the project area of its own volition. Though preferred habitat for the West Indian manatee (*Trichechus manatus*) is not present in the project area, it has wandered into Galveston Bay on rare occasions. In order to facilitate avoidance, the following measures will be implemented: 1) All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The Contractor shall advise all construction personnel that there

are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.; 2) All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.; 3) Siltation or turbidity barriers, if required, shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.; 4) All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.; and should contact with any of these species occur within the project area, the Contractor should contact the U.S. Fish and Wildlife Service's Houston Coastal Ecological Services Field Office immediately at (281)-286-8282, or in the case of a turtle or manatee, please contact the Marine Mammal Stranding Network at (409)-740-2200. As the National Oceanic and Atmospheric Administration (NOAA) has sole responsibility over sea turtles in a marine environment including bays and estuaries, they should be contacted at (727) 824-5312 for such sightings. The Contractor shall also notify the Port Authority of these sightings and notifications made to the aforementioned agencies.

5.4.3 OYSTER REEFS

There are oyster reefs present within the footprint of the HSC and BSC that will be dredged from the channel widening and channel slope. The Port Authority will provide information of oyster reefs mapped around the HSC and BSC, and within the new HSC and BSC improvement footprint. The Contractor shall not dredge outside of this footprint to avoid impacting any reef outside of the new HSC and BSC improvement footprint. Any mitigation required as a result of impacting reef outside of the new HSC and BSC improvement footprint will be the responsibility of the Contractor. Any mitigation which includes beneficial use of dredged material, occurring in the vicinity of existing oyster reef should account for the need to minimize turbidity through best management practices to decrease the potential of impacting existing oysters.

5.5 CULTURAL RESOURCES

Cultural resource investigations conducted for the proposed improvements to the HSC and BSC did not result in identifying existing historical or archeological resources within the project footprint. However, in the event that the Contractor encounters such resources, the Contractor shall not remove or disturb, or cause or permit to be removed or disturbed, any historical, archaeological, architectural, or other cultural artifacts, relics, vestiges, remains, or objects of antiquity. If any such items are discovered on the premises, the Contractor shall immediately notify the Engineer of the Port of Houston Authority of such discovery, and the site and the items discovered shall be protected by the Contractor from further

disturbance until a professional examination of them can be made or until clearance to proceed is authorized by the Port Contract Representative.

END OF SECTION

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6 HOUSTON SHIP CHANNEL DREDGING AND PLACEMENT

6.1 SCOPE OF WORK

The work for the Houston Ship Channel (HSC) Expansion Channel Improvement Project (ECIP) consists of furnishing all plant, labor, materials, and equipment, and performing the work required by these Technical Specifications, schedules, and drawings forming parts thereof for this project. The HSC shall be dredged to the lines and grades shown in the Plans and in accordance with these Technical Specification. The Contractor shall excavate the entire quantity of material necessary to complete the work, be it more or less than the amounts estimated.

The work encompasses dredging the HSC from approximate Station 15+500 to Station -0+003.94 and HSC Bayou Station 00+00 to 27+48.18. A hydrographic survey was conducted in February – March 2020 to examine existing conditions. The results of the survey are shown on the Plans. However, it should be noted that the existing federal HSC limits are currently being operated and maintained by the USACE, which includes ongoing maintenance dredging work. The Contractor is advised that the following currently known or anticipated contracts in the vicinity of work described herein consist of the following:

a) Insert Contract(s) at procurement

If awarded as option work, maintenance dredging shall be performed between HSC Stations 15+500 to -0+003.94 prior to or concurrent with new work dredging, within the existing federal channel limits, and shall be disposed of in PA15. New work materials include the 170-foot channel widening (85-feet to either side), required side slopes and the relocation of the barge lanes as shown on the Plans. However, potential obstructions may exist within the channel widening and barge lanes between approximate Stations 15+500 and 06+500. Obstruction removal is described in Technical Specifications Section 10. Additional debris may be encountered in the excavation areas. Soft shoaled materials encountered within the existing federal channel limits, during the course of new work dredging, shall be considered incidental to the work if maintenance dredging is not awarded as option work. No measurement or payment shall be made for soft shoaled materials or debris removed as part of the work.

Note that work performed prior to or concurrent with execution of this Contract, as part of the HSC ECIP, may include new work dredging of the HSC between Stations 15+500 to 14+500 as option work.

New work materials excavated from the HSC shall be used to hydraulically construct M11, a new beneficial use marsh cell at Atkinson Island. Construction includes an approximate 1.3-mile perimeter dike between the existing M7/8/9 and M10 marsh cells. New work materials shall also be used to rehabilitate portions of M7/8/9 and M10 perimeter dike as shown on the Plans.

New work dredging of the HSC shall be within the horizontal limits shown on the Plans to a required depth of minus 48.5 feet MLLW with 2 feet of allowable overdepth. The existing 530-foot wide template

was created with a 3H:1V slope (maintained at 2.5H:1V) beginning at the authorized depth of 46.5 feet MLLW plus 2 feet of advance maintenance plus 2 feet of allowable overdepth. The new work templates are shown in Table 6-1 below.

Table 6-1: Summary of Required Grades and Side Slopes for the HSC ECIP

Description	From Station	To Station	Required Depth (RD)	Advance Maintenance (AM)	Allowable Overdepth (AO)	Final Side Slope ⁽¹⁾	
						Vertical	Horizontal
HSC New Work	15+500.00	-0+003.94	-48.5	0.0	2.0	1	3
HSC Bayou New Work	00+00.00	27+48.18	-48.5	0.0	2.0	1	3
HSC Maintenance ⁽²⁾	15+500.00	-0+003.94	-46.5	2.0	2.0	1	2.5
Barge Lanes	HSC 15+500.00	HSC Bayou 04+20.00	-13.0	0.0	1.0	1	3
(1) Slopes indicated are design values perpendicular to channel toes. (2) If option is awarded.							

6.2 DREDGING

6.2.1 ORDER OF WORK FOR DREDGING

The Contractor shall perform the dredging work in the following order below and as specified in Section 1 Subsection 1.7.1 of these Technical Specifications.

The Contractor shall begin dredging new work materials at approximate HSC Station 15+500 and proceed inbound with placement of new work materials to first hydraulically rehabilitate M10 as

indicated on the Plans. Following sufficient initial hydraulic fill placement at M10, the Contractor shall continue dredging new work materials to hydraulically construct M11 as indicated on the Plans. Following sufficient initial hydraulic fill placement at M11, the Contractor shall continue dredging new work materials to HSC Bayou Station 27+48.18, with placement to hydraulically rehabilitate M7/8/9 as indicated on the Plans. Once hydraulic placement of material has been completed, creation of a circulation channel from Gorini Marsh towards the open Bay shall be performed as described in Technical Specifications Section 6 Subsection 6.2.3 and as indicated on the Plans.

For the purposes of channel acceptance only, the dredging work items in the Bidding Schedule are further divided into Sections as follows:

Table 6-2: HSC Acceptance Sections

Section No.	From Station	To Station	Length of Section (feet)
1	15+500	12+000	3,500
2	12+000	08+000	4,000
3	08+000	04+000	4,000
4	04+000	-0+003.94	4,003.94
5	HSC Bayou 00+00	HSC Bayou 27+48.18	2,748.18
HSC Station -0+003.94 is equivalent to HSC Bayou Station 00+00.			

6.2.2 ESTIMATED QUANTITIES BY STATION

The estimated quantities shown below are based on surveys conducted at the times shown and can only be considered indicative of the conditions at that time. The quantities shown were used to prepare the total estimated quantity of material to be removed shown in the Request for Competitive Sealed Bid/Proposal, and do not include effects of anticipated dredging events or shoaling that may occur prior to commencement of this Contract. Maintenance material left within the new work template is considered incidental to the new work and shall not be considered separately for payment once new work dredging commences. Please refer to Technical Specifications Section 6 Subsections 6.2.2 **Error! Reference source not found.** and 6.3.1 for descriptions of anticipated work and shoaling estimates for the project area.

Table 6-3: Estimated New Work Dredge Quantities for the HSC ECIP

HSC & HSC Bayou New Work					
Section No.	From Station	To Station	Required Depth (RD) (cy)	Allowable Overdepth (AO) (cy)	Total Estimated (cy)
1	15+500	12+000	606,700	44,100	650,800
2	12+000	08+000	739,100	50,400	789,500
3	08+000	04+000	721,900	50,400	772,300
5	04+000	-0+003.94	586,300	47,200	633,500
5	00+00	27+48.18	190,600	12,900	203,500
Total			2,844,600	205,000	3,049,600
<i>Quantities are based on hydrographic surveys, February - March 2020.</i>					

Table 6-4: Estimated Maintenance Dredge Quantities for the HSC ECIP

HSC Maintenance Work					
Section No.	From Station	To Station	Required Depth (RD) (cy)	Allowable Overdepth (AO) (cy)	Total Estimated (cy)
1	15+500	12+000	68,700	63,600	132,300
2	12+000	08+000	98,000	84,300	182,300
3	08+000	04+000	85,100	87,500	172,600
4	04+000	-0+003.94	58,800	54,900	113,700
5	00+00	27+48.18	65,900	19,700	85,600
Total			376,500	310,000	686,500
<i>Quantities are based on hydrographic surveys, February - March 2020.</i>					

6.2.3 CIRCULATION CHANNEL

The circulation channel to the Gorini Marsh shall be excavated along the alignment shown in the Plans to a minimum bottom elevation of minus 5.3 feet MLLW and a minimum bottom width of 50 feet. Excavated material shall be side-cast to the outside no closer than 50 feet from the bottom channel toe and shall not be placed to an elevation exceeding plus 0.7 feet MLLW. Side-cast excavated materials shall not inhibit circulation to the Gorini Marsh by adjacent waters.

6.3 GENERAL PROVISIONS

6.3.1 SHOALING

The Contractor shall consider shoaling in their proposal and schedule. It is estimated that the existing HSC federal channel limits between Stations 28+605 to 0+00 has the potential to shoal approximately 771,000 CY/year on average.

6.3.2 REAL TIME KINEMATIC (RTK) GPS FOR DREDGING AND PLACEMENT OPERATIONS

The Contractor shall furnish RTK GPS for surveillance of the movement and disposition of dredged material during excavation and placement. The RTK GPS shall be established, operated, and maintained by the Contractor to continuously track in real-time the horizontal location of the dredge vessel and cutterhead position and elevation at all times. The Contractor shall display and record in real-time the location of the dredge and cutterhead.

6.3.2.1 RTK GPS STANDARDS

The Contractor shall provide automated (computer) system and components to collect RTK GPS positioning and tide data. Horizontal and vertical accuracies shall meet the requirements provided in Section 4 of the Technical Specifications. Horizontal location and vertical data shall be collected in sets and each data set shall be referenced in real-time to date and local time (to the nearest 10 seconds) and shall be referenced to the same state plane coordinate system used for the survey(s) shown in the Plans. The RTK GPS shall be calibrated before dredging operations have started and at thirty-day (30-day) intervals while work is in progress. The Engineer shall have access to the RTK GPS data and equipment in order to observe its operation. It is the Contractor's responsibility to select a system that will operate properly in accordance with the requirements of these Technical Specifications and the physical conditions of the work areas.

6.3.2.2 RTK GPS DATA REQUIREMENTS AND SUBMISSIONS

The RTK for each dredge shall be in operation for all dredging and disposal activities. The Engineer shall be notified immediately in the event of RTK failure and all dredging operations for the vessel shall cease until the RTK system is fully operational. Any delays resulting from RTK system failure shall be at the Contractor's expense.

All data shall be collected and stored digitally in ASCII format and shall be readable by MS Windows compatible software. Each day's worth of RTK data shall be a separate and distinct ASCII file, labeled by the date. Data shall be recorded on 10-second intervals unless stated otherwise.

The required digital data to be collected for each day includes the following:

- Date
- Time

- Vessel ID (for each dredge and transport vessel)
- Vessel Captain
- Dredge location as defined by the dredge cutterhead location in the X and Y directions provided in State Plane Coordinates in accordance with Section 4 Subsection 4.4 of these Technical Specifications
- Dredge location as defined by both the raw and tide adjusted dredge cutterhead location in the Z direction (at the bottom of the suction mouth) provided in the project datum in accordance with Section 4 Subsection 4.4 of these Technical Specifications.
- Vessel Draft
- RTK Tides

All digital RTK GPS data shall be furnished to the Engineer within 24 hours of collection. A cut chart showing the cutterhead positions and/or bucket positions while dredging for each day shall be submitted to the Engineer each week.

6.3.3 DREDGE PIPELINES

The Contractor shall determine its own means and methods for layout and configuration of pipeline routes in accordance with the Plans and Technical Specifications. The Contractor shall identify its proposed pipeline routes on plan drawings and submit them as part of the work plan. Refer to Technical Specifications Section 2 Subsection 2.4.2 for further information.

- Floating or submerged dredge pipeline shall be located so as not to interfere with commercial navigation or safety.
- Should the Contractor elect to use a pipeline material, which is buoyant or semi-buoyant, such as HDPE pipe, or similar materials, the Contractor shall securely anchor the pipeline to prevent the pipeline from lifting off the bottom under any conditions. The Contractor shall remove all anchors when the submerged pipeline is removed. The location of the entire length of submerged pipeline shall be marked with signs, buoys, and lights, conforming to U.S. Coast Guard regulations.
- The Contractor shall plainly mark the pipeline access routes with conspicuous stakes, targets, and/or buoys to be maintained throughout the Contract operations.
- A tight dredge discharge pipeline shall be maintained to prevent spilling of dredged material or dredged water outside of the placement area.

6.3.3.1 FLOATING DREDGE PIPELINE

Should the Contractor's pipeline(s) not rest on the bottom of the seabed, it will be considered a floating pipeline and shall be visible on the surface and clearly marked. In no case will the Contractor's pipeline be allowed to fluctuate between the surface and the bottom or lie partly submerged. Lights shall be installed on the floating pipeline. The lights shall be supported either by buoys or by temporary piling, provided by the Contractor and approved by the Port Authority. Where the pipeline does not cross a navigable channel, the flashing yellow all-around lights shall be spaced at an interval not over 200 feet apart, unless closer spacing is required by U.S. Coast Guard personnel, in which case the requirements of the U.S. Coast Guard shall govern, at no additional cost to the Port Authority. At no time shall an operating floating pipeline cross the HSC or BCC.

6.3.3.2 SUBMERGED DREDGE PIPELINE

In the event the Contractor elects to submerge its pipeline, the pipeline shall rest securely on the bottom. In no case will the Contractor's pipeline be allowed to fluctuate between the surface and the bottom or lie partly submerged. If the Contractor elects to use a submerged section in the dredge discharge pipeline for crossing a navigable channel it may do so without the formality of obtaining a Department of the Army permit for work or structures in navigable waters. The Contractor shall coordinate the submerged pipeline crossings with the U.S. Coast Guard Marine Safety Office (MSO), U.S. Coast Guard Vessel Traffic Service (VTS), and the Houston Pilots Association (HPA). At least five (5) days shall be allowed for comments and their comments shall be coordinated with the Engineer. Concerns regarding impact of navigation will be considered and final resolution will be made by the Contractor, Engineer, MSO, VTS, and HPA. However, three (3) copies of detailed plans of the submerged section shall be submitted and approved prior to use of the submerged section. The plans shall indicate clearly the width and depth of the navigation opening and the method used to mark it by day and by night for the safety of navigation. The minimum bottom width of the submerged section shall not be less than the width of the authorized federal channel being crossed. The highest point on the pipe or ball connection occurring across the bottom width of a submerged section and any anchor securing the submerged pipeline shall not be higher than the required depth within the horizontal limits of the authorized federal channel being crossed. Lighted buoys, meeting the requirements of the U.S. Coast Guard Regulation 33 CFR 62.25, shall be provided by the Contractor to mark the navigation opening. A red buoy exhibiting a quick flashing red light shall be used to mark the right side of the opening and a black buoy exhibiting a quick flashing green light shall be used to mark the left side of the opening. The frequency of the flashes shall be not less than 60 per minute. "Right side" and "left side" of the opening shall be in conformance with the lateral system of buoyage established by the U.S. Coast Guard. Requirements for the lighted buoys and description of the lateral system of buoyage will be found in the U.S. Coast Guard Publication CG 208 entitled "Aids to Navigation." Lights to be displayed on pipelines shall be in accordance with the U.S. Coast Guard Regulation 33 CFR 80.23.

6.3.4 DREDGING OPERATIONS

- Dredging shall be to the lines and grades indicated on the Plans.

- Holes dug on the banks for deadmen or anchorage shall be filled and repaired to the previous existing lines and grades.
- The Contractor shall conduct a minimum of two inspections per day of the discharge pipeline during hydraulic dredging operations.
 - Routine inspections of the submerged pipe shall be performed to ensure integrity of anchorage and markings
 - Routine inspections of the floating pipeline shall be conducted to ensure marking's integrity and there are no visible leaks
 - Routine inspections of the shore pipe shall be conducted to ensure there are no visible leaks
- Hydraulic dredging shall be immediately suspended in the event of imminent or actual dike failure or pipeline leakage. Dredging shall not be resumed until the necessary dike repair or pipeline repairs have been completed.
- All manned equipment shall be supplied with two-way radio communication, fixed or portable, capable of transmitting and receiving on both, marine hailing and emergency Channels 13 and 16 as well as two additional Contractor-designated working channels.
- The Contractor will provide constant radio contact between personnel on the dredge(s), transport vessel(s) and at the placement area and pipeline. The Contractor's placement area and pipeline personnel are to immediately notify the dredge should pipeline leakage occur, or any other problems at the placement area. The Contractor shall inform the Port Authority at what time the problems were found and time when action was taken to correct the problems.
- Hydraulic discharge control measures including, but not limited to, spillbarge, Y Valves, spreaders, spoons, submerged diffusers, tremies or baffles shall be used at the pipeline discharges to disperse dredge water and materials. At no time shall open direct pipeline discharge be allowed for new work materials. Discharge control shall be used at all times when placing new work materials. The dredged material shall be discharged in the placement area in such a manner as to maximize the use of the material and minimize loss of satisfactory material.

6.3.5 ADDITIONAL DREDGING OPERATIONS FOR MAINTENANCE WORK

- Inspection frequency of the drop outlet structure discharge and placement area dike shall be in accordance with Technical Specifications Section 5 Subsection 5.2 and Section 6 Subsections 6.3.5.1 through 6.3.7. Dredging shall be suspended, if necessary, for a period of time required to achieve and maintain water quality standards of the discharge from the placement area. Dredging shall be immediately suspended in the event of imminent or actual dike failure which

could or does allow dredged water or material to escape from the placement area. Dredging shall not be resumed until the necessary dike repair(s) have been completed.

6.3.5.1 DEWATERING OPERATIONS

- Placement area effluent will be controlled by the use of drop outlet structures during dredging operations.
- Return flow from the placement area drop outlet structures shall be monitored and controlled to prevent erosion or excess turbidity.
- The Contractor shall not allow water to pond higher than 2 feet below the lowest point of the existing dike crown in the placement area.
- Upon completion of placement operations, the drop outlet structures shall be left in place and the Contractor shall begin dewatering to provide for complete drainage without ponding of the placement area for a minimum number of days as directed by the Engineer.
- The Contractor shall provide at least daily inspection of the drop outlet structure during final drainage of the placement area and raise the weir boards if necessary, to stop the effluent if it does not meet the applicable requirements. This inspection shall be at closer intervals, if necessary, during periods of rain and when the water level is approaching the interface. Refer to Technical Specification Section 5 Subsection 5.2 for more information.

6.3.6 MONITORING

The Contractor shall have continuous monitoring of the placement area(s) during dredging operations. The designated personnel shall be in radio contact with the dredge at all times. At the Port Authority's discretion, the Contractor shall expand radio contact to include the Port Authority or a designated representative of the Port Authority for emergency response purposes.

6.3.7 PROTECTION OF THE PLACEMENT AREA

The Contractor shall maintain and protect the placement areas in satisfactory condition until completion and acceptance of all work required by this Contract. All areas shall be maintained in operational condition until completion and acceptance of the work. The existing dikes shall be maintained to the required lines and grades shown and repaired as necessary, for the duration of this contract. Maintenance and repairs during dredging operations, to previously accepted dikes shall be considered a subsidiary obligation as part of the dredging, shall not be measured for payment, and shall be performed at no additional cost to the Port Authority. If in the Port Authority's or the Port Authority authorized representative's opinion, the Contractor's pipeline or equipment causes shears, rutting, quaking, heaving, or excessive deformation of the placement area, the Contractor shall make the necessary repairs to restore the damaged area at no additional cost to the Port Authority.

The Contractor shall adequately inspect its placement operations to reduce the possibility of accidental breaching of dikes and drop outlet structure with resulting spillage of dredged materials outside of the defined placement area(s). If dike failures occur, dredging operations shall be stopped immediately and the deposit of material at the placement area shall not be resumed until approved to do so by the Engineer and at no additional cost to the Port Authority.

6.3.8 PLANT

Maintain the plant, barges, pipelines, and associated equipment to meet the requirements of the work. Promptly repair leaks or breaks along the pipeline. Remove dredged material misplaced due to leaks and breaks at no additional cost to the Port Authority.

6.3.9 REMOVAL OF PLANT AND CLEANUP

Upon approval from the Port Authority of completion of the work by the Contractor, the Contractor shall promptly remove their plant, including pipeline, anchors/frames/stands, ranges, buoys, survey stakes, piles, and other markers or obstructions placed by or for the Contractor. Upon removal of a pipeline, the pipeline corridor shall be restored to its original condition. The Contractor will not be permitted to abandon any equipment in the disposal area for dredged materials or other areas adjacent to the worksite. The Contractor shall provide surveys as described in Subsection 4.9 to confirm the removal of submerged pipelines and anchors.

6.3.10 MEASUREMENT AND PAYMENT

Measurement and payment shall be in accordance with Section 3 of these Technical Specifications.

6.3.10.1 REQUIRED DEPTH

Required depth areas shall be measured within the horizontal limits for material removed lying above the Required Depth shown on the Plans, including material removed above the side slopes extending therefrom, as measured between BD and AD surveys.

6.3.10.2 ADVANCE MAINTENANCE

Advance Maintenance areas, where applicable, shall be measured between the elevations and horizontal limits of Required Depth and Allowable Overdepth shown on the Plans.

6.3.10.3 OVERDEPTH

Limits of Allowable Overdepth dredging will be as shown in Table 6-1 and on the Plans. For new work dredging, Allowable Overdepth area shall be measured between the elevations and horizontal limits of Required Depth and Allowable Overdepth as shown on the Plans. For maintenance dredging, Allowable Overdepth area shall be measured between the elevations and horizontal limits of Advanced Maintenance and Allowable Overdepth as shown on the Plans.

Material actually removed from within the specific area to be dredged will be measured and paid for at the Contract price or prices.

6.3.10.4 SIDE AND END SLOPES

The Contractor shall remove sufficient material to provide the limiting side and end slopes specified in this Section for the HSC. Material actually removed, within the limits shown on the Plans to provide for final side slopes not flatter than one (1) vertical on three (3) horizontal, but not in excess of the amount originally lying above this limiting side slope will be measured and paid for, whether dredged in original position or by box cutting. Box cutting is defined as dredging the space below the pay slope plane at the bottom of the slope for upslope material capable of falling into the cut. There will be no payment for end slope material that falls into the required cut and is subsequently removed. This Section for compensating side slopes will not apply to areas where dredging is limited due to the proximity of terminal structures or as otherwise indicated in the Plans.

Side and end slopes for the circulation channel shall be at the angle of repose but no steeper than 1-foot vertical to 3-foot horizontal.

6.3.10.5 EXCESSIVE DREDGING

Payment will not be made for material taken from beyond the limits as shown in the Plans , except as specified in Technical Specifications Section 6 Subsections 6.3.10.3 and 6.3.10.4.

END OF SECTION

7 DIKE CONSTRUCTION

7.1 SCOPE OF WORK

The work in this Section consists of furnishing all plant, labor, equipment, supplies, and material for performing the operations necessary for the clearing of areas specified herein or indicated on the Plans, and for the removal and disposal of cleared materials; excavations of borrow areas, and for all other excavations incidental to the construction of the dikes as specified on the Plans to the lines and grades shown; and other incidental earthwork as may be necessary to complete the work as specified herein and as shown on the Plans. The work covered in this section includes:

3. Hydraulic construction of the new Atkinson Marsh Dike M11 between approximate Station 06+367.97 to Station 13+293.81.
4. Hydraulic construction of the rehabilitated Atkinson Marsh Dike M7/8/9 between approximate Station 00+00 to Station 6+367.97.
5. Hydraulic construction of the rehabilitated Atkinson Marsh Dike M10 between approximate Station 13+293.81 to Station 15+106.54.
6. Mechanical rehabilitation of Atkinson Marsh Dike M10 between approximate Station 15+106.54 to Station 19+350.78.
7. Removal of four (4) existing drop-outlet structures from M7/8/9 and M10 as shown on the Plans.
8. Construction of breaches along M7/8/9 and M10 interior dikes as shown on the Plans.

The design of the hydraulically constructed dike at M11 anticipates the displacement of soft bay bottom will occur. The design of the hydraulically rehabilitated M7/8/9 and M10 dikes, and mechanically rehabilitated M10 dike anticipates little to no displacement of the existing dike material will occur. The designs have taken this into account in determination of the lines and grades shown on the Plans.

7.2 REFERENCES

The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

- American Society for Testing and Materials (ASTM) Publication D 2487-17e1 Classification of Soils for Engineering Purposes (Unified Soil Classification System)

7.3 MATERIALS

7.3.1 HYDRAULIC FILL

Satisfactory materials for construction of the hydraulic fill dikes shall consist of available soils classified as CH, CL, SC, SP, SM, MH or ML in accordance with ASTM D 2487 from material obtained within the HSC new work dredge areas as outlined in Section 6 of these Technical Specifications. It is anticipated that

incidental soft shoaled materials removed from within the dredge limits as part of the Work will not be retained at the placement sites during the hydraulic placement process.

7.3.2 MECHANICAL FILL

Satisfactory material for construction of M10 dike rehabilitation shall consist of available soils classified as CH, CL, SC, SP, SM, MH or ML in accordance with ASTM D 2487 mechanically excavated from adjacent areas to the existing M10 perimeter dike. Fill shall be free of debris and organic materials.

7.3.3 UNSATISFACTORY MATERIALS

Unsatisfactory materials shall consist of materials such as roots, brush, sod, or other perishable materials and debris. Organic soils classified as OL, OH, and PT in accordance with ASTM D 2487 are also considered unsatisfactory for construction.

7.4 GENERAL PROVISIONS

The work in this section consists of furnishing all plant, labor, equipment, supplies, and materials for performing the operations necessary to hydraulically construct M11 dike and rehabilitate M7/8/9 and M10 eastern dike with hydraulic fill, and to mechanically rehabilitate M10 southern dike to the lines and grades as shown; and other incidental earthwork as may be necessary to complete the work as specified herein and as shown on the Plans. The dike fill templates shall be constructed to the minimum lines, grades, and cross sections shown, unless otherwise directed. Explorations to determine the character of materials at M11 have been made, including probings and core borings and the results are included in Appendix A and Appendix B. Additional explorations for M7/8/9 and M10 were not made, however results of historic core borings at M7/8/9 and M10 are included in Appendix B. The materials in the vicinity of M7/8/9 and M10 existing dike alignments consist of previously placed hydraulic fill with areas of soft to very soft foundation characteristics. Displacement and settlement can be expected and shall be anticipated by the Contractor during construction of the dikes. The templates shown do not represent the total volume of excavated satisfactory materials needed to construct the new dike templates to the lines and grades specified. Additional work shall include the removal of the existing spillboxes and outfall pipes on M7/8/9 and M10. The Contractor shall satisfy itself as to the nature of the foundation characteristics and shall base its Contract unit prices and conduct its work accordingly.

7.4.1 CHANGES IN DIKE TEMPLATE OR ALIGNMENT

The Engineer reserves the right to make changes in the dike fill templates and/or alignments, as may be found necessary before completion of the work. The Engineer reserves the right to increase or decrease the foundation widths and slopes of the dikes or make changes in the final templates as may be deemed necessary. Should such changes be necessary, a mutually agreed upon adjustment to the Contract shall be made in accordance with the General Conditions. Should it become necessary, through no fault of the Contractor, to abandon a line or location where work has been done, payment for materials placed shall be made in accordance with the Contract Documents.

7.4.2 PROTECTION

The location of work is in Upper Galveston Bay and is subject to ship wakes from the Houston Ship Channel, Bayport Ship Channel, Cedar Bayou and significant fetch length and storm influences on wave height. The Contractor shall expect erosion of unprotected dike construction. The Contractor is advised to stage the installation of shore protection with its construction progress in order to protect the dikes from erosion. The Contractor shall be responsible for protecting the work site and for repair of eroded or otherwise damaged portions of the dike templates at no additional cost to the Port Authority.

7.4.3 SITE PREPARATION

Prior to beginning construction, the Contractor may be required to furnish, at its expense, stakes, buoys, templates, platforms, equipment, range markers, and labor as may be required to lay out any part of the Work at the direction of the Engineer. Stakes, buoys or other such markers, shall also be placed along the intersection of the dike template with the pre-existing bay bottom at intervals not to exceed 400 feet. Stakes, buoys or other such markers, shall be flagged, painted, or otherwise dressed to ensure they are clearly visible from distances of 500 feet under normal clear weather conditions. Stakes, buoys, or other such markers, shall be maintained until each fill section is accepted as complete and then completely removed.

7.4.3.1 STRIPPING, CLEARING AND GRUBBING

Prior to placing material for new dike construction and prior to connecting new dike sections to existing dikes, the following surface preparation shall be performed:

Stripping, clearing and grubbing shall be required for all portions of M7/8/9 and M10 dikes to be rehabilitated as shown on the Plans. Stripping, clearing and grubbing shall be carried out to the extent needed to prepare the dike footprint for dike construction free from objectionable materials such as, but not necessarily limited to trees, brush, vegetation, stumps, grass, roots, trash and organic or silty soil. Existing shore protection is to remain in place and shall not be removed as part of clearing. All stripping, clearing and grubbing work shall be completed prior to material placement. If regrowth of vegetation or trees or debris deposit occurs after stripping, clearing and grubbing and before placement of fill, the Contractor will be required to strip, clear and grub again prior to fill placement. Stripping, clearing and grubbing shall be performed according to the Contractor's means and methods, subject to approval by the Engineer. Vegetative materials cleared may be deposited and buried to the interior of the placement areas. Trash and debris shall become the property of the Contractor and removed from the site in accordance with all applicable Local, State and Federal laws at no cost to the Port Authority.

7.4.3.2 EXISTING SPILLBOXES TO BE REMOVED

Prior to hydraulic dike construction, two (2) existing spillboxes located at M7/8/9, approximate Stations 2+300 and 4+215, and two (2) existing spillboxes located along the M10 interior dike are to be removed. The Contractor shall excavate and remove the spillboxes and connecting outfall pipes. However, the outfall pipes for the easternmost M10 spillbox may be filled and left in place. The means and methods of filling the outfall pipes with flowable fill are subject to approval by the Port Authority and shall be

included in the Contractor's Drop-Outlet Structure Construction Plan if the Contractor elects to do so. The removed spillboxes and removed outfall pipes shall become the property of the Contractor and shall be removed from the Site and be disposed of in accordance with any and all applicable Federal, State, or local requirements. The Contractor shall determine its own means and methods for excavating and removing the spillboxes and outfall pipes subject to approval by the Engineer. The Contractor shall coordinate with the pipeline companies prior to commencing excavation at these locations. The locations of the removed spillboxes shall be covered and filled during the hydraulic dike construction with the exception of the westernmost spillbox along M10 interior dike as shown on the Plans. A breach shall remain in the M10 interior dike at the spillbox location as described in Subsection 7.4.3.3.

7.4.3.3 INTERIOR DIKE BREACHES

Two (2) dike breaches shall be created within the Atkinson Island Marsh Complex as shown on the Plans to allow for circulation between M7/8/9, M10 and M11 marsh cells. The bottom elevation of the breaches shall be no higher than 0.0 feet MLLW and shall be graded at a constant slope up to the existing dike. The bottom width of the breaches shall have a minimum width of 25 feet. No separate measurement or payment will be made for dike breach creation.

7.5 HYDRAULIC DIKE CONSTRUCTION

7.5.1 FOUNDATION PREPARATION

No dike foundation preparation, other than the specified stripping, clearing and grubbing will be required for M10 and M7/8/9 construction.

7.5.2 INITIAL PLACEMENT

The initial placement of material shall consist of controlled discharge of the dredged material within the limits of placement area construction, as shown on the Plans. The initial placement quantity shall provide sufficient material within the limits of recovery to accomplish final shaping and grading. The Contractor shall take measures to maximize retention of satisfactory materials within the limits of recovery including, but not necessarily limited to, control of discharge actions and discharge elevations, end treatments of the discharge pipe and use of retention dikes. The Contractor shall evenly distribute sufficient hydraulic fill material at all locations within the construction template so that the final new hydraulic fill dikes can be constructed to the minimum lines and grades before any materials are stockpiled. Details of initial placement shall be included in the Contractor's work plan. The limits, that generally identify materials to be used for construction, shall be identified on individual cross-sections to allow monitoring of initial placement as required by the specifications.

Over-placed material as determined by the Engineer, shall be relocated where directed by the Engineer at no additional cost to the Port Authority. Conversely, areas of under-placement of material as determined by the Engineer, shall have additional materials placed, whether hydraulically or mechanically, until sufficient material has been placed to complete construction of the template at no additional cost to the Port Authority. Excess satisfactory material shall not be wasted. Satisfactory

material shall be stockpiled on the interior slope of the M7/8/9 dike and graded and shaped to allow for drainage. No separate payment will be made for the stockpiles.

7.5.3 HYDRAULIC DIKE FILL SEQUENCE

Generally, the order of material placement after completion of earthwork and site preparation is as follows:

1. M10 Station 15+106.54 to 13+293.81
2. M11 Station 13+293.81 to 6+367.97
3. M7/8/9 Station 6+367.97 to 0+000.00

The Contractor shall satisfy itself that sufficient hydraulic fill materials have been placed in each section outlined and in the order of placement shown above to meet the final lines and grades of the dike construction prior to moving on to the next section. All sections of dike must be completed. If it is found that the Contractor has stockpiled materials or not controlled its discharge on the site prior to completing the dike templates, it shall move the stockpiled or uncontrolled materials and complete the required dike templates at no additional cost to the Port Authority. The Contractor may elect to perform the required hydraulic fill with an alternate sequencing, subject to approval by the Engineer.

7.5.3.1 ESTIMATED NEATLINE QUANTITIES

The following neat-line quantities are based on hydrographic and topographic surveys generated from February - July 2020 and used by the Engineer to prepare the estimate. The quantities are estimates only and the Contractor is responsible for interpreting the quantity numbers shown for the actual quantities necessary to achieve the required lines and grades shown in the Plans. The quantities are unadjusted, neatline quantities computed from the existing bay bottom to the design templates. The percentage for items including, but not limited to, compaction, settlement, foundation displacement, and hydraulic material losses is the responsibility of the Contractor. Actual dredge quantities required to construct the hydraulic fill dikes will be higher. The neatline quantities at M11, M10 and M7/8/9 are as follows:

Table 7-1: Estimated Neatline Hydraulic Fill Quantities for M11, M10 and M7/8/9

M11 QUANTITIES	
STATION	NEATLINE QUANTITY (CY)
13+293.81 to 6+367.97	279,000
M10 QUANTITIES	
15+106.54 to 13+293.81	7,000
M7/8/9 QUANTITIES	
6+367.97 to 0+000.00	68,000
Note: Quantities are based on hydrographic and topographic surveys from the JV dated February – July 2020.	

7.5.4 CONTROL OF DISCHARGE

The Contractor shall use frequent movement of the discharge point during the initial placement, along with an effective directing of the discharge flow to retain the maximum quantity of material possible within the hydraulic fill template.

The Contractor may use a spillbarge or similar technique for M11 construction to control initial placement of the hydraulically transported material. Additionally, the spillbarge shall be capable of varying the discharge elevation from below the water surface to a sufficient height above the specified construction template so that material may be hydraulically placed to the minimum lines and grades shown. The spillbarge discharge shall be fitted with a spreader, spoon, diffuser, or other effective means that will dampen the velocity of dredge slurry exiting the pipe. Discharge of slurry shall not occur without such a device attached to the end of the pipe.

Additionally, during hydraulic fill placement, the contractor shall ensure satisfactory material placement from the hydraulic fill, over the full horizontal limits of the final design template. Control measures including but not limited to Wye valves, spreaders, spoons or other effective methods shall be employed to limit lateral wash or loss of suitable material. At no time shall the Contractor use direct pipe placement along M11 unless approved by the Engineer. The Engineer may approve or disapprove of open pipe discharge at any point during the course of the Work.

M7/8/9 and M10 shall be filled without use of a spillbarge, but rather by laying and advancing of shore pipe. For both placement areas, at no time shall hydraulic discharge be in the direction of existing dike (i.e. at the tie-in points of M10, M7/8/9, or PA-15), within 1,000 feet of the dike in order to avoid erosion or otherwise cause damage. The Contractor shall stage the fill direction to complete the required fill templates in a manner that protects the existing dikes.

The Contractor shall include details in the work plan regarding the proposed technique and equipment to be used to accomplish the required control of discharge. The method used to place the hydraulic fill shall maximize the use of the material and minimize waste of satisfactory materials.

7.5.5 MECHANICAL PLACEMENT AND COMPACTION

Satisfactory material mechanically placed on top of the hydraulic fill during shaping and grading shall be placed in loose lifts not exceeding 12 inches and shall be mechanically compacted by not less than three passes of a crawler-type tractor weighing not less than 30,000 pounds, exerting a unit tread pressure of not less than 5 pounds per square inch, and shall not be operated at a speed exceeding 5 miles per hour. Satisfactory material that becomes mixed with unsatisfactory materials, including displaced foundation materials, is no longer satisfactory material and shall be disposed of in the interior of the placement areas.

7.5.6 FINAL SHAPING AND GRADING

Final Shaping and Grading shall consist of constructing the dikes generally to the minimum lines and grades shown on the Plans. The Contractor shall determine its own timing, means and methods for commencement of and performance of Final Shaping and Grading following initial hydraulic fill placement. Satisfactory materials shall be recovered and shaped and used to construct the dikes.

The Engineer reserves the right to increase, decrease, or alter the dimensions of the design template upon request of the Contractor due to the actual quantity of satisfactory materials encountered during construction.

7.5.6.1 GRADE TOLERANCES

For acceptance, hydraulic fill dike construction of M11, M10 and M7/8/9 shall be constructed, at a minimum, to the grades and elevations shown in the Plans. Tolerances shall include -0.5 to +0.5 feet on the crown height, crown width and slopes. Final height, width, and alignment shall be within 1 foot horizontally of the baselines shown unless otherwise approved by the Engineer. Abrupt changes in alignment, as determined by the Engineer, will not be permitted and shall be corrected by the Contractor at no cost to the Port Authority.

7.6 MECHANICAL DIKE CONSTRUCTION

7.6.1 FOUNDATION PREPARATION

No dike foundation preparation, other than specified stripping, clearing and grubbing will be required for M10 construction.

7.6.2 INITIAL PLACEMENT

Satisfactory materials used for M10 dike rehabilitation shall be obtained from interior areas adjacent to the existing M10 perimeter dikes as shown on the Plans. The Contractor shall distribute sufficient material at all locations along the dikes so that the final new dike section can be constructed to the lines and grades shown on the Plans. The Contractor shall submit its proposed grading and borrow plan for approval by the Engineer.

7.6.3 MECHANICAL EXCAVATION MATERIALS

Materials obtained adjacent to the interior of M10 perimeter dikes which meet, or which can be processed to meet, the requirements for satisfactory materials, as specified herein, may be utilized. All roots, limbs, and wood fragments shall be removed from materials. Materials containing sod, other organic or perishable material, trash, and debris shall not be used.

7.6.4 DRAINAGE FOR M10 MECHANICALLY CONSTRUCTED DIKE MATERIALS

Materials shall be worked, dried or drained to the level necessary to comply with the Technical Specification Section 7 Subsection 7.6.6. The Contractor shall ditch the borrow pits (if applicable) and/or move materials out of excessively wet areas to allow for materials to drain, to the extent necessary, to perform the work as specified herein. As borrow materials are suitably drained, additional dike

construction may proceed. The work in connection with drainage or foundation preparation shall be included in the applicable contract price for the item to which the work pertains.

7.6.5 UNSATISFACTORY MATERIALS

Unsatisfactory materials shall be disposed of in a n appropriate manner and placed in a location approved by the Engineer.

7.6.6 WORKABILITY OF RANDOM MATERIALS

M10 perimeter dikes shall be constructed of materials either graded from existing dike material or borrowed from the interior of M10 adjacent to the dike, or from locations otherwise specified or approved by the Engineer. The moisture content of the material shall be maintained at a level that will allow for the optimum compaction with the equipment used as specified in Technical Specification Section 7 Subsection 7.6.7. If, in the Engineer's opinion, the material is excessively wetted or dried, the Contractor shall take the necessary steps to dry or wet the material before continuing further construction with the materials.

7.6.7 RANDOM FILL CONSTRUCTION

Fill shall be placed with suitable equipment in uniform layers, which before compaction shall not exceed 18 inches in thickness and shall be mechanically compacted by not less than three passes of a crawler-type tractor weighing not less than 30,000 pounds, exerting a unit tread pressure of not less than 5 pounds per square inch, and shall not be operated at a speed exceeding 5 miles per hour. Alternative methods may be used at the Contractor's discretion, subject to approval by the Engineer, without undermining the dike foundation.

7.6.8 MECHANICAL DIKE FILL SEQUENCE

The sequence of dike construction at M10 shall be determined by the Contractor, unless otherwise restricted by the Contract Documents. Dike construction shall be continuous from start to finish with no appreciable shut down periods. The Contractor shall determine its means and methods for conducting the work.

The Contractor shall satisfy itself that sufficient mechanical fill materials have been placed in each dike section to meet the final lines and grades of the dike construction prior to moving on to the next section. All sections of dike must be completed.

7.6.8.1 ESTIMATED NEATLINE QUANTITIES

The following neat-line quantities are based on topographic surveys generated from February - July 2020 and used by the Engineer to prepare the estimate. The quantities are estimates only and the Contractor is responsible for interpreting the quantity numbers shown for the actual quantities necessary to achieve the required lines and grades shown in the Plans. The quantities are unadjusted, neatline quantities computed from the existing bay bottom to the design templates. The percentage for items including, but not limited to, compaction, settlement, foundation displacement, and mechanical

material losses is the responsibility of the Contractor. Actual excavated quantities required to construct the mechanical fill dikes will be higher. The neatline quantities at M10 are as follows:

Table 7-2: Estimated Neatline Mechanical Fill Quantities for M10

M10 QUANTITIES	
STATION	NEATLINE QUANTITY (CY)
19+350.78 to 15+106.54	0
<i>Note: Quantities are based on topographic surveys from the JV dated February - July 2020.</i>	

7.6.9 FINAL SHAPING AND GRADING

Final Shaping and Grading shall consist of constructing the dikes generally to the minimum lines and grades shown on the Plans. The Contractor shall determine its own timing, means and methods for commencement of and performance of Final Shaping and Grading following initial mechanical fill placement. Satisfactory materials shall be recovered and shaped and used to construct the dikes.

The Engineer reserves the right to increase, decrease, or alter the dimensions of the design template upon request of the Contractor due to the actual quantity of satisfactory materials encountered during construction.

7.6.9.1 GRADE TOLERANCES

For acceptance, mechanical fill dike construction of M10 shall be constructed, at a minimum, to the grades and elevations shown in the Plans. Tolerances shall include -0.5 to +0.5 feet on the crown height, crown width and slopes. Final height, width, and alignment shall be within 1 foot horizontally of the baselines shown unless otherwise approved by the Engineer. Abrupt changes in alignment, as determined by the Engineer, will not be permitted and shall be corrected by the Contractor at no cost to the Port Authority.

7.6.9.2 ACCEPTANCE OF COMPLETED DIKES

Acceptance will be based on topographic surveys performed by the Contractor as specified in Section 4 of the Technical Specifications. If the final survey cross sections for a particular acceptance section show that the acceptance template as shown has been achieved, the section will be accepted as complete.

7.6.9.3 SEEDING AND FERTILIZING

The constructed dikes shall be seeded and fertilized. Seeding and fertilizing shall be performed in accordance with Section 9 of the Technical Specifications.

7.7 DAMAGES OR FAILURES

7.7.1.1 CONDUCT OF WORK

The Contractor shall maintain and protect the dike fill in a satisfactory condition until completion and acceptance of the work in this Contract. If the Contractor's equipment causes shears, rutting, quaking,

heaving, cracking or excessive deformation of the hydraulic fill, the Contractor shall limit the type, load or travel speed of the equipment on the fill and make necessary repairs at no additional cost to the Port Authority.

7.7.1.2 EROSION, SLIDES, AND SETTLEMENT

If erosion, sliding, or settlement occurs in any part of the dikes prior to its acceptance, the Contractor shall rebuild that portion of the dike. If the slide is caused through fault of the Contractor, the foregoing operations shall be performed without cost to the Port Authority.

Sections not conforming to the minimum acceptance template shall be corrected and re-surveyed by the Contractor at no additional cost to the Port Authority. The Contractor shall be responsible for repair of damages to the dikes resulting from construction equipment operation, settlement, subsidence, slides, displacement and handling of foundation materials; normal seasonal weather-related damage; and Contractor negligence. After acceptance of a section, the Contractor shall be responsible for damages to the dikes resulting from its operations or negligence at no additional cost to the Port Authority. Should erosion, slides, or settlement occur after acceptance through no fault of the Contractor, repairs shall be made at a mutually agreed upon addendum to the Contract.

END OF SECTION

8 SHORE PROTECTION

8.1 SCOPE OF WORK

The work in this Section consists of providing labor, material, and equipment for furnishing, hauling, handling, placing and maintaining the stone until final acceptance by the Engineer. The work covered in this Section also consists of slope preparation and installation of geotextile under the stone shore protection, which includes the labor, material, and equipment to perform the operations required to furnish, haul, place, and maintain the geotextile, complete as specified herein and as shown until placement of the stone shore protection is completed and accepted.

8.2 ACCESS TO WORK SITE

The work site can only be accessed by waterborne transport. Access and floatation channel(s), if required, shall be performed via mechanical means. The floatation channel depths shall not be deeper than minus 8.0 feet MLLW. The Contractor shall coordinate with the pipeline owners as to the location and depths of the proposed channels. The inside top edge of the floatation channel shall be no closer to the placement area than as shown on the Plans. Material excavated from the access channel shall be placed to either side of the channel to an elevation not exceeding plus 0.7 feet MLLW. No measurement or payment will be made for floatation channel excavation.

8.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

American Society for Testing and Materials (ASTM) Publications:

- C97/C97M-18 Absorption and Bulk Specific Gravity of Dimension Stone
- C127-15 Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
- C131/C131M-20 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C295/C295M-19 Petrographic Examination of Aggregates for Concrete
- C535-16 Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C1141/C1141M-15 Admixtures for Shotcrete
- D5313/D5313M-12(2013) Evaluation of Durability of Rock for Erosion Control under Wetting and Drying Conditions
- D5519-15 Particle Size Analysis of Natural and Man-made Riprap Materials

- D123-19 - Standard Terminology Relating to Textiles
- D1683/D1683M-17(2018) - Failure in Sewn Seams of Woven Fabrics
- D3786/D3786M-18 - Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method
- D3884-09(2017) - Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
- D4355/D4355M-14(2018) - Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus
- D4491/D4491M – 17 - Water Permeability of Geotextiles by Permittivity
- D4533/D4533M-15 - Trapezoid Tearing Strength of Geotextiles
- D4632/D4632M-15a - Grab Breaking Load and Elongation of Geotextiles
- D4751-20 - Determining Apparent Opening Size of a Geotextile
- D4833/D4833M-07(2013)e1 - Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
- D4873/D4873M-17 - Identification, Storage, and Handling of Geosynthetic Rolls and Samples

8.4 HANDLING AND STORAGE

Construction materials received with certified weights which shall be unloaded, and which cannot be used immediately for construction, shall be stored in an acceptable storage area. The storage area shall be reasonably near the job site and shall be approved. The storage area shall be a relatively smooth area so that the stored material may later be recovered free from dirt or other foreign materials.

During the periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, and temperatures above 140 degrees Fahrenheit, mud, dirt, dust, and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy-duty protective covering. No hooks, tongs, or other sharp instruments shall be used for handling geotextile. Geotextile shall not be dragged along the ground.

8.5 MATERIALS

8.5.1 STONE

The Contractor shall make arrangements, pay royalties, and secure the permits for procurement, furnishing, and transporting stone. The Contractor shall vary the quarrying, processing, loading, and placing operations to produce the sizes and quality of stone specified. If the stone being furnished by

the Contractor does not meet the requirements as specified herein, the Contractor shall furnish, at no additional cost to the Port Authority, other stone meeting these requirements.

8.5.1.1 QUALITY COMPLIANCE TESTING

8.5.1.1.1 SAMPLES

If required, samples shall be submitted in advance of the time when the stone will be required in the work. Stone from a proposed source or sources shall be tested by the Contractor for quality compliance.

8.5.1.1.2 STONE QUALITY

Stone shall meet the following test requirements:

Table 8-1: Test Requirements for Stone Quality

Test	Test Method	Requirements
Specific Gravity (Bulk SSD)	ASTM C 127	2.65 minimum
Absorption	ASTM C 127	3.0% average
Wetting and Drying	ASTM D 5313 ⁽¹⁾	No fracturing ⁽²⁾
Abrasion Loss	ASTM C 131, ASTM C 535	40% maximum loss ⁽³⁾
<p>(1) The testing procedure used in ASTM D 5313 shall include testing each sample in potable and in salt water prepared in accordance with ASTM C1141.</p> <p>(2) Weakening and loss of individual surface particles is permissible unless bonding of the surface grains softens and causes general disintegration of the surface material.</p> <p>(3) Stone which has a loss greater than the specified limit will be accepted if the Contractor demonstrates that the stone has a satisfactory service record that exceeds ten (10) years.</p>		

In addition to the above tests, the stone shall be subjected to a Petrographic and X-ray Diffraction analysis in accordance with ASTM C 295. The stone shall not contain expansive clays. Test procedure for Petrographic and X-ray Diffraction is performed according to ASTM C 295, except for the following:

- A colored microscope photograph shall be made of each stone type, including igneous, sedimentary, or metamorphic and the individual minerals within the stone type shall be identified by labels and arrows upon the photograph.
- Detailed macroscopic and microscopic descriptions shall be made of the stone, to include the entire mineral constituents, individual sizes, their approximate percentages and mineralogical histories. A description of stone hardness, texture, weathering, and durability factors shall be discussed. Pictures of the source wall within the quarry to show any layering and lithology shall be included.
- A written summary of the suitability of stone for use as armor stone based on the Petrographic and X-ray tests and the abrasion loss (L.A. Rattler) shall be presented in the final laboratory report on stone quality.

8.5.1.2 STONE ACCEPTANCE

Prior to placement, stone shall be subject to approval. Approval of stone shall not constitute acceptance of all stone from a source. Approved stone shall be: of the same lithology as the original stone from which test results or service records were taken as a basis for authorization of the source, sound, durable, hard; and free from laminations, weak cleavages, undesirable weathering, blasting or handling-induced fractures, or fracture zones which subtend more than 1/3 of the total circumference of the stone along the plane of fracturing. The stone shall be of good quality so that it shall not disintegrate from the action of air, water, or the conditions of handling and placing; shall be clean and free from earth, clay, refuse, or adherent coatings. The stone shall be angular quarried material with a shape that assures interlocking with adjacent stone and the greatest dimension of each piece shall not be greater than 3 times the least dimension (aspect ratio of 3:1). Not more than 25% of the stones within a gradation range shall have an aspect ratio greater than 2.5:1.

8.5.1.3 REJECTED STONE

Stone of unsuitable quality or size distribution as specified will be rejected and shall be promptly removed from the project at no expense to the Port Authority. Portions of the work specified herein containing rejected stone will be considered unacceptable and incomplete.

8.5.1.4 PERIODIC TESTING

Stone taken from a particular source shall be tested and certified in terms of gradation and specific gravity. A copy of each certification shall be submitted five (5) days before placement of that stone. Gradation testing shall be in accordance with ASTM D 5519. Specific gravity testing shall be in accordance with the procedures specified in the Paragraph: STONE QUALITY above. Testing shall commence prior to shipment of the material. Sampling and gradation tests performed by the Contractor shall be as indicated and the Engineer shall be given seven (7) days' notice to witness the tests. Test results shall be submitted upon completion of each test. Additional sampling and testing of a load of material delivered to the project site shall be at the Port Authority's discretion, randomly chosen up to a maximum of five tests. Tests shall be performed by an approved testing laboratory on samples selected by the Engineer. The Port Authority reserves the right to perform the tests. Costs for this additional sampling and testing shall be at the Contractor's expense.

8.5.1.5 ADDITIONAL TESTS

The Port Authority may, as it deems necessary, make additional tests from representative samples of the stone being furnished for the work.

8.5.1.6 STONE SIZE

Reference the table below for stone dimensions. Dimensions will depend on specific gravity of rock and the weight of the stone governs the design gradation.

Table 8-2: Stone Dimensions for Shore Protection at Atkinson Island Marsh Complex

Percent of Stone by Weight Less than Design Stone Size (%)	M11 Weight of Design Stone Size (pounds)	M7/8/9 & M10 Weight of Design Stone Size (pounds)
0	42	49
15	169	197
50	338	394
85	662	772
100	1,352	1,576

8.5.2 GEOTEXTILE

The geotextile shall be a woven pervious sheet of plastic yarn in accordance with ASTM D 123. The geotextile shall meet the physical requirements listed in the TABLE below. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85% by weight of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers or inhibitors added to the base plastic, if necessary, to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

8.5.2.1 SEAMS

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or other approved location, if necessary, to form sections not less than 18-feet-wide. Seams shall be tested in accordance with ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall not be less than 90% of the required tensile strength, listed in Table 8-3 below, of the unaged geotextile in any principal direction.

8.5.2.2 REQUIREMENTS

Brands of geotextile and the seams to be used shall be accepted on the following basis. The Contractor shall submit, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical, and manufacturing requirements specified herein.

Table 8-3: Physical Requirements for Woven Geotextiles

PHYSICAL REQUIREMENTS FOR WOVEN GEOTEXTILE			
PROPERTY	TEST METHOD	UNIT	MINIMUM TEST VALUE
Apparent Opening	ASTM D 4751	U.S. Sieve	#70
Permittivity	ASTM D 4491	sec ⁻¹	0.25
Puncture	ASTM D 4833	lbs.	130

Grab Tensile – In any principal direction	ASTM D 4632	lbs. and %	250, 15% minimum
Burst Strength	ASTM D 3786	psi	480
Trapezoidal Tear	ASTM D 4533	lbs.	55
Ultraviolet Degradation (percent Strength retained at 500 hours)	ASTM D 4355	%	70% strength retained for all classes
Seam Strength	ASTM D 1683	lbs.	225
Abrasion Resistance Residual	ASTM D 3884	lbs.	55% residual breaking load in any principal direction
Percent Open Area	See Section 8.5.2.3 below	%	4

8.5.2.3 DETERMINATION OF PERCENT OF OPEN AREA

Five samples of unaged woven geotextile shall be placed separately in a 2-inch by 2-inch slide holder and the image projected with a slide projector on a rigid screen. A square block of 25 openings near the center of that image shall be selected and the length and width of each of the 25 openings shall be measured to the nearest 0.02-inch. The total area shall be determined by measuring the length of the sides of the five openings and five adjacent fibers in each direction to the nearest 0.02-inch. The Percent Open Area (POA) is determined by dividing the sum of the 25 pen areas by the total area of the 25 openings and their adjacent fibers. The POA shall be quoted as the percent determined by averaging the POAs of the five individual specimens. However, if more than one of the five specimens are outside of the specified POA limits, the fabric shall be considered to have failed the test.

8.6 EXECUTION

8.6.1 SLOPE PREPARATION

Slopes to receive stone protection shall be shaped and prepared as shown on the Plans.

Following the completion of dredging, the post-dredge shoreline survey will be used to determine the required alignment for the placement of the stone protection. The limits of the stone in-place shall follow with reasonable variation of the alignment determined and agreed on with the Engineer. Slope preparation to receive stone shore protection shall be undertaken following the completion of dredging and the performance of the post dredge shoreline survey. The post-dredge shoreline survey will be used to determine the required excavation template for stone placement, but shore protection installation shall generally conform to the required lines and grades shown on the Plans. Some field fitting may be required.

8.6.2 INSTALLATION OF GEOTEXTILES

Before placement of stone, the Contractor shall demonstrate that the placement technique for each application shall prevent damage to the geotextile. The geotextile shall be placed at the locations as

shown on the Plans. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage. Geotextile shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The strips shall be placed to provide a minimum width of 18 inches of overlap for each joint after stone is placed. The extension above and below the stone after the stone is placed is as shown on the Plans. Temporary pinning of the textile to help hold it in place until the stone is placed shall be allowed on soil slopes. Securing pins shall be inserted through both strips of overlapping geotextile along the line passing through midpoints of the overlap. The geotextile shall be protected during construction from contamination by surface runoff. If the geotextile becomes contaminated, it shall be removed and replaced with uncontaminated geotextile at no expense to the Port Authority. Geotextile damaged during its installation or during placement of the stone shall be replaced by the Contractor at no cost to the Port Authority. The slope shore protection work shall be scheduled so that covering the geotextile with a layer of the stone is accomplished within two (2) days after placement of the geotextile. Failure to comply shall require replacement of the geotextile at Contractor's expense. The geotextile shall be protected from damage prior to and during the placement of stone. Equipment shall not be allowed on unprotected geotextile. The soil surface on the slopes to receive the geotextile shall be prepared to a relative smooth condition free of obstructions, depressions, debris, and soft or low-density pockets of material. Erosion features, including rills or gullies, shall be graded out of the surface before geotextile placement.

8.6.3 INSTALLATION OF BLANKET STONE

A layer of blanket, or bedding, stone shall be installed by the Contractor between the Geotextile and armor stone layers. The stone shall be approximately 0.5 feet thick and comprised of 2-inch to 3-inch crushed rock to provide separation of the geotextile and the armor stone.

8.6.4 INSTALLATION OF STONE

The stone shall be placed so that a reasonably well-graded mass is produced with a minimum practicable percentage of voids. Stone shall be constructed to the lines and grades shown. Stone shall be placed evenly and to its full course thickness in one operation, using a method that shall avoid damage to the geotextile, when present. Stone shall be allowed to fall no more than 1-foot from the bottom of the clam or other bucket to the placement surface. For underwater work, where the work surface is more than 5 feet below the water level, the maximum drop shall be 5 feet. In no case shall the drop be greater than that which may cause damage to the geotextile when present. An otherwise allowable height, using the Contractor's approved placement method, will not be permitted if it is shown to cause segregation of stone sizes, breakage of individual stone, or damage to the filter fabric when present. When allowable drop heights are developed on-site, between the Engineer and Contractor, these heights shall be based on actual performance. The Contractor shall maintain the stone layer until accepted and if material is displaced or the surface damaged, replacement shall be made to the indicated lines and grades, at the Contractor's expense. Protruding rock shall be removed, and the void filled with smaller rock. The stone work shall be finished smooth.

8.6.5 COMPLIANCE INSPECTION

The Contractor shall inspect for compliance with the contract requirements and record the inspection of operations. The Contractor, at Contractor's expense, shall perform inspections in accordance with the following schedule:

- Stone quality - one (1) set of quality tests, for each new stone type provided.
- Gradation - one (1) gradation test to be performed per stone type.
- Specific gravity - one (1) specific gravity test per stone type.
- Placement - continuous check of placement to ensure proper size and compliance with grade lines shown.
- Excavation and placement - Lines and grades, disposition of material.

8.6.6 TOLERANCES

Stone work for shore protection shall be carried to the lines and grades shown, the tolerances as specified herein, and as directed. Final surfaces of the finished course shall be reasonably even, uniform, and shall follow with reasonable variation the indicated lines and grades without continuous under or overbuilding. Deviations in slope shore protection thickness and elevation from the design value shall not be greater than +0.5 foot and -0.0-foot. The surface slope of the stone shall not deviate greater than or less than 8% from the slope(s) shown. Transitions in alignments shall be smooth and shall be no more than 1-foot Horizontal change in a 20-foot length unless otherwise approved.

The intention is that the work shall be built generally to the required elevations, slope and grade and that the outer surfaces shall be even and present a neat appearance. Placed material not meeting these limits shall be removed or reworked as directed by the Engineer. Payment will not be made for excess material which the Engineer permits to remain in place.

8.6.7 MISPLACED MATERIAL

Material that escapes or is lost while loading, transporting or placing stone, or which is deposited other than in the area shown or a change approved in writing, shall be removed and re-deposited where directed at Contractor's expense.

8.6.8 MISPLACED EQUIPMENT

If, during progress of the work, the Contractor loses, dumps, throws overboard, sinks, or misplaces material, plant, machinery or appurtenances that may be dangerous to or interfere with uses of the Waterway or cause pollution of the waters, the Engineer shall be notified immediately. The Engineer shall be given the description and location of these obstructions and removal by the Contractor shall be as directed. If the Contractor refuses, neglects, or delays compliance with the above requirements,

these obstructions may be removed by the Port Authority and the cost of removal will be deducted from the money due or to become due to the Contractor.

8.7 ACCEPTANCE

Shore protection will be accepted for each completed 100-foot section. Acceptance will be based on the topographic surveys performed by the Contractor as specified in Technical Specifications Section 4. The Port Authority may perform field check surveys. The Engineer reserves the right to check surveys during any phase of shore protection installation. If discrepancies be found between the Contractor's survey and surveys performed by the Engineer, the survey performed by the Engineer shall govern.

The geotextile fabric will be accepted in-place and in conjunction with acceptance of the shore protection. Its presence and condition will be observed daily by the Engineer while being installed and covered. The Contractor shall refrain from covering the fabric without giving the Engineer sufficient opportunity for inspection.

END OF SECTION

9 SEEDING & FERTILIZING

9.1 SCOPE OF WORK

The work covered in this section consists of preparing seedbeds, furnishing and placing seedbeds, and other operations necessary for the permanent establishment of a warm season perennial grass and forb mix from seed. The Contractor shall adapt its operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses. Seeding and fertilizing shall be accomplished on the final M7/8/9, M10 and M11 shaped and graded dikes.

9.2 REFERENCES

The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

- United States Department of Agriculture (USDA) Regulation
- Rules and Regulations under the Federal Seed Act and the Texas Seed Law

9.3 HANDLING AND STORAGE

During handling and storing, the seed and fertilizer shall be stored in an area that shall protect the seed from heat, moisture, rodents, or other damage.

9.4 MATERIALS

Seed containers shall carry a label showing the percent purity and germination, name of the seed, and that the seed meets the requirements of the USDA and applicable State laws. Use seed that has been treated with an approved fungicide. Seed that has become wet, moldy, bears a test date older than five months, or is otherwise damaged from transit or storage will not be accepted. Seeds of the species specified herein shall have 85% live seed and shall be free of weeds. Each species or variety of seed shall be furnished and delivered in separate bags. Seed is to be mixed before sowing; the mixing shall be done in a commercial seed-mixing machine or by equally thorough hand mixing after sampling and testing have been completed.

9.4.1 FERTILIZER

The fertilizer used shall be controlled release commercial grade, free flowing, and uniform in composition. The nutrient ratio shall be 13% nitrogen, 13% phosphorous, and 13% potassium. The fertilizer shall be balanced with the inclusion of trace minerals and micronutrients including mycorrhizal fungi.

9.4.2 SEED MIX

Seed planting shall be done between the dates specified for each type, except as specifically authorized in writing. The seeds planted per acre shall be of the type specified with the mixture, rate, and planting dates as follows:

Table 9-1: Seed Mixture Planting Dates

Mix	Application Rate (pounds/acre)	Planting Dates
Type 1 Mix		March 15 to Sept. 15
Hulled Common Bermuda (Cynodondactylon)	50	
Hulled NK-37 Bermuda Grass	20	
Sand Love Grass	20	
Type 2 Mix		Sept. 16 to March 14
Hulled Common Bermuda	30	
Unhulled Common Bermuda	60	
Crimson Clover (TrifoltumIncarnatum)	10	
Hulled NK-37 Bermuda Grass	20	

9.4.3 WATER

Water used during the planting shall be fresh and have no more than 10 parts per thousand of salt.

9.4.4 DIKES

Dikes shall not be saturated with salt water prior to planting.

9.5 EXECUTION

9.5.1 SEEDING CONDITIONS

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed by the Port Authority.

9.5.2 SEED BED PREPARATION

The soil surface shall be regraded to the lines and grades specified and shall be free of ruts and other disturbances. The soil shall be scarified or otherwise loosened to a depth of not less than 4 inches except as otherwise specified below or directed. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, harrows, or by other approved methods. Rock and debris, 3 inches or larger, shall be removed prior to the application of seed and fertilizer. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

9.5.3 FERTILIZER APPLICATION

Fertilizer shall be applied at the rate of 400 pounds per acre. Fertilizer shall be incorporated into the soil to a maximum 4-inch depth.

9.5.4 SEEDING

Seeding shall be placed at the dates specified in Technical Specifications Section 9 Subsection 9.4.2. The timing of the seeding may correspond with rain forecasts such that the seeded areas remain moist.

9.5.4.1 BROADCAST SEEDING

Seed shall be uniformly broadcast after the application of fertilizer at the rate specified. After broadcasting, the Contractor shall till seeds into soil to a depth not to exceed ½-inch. Complete seeding by rolling and packing with a roller or cultipacker developing 15 to 25 pounds per inch of tread. Keep seeded areas evenly moist for a period of ten (10) to fourteen (14) days immediately following placement. When watering seeded areas, use fine spray to prevent erosion of seeds or soil. Do not apply seeds when weather is too windy, hot or drying, or other adverse conditions exist.

9.5.4.2 PROTECTION OF SEEDED AREAS

Immediately after seeding, the area shall be protected against equipment traffic or other use as directed.

9.6 ACCEPTANCE

A satisfactory stand of vegetation shall be healthy and vigorous with scattered bare spots not larger than 1-foot square, with the bare spots not exceeding 5% of each seeded area.

An inspection shall be held by the Engineer to make note of deficiencies in germination. Germination should occur within ten (10) to fourteen (14) days after seeding depending upon weather conditions. Adequate coverage shall be achieved in thirty (30) to forty-five (45) days. Final inspection with the Engineer shall be scheduled within forty-five (45) to sixty (60) days after seeding. The Contractor shall repair areas not properly germinating within four (4) weeks.

END OF SECTION

10 DROP-OUTLET STRUCTURES

10.1 SCOPE OF WORK

The work in this Section consists of furnishing all plant, labor, materials and supplies for performing the work required by these Specifications, Schedules, and Plans as specified herein for all operations in connection with installing three (3) new drop-outlet structures, one each at M7/8/9, M10 and M11.

10.2 REFERENCES

The publications listed below form a part of the Technical Specifications to the extent referenced. The publications are referred to within the text by the basic designation only.

- American Welding Society (AWS) specifications:
 - AWS D1.1/D1.1M (2020) Structural Welding Code – Steel
- American Wood Protection Association (AWPA) specifications:
 - AWPA U1 (2020) - UC5C MARINE USE Southern WatersAWPA M4 (2015) Standard for the Care of Preservative-Treated Wood Products
- ASTM International (ASTM) specifications:
 - A 139/A 139M – (2016) Standard Specification for Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and over)
 - A 123/A 123M – (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - A 588/A 588M – (2019) Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance
 - A 36/A 36M – (2019) Standard Specification for Carbon Structural Steel
 - A1011/A1011M – (2017a) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - A510 – (2008) Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- United Facilities Guide Specifications
 - UFGS 09 97 02 Painting: Hydraulic Structures

10.3 QUALITY ASSURANCE/QUALITY CONTROL

The Contractor shall establish and maintain quality control for excavation and backfill and installation of the drop-outlet structures. The Contractor shall maintain records of its quality control for all construction operations and certify compliance with applicable sections of the Technical Specifications. The Contractor's records shall include the following:

- Equipment Type: size, and suitability for construction of the prescribed work
- Structural Excavation: check grades, slopes, and dimensions for compliance with design sections
- Grade Tolerances: check fills to determine if placement conforms to prescribed grade and design section
- Construction: layout, maintaining existing drainage, moisture control, thickness of layers, spreading and compacting
- Classification of soils, placing and compacting of structural fill, and density tests
- Material certifications shall be submitted to show conformance with applicable specification requirements
- Lumber installation: boards meet minimum height, length and width meets specification requirements
- Welding procedures, inspections, and examinations
- Welder qualifications

The original and two copies of these records of inspections and tests, as well as the records of corrective action taken, shall be furnished with the daily quality control report.

10.3.1 WELDING WORKMANSHIP

Workmanship for welding shall be in accordance with AWS D 1.1/D 1.1M and other applicable safety and environmental requirements of these Technical Specifications.

10.3.2 QUALIFICATIONS OF WELDERS AND WELDING OPERATORS

Welding operators, welders, and tack welders shall be qualified and re-qualified if necessary, for the particular type of work to be done. Qualification shall be in accordance with AWS D 1.1/D 1.1M and shall be submitted for approval. The Contractor shall certify by name the welders and welding operators so qualified, the date of qualification, and the code and procedures under which qualified. Prior qualification will be accepted if welders have performed satisfactory work under code for which qualified within the preceding three (3) months. The Contractor shall require welders and welding operators to repeat the qualifying tests when in the opinion of the Engineer their work indicates a

reasonable doubt as to proficiency. Those passing the re-qualification tests shall be re-certified. Those not passing shall be disqualified until passing. Expenses in connection with qualification and re-qualification shall be borne by the Contractor.

10.3.3 WELDING INSPECTION

The Contractor shall maintain an approved inspection system and perform required inspections in accordance with the Technical Specifications. Welding shall be subject to inspection to determine conformance with the requirements of AWS D 1.1/D 1.1M, the approved welding procedures, and provisions specified in other sections of these Technical Specifications.

10.3.4 VISUAL EXAMINATION

Completed welds shall be cleaned and carefully examined in accordance with the acceptance criteria specified in AWS D 1.1/D 1.1M.

10.3.5 SUPPLEMENTAL EXAMINATION

When the soundness of the weld is suspected of being deficient due to faulty welding or stresses that can occur during erection, the Engineer reserves the right to perform supplemental non-destructive examinations before final acceptance.

10.4 HANDLING AND STORAGE

Materials delivered to the site shall be inspected for damage, unloaded, and stored with minimum handling. Upon delivery of pipe materials, certified copies of test reports demonstrating conformance to applicable pipe specifications shall be submitted before the pipes are installed for approval by the Port Authority. The inside of pipes shall be kept free of dirt and debris. Materials shall be handled using a method that will ensure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench, not dragged or rolled.

10.5 MATERIALS

Materials for the drop-outlet structure and adjacent dike raising shall meet the requirements specified below.

10.5.1 SATISFACTORY BACKFILL MATERIAL

Satisfactory soils for backfill shall be firm or medium stiff to hard clays and sands. In addition, these materials shall have a moisture content not to exceed 35 percent in accordance with ASTM D 2216 (2019) for use as semi-compacted fill.

10.5.2 SUITABLE MATERIAL

Suitable Material is the definition of the material that is excavated for use as semi-compacted fill but may exhibit an unacceptable moisture content at the time of excavation. Suitable material shall be handled and dried to the extent necessary so that it is considered satisfactory.

10.5.3 CONCRETE BALLAST

Concrete ballast or sacks of cement shall be furnished and installed at the drop-outlet structures as shown on the Plans.

10.5.4 STRUCTURAL STEEL

Structural Steel shall conform to the requirements of ASTM A 36/A 36M for steel members.

10.5.5 GRATING

Grating is to be galvanized welded steel grating and consist of 1-1/4-inch by 3/16-inch rectangular bearing bars spaced at 1-3/16-inch centers and cross bars welded at 4-inch centers. End banding bars of 1-1/4 inch by 3/16 inch are to be welded to the ends of every bearing bar. The top surface of the bearing bars are to be serrated for slip resistance. The grating is to be welded to the supporting members as shown on the Plans. The grating material is to meet the requirements of ASTM A1011/A1011M and ASTM 510.

10.5.6 HANDRAILS

Handrails are as shown on the Plans.

10.5.7 LUMBER

Lumber shall be southern yellow pine rough No. 2, dense, minimum allowable bending stress of 1,400 psi. Cuts in timber or abraded surfaces of new work shall receive a field treatment in accordance with AWPA M4.

10.5.8 TREATED LUMBER

Treated Lumber shall be furnished and installed by the Contractor on the sides of the structures from the top of the concrete slab or headwall to two feet below the top of the structure. Lumber thickness and length shall be as shown. Lumber shall be 6-inch nominal width. Lumber to be furnished shall be straight, even sawed, sound, and entirely free from defects which can impair its durability or its usefulness for the purpose intended. Lumber shall bear the official Grade mark of the association under whose rules it is purchased or, in lieu thereof, each shipment shall be accompanied by a certificate of inspection issued by the inspection association. Lumber shall have a Chromated Copper Arsenate (CCA) preservative treatment and shall be accompanied by a certificate with Best Management Practices from a recognized treatment company certifying the amount of treatment.

10.5.9 PRESERVATIVE TREATMENT

Preservative Treatment by pressure processes shall be in accordance with AWPA U1. Lumber shall receive a treatment of 2.5 pcf of CCA solution.

10.5.10 STEEL PIPE

The steel pipes shall be of the size shown and shall conform to the requirements of ASTM A 139/A 139M, as applicable, shall be fabricated from steel sheet conforming to ASTM A 36/A 36M, and shall be

a minimum thickness of 1/2 inches for structures at Bird Island Marsh. Only intact new pipe will be accepted.

10.5.11 PROTECTIVE COATINGS

10.5.11.1 GALVANIZING

Galvanizing of steel handrails and grating are to conform to the requirements of ASTM A123/A123M. Galvanizing coating thickness grade is to be "G85" or 2 ounces of hot-dip zinc coating per square foot of surface area in accordance with ASTM A123/A123M. Galvanized areas damaged, abraded, or where galvanized material has been broken by field welding, cutting, drilling, handling, storage, or by other methods are to be coated with two coats of Galvaweld or other field coating materials as approved by the Engineer.

10.5.11.2 COATING

Interior and exterior surfaces of the pipe and structural steel shall be painted in conformance with UFGS 09 97 02, specifically Subsection 2.2.6 Formula C-200A, Coal Tar-Epoxy (Black) Paint. Surface preparation and paint application shall follow UFGS 09 97 02 Section 3, specifically Subsection 3.2.12 Coal Tar-Epoxy (Black) Paint (Formula C-200A) and Subsection 3.3.12 System No. 6-A-Z. Safety precautions included with the application instructions shall be observed during storage, handling, and use.

10.5.12 FILLER METAL

The electrode, electrode-flux combination, and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures.

10.6 COMPACTION EQUIPMENT

Equipment for compaction shall conform to the requirements herein.

10.6.1 CRAWLER-TYPE TRACTORS

Crawler-type Tractors used for spreading and compacting shall conform to the requirements of Technical Specifications Section 1 Subsection 1.6 and shall not be operated at a speed exceeding 5 miles per hour.

10.6.2 POWER DRIVEN TAMPERS

Compaction of material in areas where it is impracticable to use a crawler-type tractor shall be performed by the use of approved power-driven tampers of the rammer type having a static weight of at least 70 pounds or by approved hydraulic actuated tractor-mounted tampers.

10.6.3 ALTERNATIVE COMPACTION EQUIPMENT

The Contractor may propose for use alternative types of compaction equipment not included in these Technical Specifications. The suitability of the alternative equipment shall be demonstrated to the Engineer by a field test conducted by and at the expense of the Contractor. The alternative compaction

equipment shall be capable of properly compacting the soil so that no planes of weakness or laminations are formed in the fill. Additionally, the alternative compaction equipment shall not detrimentally affect any adjacent structure. The field test shall consist of compacting a minimum of three layers of an area of embankment with the alternative type equipment.

10.6.4 MISCELLANEOUS EQUIPMENT

Scarifiers, disks, spring-tooth or spike-tooth harrows, spreaders, pontoon-mounted track excavators and other equipment shall be of types suitable for the required construction. Sprinkling equipment shall be designed to apply water uniformly and in controlled quantities to variable widths of surface.

10.7 EXECUTION

10.7.1 EXCAVATION, BACKFILL, AND COMPACTION

The Contractor shall make all excavations required for the construction of the drop-outlet structures. Excavations for the structure shall conform to the dimensions and elevations for the structure as shown on the Plans. Materials determined to be unsuitable by the Engineer shall be placed a minimum of 50 feet from the final drop-outlet structure location. Backfill and fill for structures shall be placed in horizontal layers not to exceed 8 inches in loose depth and then compacted. Material shall not be placed on a surface that is muddy, frozen, or contains frost. Backfilling shall not begin until the drop-outlet structure has been approved and the excavation cleaned of trash and debris. Backfill and fill shall be brought up to the indicated finished grade. Where material is to be placed against both sides of the outfall pipe, the placement of lifts shall be controlled so that the difference between the earth elevation on one side and the earth elevation on the other side of the outfall pipe is as small as practicable. Heavy equipment for spreading or compacting shall not be operated closer than 3 feet to a foundation or wall. Material within 3 feet of the structures and pipes shall be compacted by hand operated power-driven tampers.

Installation of the pipes shall be sufficiently sloped back or shored up with sheeting and bracing to prevent the excavation walls from caving in. Excavation shall only be carried to the extent necessary to construct the drop-outlet structure and install the pipe to the lines and grades shown. Care shall be taken not to excavate below the lines and grades as shown. Excavation carried below indicated depths will not be permitted except to remove the unsatisfactory material as directed. Unsatisfactory material shall be excavated below the depths shown and replaced with satisfactory material to establish a firm-bedding for the structure and outfall pipe at the required alignment and grade. When backfilling around the drop-outlet structure and pipe, care shall be taken to ensure that areas underneath the haunches of the pipe are thoroughly filled and compacted, leaving no voids.

10.7.2 FINAL SUB-GRADE

Soft spots encountered within the sub-grade foundation area shall be removed, replaced by approved satisfactory materials of similar soil type, and compacted as specified.

10.7.3 UNSUITABLE MATERIALS

Materials, which are classified as unsuitable structural backfill, are defined as material containing organic matter, sticks, branches, roots, brick, concrete, rock, and other debris. Unsatisfactory material in surfaces to receive fill shall be removed and replaced with satisfactory materials.

10.7.4 PLACING PIPE

Each pipe shall be carefully examined for flaws before being laid, and if found defective or damaged shall not be used. Pipe shall be laid to the grades and alignment shown, using proper facilities to lower the sections of pipe into the trenches. No pipe shall be laid in water or laid when trench conditions or the weather are unsuitable for this work. The Contractor shall provide dewatering pumps and equipment as necessary to dewater the pipe trench. Pipe in place shall be inspected before backfilling.

10.7.5 PIPE TOLERANCE

The Contractor shall inspect the pipe for any settling or buckling, in order that the pipe invert is continuous throughout its length. The slope of the pipe shall not be less than 0.30% of the required slope.

10.7.6 WELDING PROCESS

Welding of steel pipe shall be by an electric arc welding process and shall conform to the applicable provisions of AWS D 1.1/D 1.1M unless otherwise specified.

10.7.6.1 PREHEAT AND INTERPASS TEMPERATURE

Preheating shall be performed as required by AWS D 1.1/D 1.1M or as otherwise specified except that the temperature of the base metal shall be at least 79 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved methods to the prescribed temperature, held at that temperature until the welding is completed, and then permitted to cool slowly in still air.

10.7.6.2 PREPARATION OF BASE METAL

Prior to welding the Contractor shall inspect surfaces to be welded to ensure compliance with AWS D 1.1/D 1.1M.

10.7.6.3 TEMPORARY WELDS

Temporary welds required for erection shall be made under the controlled conditions prescribed herein for permanent work. Temporary welds shall be subject to the same quality requirements as the final welds permanent work as specified herein. Preheating for temporary welds shall be as required by AWS D 1.1/D 1.1M for permanent welds. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose.

10.7.6.4 TACK WELDS

Tack welds that are to be incorporated in the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent

welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

10.7.6.5 REPAIRS

Defective welds shall be repaired in accordance with AWS D 1.1/D 1.1M. A welding repair plan shall be submitted for approval before repairs are made when deemed necessary by the Engineer. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection.

10.7.7 CONCRETE BALLAST

Concrete ballast or sacks of cement shall be placed at each drop-outlet structure as shown on the drawings. During placement of the concrete or sacks, the Contractor shall take the necessary precautions to ensure against damage to the existing portions of the drop-outlet structure. If this work is damaged, it shall be repaired or replaced as approved at no additional cost to the Government.

10.7.8 ERECTION OF STRUCTURAL STEEL

Erection of structural steel shall be in accordance with the latest specifications of the AISC.

10.7.9 WEIR BOARDS

Weir boards shall be provided to the full height of the drop-outlet structures.

END OF SECTION

11 HSC EXISTING STRUCTURE DEMOLITION/REMOVAL (OPTION 2)

11.1 SCOPE OF WORK

Submerged obstructions may exist within the new work dredge limits and barge lane replacement limits. Removal of the existing structures, if encountered, may be required in order to excavate the HSC to the lines and grades shown on the Plans. Obstructions including, but not necessarily limited to; timber piles, stakes, sheet piling, scrap metal or other obstructive materials encountered during demolition/removal activities shall be disposed of in accordance with any and all applicable Federal, State, or local requirements.

The work in this Part consists of providing all labor, material, and equipment for removing and disposing of potential existing submerged structures within or near the new work limits of the HSC as outlined in Section 6 of these Technical Specifications, which may prevent the excavation and dredging of new work materials to the lines and grades shown on the Plans and in accordance with the Technical Specifications.

The Contractor shall make its own investigations to determine the exact type, size, and quantity of submerged obstructions to be removed, if any. The Contractor shall remove the obstructions or cut them off in accordance with these Technical Specifications. Unless otherwise indicated by the Engineer, where piles are cut off, they shall be cut off at a minimum depth of one (1.0) foot below the allowable template as shown on the Plans. The Contractor shall determine its own means and methods by which to complete the Work. Removed or demolished materials shall become the property of the Contractor and shall be removed from the Site. Removed or demolished materials shall not be allowed to encroach on to adjoining property, including public or private places, unless approved by the Engineer.

Surface trash and debris encountered in the new work dredge limits as described in Technical Specification Section 1 Subsection 1.10.2 shall not constitute as basis for execution of the Work outlined in this Section. The Work in this Section shall only be exercised for structures of a type or form necessitating mobilization of additional plant or equipment for removal, to allow for complete excavation of the channel template as shown on the Plans.

11.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM International (ASTM):

- ASTM E 1609 (2001) Development and Implementation of a Pollution Prevention Plan

Publications:

- Vincent, Mark, and Glahn, Lisa, and Raphaelson, Rebecca. "The History of Dredging at The Port of Houston: Ditching High and Low to Build a Port" Proceedings of the Western Dredging Association and Texas A&M University Center for Dredging Studies' "Dredging Summit and Expo 2015"
- Ward, George. "Dredge and Fill Activities in Galveston Bay" The Galveston Bay National Estuary Program "Publication GBNEP-28 April, 1993"

11.3 BACKGROUND

Dredge delays were encountered during the HSC Expansion Channel Improvement Project 10 due to believed wood bulkheads in the vicinity of Bulkhead Reef. The results of further historical investigations performed on behalf of the PHA are provided below.

11.3.1 HISTORICAL DATA

Both publications in Section 10 Subsection 11.2 of these Technical Specifications provide a history of the development of the Houston Ship Channel from the early 20th century to the current-day HSC. The Contractor is encouraged to review the provided references and to perform their own research as to any potential existing submerged obstructions within the limits of the HSC new work. The excerpts provided below were deemed of note during the historical investigation performed on behalf of the PHA.

- The bulkhead retaining walls first formed for Morgan's Cut were extended for up to twelve miles down the bay reach, in the form of king pile walls with brush infill for sediment management. When that wall proved inadequate, a second sheet pile wall was constructed offset 30.48 m (100 ft) from the first line of silt defense. While the pile walls were eventually abandoned, remnants of the wall are still charted as obstructions to boaters in Galveston Bay (Vincent & Glahn & Raphaelson, p. 479).
- Another barrier to flow in the system was the dike extending 18 km out across the bay from Morgans Point. First completed as a timber-and-brush dike in 1902, the dike survived for a decade, with high maintenance, until the hurricane of 1911, and allowed stabilization of spoil islands just to the east of the Houston Ship Channel (Atkinson Island). The dike is clearly visible in Fig. 2-3. While the dike is now gone (a few sections of the old dike still survive near Bulkhead Reef), the disposal areas along the channel above Redfish Reef now serve its original function of blocking lateral flow across the channel (Ward, p. 171).

11.3.2 POTENTIAL AREAS OF CONCERN

11.3.2.1 NOAA NAUTICAL CHART 11327 (current)

1. Note B suggests that submerged stakes may exist 400 feet east of and parallel to the Houston Ship Channel between Light 58 and Light 90.
2. A submerged bulkhead is shown near Bulkhead Reef on the east side of the HSC. Bulkhead Reef is a spoil area located on the east side of the HSC, between Midbay placement area and North Boater's Cut, as shown on NOAA Nautical Chart 11327.

11.3.2.2 COAST CHART NO. 204 GALVESTON BAY, TEXAS (dated 1901)

1. "Lines of Piles" are displayed on the chart on the west side of the horizontal limits of the historic 1901 HSC between Morgan's Point and the current day Bayport Flare.
2. A second "Lines of Piles" is displayed on the chart on both the west and east sides of the horizontal limits of the historic 1901 HSC offshore of Eagle Point.

11.4 INTENT

Supplemental to dredging of material to the required lines and grades shown on the Plans, the intent of the Work covered under this section is to remove or cut off the existing structures in accordance with these Technical Specifications and apply sound environmental principles in the disposal of the generated debris. As part of the implementation of this policy the Contractor shall use all reasonable means to divert demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

11.5 OBSTRUCTION DEMOLITION/REMOVAL

The Contractor shall remove or cut off below the allowable template, all of the potential existing submerged obstructions as referenced in Appendix C and Appendix D, or as encountered during the progress of Work. The material generated from this Work shall be classified as demolished material or debris, shall become property of the Contractor, and shall be removed from the Site in accordance with this Section. No separate payment shall be made for standby time incurred as a result of "HSC Existing Structure Demolition/Removal".

11.5.1 MEETINGS

After award of the Contract and prior to commencement of Work, the Contractor shall schedule and conduct a meeting with the Engineer to discuss the proposed Obstruction Demolition Plan, and to develop a mutual understanding relative to the details of the Work. At a minimum, the Obstruction Demolition Plan and waste management goals and issues shall be discussed at the Preconstruction Conference or other meetings as scheduled during performance of the Work under this Contract.

11.5.2 RECORDS

Submit documentation for solid waste disposal and diversion, and submit manifests, weight tickets, receipts, and invoices specifically identifying the Project and waste material. The records shall be made available to the Engineer during construction, and a copy of the records shall be delivered to the Engineer upon completion of obstruction removal/cutoff and disposal.

11.5.3 COLLECTION

Provide the necessary containers, bins and storage areas to facilitate effective waste management. Provide materials for barriers and enclosures around material storage areas. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to subcontractors. Handle hazardous waste and hazardous materials in accordance with applicable regulations.

11.5.4 DISPOSAL

All waste and debris materials generated shall become property of the Contractor. Control accumulation of waste materials and trash. Recycle or dispose of waste and debris materials off-site and in compliance with federal, state, and local laws and regulations.

11.6 ACCEPTANCE

Acceptance of the Work covered under this Part shall be determined by two components:

1. Upon completion of the Work, the Port Authority shall perform a multibeam survey over the demolition area as determined by the Engineer to inspect the Work and determine if:
 - a. The channel has been dredged to the required lines and grades shown on the Plans, in accordance with the Technical Specifications and;
 - b. All obstructions have been removed or cut off to a minimum of 1-foot below the allowable template, and that the demolition area is clear of debris resulting from the Work. The multibeam survey shall be provided to the Contractor upon its request.
2. Completion of the obstruction demolition survey as described in Technical Specifications Section 4 subsection 4.13 and acceptance of the corresponding obstruction demolition survey submittals as described in Technical Specifications Section 2 subsection 2.7.3.

If one or both of the acceptance components as defined above are not met, corrective action will be required as determined by the Engineer, and at the sole cost and expense of the Contractor. If both acceptance components are met, the work will be finally accepted.

END OF SECTION

Appendix A – Probing Logs, Location Tables, and Maps

95% DRAFT



Project 11

Houston Ship Channel Expansion Channel Improvement Project

Probing Logs, Location Tables, and Maps



PORT HOUSTONSM
THE INTERNATIONAL PORT OF TEXAS

December 9, 2020

95% PRELIMINARY

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
AND IS NOT INTENDED TO BE USED
FOR CONSTRUCTION, BIDDING, OR
PERMITTING PURPOSES.

ENGINEER: ASHLEY P. JUDITH
LICENSE NO: TX# 112988
DATE: DECEMBER 09, 2020

ENGINEER: CHESTER HEDDERMAN
LICENSE NO: TX# 100209
DATE: DECEMBER 09, 2020

TurnerCollie&Braden, Inc.

JOINT VENTURE - PORT DEVELOPMENT AND ENVIRONMENTAL SERVICES

Gahagan & Bryant Associates, Inc.

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.17.20	Easting(NAD83):	3,259,803	Northing(NAD83):	13,798,066
Hole Number:	ECP-2029-A			Freeboard:	7
Time:	11:13			Tide:	1.16
Sounding Elev.:	-5.9	Bottom of Probe:	-43.8	Penetration:	38.0 ft.

	Elevation	Description / Material	
Surveyed ==>	-5.9	=====	
Penetration Depth:		WOR SURFICIAL SILT	
13.0	-18.8	=====	
		CL SILT/CLAY	BEGIN JET
18.5	-24.3	=====	
		SH SHELL	JET
33.0	-38.8	=====	
		CL SILT/CLAY	NO REFUSAL
38.0	-43.8	=====	

Character of Finish:	REFUSAL IN NO REFUSAL	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,339	Northing(NAD83):	13,798,121
Hole Number:	ECP-2030-A			Freeboard:	7
Time:	8:27			Tide:	0
Sounding Elev.:	-6.8	Bottom of Probe:	-45.0	Penetration:	38.2 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.8	=====	
Penetration Depth:		WOR SURFICIAL SILT	
11.2	-18.0	=====	
		CL SILT/CLAY	BEGIN JET
20.7	-27.5	=====	
		CL SILT/CLAY	NO REFUSAL
38.2	-45.0	=====	

Character of Finish:	REFUSAL IN NO REFUSAL	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,783	Northing(NAD83):	13,798,301
Hole Number:	ECP-2031-A			Freeboard:	6
Time:	9:12			Tide:	-0.21
Sounding Elev.:	-7.1	Bottom of Probe:	-46.2	Penetration:	39.1 ft.

	Elevation	Description / Material
Surveyed ==>	-7.1	=====
Penetration Depth:		WOR SURFICIAL SILT
10.1	-17.2	=====
		CL SILT/CLAY BEGIN JET
18.1	-25.2	=====
		CL SILT/CLAY NO REFUSAL
39.1	-46.2	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,261,260	Northing(NAD83):	13,798,478
Hole Number:	ECP-2032-A			Freeboard:	7
Time:	9:32			Tide:	-0.13
Sounding Elev.:	-7.3	Bottom of Probe:	-45.1	Penetration:	37.8 ft.

	Elevation	Description / Material
Surveyed ==>	-7.3	=====
Penetration Depth:		WOR SURFICIAL SILT
13.3	-20.6	=====
		CL SILT/CLAY BEGIN JET
14.3	-21.6	=====
		CL SILT/CLAY NO REFUSAL
37.8	-45.1	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,261,865	Northing(NAD83):	13,798,355
Hole Number:	ECP-2033-A			Freeboard:	6
Time:	9:56			Tide:	-0.24
Sounding Elev.:	-7.8	Bottom of Probe:	-45.2	Penetration:	37.5 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.8	=====	
Penetration Depth:		WOR SURFICIAL SILT	
7.5	-15.2	=====	
		CL SILT/CLAY	BEGIN JET
14.5	-22.2	=====	
		SA SAND	REFUSAL
37.5	-45.2	=====	

Character of Finish:	REFUSAL IN SAND	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,261,558	Northing(NAD83):	13,799,144
Hole Number:	ECP-2028-A			Freeboard:	6
Time:	10:18			Tide:	-0.2
Sounding Elev.:	-7.6	Bottom of Probe:	-39.7	Penetration:	32.2 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.6	=====	
Penetration Depth:		WOR SURFICIAL SILT	
9.2	-16.7	=====	
		CL SILT/CLAY	BEGIN JET
18.7	-26.2	=====	
		CL SILT/CLAY	REFUSAL
32.2	-39.7	=====	

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,261,083	Northing(NAD83):	13,798,936
Hole Number:	ECP-2027-A			Freeboard:	9.5
Time:	10:33			Tide:	-0.32
Sounding Elev.:	-7.3	Bottom of Probe:	-42.8	Penetration:	35.6 ft.

	Elevation	Description / Material
Surveyed ==>	-7.3	=====
Penetration Depth:		WOR SURFICIAL SILT
9.6	-16.8	=====
		CL SILT/CLAY BEGIN JET
17.6	-24.8	=====
		CL-SA SILT/CLAY & SAND NO REFUSAL
35.6	-42.8	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,626	Northing(NAD83):	13,798,782
Hole Number:	ECP-2026-A			Freeboard:	8.5
Time:	10:52			Tide:	-0.3
Sounding Elev.:	-7.0	Bottom of Probe:	-43.8	Penetration:	36.8 ft.

	Elevation	Description / Material
Surveyed ==>	-7.0	=====
Penetration Depth:		WOR SURFICIAL SILT
10.8	-17.8	=====
		CL SILT/CLAY BEGIN JET
20.8	-27.8	=====
		CL SILT/CLAY NO REFUSAL
36.8	-43.8	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,152	Northing(NAD83):	13,798,585
Hole Number:	ECP-2025-A			Freeboard:	7
Time:	11:11			Tide:	-0.17
Sounding Elev.:	-6.8	Bottom of Probe:	-45.2	Penetration:	38.4 ft.

	Elevation	Description / Material
Surveyed ==>	-6.8	=====
Penetration Depth:		WOR SURFICIAL SILT
11.4	-18.2	=====
		CL SILT/CLAY BEGIN JET
17.4	-24.2	=====
		CL SILT/CLAY JET
31.4	-38.2	=====
		CL SILT/CLAY JET
33.4	-40.2	=====
		CL SILT/CLAY NO REFUSAL
38.4	-45.2	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,696	Northing(NAD83):	13,798,413
Hole Number:	ECP-2024-A			Freeboard:	10.5
Time:	11:26			Tide:	-0.37
Sounding Elev.:	-6.2	Bottom of Probe:	-41.9	Penetration:	35.7 ft.

	Elevation	Description / Material
Surveyed ==>	-6.2	=====
Penetration Depth:		WOR SURFICIAL SILT
10.7	-16.9	=====
		CL SILT/CLAY BEGIN JET
15.7	-21.9	=====
		CL SILT/CLAY NO REFUSAL
35.7	-41.9	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,519	Northing(NAD83):	13,798,892
Hole Number:	ECP-2019-A			Freeboard:	11
Time:	11:47			Tide:	-0.37
Sounding Elev.:	-6.1	Bottom of Probe:	-41.4	Penetration:	35.2 ft.

	Elevation	Description / Material
Surveyed ==>	-6.1	=====
Penetration Depth:		WOR SURFICIAL SILT
12.2	-18.4	=====
		SA SAND BEGIN JET
14.2	-20.4	=====
		CL SILT/CLAY JET
30.2	-36.4	=====
		SA SAND NO REFUSAL
35.2	-41.4	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,995	Northing(NAD83):	13,799,065
Hole Number:	ECP-2020-A			Freeboard:	8.5
Time:	12:29			Tide:	-0.31
Sounding Elev.:	-6.6	Bottom of Probe:	-43.8	Penetration:	37.3 ft.

	Elevation	Description / Material
Surveyed ==>	-6.6	=====
Penetration Depth:		WOR SURFICIAL SILT
12.3	-18.8	=====
		CL SILT/CLAY BEGIN JET
17.8	-24.3	=====
		CL SILT/CLAY NO REFUSAL
37.3	-43.8	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,447	Northing(NAD83):	13,799,245
Hole Number:	ECP-2021-A			Freeboard:	9.5
Time:	12:59			Tide:	-0.16
Sounding Elev.:	-6.9	Bottom of Probe:	-42.7	Penetration:	35.8 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.9	=====	
Penetration Depth:		WOR SURFICIAL SILT	
11.3	-18.2	=====	
		CL SILT/CLAY	BEGIN JET
14.8	-21.7	=====	
		SA SAND	JET
32.8	-39.7	=====	
		CL SILT/CLAY	NO REFUSAL
35.8	-42.7	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,914	Northing(NAD83):	13,799,411
Hole Number:	ECP-2022-A			Freeboard:	6.5
Time:	13:17			Tide:	-0.13
Sounding Elev.:	-7.2	Bottom of Probe:	-45.6	Penetration:	38.5 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.2	=====	
Penetration Depth:		WOR SURFICIAL SILT	
12.0	-19.1	=====	
		CL SILT/CLAY	BEGIN JET
20.5	-27.6	=====	
		SA SAND	JET
34.5	-41.6	=====	
		CL SILT/CLAY	NO REFUSAL
38.5	-45.6	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,261,380	Northing(NAD83):	13,799,605
Hole Number:	ECP-2023-A			Freeboard:	8.5
Time:	13:33			Tide:	-0.21
Sounding Elev.:	-7.4	Bottom of Probe:	-43.7	Penetration:	36.3 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.4	=====	
Penetration Depth:		WOR SURFICIAL SILT	
9.3	-16.7	=====	
		SH SHELL	-
12.8	-20.2	=====	
		CL SILT/CLAY	BEGIN JET
19.8	-27.2	=====	
		SA-SH SAND & SHELL	NO REFUSAL
36.3	-43.7	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,751	Northing(NAD83):	13,799,886
Hole Number:	ECP-2018-A			Freeboard:	7.5
Time:	13:53			Tide:	-0.06
Sounding Elev.:	-7.0	Bottom of Probe:	-44.6	Penetration:	37.6 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.0	=====	
Penetration Depth:		WOR SURFICIAL SILT	
11.6	-18.6	=====	
		SH SHELL	-
16.6	-23.6	=====	
		CL SILT/CLAY	BEGIN JET
20.6	-27.6	=====	
		SA-SH SAND & SHELL	NO REFUSAL
37.6	-44.6	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,275	Northing(NAD83):	13,799,717
Hole Number:	ECP-2017-A			Freeboard:	7.5
Time:	14:07			Tide:	0.06
Sounding Elev.:	-6.7	Bottom of Probe:	-44.4	Penetration:	37.7 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.7	=====	
Penetration Depth:		WOR SURFICIAL SILT	
10.7	-17.4	=====	
		CL SILT/CLAY	BEGIN JET
19.2	-25.9	=====	
		SA-SH SAND & SHELL	BEGIN JET
33.7	-40.4	=====	
		CL SILT/CLAY	NO REFUSAL
37.7	-44.4	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,792	Northing(NAD83):	13,799,545
Hole Number:	ECP-2016-A			Freeboard:	7.5
Time:	14:24			Tide:	0.06
Sounding Elev.:	-6.5	Bottom of Probe:	-44.4	Penetration:	38.0 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.5	=====	
Penetration Depth:		WOR SURFICIAL SILT	
12.5	-18.9	=====	
		CL SILT/CLAY	BEGIN JET
19.0	-25.4	=====	
		CL SILT/CLAY	NO REFUSAL
38.0	-44.4	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,348	Northing(NAD83):	13,799,365
Hole Number:	ECP-2015-A			Freeboard:	8.5
Time:	14:39			Tide:	0.25
Sounding Elev.:	-6.1	Bottom of Probe:	-43.3	Penetration:	37.2 ft.

	Elevation	Description / Material
Surveyed ==>	-6.1	=====
Penetration Depth:		WOR SURFICIAL SILT
13.2	-19.3	=====
		CL SILT/CLAY BEGIN JET
19.2	-25.3	=====
		CL SILT/CLAY JET
33.2	-39.3	=====
		SA SAND JET
35.2	-41.3	=====
		CL SILT/CLAY NO REFUSAL
37.2	-43.3	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,206	Northing(NAD83):	13,799,732
Hole Number:	ECP-2012-A			Freeboard:	7.5
Time:	14:54			Tide:	0.31
Sounding Elev.:	-6.0	Bottom of Probe:	-44.2	Penetration:	38.2 ft.

	Elevation	Description / Material
Surveyed ==>	-6.0	=====
Penetration Depth:		WOR SURFICIAL SILT
12.7	-18.7	=====
		CL SILT/CLAY BEGIN JET
15.2	-21.2	=====
		CL SILT/CLAY NO REFUSAL
38.2	-44.2	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,259,639	Northing(NAD83):	13,799,959
Hole Number:	ECP-2013-A			Freeboard:	6.5
Time:	15:09			Tide:	0.37
Sounding Elev.:	-6.3	Bottom of Probe:	-45.1	Penetration:	38.8 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.3	=====	
Penetration Depth:		WOR SURFICIAL SILT	
12.3	-18.6	=====	
		CL SILT/CLAY	BEGIN JET
16.3	-22.6	=====	
		SA SAND	JET
27.8	-34.1	=====	
		CL SILT/CLAY	NO REFUSAL
38.8	-45.1	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,109	Northing(NAD83):	13,800,186
Hole Number:	ECP-2014-A			Freeboard:	7.5
Time:	15:24			Tide:	0.28
Sounding Elev.:	-6.6	Bottom of Probe:	-44.2	Penetration:	37.7 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.6	=====	
Penetration Depth:		WOR SURFICIAL SILT	
12.7	-19.2	=====	
		SA SAND	-
13.7	-20.2	=====	
		CL SILT/CLAY	BEGIN JET
15.7	-22.2	=====	
		CL SILT/CLAY	NO REFUSAL
37.7	-44.2	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,260,980	Northing(NAD83):	13,800,692
Hole Number:	ECP-2011-A			Freeboard:	7
Time:	15:38			Tide:	0.34
Sounding Elev.:	-7.2	Bottom of Probe:	-44.7	Penetration:	37.5 ft.

	Elevation	Description / Material
Surveyed ==>	-7.2	=====
Penetration Depth:		WOR SURFICIAL SILT
10.0	-17.2	=====
		CL SILT/CLAY
13.5	-20.7	=====
		CL SILT/CLAY BEGIN JET
15.5	-22.7	=====
		CL SILT/CLAY NO REFUSAL
37.5	-44.7	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,258,810	Northing(NAD83):	13,800,759
Hole Number:	ECP-2008-A			Freeboard:	8
Time:	15:57			Tide:	0.55
Sounding Elev.:	-5.6	Bottom of Probe:	-43.5	Penetration:	37.8 ft.

	Elevation	Description / Material
Surveyed ==>	-5.6	=====
Penetration Depth:		WOR SURFICIAL SILT
5.8	-11.5	=====
		CL SILT/CLAY BEGIN JET
14.8	-20.5	=====
		CL SILT/CLAY JET
30.8	-36.5	=====
		SA SAND NO REFUSAL
37.8	-43.5	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.20.20	Easting(NAD83):	3,258,625	Northing(NAD83):	13,801,238
Hole Number:	ECP-2006-A			Freeboard:	7.5
Time:	16:12			Tide:	0.68
Sounding Elev.:	-5.3	Bottom of Probe:	-42.8	Penetration:	37.5 ft.

	Elevation	Description / Material	
Surveyed ==>	-5.3	=====	
Penetration Depth:		WOR SURFICIAL SILT	
7.0	-12.3	=====	
		CL SILT/CLAY	BEGIN JET
14.5	-19.8	=====	
		SA-SH SAND & SHELL	JET
29.5	-34.8	=====	
		SA-SH SAND & SHELL	JET
33.5	-38.8	=====	
		CL SILT/CLAY	REFUSAL
37.5	-42.8	=====	

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,244	Northing(NAD83):	13,800,907
Hole Number:	ECP-2009-A			Freeboard:	7
Time:	8:37			Tide:	0.4
Sounding Elev.:	-5.9	Bottom of Probe:	-40.6	Penetration:	34.7 ft.

	Elevation	Description / Material	
Surveyed ==>	-5.9	=====	
Penetration Depth:		WOR SURFICIAL SILT	
7.2	-13.1	=====	
		CL SILT/CLAY	-
18.7	-24.6	=====	
		SA SAND	BEGIN JET
32.7	-38.6	=====	
		SA SAND	REFUSAL
34.7	-40.6	=====	

Character of Finish: REFUSAL IN SAND DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,089	Northing(NAD83):	13,801,398
Hole Number:	ECP-2007-A			Freeboard:	9.5
Time:	9:51			Tide:	-0.09
Sounding Elev.:	-5.6	Bottom of Probe:	-42.6	Penetration:	37.0 ft.

	Elevation	Description / Material
Surveyed ==>	-5.6	=====
Penetration Depth:		WOR SURFICIAL SILT
7.5	-13.1	=====
		CL SILT/CLAY
17.5	-23.1	=====
		SA SAND BEGIN JET
35.0	-40.6	=====
		SA SAND NO REFUSAL
37.0	-42.6	=====

Character of Finish:	REFUSAL IN NO REFUSAL	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,666	Northing(NAD83):	13,801,309
Hole Number:	ECP-2010-A			Freeboard:	8
Time:	10:10			Tide:	-0.03
Sounding Elev.:	-6.2	Bottom of Probe:	-40.0	Penetration:	33.8 ft.

	Elevation	Description / Material
Surveyed ==>	-6.2	=====
Penetration Depth:		WOR SURFICIAL SILT
7.8	-14.0	=====
		CL SILT/CLAY
15.8	-22.0	=====
		SA SAND BEGIN JET
31.8	-38.0	=====
		SA SAND REFUSAL
33.8	-40.0	=====

Character of Finish:	REFUSAL IN SAND	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,150	Northing(NAD83):	13,802,652
Hole Number:	ECP-2004-A			Freeboard:	8
Time:	10:31			Tide:	0.14
Sounding Elev.:	-5.5	Bottom of Probe:	-41.9	Penetration:	36.3 ft.

	Elevation	Description / Material	
Surveyed ==>	-5.5	=====	
Penetration Depth:		WOR	SURFICIAL SILT
6.8	-12.4	=====	
		SA	SAND
10.3	-15.9	=====	
		CL	SILT/CLAY
17.8	-23.4	=====	BEGIN JET
		SA	SAND
36.3	-41.9	=====	REFUSAL

Character of Finish: REFUSAL IN SAND DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,511	Northing(NAD83):	13,803,082
Hole Number:	ECP-2003-A			Freeboard:	7
Time:	10:48			Tide:	0.01
Sounding Elev.:	-6.1	Bottom of Probe:	-39.0	Penetration:	32.9 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.1	=====	
Penetration Depth:		WOR	SURFICIAL SILT
5.9	-12.0	=====	
		SA	SAND
11.9	-18.0	=====	BEGIN JET
		CL	SILT/CLAY
32.9	-39.0	=====	REFUSAL

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,260,106	Northing(NAD83):	13,802,975
Hole Number:	ECP-2005-A			Freeboard:	6.5
Time:	11:01			Tide:	0.02
Sounding Elev.:	-6.6	Bottom of Probe:	-43.5	Penetration:	36.9 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.6	=====	
Penetration Depth:		WOR	SURFICIAL SILT
6.4	-13.0	=====	
		CL	SILT/CLAY
9.9	-16.5	=====	BEGIN JET
		CL	SILT/CLAY
36.9	-43.5	=====	REFUSAL

Character of Finish:	REFUSAL IN	SILT/CLAY	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS	
Location:	M11	Engineer:	JRB, JWB, NM	
		Vessel:	"Shallow Draft 11"	

Date:	01.21.20	Easting(NAD83):	3,259,790	Northing(NAD83):	13,803,815
Hole Number:	ECP-2001-A			Freeboard:	7.5
Time:	11:30			Tide:	0
Sounding Elev.:	-6.5	Bottom of Probe:	-44.5	Penetration:	38.1 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.5	=====	
Penetration Depth:		WOR	SURFICIAL SILT
6.1	-12.5	=====	
		CL-SA	SILT/CLAY & SAND
8.1	-14.5	=====	
		SH	SHELL
24.1	-30.5	=====	BEGIN JET
		SA	SAND
38.1	-44.5	=====	NO REFUSAL

Character of Finish:	REFUSAL IN	NO REFUSAL	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.21.20	Easting(NAD83):	3,259,140	Northing(NAD83):	13,804,085
Hole Number:	ECP-2000-A			Freeboard:	6.5
Time:	11:45			Tide:	-0.08
Sounding Elev.:	-5.7	Bottom of Probe:	-45.6	Penetration:	39.9 ft.

	Elevation	Description / Material
Surveyed ==>	-5.7	=====
Penetration Depth:		WOR SURFICIAL SILT
6.4	-12.1	=====
		SA SAND BEGIN JET
9.9	-15.6	=====
		CL SILT/CLAY NO REFUSAL
39.9	-45.6	=====

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	Driller:
Location:	Engineer:
	Vessel:

Date:	Easting(NAD83):	Northing(NAD83):
Hole Number:		Freeboard:
Time:		Tide:
Sounding Elev.:	Bottom of Probe:	Penetration:

	Elevation	Description / Material
Surveyed ==>		=====
Penetration Depth:		

Character of Finish: DATUM:

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,094	Northing(NAD83):	13,794,672
Hole Number:	ECP-2053-A			Freeboard:	9.5
Time:	9:21			Tide:	0.03
Sounding Elev.:	-6.7	Bottom of Probe:	-27.0	Penetration:	20.3 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.7	=====	
Penetration Depth:		WOR SURFICIAL SILT	
9.3	-16.0	=====	
		SH SHELL	-
12.8	-19.5	=====	
		CL-SH SILT/CLAY & SHELL	BEGIN JET
14.3	-21.0	=====	
		CL SILT/CLAY	REFUSAL
20.3	-27.0	=====	

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,599	Northing(NAD83):	13,794,858
Hole Number:	ECP-2054-A			Freeboard:	7.5
Time:	10:04			Tide:	-0.16
Sounding Elev.:	-7.3	Bottom of Probe:	-27.2	Penetration:	19.8 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.3	=====	
Penetration Depth:		WOR SURFICIAL SILT	
8.8	-16.2	=====	
		CL SILT/CLAY	BEGIN JET
13.8	-21.2	=====	
		CL SILT/CLAY	REFUSAL
19.8	-27.2	=====	

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,056	Northing(NAD83):	13,795,036
Hole Number:	ECP-2055-A			Freeboard:	9
Time:	10:34			Tide:	-0.17
Sounding Elev.:	-7.8	Bottom of Probe:	-23.2	Penetration:	15.4 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.8	=====	
Penetration Depth:		WOR	SURFICIAL SILT
6.9	-14.7	=====	
		SA	SAND
9.4	-17.2	=====	
		CL	SILT/CLAY
11.4	-19.2	=====	
		CL	SILT/CLAY
13.9	-21.7	=====	BEGIN JET
		CL	SILT/CLAY
15.4	-23.2	=====	REFUSAL

Character of Finish: REFUSAL IN SILT/CLAY **DATUM:** MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,521	Northing(NAD83):	13,795,204
Hole Number:	ECP-2056-A			Freeboard:	8.5
Time:	10:48			Tide:	-0.21
Sounding Elev.:	-8.1	Bottom of Probe:	-28.7	Penetration:	20.7 ft.

	Elevation	Description / Material	
Surveyed ==>	-8.1	=====	
Penetration Depth:		WOR	SURFICIAL SILT
8.2	-16.2	=====	
		CL	SILT/CLAY
16.7	-24.7	=====	BEGIN JET
		CL	SILT/CLAY
20.7	-28.7	=====	REFUSAL

Character of Finish: REFUSAL IN SILT/CLAY **DATUM:** MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,984	Northing(NAD83):	13,795,402
Hole Number:	ECP-2057-A			Freeboard:	10
Time:	11:13			Tide:	-0.36
Sounding Elev.:	-8.4	Bottom of Probe:	-33.9	Penetration:	25.5 ft.

	Elevation	Description / Material
Surveyed ==>	-8.4	=====
Penetration Depth:		WOR SURFICIAL SILT
10.0	-18.4	=====
		CL SILT/CLAY BEGIN JET
15.0	-23.4	=====
		CL SILT/CLAY REFUSAL
25.5	-33.9	=====

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,792	Northing(NAD83):	13,795,870
Hole Number:	ECP-2052-A			Freeboard:	10.5
Time:	11:28			Tide:	-0.34
Sounding Elev.:	-8.3	Bottom of Probe:	-32.8	Penetration:	24.5 ft.

	Elevation	Description / Material
Surveyed ==>	-8.3	=====
Penetration Depth:		WOR SURFICIAL SILT
9.5	-17.8	=====
		CL SILT/CLAY BEGIN JET
14.5	-22.8	=====
		CL-SA SILT/CLAY & SAND REFUSAL
24.5	-32.8	=====

Character of Finish:	REFUSAL IN SILT/CLAY & SAND	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,157	Northing(NAD83):	13,796,155
Hole Number:	ECP-2051-A			Freeboard:	10
Time:	11:41			Tide:	-0.37
Sounding Elev.:	-7.9	Bottom of Probe:	-27.4	Penetration:	19.5 ft.

	Elevation	Description / Material
Surveyed ==>	-7.9	=====
Penetration Depth:		WOR SURFICIAL SILT
11.5	-19.4	=====
		CL SILT/CLAY BEGIN JET
16.5	-24.4	=====
		CL SILT/CLAY REFUSAL
19.5	-27.4	=====

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,682	Northing(NAD83):	13,795,952
Hole Number:	ECP-2050-A			Freeboard:	9
Time:	11:51			Tide:	-0.39
Sounding Elev.:	-7.6	Bottom of Probe:	-24.4	Penetration:	16.8 ft.

	Elevation	Description / Material
Surveyed ==>	-7.6	=====
Penetration Depth:		WOR SURFICIAL SILT
9.3	-16.9	=====
		CL SILT/CLAY BEGIN JET
15.3	-22.9	=====
		CL SILT/CLAY REFUSAL
16.8	-24.4	=====

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,217	Northing(NAD83):	13,795,795
Hole Number:	ECP-2049-A			Freeboard:	8.5
Time:	12:04			Tide:	-0.43
Sounding Elev.:	-7.0	Bottom of Probe:	-23.9	Penetration:	17.0 ft.

	Elevation	Description / Material
Surveyed ==>	-7.0	=====
Penetration Depth:		WOR SURFICIAL SILT
9.5	-16.4	=====
		CL SILT/CLAY BEGIN JET
14.0	-20.9	=====
		CL SILT/CLAY REFUSAL
17.0	-23.9	=====

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,753	Northing(NAD83):	13,795,610
Hole Number:	ECP-2048-A			Freeboard:	9.5
Time:	12:47			Tide:	-0.44
Sounding Elev.:	-4.4	Bottom of Probe:	-26.4	Penetration:	22.1 ft.

	Elevation	Description / Material
Surveyed ==>	-4.4	=====
Penetration Depth:		WOR SURFICIAL SILT
2.6	-6.9	=====
		CL SILT/CLAY BEGIN JET
3.6	-7.9	=====
		CL-SH SILT/CLAY & SHELL JET
11.6	-15.9	=====
		CL SILT/CLAY REFUSAL
22.1	-26.4	=====

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,514	Northing(NAD83):	13,796,232
Hole Number:	ECP-2044-A			Freeboard:	11
Time:	13:03			Tide:	-0.49
Sounding Elev.:	-4.1	Bottom of Probe:	-29.5	Penetration:	25.4 ft.

	Elevation	Description / Material	
Surveyed ==>	-4.1	=====	
Penetration Depth:		WOR	SURFICIAL SILT
1.4	-5.5	=====	
		CL	SILT/CLAY
19.4	-23.5	=====	BEGIN JET
		CL-SA	SILT/CLAY & SAND
25.4	-29.5	=====	REFUSAL

Character of Finish:	REFUSAL IN	SILT/CLAY & SAND	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS	
Location:	M11	Engineer:	JRB, JWB, NM	
		Vessel:	"Shallow Draft 11"	

Date:	01.24.20	Easting(NAD83):	3,261,056	Northing(NAD83):	13,796,261
Hole Number:	ECP-2045-A			Freeboard:	9
Time:	13:14			Tide:	-0.52
Sounding Elev.:	-7.0	Bottom of Probe:	-28.0	Penetration:	21.1 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.0	=====	
Penetration Depth:		WOR	SURFICIAL SILT
8.6	-15.5	=====	
		CL	SILT/CLAY
18.6	-25.5	=====	BEGIN JET
		CL-SH	SILT/CLAY & SHELL
21.1	-28.0	=====	REFUSAL

Character of Finish:	REFUSAL IN	SILT/CLAY & SHELL	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,517	Northing(NAD83):	13,796,448
Hole Number:	ECP-2046-A			Freeboard:	8.5
Time:	13:26			Tide:	-0.51
Sounding Elev.:	-7.5	Bottom of Probe:	-31.0	Penetration:	23.6 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.5	=====	
Penetration Depth:		WOR SURFICIAL SILT	
8.6	-16.0	=====	
		CL SILT/CLAY	BEGIN JET
16.6	-24.0	=====	
		CL-SA SILT/CLAY & SAND	REFUSAL
23.6	-31.0	=====	

Character of Finish:	REFUSAL IN SILT/CLAY & SAND	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,449	Northing(NAD83):	13,796,799
Hole Number:	ECP-2047-A			Freeboard:	9.5
Time:	13:37			Tide:	-0.5
Sounding Elev.:	-8.0	Bottom of Probe:	-43.0	Penetration:	35.0 ft.

	Elevation	Description / Material	
Surveyed ==>	-8.0	=====	
Penetration Depth:		WOR SURFICIAL SILT	
12.0	-20.0	=====	
		CL SILT/CLAY	BEGIN JET
18.5	-26.5	=====	
		SA SAND	NO REFUSAL
35.0	-43.0	=====	

Character of Finish:	REFUSAL IN NO REFUSAL	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,260	Northing(NAD83):	13,797,256
Hole Number:	ECP-2043-A			Freeboard:	9.5
Time:	13:50			Tide:	-0.56
Sounding Elev.:	-8.0	Bottom of Probe:	-43.1	Penetration:	35.1 ft.

	Elevation	Description / Material	
Surveyed ==>	-8.0	=====	
Penetration Depth:		WOR SURFICIAL SILT	
9.6	-17.6	=====	
		SA SAND	-
12.6	-20.6	=====	
		CL SILT/CLAY	-
17.1	-25.1	=====	
		CL SILT/CLAY	BEGIN JET
19.6	-27.6	=====	
		SA SAND	NO REFUSAL
35.1	-43.1	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,780	Northing(NAD83):	13,797,082
Hole Number:	ECP-2042-A			Freeboard:	9
Time:	14:01			Tide:	-0.56
Sounding Elev.:	-7.7	Bottom of Probe:	-43.6	Penetration:	35.8 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.7	=====	
Penetration Depth:		WOR SURFICIAL SILT	
11.8	-19.6	=====	
		CL SILT/CLAY	BEGIN JET
14.8	-22.6	=====	
		SA SAND	JET
31.8	-39.6	=====	
		SA SAND	NO REFUSAL
35.8	-43.6	=====	

Character of Finish: REFUSAL IN NO REFUSAL DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,321	Northing(NAD83):	13,796,910
Hole Number:	ECP-2041-A			Freeboard:	8.5
Time:	14:13			Tide:	-0.5
Sounding Elev.:	-7.5	Bottom of Probe:	-34.5	Penetration:	27.0 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.5	=====	
Penetration Depth:		WOR SURFICIAL SILT	
9.5	-17.0	=====	
		SA SAND	-
11.5	-19.0	=====	
		CL SILT/CLAY	-
13.5	-21.0	=====	
		CL SILT/CLAY	BEGIN JET
18.5	-26.0	=====	
		CL SILT/CLAY	REFUSAL
27.0	-34.5	=====	

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,850	Northing(NAD83):	13,796,723
Hole Number:	ECP-2040-A			Freeboard:	9
Time:	14:26			Tide:	-0.51
Sounding Elev.:	-6.8	Bottom of Probe:	-29.0	Penetration:	22.2 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.8	=====	
Penetration Depth:		WOR SURFICIAL SILT	
8.7	-15.5	=====	
		SA SAND	-
14.7	-21.5	=====	
		CL SILT/CLAY	BEGIN JET
19.2	-26.0	=====	
		CL SILT/CLAY	REFUSAL
22.2	-29.0	=====	

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,379	Northing(NAD83):	13,796,643
Hole Number:	ECP-2039-A			Freeboard:	10.5
Time:	14:39			Tide:	-0.46
Sounding Elev.:	-3.3	Bottom of Probe:	-30.5	Penetration:	27.2 ft.

	Elevation	Description / Material	
Surveyed ==>	-3.3	=====	
Penetration Depth:		WOR	SURFICIAL SILT
2.2	-5.5	=====	
		CL	SILT/CLAY
14.7	-18.0	=====	BEGIN JET
		CL-SA	SILT/CLAY & SAND
27.2	-30.5	=====	REFUSAL

Character of Finish: REFUSAL IN SILT/CLAY & SAND DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,221	Northing(NAD83):	13,797,019
Hole Number:	ECP-2034-A			Freeboard:	13
Time:	14:53			Tide:	-0.43
Sounding Elev.:	-2.6	Bottom of Probe:	-30.9	Penetration:	28.4 ft.

	Elevation	Description / Material	
Surveyed ==>	-2.6	=====	
Penetration Depth:		WOR	SURFICIAL SILT
0.4	-2.9	=====	
		SA	SAND
0.9	-3.4	=====	BEGIN JET
		CL-SA	SILT/CLAY & SAND
28.4	-30.9	=====	REFUSAL

Character of Finish: REFUSAL IN SILT/CLAY & SAND DATUM: MLLW

Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,260,698	Northing(NAD83):	13,797,220
Hole Number:	ECP-2035-A			Freeboard:	9
Time:	15:08			Tide:	-0.38
Sounding Elev.:	-6.9	Bottom of Probe:	-41.4	Penetration:	34.5 ft.

	Elevation	Description / Material	
Surveyed ==>	-6.9	=====	
Penetration Depth:		WOR SURFICIAL SILT	
10.5	-17.4	=====	
		CL SILT/CLAY	BEGIN JET
17.5	-24.4	=====	
		SA-SH SAND & SHELL	REFUSAL
34.5	-41.4	=====	

Character of Finish:	REFUSAL IN SAND & SHELL	DATUM:	MLLW
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,121	Northing(NAD83):	13,797,424
Hole Number:	ECP-2036-A			Freeboard:	10
Time:	15:20			Tide:	-0.34
Sounding Elev.:	-7.3	Bottom of Probe:	-37.3	Penetration:	30.0 ft.

	Elevation	Description / Material	
Surveyed ==>	-7.3	=====	
Penetration Depth:		WOR SURFICIAL SILT	
11.5	-18.8	=====	
		CL SILT/CLAY	BEGIN JET
17.0	-24.3	=====	
		CL SILT/CLAY	REFUSAL
30.0	-37.3	=====	

Character of Finish:	REFUSAL IN SILT/CLAY	DATUM:	MLLW
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Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,261,636	Northing(NAD83):	13,797,572
Hole Number:	ECP-2037-A			Freeboard:	10.5
Time:	15:36			Tide:	-0.27
Sounding Elev.:	-7.6	Bottom of Probe:	-31.8	Penetration:	24.2 ft.

	Elevation	Description / Material
Surveyed ==>	-7.6	=====
Penetration Depth:		WOR SURFICIAL SILT
9.7	-17.3	=====
		CL SILT/CLAY BEGIN JET
23.7	-31.3	=====
		CL SILT/CLAY REFUSAL
24.2	-31.8	=====

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

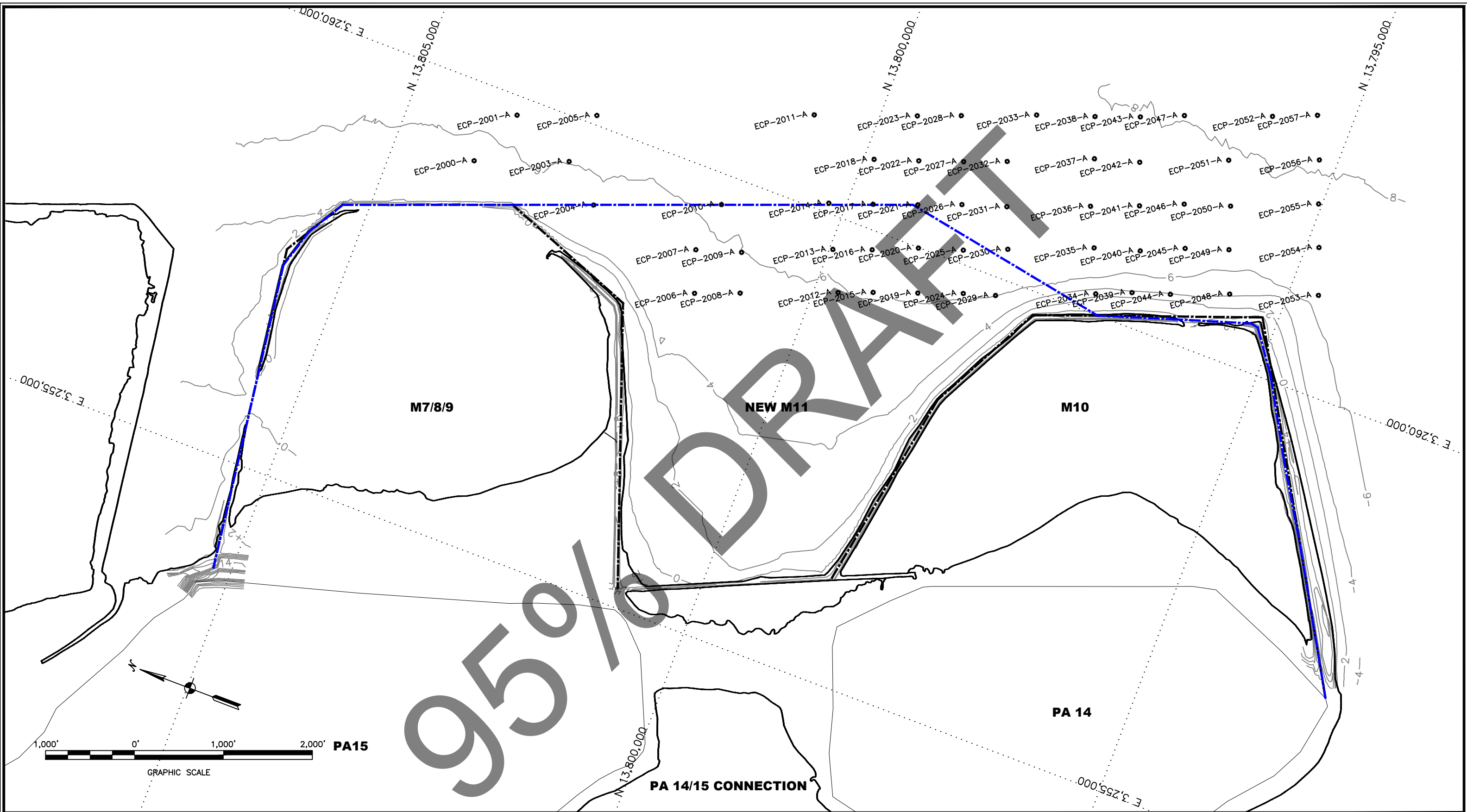
Project:	HSC-ECIP-PED	Driller:	DAS
Location:	M11	Engineer:	JRB, JWB, NM
		Vessel:	"Shallow Draft 11"

Date:	01.24.20	Easting(NAD83):	3,262,082	Northing(NAD83):	13,797,735
Hole Number:	ECP-2038-A			Freeboard:	9
Time:	15:49			Tide:	-0.28
Sounding Elev.:	-7.9	Bottom of Probe:	-29.8	Penetration:	21.9 ft.

	Elevation	Description / Material
Surveyed ==>	-7.9	=====
Penetration Depth:		WOR SURFICIAL SILT
11.4	-19.3	=====
		SA SAND -
13.4	-21.3	=====
		CL SILT/CLAY BEGIN JET
19.4	-27.3	=====
		CL SILT/CLAY REFUSAL
21.9	-29.8	=====

Character of Finish: REFUSAL IN SILT/CLAY DATUM: MLLW

M11 PROBING LOCATIONS					
PROBING ID	EASTING	NORTHING	PROBING ID	EASTING	NORTHING
ECP-2000-A	3,259,139.88	13,804,084.51	ECP-2030-A	3,260,339.13	13,798,120.97
ECP-2001-A	3,259,790.14	13,803,814.66	ECP-2031-A	3,260,782.62	13,798,301.47
ECP-2003-A	3,259,511.23	13,803,081.90	ECP-2032-A	3,261,259.71	13,798,478.37
ECP-2004-A	3,259,150.41	13,802,651.81	ECP-2033-A	3,261,865.40	13,798,354.84
ECP-2005-A	3,260,105.66	13,802,975.12	ECP-2034-A	3,260,221.03	13,797,018.51
ECP-2006-A	3,258,624.98	13,801,237.71	ECP-2035-A	3,260,697.92	13,797,220.07
ECP-2007-A	3,259,088.97	13,801,398.35	ECP-2036-A	3,261,120.82	13,797,423.95
ECP-2008-A	3,258,810.00	13,800,759.39	ECP-2037-A	3,261,636.37	13,797,571.98
ECP-2009-A	3,259,244.01	13,800,907.27	ECP-2038-A	3,262,082.19	13,797,734.52
ECP-2010-A	3,259,666.45	13,801,309.25	ECP-2039-A	3,260,378.94	13,796,642.54
ECP-2011-A	3,260,979.50	13,800,692.30	ECP-2040-A	3,260,850.05	13,796,723.04
ECP-2012-A	3,259,205.59	13,799,731.69	ECP-2041-A	3,261,321.10	13,796,910.08
ECP-2013-A	3,259,638.84	13,799,959.31	ECP-2042-A	3,261,780.32	13,797,082.28
ECP-2014-A	3,260,109.08	13,800,186.45	ECP-2043-A	3,262,260.06	13,797,256.49
ECP-2015-A	3,259,347.87	13,799,364.66	ECP-2044-A	3,260,514.17	13,796,232.16
ECP-2016-A	3,259,792.30	13,799,545.08	ECP-2045-A	3,261,055.91	13,796,260.67
ECP-2017-A	3,260,274.58	13,799,717.24	ECP-2046-A	3,261,517.43	13,796,447.82
ECP-2018-A	3,260,750.71	13,799,885.94	ECP-2047-A	3,262,449.24	13,796,798.78
ECP-2019-A	3,259,518.61	13,798,892.29	ECP-2048-A	3,260,753.33	13,795,610.49
ECP-2020-A	3,259,994.98	13,799,065.45	ECP-2049-A	3,261,216.57	13,795,795.04
ECP-2021-A	3,260,446.67	13,799,245.35	ECP-2050-A	3,261,682.05	13,795,952.18
ECP-2022-A	3,260,913.90	13,799,410.63	ECP-2051-A	3,262,157.08	13,796,155.31
ECP-2023-A	3,261,380.16	13,799,604.89	ECP-2052-A	3,262,792.44	13,795,869.80
ECP-2024-A	3,259,696.27	13,798,412.74	ECP-2053-A	3,261,093.61	13,794,672.39
ECP-2025-A	3,260,152.21	13,798,585.06	ECP-2054-A	3,261,599.36	13,794,857.56
ECP-2026-A	3,260,625.71	13,798,781.65	ECP-2055-A	3,262,056.23	13,795,035.51
ECP-2027-A	3,261,083.34	13,798,935.88	ECP-2056-A	3,262,521.35	13,795,203.51
ECP-2028-A	3,261,557.62	13,799,143.84	ECP-2057-A	3,262,983.64	13,795,401.59
ECP-2029-A	3,259,803.41	13,798,066.21			



REV	REVISIONS	DATE	APP

NOTES:

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2. ALL ELEVATIONS ARE IN U.S. SURVEY FEET AND REFERENCED TO MLLW AND ARE BELOW THE REFERENCE PLANE UNLESS PRECEDED BY A PLUS (+) SIGN.

LEGEND:

- HSC-ECIP P11 95% DESIGN M11 ALIGNMENT
- EXISTING M7/8/9 AND M10 ALIGNMENTS
- PROBING SURVEY LOCATIONS CONDUCTED BY THE JV IN JANUARY, 2020.

PRELIMINARY DRAFT

THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, RECORDATION, CONVEYANCE, SALES, OR AS THE BASIS FOR THE ISSUANCE OF A PERMIT.

ENGINEER:	C. HEDDERMAN
LICENSE NO.:	TX #100209
DATE:	12/08/2020

TurnerCollie&Braden Inc.
JOINT VENTURE - PORT DEVELOPMENT AND ENVIRONMENTAL SERVICES

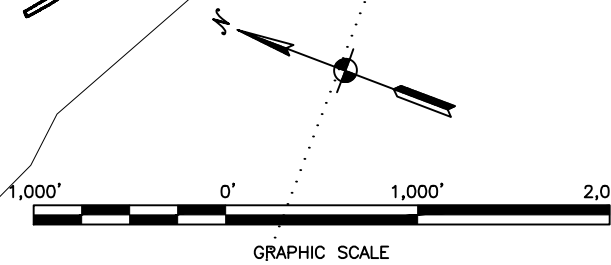
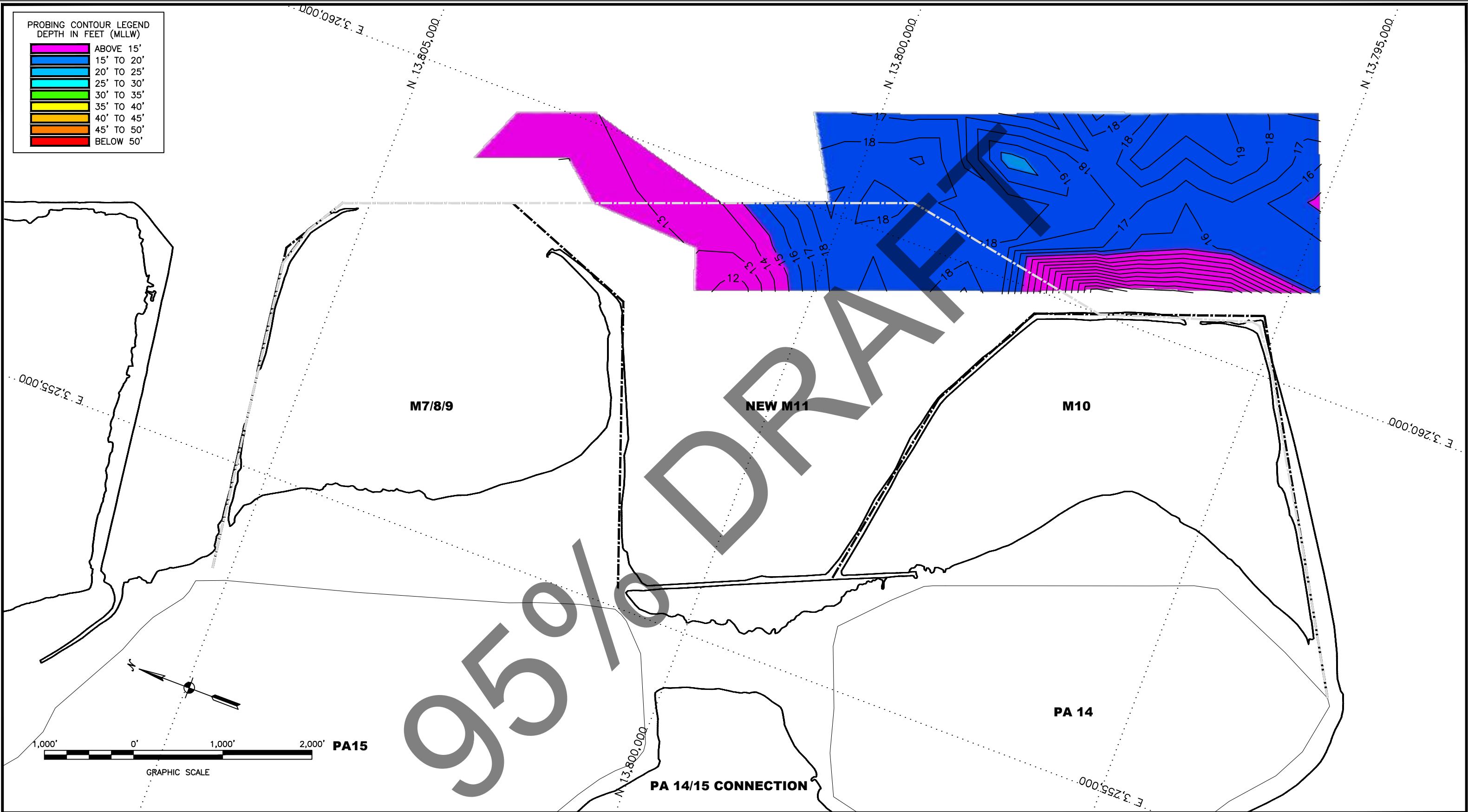
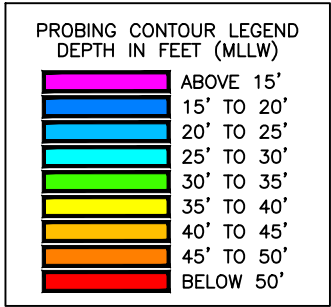
GAHAGAN & BRYANT ASSOCIATES
TEXAS ENGINEERING FIRM F-10788
5444 WESTHEIMER, SUITE 200
HOUSTON, TEXAS 77056
TEL. 713.780.4100

PORT OF HOUSTON AUTHORITY

HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENTS PROJECT

M11 - PROBING SURVEY

DWG DATE:	DECEMBER 08, 2020	DWG:	DOR-Exhibit-M11_201130		
DRAWN:	S. HALPIN	CHECKED:	D.CHENEY	ENGR:	C. HEDDERMAN
SCALE:	AS SHOWN	SHEET:	21 OF 24	REV:	



REV	REVISIONS	DATE	APP

NOTES:

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LEGEND:

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--- EXISTING M7/8/9 AND M10 ALIGNMENTS

PRELIMINARY
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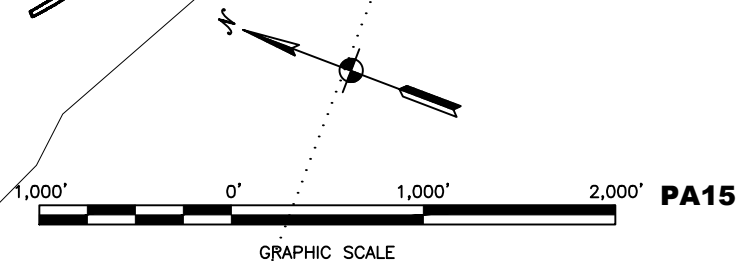
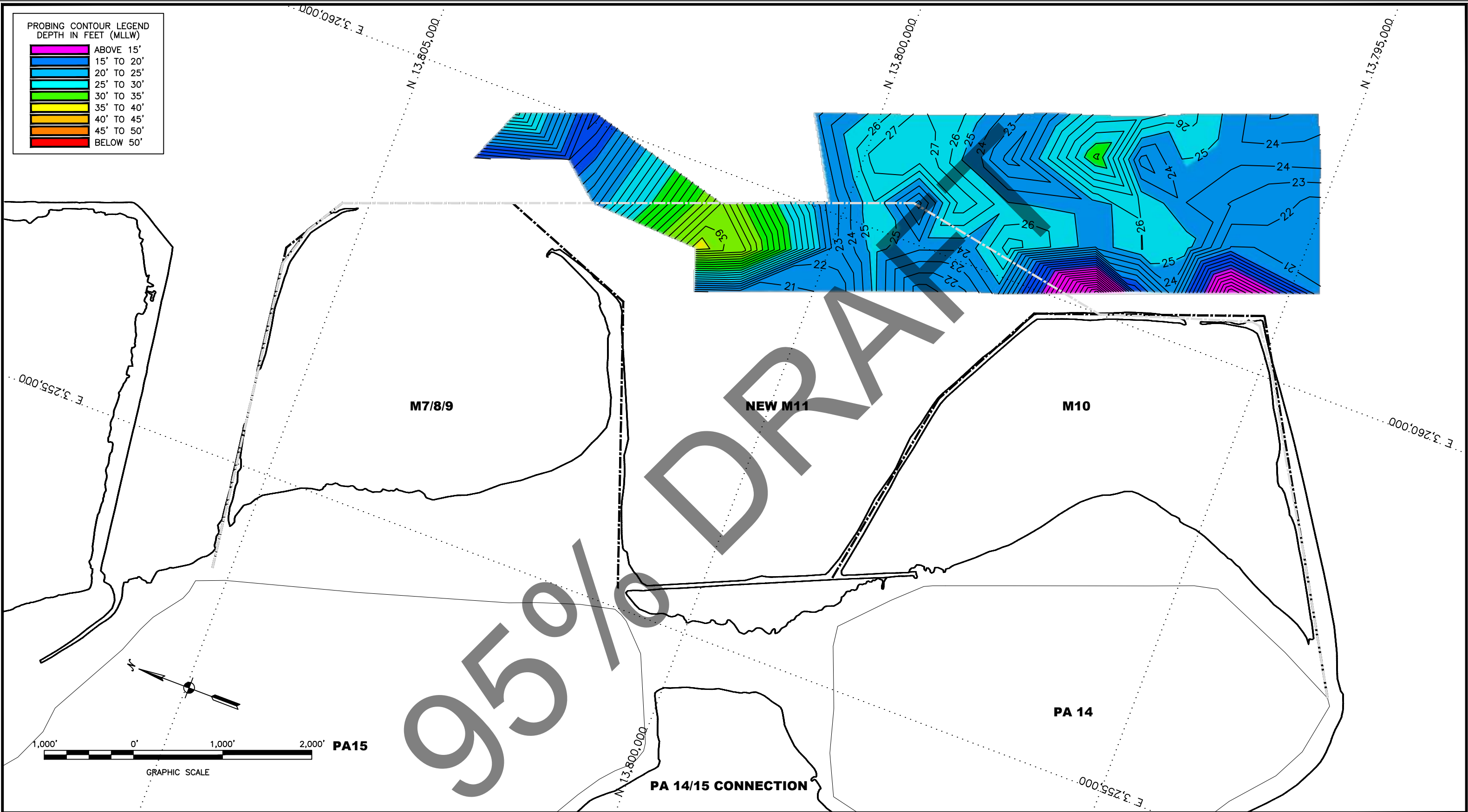
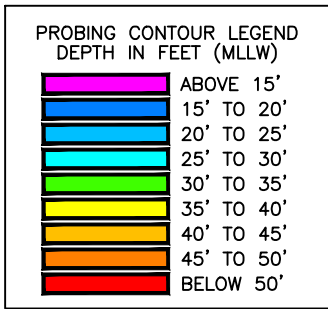
ENGINEER:	C. HEDDERMAN
LICENSE NO.:	TX #100209
DATE:	12/08/2020

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HOUSTON, TEXAS 77056
TEL. 713.780.4100

PORT OF HOUSTON AUTHORITY

HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENTS PROJECT

M11 - PROBING SURVEY WOR LAYER			
DWG DATE:	DECEMBER 08, 2020	DWG:	DOR-Exhibit-M11_201130
DRAWN:	S. HALPIN	CHECKED:	D.CHENEY
SCALE:	AS SHOWN	ENGR:	C. HEDDERMAN
SHEET:	22 OF 24	REV:	



REV	REVISIONS	DATE	APP

NOTES:

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DRAFT

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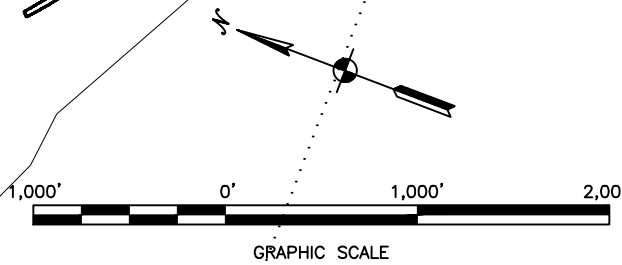
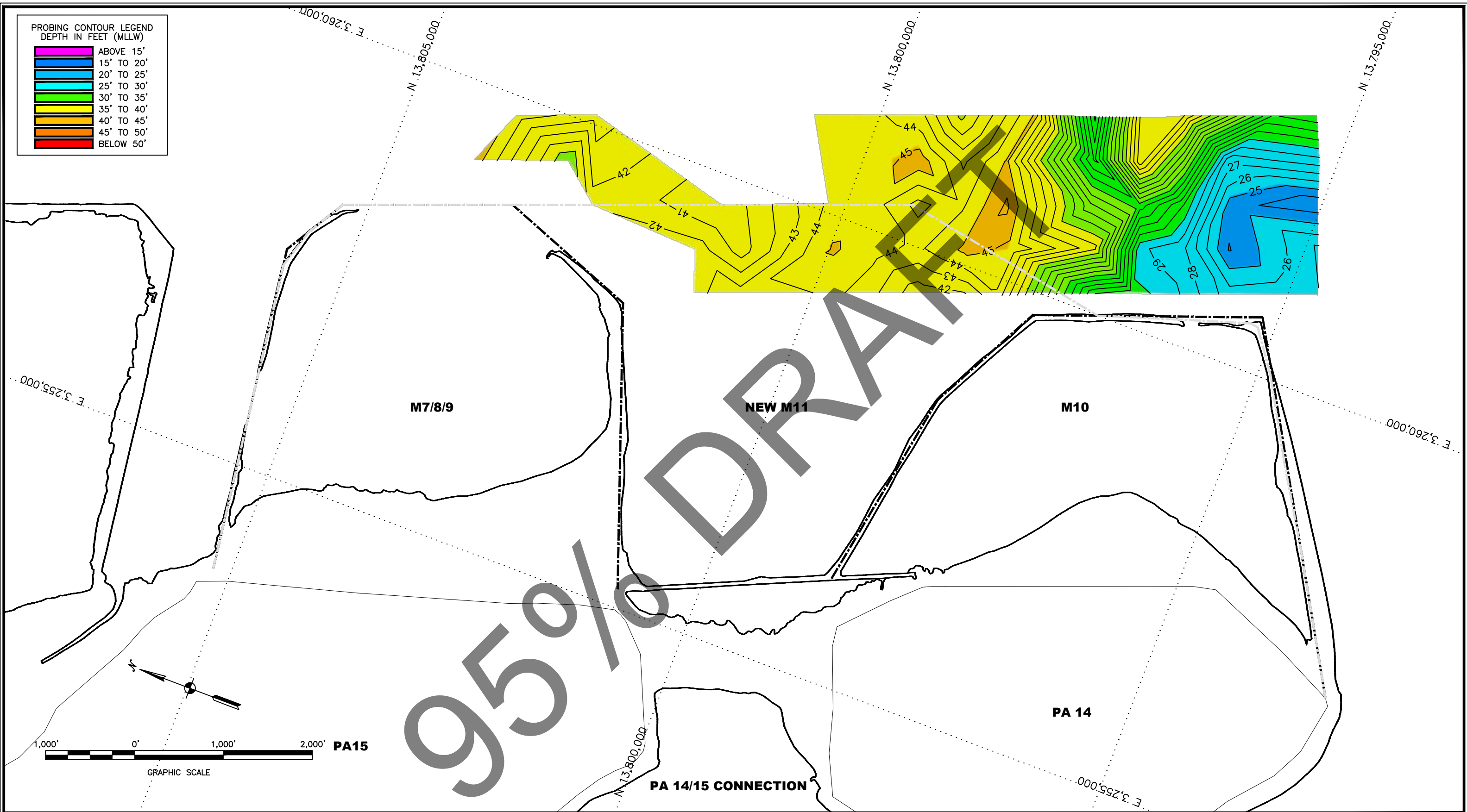
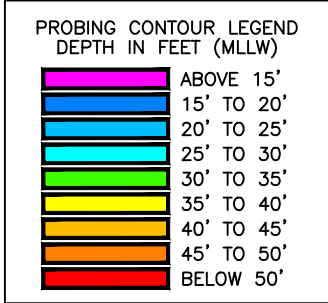
ENGINEER:	C. HEDDERMAN
LICENSE NO.:	TX #100209
DATE:	12/08/2020

TurnerCollie&BradenInc.
JOINT VENTURE - PORT DEVELOPMENT AND ENVIRONMENTAL SERVICES
GAHAGAN & BRYANT ASSOCIATES
TEXAS ENGINEERING FIRM F-10788
5444 WESTHEIMER, SUITE 200
HOUSTON, TEXAS 77056
TEL. 713.780.4100

PORT OF HOUSTON AUTHORITY

HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENTS PROJECT

M11 - PROBING SURVEY FIRM LAYER			
DWG DATE:	DECEMBER 08, 2020	DWG:	DOR-Exhibit-M11_201130
DRAWN:	S. HALPIN	CHECKED:	D.CHENEY
SCALE:	AS SHOWN	ENGR:	C. HEDDERMAN
SHEET:	23 OF 24	REV:	



REV	REVISIONS	DATE	APP

NOTES:

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PRELIMINARY DRAFT

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ENGINEER:	C. HEDDERMAN
LICENSE NO.:	TX #100209
DATE:	12/08/2020

TurnerCollie&Braden Inc.
JOINT VENTURE - PORT DEVELOPMENT AND ENVIRONMENTAL SERVICES

GAHAGAN & BRYANT ASSOCIATES
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HOUSTON, TEXAS 77056
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PORT OF HOUSTON AUTHORITY

HOUSTON SHIP CHANNEL
EXPANSION CHANNEL IMPROVEMENTS PROJECT

M11 - PROBING SURVEY REFUSAL LAYER

DWG DATE:	DECEMBER 08, 2020	DWG:	DOR-Exhibit-M11_201130		
DRAWN:	S. HALPIN	CHECKED:	D.CHENEY	ENGR:	C. HEDDERMAN
SCALE:	AS SHOWN	SHEET:	24 OF 24	REV:	

Appendix B – Boring Logs

The boring logs provided herein are taken from multiple sources and may not reflect the full extent of data collected or reporting provided at that time. Full data reports in possession of the Engineer can be provided electronically upon request by the Contractor.

95% DRAFT



Project 11

Houston Ship Channel Expansion Channel Improvement Project

Boring Logs



PORT HOUSTONSM
THE INTERNATIONAL PORT OF TEXAS

December 9, 2020

95% PRELIMINARY

THIS DOCUMENT IS RELEASED FOR
THE PURPOSE OF INTERIM REVIEW
AND IS NOT INTENDED TO BE USED
FOR CONSTRUCTION, BIDDING, OR
PERMITTING PURPOSES.

ENGINEER: ASHLEY P. JUDITH
LICENSE NO: TX# 112988
DATE: DECEMBER 09, 2020

ENGINEER: CHESTER HEDDERMAN
LICENSE NO: TX# 100209
DATE: DECEMBER 09, 2020

TurnerCollie&Braden, Inc.

JOINT VENTURE - PORT DEVELOPMENT AND ENVIRONMENTAL SERVICES

Gahagan & Bryant Associates, Inc.

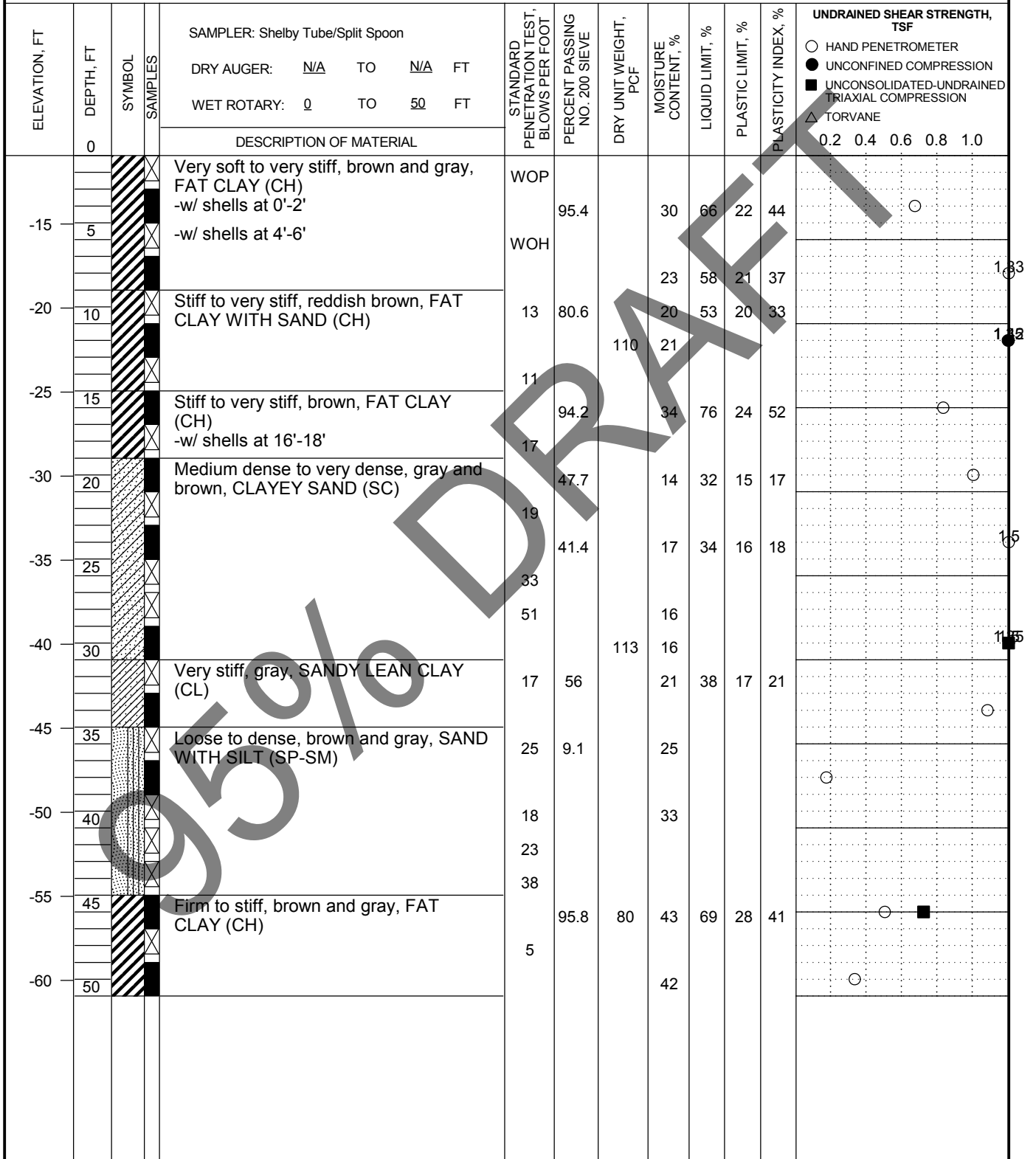
LOG OF BORING ECP-143

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13796795.5; E: 3251145.93
 DEPTH OF WATER: 11.30 FT
 OFFSET: N/A
 SURFACE ELEVATION: -10.93 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 12/19/2019



Remarks: Mudline was encountered at 11.30' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-144

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13800187.19; E: 3251373.18
 DEPTH OF WATER: 10.40 FT
 OFFSET: N/A
 SURFACE ELEVATION: -10.29 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 1/4/2020

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: N/A TO N/A FT WET ROTARY: 0 TO 50 FT	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION △ TORVANE
	0			DESCRIPTION OF MATERIAL								
				Very soft, gray, LEAN CLAY (CL) -w/ shells at 0'-4'		89.6		54	45	18	27	△
-15	5			-w/ shells at 6'-8'	WOP			28	27	14	13	△
-20	10			Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ ferrous stains at 10'-12'	WOP		94	30				
				-w/ shells at 12'-16'	8	96.5		25	61	22	39	
-25	15			-w/ calcareous nodules at 14'-18'								
				-w/ ferrous stains at 14'-30'	11			23				
-30	20				10			29				
						95.9	99	25	61	27	34	●
-35	25			-w/ calcareous nodules at 24'-26'	8							
					11			25				
-40	30				22							
				Medium dense to very dense, reddish brown, brown and gray, CLAYEY SAND (SC) -w/ shells at 32'-34'		45.2		17	39	18	21	
-45	35			-w/ ferrous stains at 32'-34'	24			29				
				-w/ ferrous stains at 36'-38'								
-50	40				26	45.3		25	27	14	13	
					53							
-55	45			Stiff, reddish brown and gray, FAT CLAY (CH) -w/ silt and sand seams at 44'-50'	9	99.5		27	55	20	35	
-60	50				13							

Remarks: Mudline was encountered at 10.40' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-145

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13802709.33; E: 3248958.71
 DEPTH OF WATER: 10.80 FT
 OFFSET: N/A
 SURFACE ELEVATION: -10.17 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 1/1/2020

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF
	0			DRY AUGER: N/A TO N/A FT WET ROTARY: 0 TO 50 FT								○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION △ TORVANE
				DESCRIPTION OF MATERIAL								0.2 0.4 0.6 0.8 1.0
				Very soft, gray, SANDY LEAN CLAY (CL) -w/ shells at 0'-10'	WOP			30				△
-15	5				WOP	65.3		44	40	18	22	△
				Stiff to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ shells at 10'-14'	10	96.3	98	26	61	37	24	○ ●
-20	10				9	97.1		29	68	22	46	○
-25	15				12			23				○
-30	20			Very stiff, reddish brown and gray, FAT CLAY WITH SAND (CH) with occasional sand seams	10	80.9	107	22	58	25	33	● 1.38
-35	25				10			16				○ 1.5
-40	30			Stiff to very stiff, gray and reddish brown, LEAN CLAY (CL) -w/ sand pockets at 32'-36' -w/ sand seams at 36'-40'	13	89.7	106	22	38	20	18	○ ■
-45	35				11			24	37	18	19	○
-50	40				12			27				○
-55	45			Stiff to very stiff, gray and reddish, FAT CLAY (CH) -w/ ferrous stains at 40'-48' -w/ calcareous nodules at 44'-48'	13		96	28	71	27	44	■ 1.83
-55	45				11			24				○ 1.62
-60	50							25				○ 1.5

Remarks: Mudline was encountered at 10.80' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-146A

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13806462.57; E: 3249035.25
 DEPTH OF WATER: 9.60 FT
 OFFSET: N/A
 SURFACE ELEVATION: -9.79 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 52 FT

DATE: 12/31/2019

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: N/A TO N/A FT WET ROTARY: 0 TO 52 FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION △ TORVANE
-10	0				Very loose, gray, SILTY SAND (SM) -w/ shells at 0'-14'	WOP			35				
-15	5					WOP	24.2		24				
-20	10					WOH			24				
-25	15				Very soft to soft, gray, SANDY LEAN CLAY (CL) -w/ shells at 14'-16'	WOP	62.8	92	33	35	18	17	
-30	20					WOP	63.9		36	49	19	30	
-35	25				Very loose, gray, CLAYEY SAND (SC) -w/ shells at 24'-28'	WOP	46.0		31	32	16	16	
-40	30				Very soft to firm, gray, FAT CLAY WITH SAND (CH)	WOP	82.2		54	75	23	52	
-45	35				Firm to stiff, reddish brown and gray, SANDY LEAN CLAY (CL)	7	53.2		24	35	17	18	
-50	40					8		110	20				
-55	45				Very loose to medium dense, gray and brown, SILTY SAND (SM)	8			20				
-60	50					27	24.9		28				
						10			19				
						24			18				

Remarks: Mudline was encountered at 9.60' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-147

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13808693.12; E: 3246756.39
 DEPTH OF WATER: 11.30 FT
 OFFSET: N/A
 SURFACE ELEVATION: -11.43 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 12/31/2019

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF
				DRY AUGER: <u>N/A</u> TO <u>N/A</u> FT								
				DESCRIPTION OF MATERIAL								
	0			Very loose, gray, CLAYEY SAND (SC-SM)	WOP			27				
-15	5				WOP	26.5		25				
					WOH							
-20	10				WOH	26.4		24	25	18	7	
					WOH			35				
								33				△
-25	15			Very soft, gray, SANDY LEAN CLAY (CL)	WOH	65.7		40	48	19	29	△
					WOH							
-30	20					63.4		37	44	20	24	○
					WOH			57				
-35	25			Very loose, gray, SILTY SAND (SM)		37.5		20	22	19	3	○
					WOH							
-40	30			Loose, reddish brown and gray, CLAYEY SAND (SC)			111	18	38	21	17	○ ■
					9			22				
-45	35			Loose to medium dense, brown, SILTY SAND (SM)	10	32.3		20	22	20	2	
					10							
					4			24				
					5							
-50	40				9			24				
					15							
-55	45			Medium dense, brown, SAND WITH SILT (SP-SM)	13	6.6		19				
					16							
				-w/ gravel at 46'-48'	13			18				
-60	50				16							

Remarks: Mudline was encountered at 11.30' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-148

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13812157.97; E: 3246947.59
 DEPTH OF WATER: 7.0 FT
 OFFSET: N/A
 SURFACE ELEVATION: -6.9 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 54 FT

DATE: 12/30/2019

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: <u>N/A</u> TO <u>N/A</u> FT WET ROTARY: <u>0</u> TO <u>54</u> FT	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAxIAL COMPRESSION △ TORVANE
	0			DESCRIPTION OF MATERIAL								0.2 0.4 0.6 0.8 1.0
				Very loose, gray, SILTY SAND (SM)	WOP			27				
-10					WOP	35.7		29				
	5							27				△
-15				-w/ shells at 8'-16'	WOP							
	10					21.5		23				△
-20					WOH			26				△
	15											
-25				Very soft, gray, SANDY LEAN CLAY (CL) -w/ shells at 18'-26'	WOH	55.3		33	32	20	12	△
	20				WOH			36				△
-30					WOH							
	25			Loose, gray, CLAYEY SAND (SC)		6	45.7	28	38	22	16	
-35						8						
	30					5		32				
-40				Firm to stiff, gray, FAT CLAY WITH SAND (CH)			82.9	56	81	31	50	△
	35					13		48				
-45				Loose to medium dense, gray, SILTY SAND (SM)		7	30.7	32	28	25	3	
	40					11						
-50						15		24				
	45					6	39.8	25	23	20	3	
-55						12						
	50					20		16				
-60						10	31.3	21				○
						12						■

Remarks: Mudline was encountered at 7.0' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP-149

PROJECT: Houston Ship Channel Expansion - Segment 1C
 LOCATION: N: 13815925.89; E: 3245563.42
 DEPTH OF WATER: 10.60 FT
 OFFSET: N/A
 SURFACE ELEVATION: -10.77 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 1/4/2020

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: <u>N/A</u> TO <u>N/A</u> FT WET ROTARY: <u>0</u> TO <u>50</u> FT	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAxIAL COMPRESSION △ TORVANE
	0			DESCRIPTION OF MATERIAL								
				Very soft, gray, SANDY LEAN CLAY (CL) -w/ shells at 0'-8'	WOP			25				
-15	5				WOP	56.3		25	21	13	8	
					WOH							
					WOH			26				
-20	10				WOH							
					WOH			26				
-25	15			Very loose, gray, CLAYEY SAND (SC) -w/ shells at 12'-16'		47.9		29	34	16	18	○
					2							
								30				△
-30	20				3							
				Very loose, gray, SILTY CLAYEY SAND (SC-SM)	WOH	17.9		23	18	13	5	
-35	25			Firm, reddish brown and gray, SANDY LEAN CLAY (CL) -w/ calcareous nodules at 24'-30'	5							
						67.6	108	18	45	21	24	■
-40	30			Firm to very stiff, reddish brown and gray, FAT CLAY (CH) -w/ sand seams at 24'-32'	9							○
					16			21				
-45	35			-w/ claystone at 32'-34'				25	74	24	50	○
					13							
-50	40			-w/ sand seams at 36'-40'			111	19				■
					13							
-55	45			Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL) -w/ calcareous nodules at 44'-48'		71.6		18	48	19	29	○
					10							
-60	50				15			22				○
								22				○

Remarks: Mudline was encountered at 10.60' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 1C.GPJ 4/27/20

LOG OF BORING ECP- 303A

PROJECT: Houston Ship Channel Expansion - Segment 3
 LOCATION: N: 13819330.17; E: 3242597.76
 DEPTH OF WATER: 11.50 FT
 OFFSET: N/A
 SURFACE ELEVATION: -11.24 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 50 FT

DATE: 12/29/2019

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF
				DRY AUGER: N/A TO N/A FT								○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAxIAL COMPRESSION △ TORVANE
				WET ROTARY: 0 TO 50 FT								0.2 0.4 0.6 0.8 1.0
				DESCRIPTION OF MATERIAL								
	0			Very loose, gray, CLAYEY SAND (SC) -w/ shells at 0'-6'	WOP			32				
-15	5				WOP	42.7		25	25	16	9	△
-20	10			Firm to stiff, gray, SANDY LEAN CLAY (CL)				28				
					7	62.7		23	38	19	19	
-25	15			Very soft, gray, SANDY FAT CLAY (CH)								
					2			22	52	22	30	
				-w/ shells at 14'-16'								△
-30	20			Stiff to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)	11	65.4	105	23	45	19	26	
					14	51.5		24	73	29	44	
-35	25			Stiff to very stiff, gray and reddish brown, SANDY FAT CLAY (CH)								
					9							
				-w/ ferrous stains at 24'-26'			93	29				
-40	30			Stiff to very stiff, gray and reddish brown, LEAN CLAY WITH SAND (CL)	15	77.4		19	43	15	28	
					23			22				
-45	35						108	22				
					20							
-50	40			Very stiff, gray and reddish brown, FAT CLAY WITH SAND (CH)		75.2		21	53	18	35	
				-w/ sand at 36'-38'	21							
				-w/ ferrous nodules at 38'-42'				22				
-55	45				19							
				-slickensided at 44'-46'								
				Very stiff, gray and reddish brown, FAT CLAY (CH)			109	20				
-60	50				30	97.4		30	61	22	39	
				-slickensided at 48'-50'				29				

Remarks: Mudline was encountered at 11.5' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 4/27/20

LOG OF BORING ECP- 304B

PROJECT: Houston Ship Channel Expansion - Segment 3
 LOCATION: N: 13815732.01; E: 3244430.59
 DEPTH OF WATER: 9.10 FT
 OFFSET: N/A
 SURFACE ELEVATION: -9.44 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 52 FT

DATE: 01/04/2020

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: N/A TO N/A FT WET ROTARY: 0 TO 52 FT	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION △ TORVANE
	0			DESCRIPTION OF MATERIAL								0.2 0.4 0.6 0.8 1.0
-10				Very loose to loose, gray, CLAYEY SAND (SC) -w/ shells at 0'-6'	1							
	5				4	46.4		23				
-15				Very soft to firm, gray, SANDY LEAN CLAY (CL)	5							
	10				3	67.2		27	31	16	15	
-20					4							
	15			-w/ shells at 12'-14'	5			28				
-25					4	68.3		30	37	15	22	△
	20			Very soft, gray, FAT CLAY WITH SAND (CH)	2			35				
-30						83.9		45	64	24	40	○
	25			-w/ wood pieces at 22'-24'	2							
-35				Firm to very stiff, gray and reddish brown, SANDY LEAN CLAY (CL)			100	27				●
	30				7	55.9		22	36	18	18	
-40					5			21				
	35			Loose, gray and reddish brown, CLAYEY SAND (SC) -w/ sand layer at 34'-36'	7	46.3		23	25	15	10	
-45							109	20				●
	40			Very soft to firm, brown, SANDY LEAN CLAY (CL)	2							
-50						63.2		25	32	17	15	○
	45			Loose, brown, SAND WITH SILT (SP-SM)	6							
-55					9	7.7		20				
	50			Loose to medium dense, brown, SILTY SAND (SM)	10	20.2		20				
-60								20				

Remarks: Mudline was encountered at 9.1' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 4/27/20

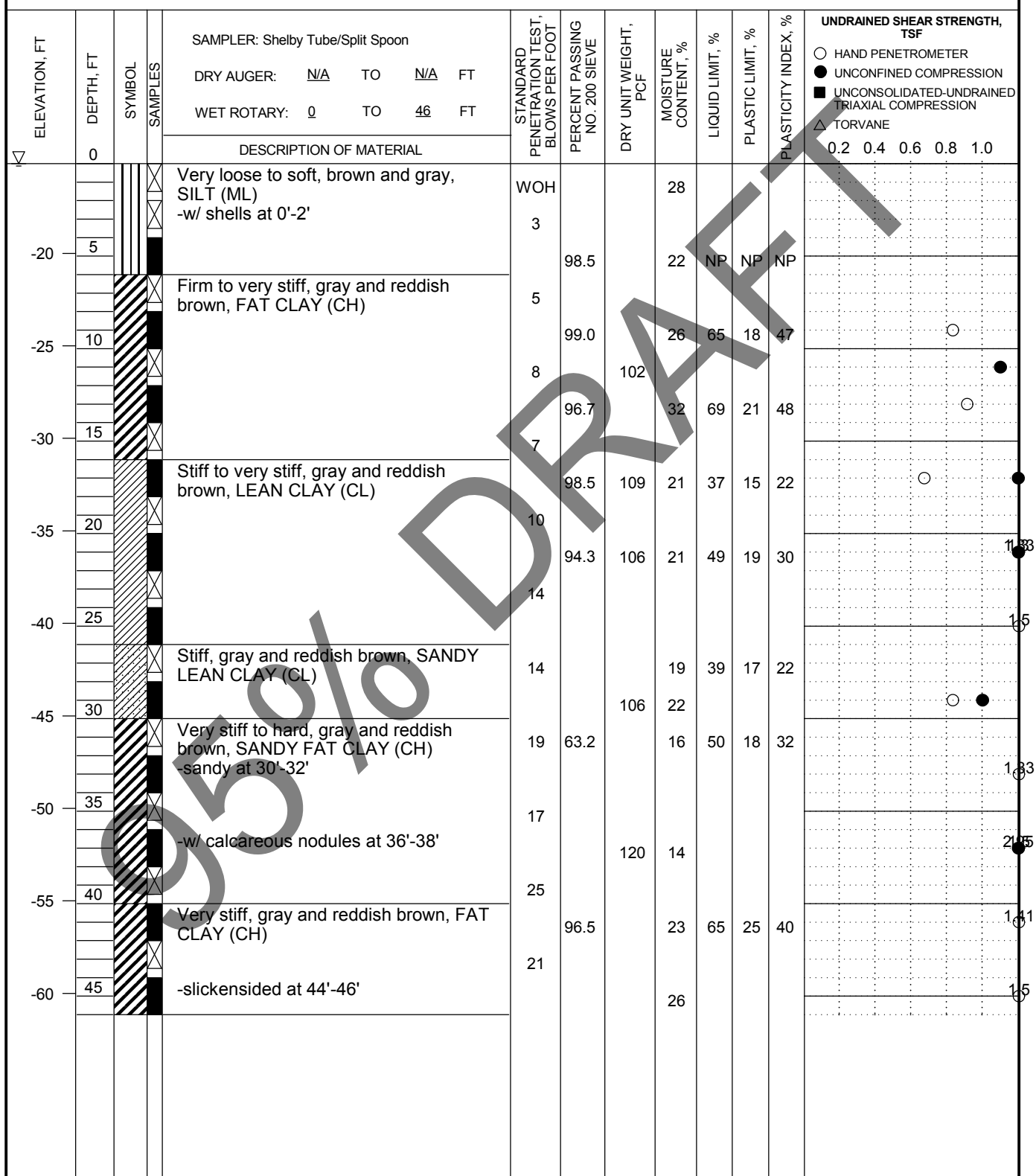
LOG OF BORING ECP-307A

PROJECT: Houston Ship Channel Expansion - Segment 3
 LOCATION: N: 13817621.32; E: 3243747.99
 DEPTH OF WATER: 15.90 FT
 OFFSET: N/A
 SURFACE ELEVATION: -15.15 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 46 FT

DATE: 01/03/2020



COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 4/27/20

Remarks: Mudline was encountered at 15.9' below the water level during drilling operations.

LOG OF BORING ECP-308A

PROJECT: Houston Ship Channel Expansion - Segment 3
 LOCATION: N: 13817237.59; E: 3243951.24
 DEPTH OF WATER: 29.40 FT
 OFFSET: N/A
 SURFACE ELEVATION: -28.4 FT

PROJECT NO.: HG1910092.1.1

COMPLETION DEPTH: 32 FT

DATE: 01/03/2020

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	SAMPLER: Shelby Tube/Split Spoon DRY AUGER: N/A TO N/A FT WET ROTARY: 0 TO 32 FT	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	UNDRAINED SHEAR STRENGTH, TSF ○ HAND PENETROMETER ● UNCONFINED COMPRESSION ■ UNCONSOLIDATED-UNDRAINED TRIAxIAL COMPRESSION △ TORVANE
	0			DESCRIPTION OF MATERIAL								0.2 0.4 0.6 0.8 1.0
-30				Firm to stiff, gray and tan, LEAN CLAY (CL) -w/ shells at 0'-6'	4	96.8		41				
	5							37	35	16	19	
-35					7							
	10											
-40					7							
	15			Stiff, gray and tan, FAT CLAY (CH) -w/ ferrous stains at 14'-16'	8	96.2	85	37				
-45								41	85	32	53	
	20				9		80	41				
-50				Stiff, gray and tan, SANDY LEAN CLAY (CL)			116	39				
	25				9	62.8		19				
-55				Stiff to very stiff, gray and tan, FAT CLAY WITH SAND (CH)		70.6		27	49	19	30	
	30				11			30	50	17	33	
-60					11			20				
								19				

Remarks: Mudline was encountered at 29.4' below the water level during drilling operations.

COH HG1910092.1.1 - HSC SEGMENT 3.GPJ 4/27/20

LOG OF BORING

Project: HSC Borings

Project No.: HG0915782

Boring No.: HSC-09-01 (Depth of water = 14.3 ft)

Date: 10/23/2009

Elevation: -12.0 feet

Groundwater during drilling: 0 feet

Northing: 13,803,857.5

Station: --

Groundwater after drilling: ---

Easting: 3,248,730.1

Offset: --

ELEV. DEPTH, FEET	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL/ROCK CLASSIFICATION	% PASSING NO. 200 SIEVE	DRY DENSITY PCF	<div> <div> SHEAR STRENGTH, TSF 0.5 1.0 1.5 2.0 </div> <div> MOISTURE CONTENT, % 10 20 30 40 50 60 70 80 90 </div> <div> PLASTIC LIMIT LIQUID LIMIT </div> </div>
0	▼				
0					
5					
-5					
-10					
-15					
-20					
-25					
-30					
-35					
-40					

Shear Types:

● = Hand Penet.

■ = Torvane

▲ = Unconf. Comp.

* = UU Triaxial

See Plate 2 for boring location.

PLATE A-1a

LOG OF SOIL BORING HG-09-15782.GPJ HVJ GDT 11/23/09

LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-01 (Depth of water = 14.3 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/23/2009

Northing: 13,803,857.5

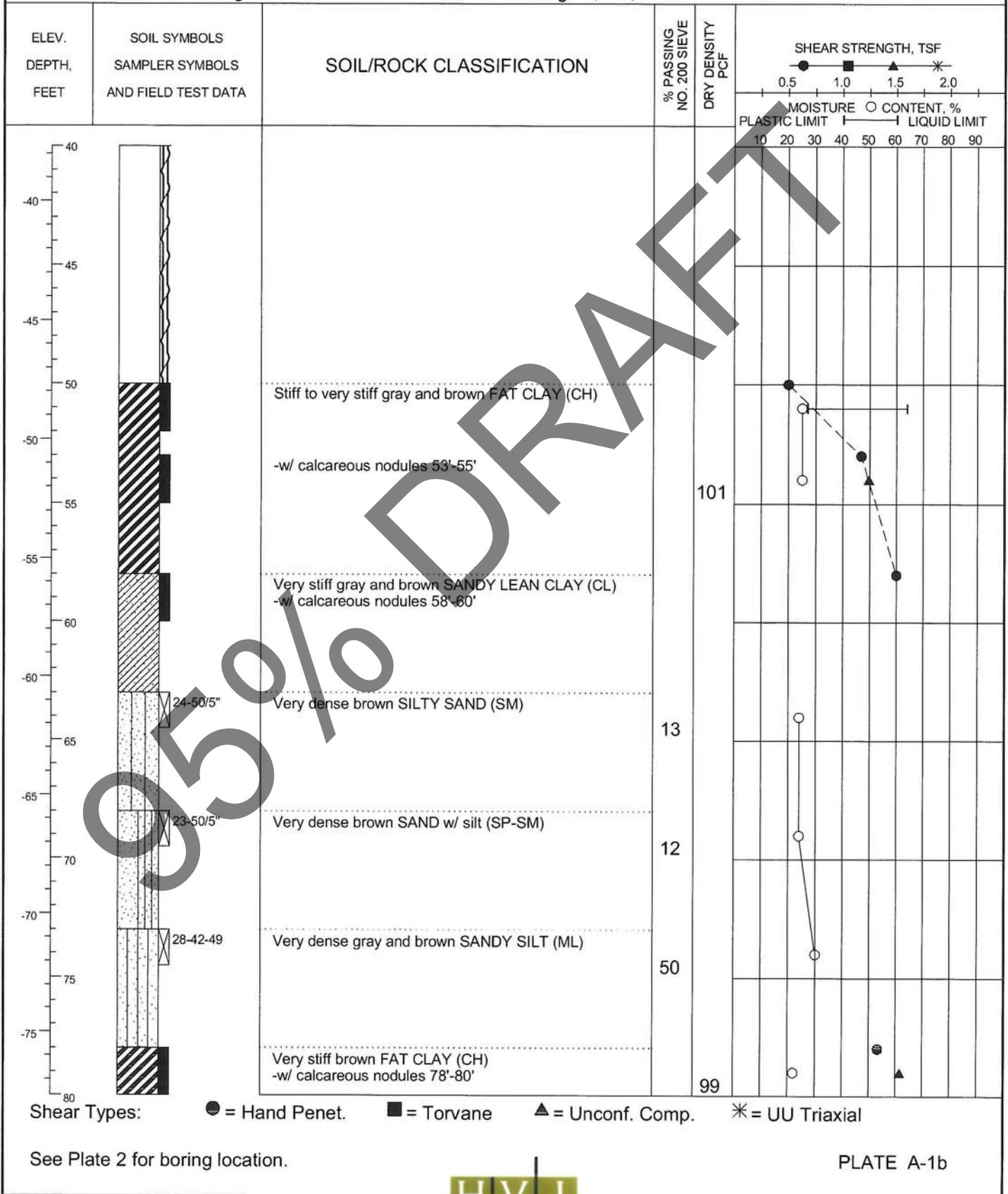
Easting: 3,248,730.1

Project No.: HG0915782

Elevation: -12.0 feet

Station: --

Offset: --



LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-02 (Depth of water = 10.6 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/23/2009

Northing: 13,803,237.3

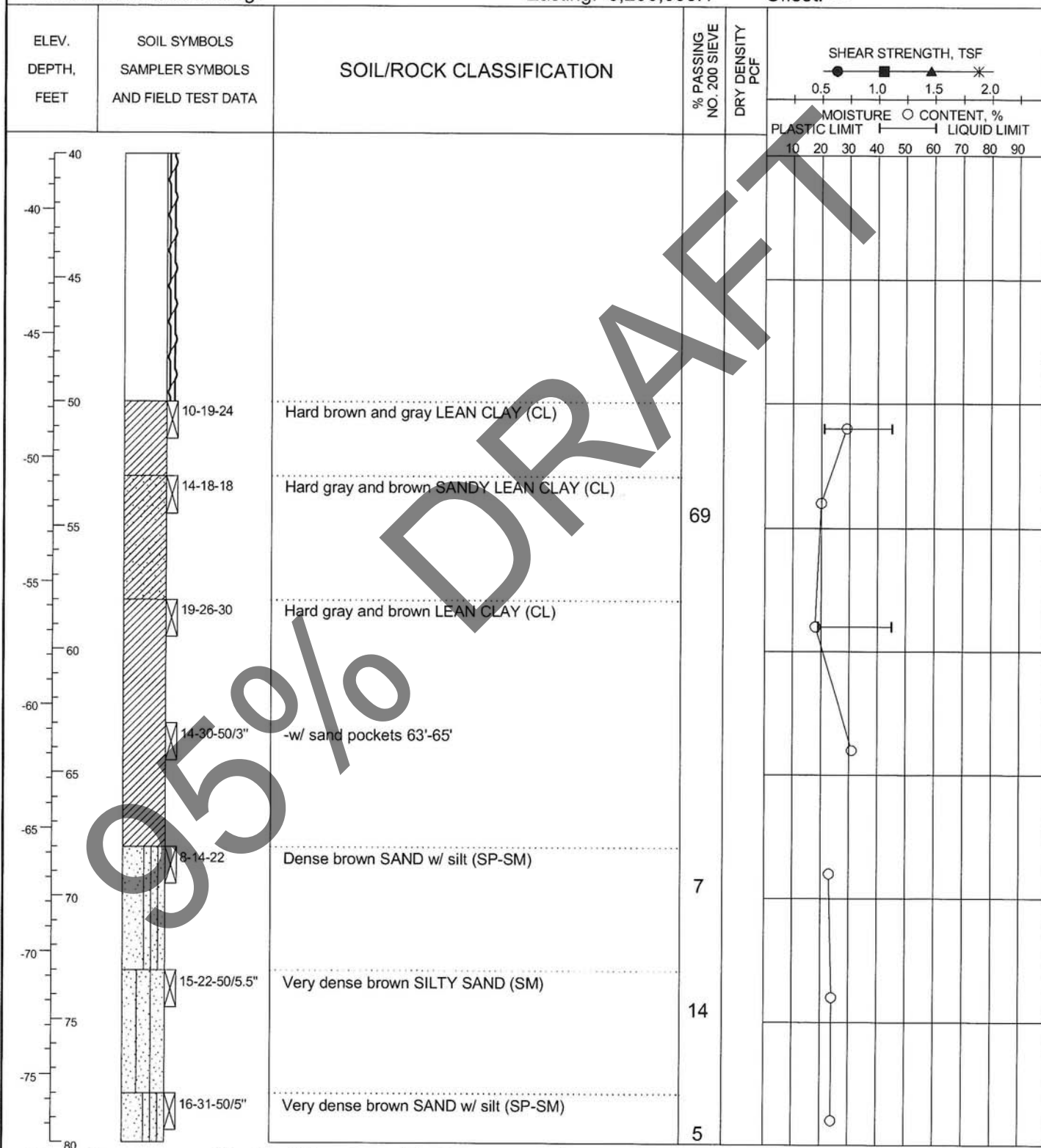
Easting: 3,250,063.1

Project No.: HG0915782

Elevation: -8.4 feet

Station: --

Offset: --



Shear Types:

● = Hand Penet.

■ = Torvane

▲ = Unconf. Comp.

* = UU Triaxial

See Plate 2 for boring location.

PLATE A-2b

LOG OF SOIL BORING HG-09-15782.GPJ HVJ.GDT 11/23/09



LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-03 (Depth of water = 18.5 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/24/2009

Northing: 13,801,516.6

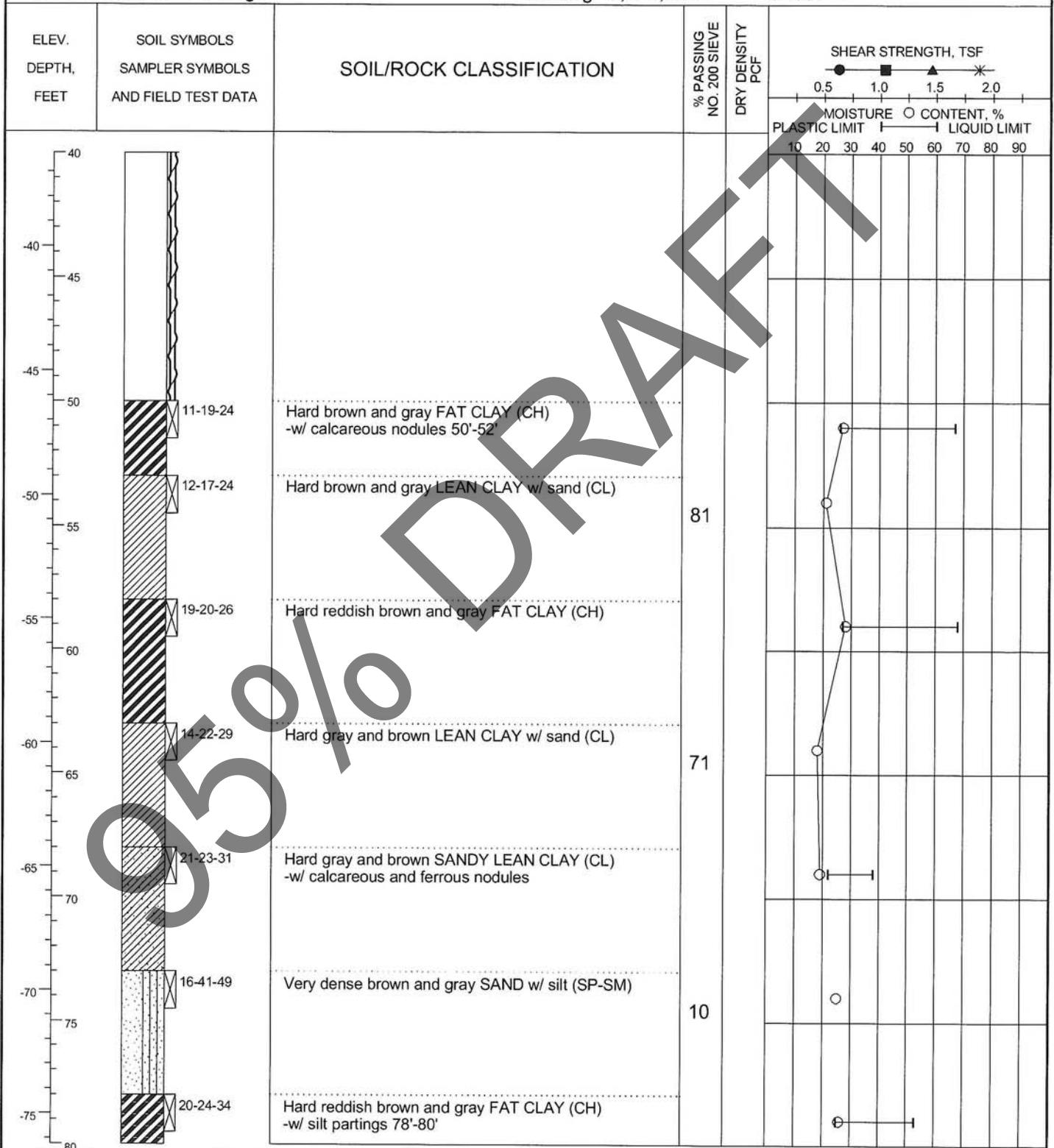
Easting: 3,249,669.1

Project No.: HG0915782

Elevation: -14.7 feet

Station: --

Offset: --



Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. * = UU Triaxial

See Plate 2 for boring location.

PLATE A-3b

LOG OF SOIL BORING HG-09-15782.GPJ HVJ GDT 11/23/09



LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-04 (Depth of water = 17 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/24/2009

Northing: 13,800,523.9

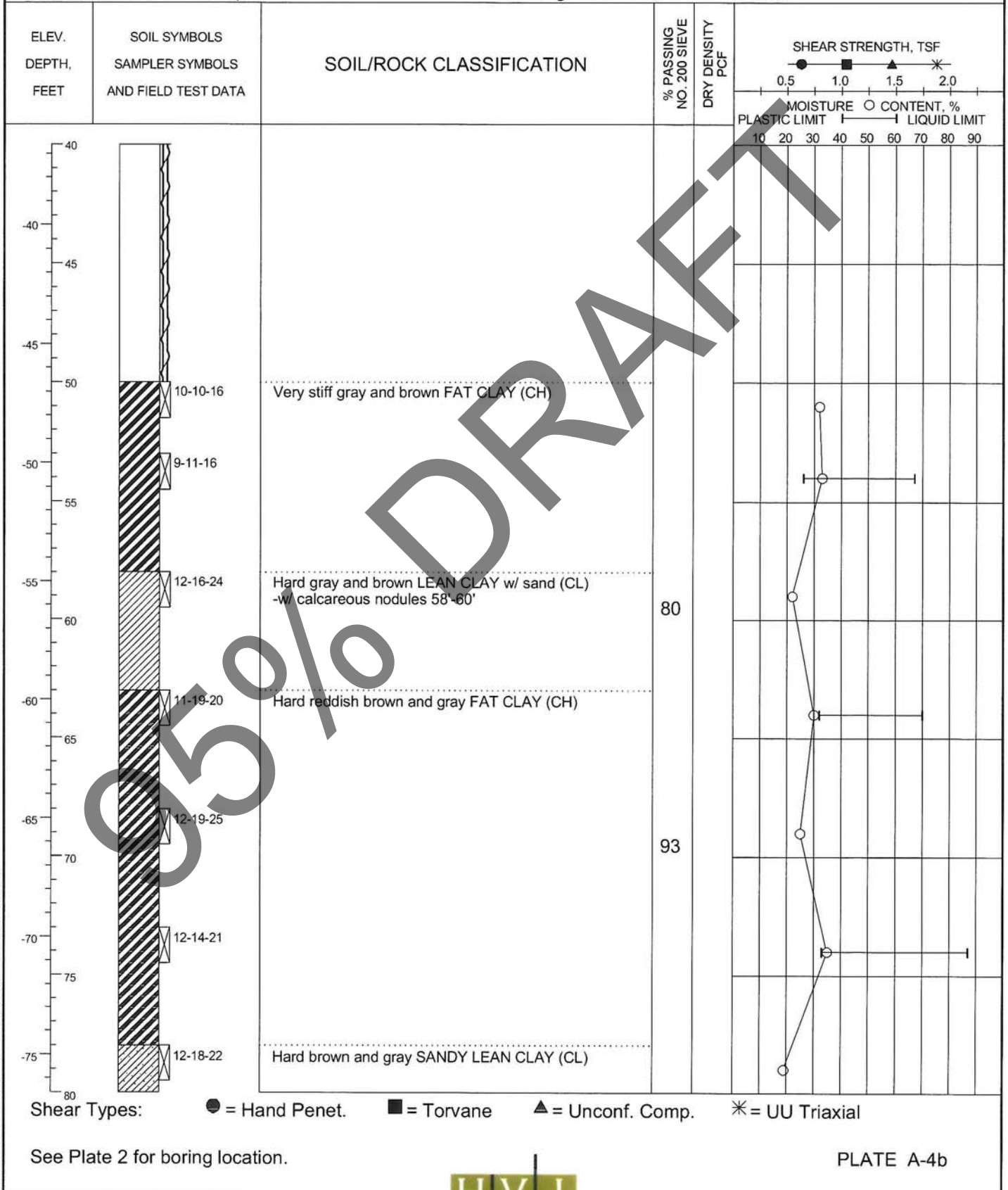
Easting: 3,251,030.5

Project No.: HG0915782

Elevation: -13.6 feet

Station: --

Offset: --



LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-05 (Depth of water = 17.2 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/25/2009

Northing: 13,798,751.9

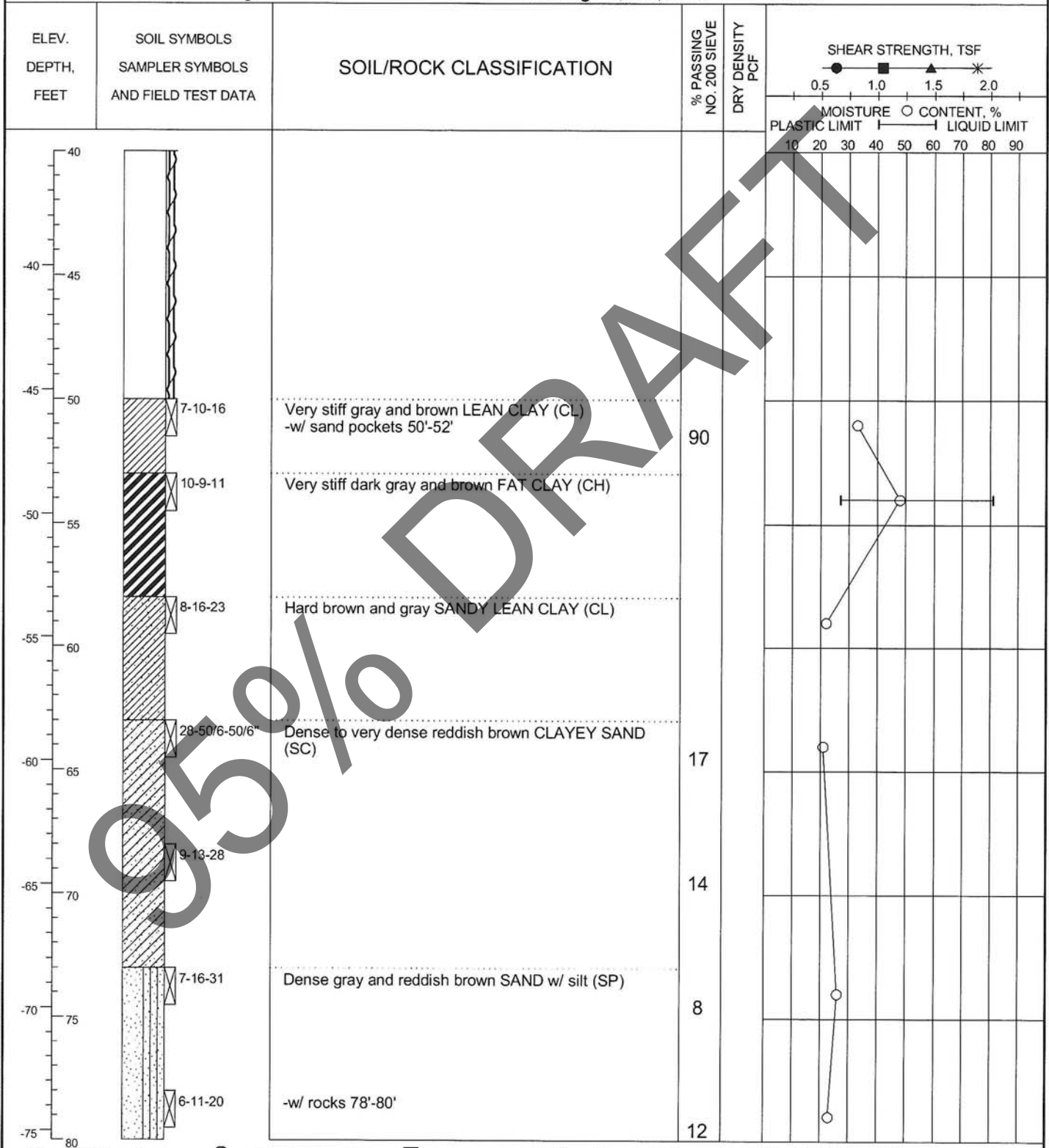
Easting: 3,250,628.5

Project No.: HG0915782

Elevation: -12.6 feet

Station: --

Offset: --



Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. * = UU Triaxial

See Plate 2 for boring location.

PLATE A-5b



LOG OF BORING

Project: HSC Borings

Boring No.: HSC-09-06 (Depth of water = 14.5 ft)

Groundwater during drilling: 0 feet

Groundwater after drilling: ---

Date: 10/25/2009

Northing: 13,797,685.5

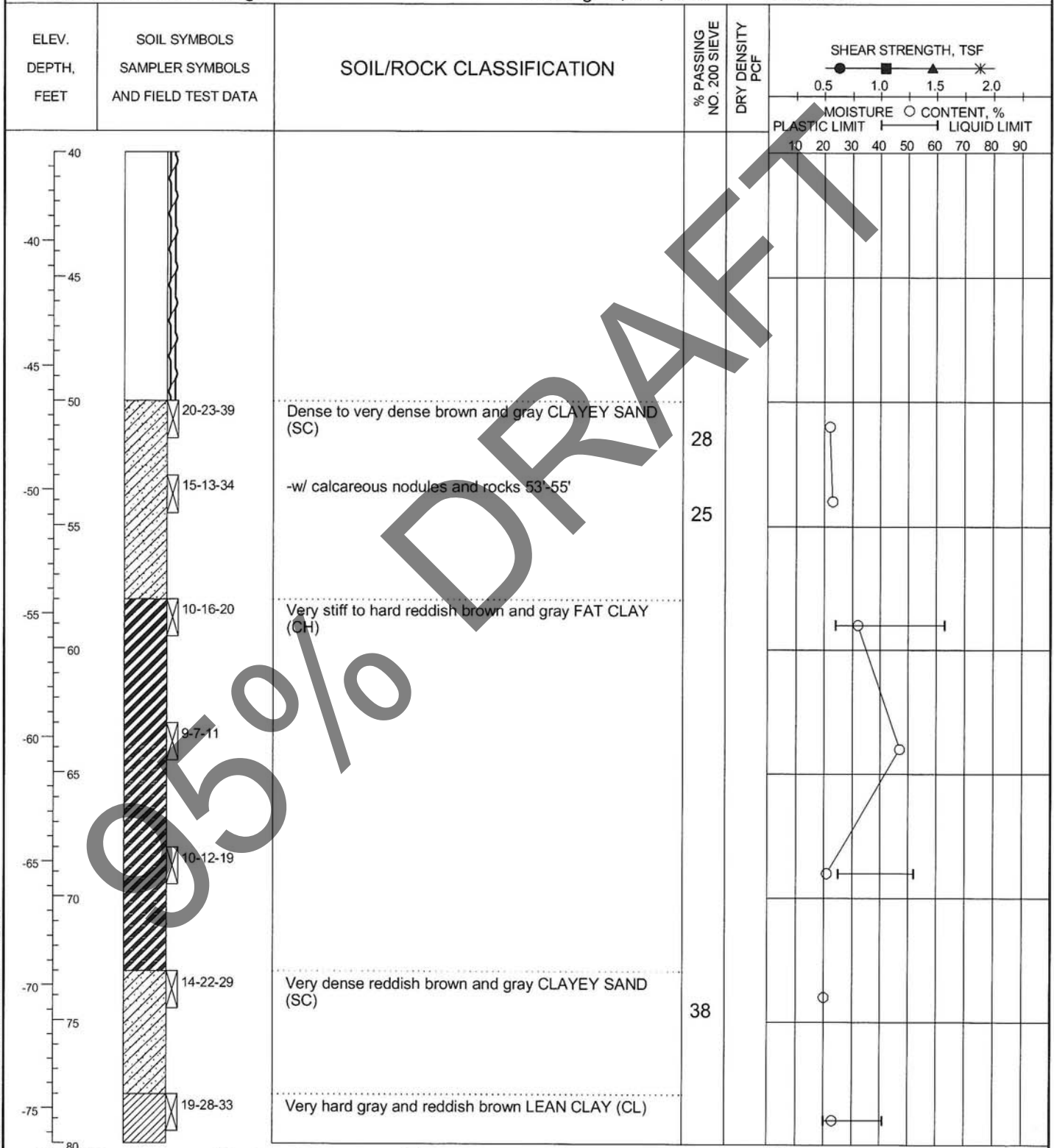
Easting: 3,252,091.7

Project No.: HG0915782

Elevation: -10.9 feet

Station: --

Offset: --



Shear Types:

● = Hand Penet.

■ = Torvane

▲ = Unconf. Comp.

* = UU Triaxial

See Plate 2 for boring location.

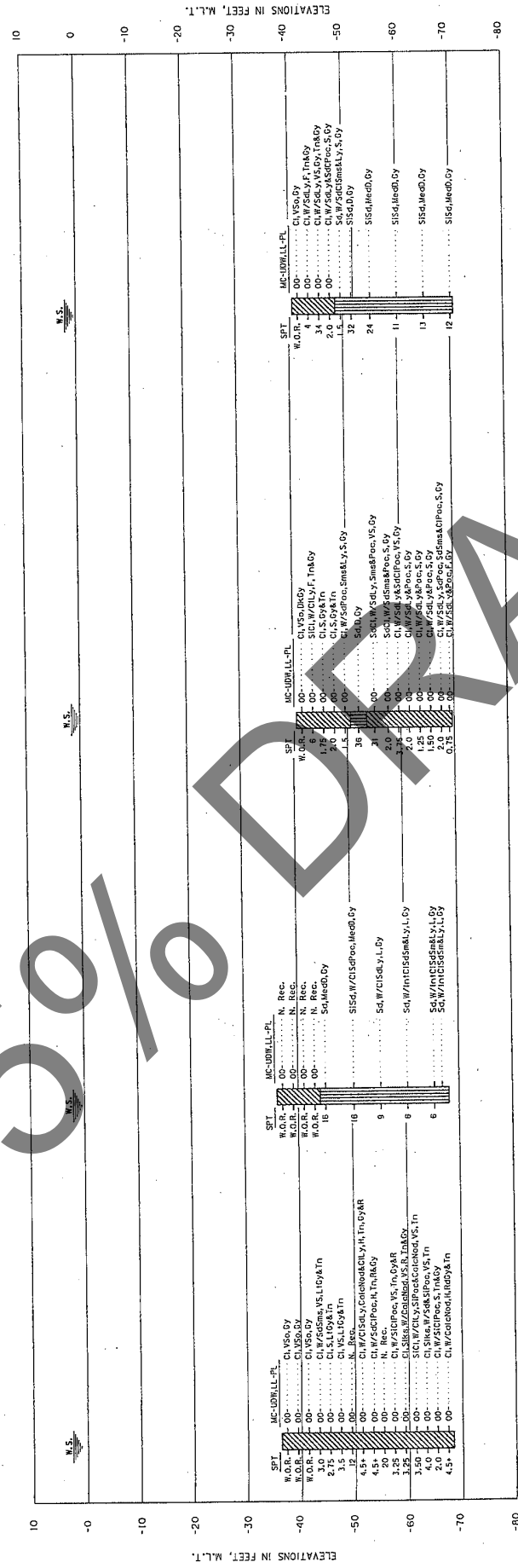
PLATE A-6b

04-155
Sta 0+00
LT-RT

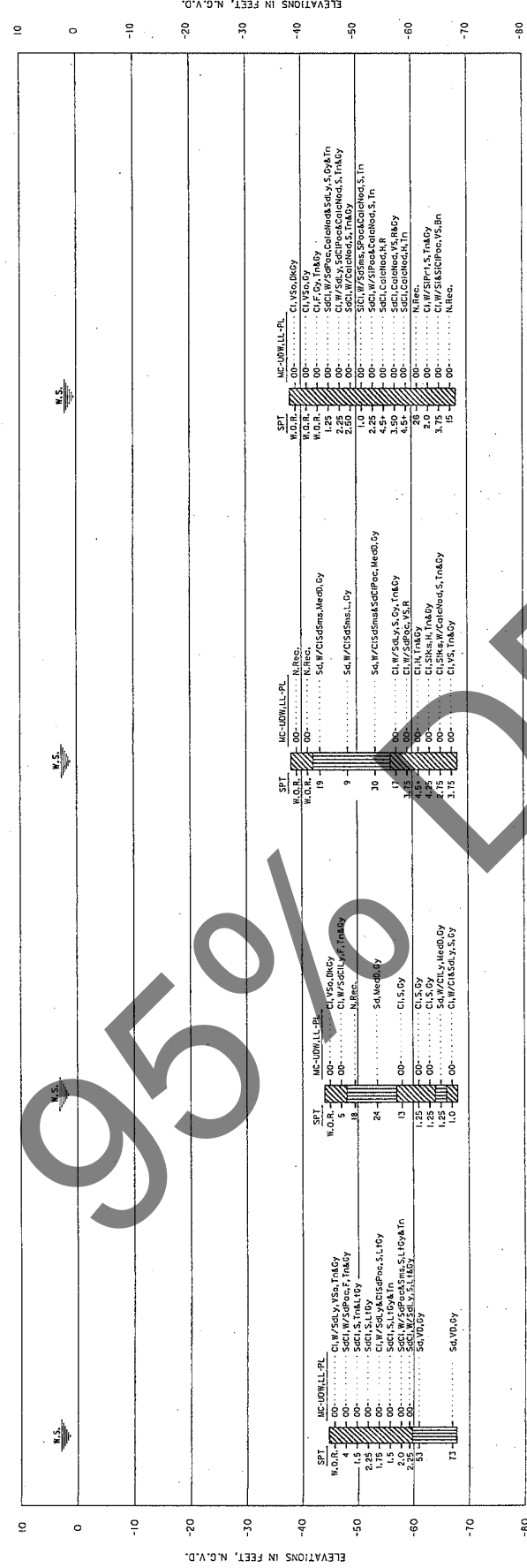
04-154
Sta 0+00
LY-RT

04-153
Sta 0+00
LT-RT

04-152
Sta 0+00
LT-RT



NOTE:
FOR BORING NOTES AND LEGEND, SEE
DRAWING F-11.



NOTES:

1. SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH ASTM 2487 "CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (UNIFIED SOILS CLASSIFICATION SYSTEM)". CONSISTENCY OF SOILS SUCH AS SOFT, FIRM, STIFF, HARD, LOOSE, DENSE, ETC., ARE RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED UNCONFINED COMPRESSIVE STRENGTH. THE COHESIVE MATERIALS DESCRIBED IN THIS LOG HAVE BEEN CLASSIFIED AS TO PENETRATION RESISTANCE. PENETRATION RESISTANCE VALUES WERE DETERMINED WITH STANDARD PENETRATION RESISTANCE VALUES OBTAINED DURING SAMPLING.
2. FIGURES TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF (MC-UDWL/LL-PL), THE DRY WEIGHT, DRY DENSITY, LIQUID LIMIT, AND PLASTIC LIMIT.
3. VALUES TO THE LEFT OF BORING LOGS ARE BLOW PER FOOT OF PENETRATION FROM STANDARD PENETRATION TESTING EXPRESSED IN WHOLE NUMBERS. OR POCKET PENETROMETER TEST RESULTS EXPRESSED IN TONS PER SQUARE FOOT. VALUES NOTED WITH A "T" INDICATE TORVANE READINGS (TSF) IN COHESIVE MATERIAL.
4. BORINGS WERE DRILLED FROM A BARGE-MOUNTED DRILLING RIG USING CASING AND ROTARY-WASH DRILLING TECHNIQUES. IN COHESIVE MATERIALS, UNDISTURBED SAMPLES WERE RECOVERED WITH A 3-INCH DIAMETER THIN WALL SAMPLER, WHERE COHESIONLESS MATERIALS WERE ENCOUNTERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPOON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.
5. WATER SURFACE LEVELS SHOWN ON BORING LOGS WERE DETERMINED AT THE TIME OF DRILLING, AND REFLECT TIDE AND OTHER WEATHER-RELATED FACTORS AT THE TIME OF DRILLING. THE DEPTH OF WATER WAS RECORDED TO ESTABLISH THE MID LINE ELEVATION (M.L.L.).

VISUAL CLASSIFICATIONS:

- | | | | |
|-----------------|------------------|------------------|-------------------------|
| Bn Brownish | H Hard | Pro. Pocket(s) | Sms Seams |
| Coic Calcareous | Int Interbedded | R Reddish | Tn Tannish |
| Cl Clayey | Ly Loamlike | S Shiff | W With |
| D Dense | LI Light | Sd Sandy | W.O.R. Weight of Hammer |
| Dk Dark | Nod Nodules | St Silty | W.O.R. Weight of Rod |
| Gy Grayish | Nrec No Recovery | Sls Silken Sides | |

LABORATORY CLASSIFICATIONS:

- CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
- SM SILTY SANDS, SAND-SILT MIXTURES.

1. SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH ASTM 2487-93 "CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (UNIFIED SOILS CLASSIFICATION SYSTEM)". CONSISTENCY OF SOILS SUCH AS SOFT, MEDIUM, HARD, LOOSE, DENSE, ETC., ARE RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH OF THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION POCKET PENETROMETER TESTS AND PENETRATION RESISTANCE DURING SAMPLING.

2. FIGURES TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF THE DRY WEIGHT, DRY DENSITY, LIQUID LIMIT, PLASTIC LIMIT, AND BAR LINEAR SHRINKAGE, (MC-UDWA, (LL-PL), (B.L.S.)* FIGURES TO THE LEFT OF BORING LOGS ARE BLOWS PER FOOT OF PENETRATION FROM STANDARD PENETRATION TESTING.
3. BORINGS WERE DRILLED USING WET ROTARY DRILLING TECHNIQUES AND UNDISTURBED SAMPLES WERE RECOVERED WITH A 3-INCH DIAMETER THIN WALL SAMPLER WHERE COHESIVE MATERIALS WERE ENCOUNTERED. WHERE COHESIONLESS MATERIALS WERE ENCOUNTERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPOON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.
4. (*) INDICATES BAR-LINEAR SHRINKAGE

Ba Ballist)	L Loose	Sta Stains
Bk Black	Lt Light	Tn Tannish)
Bl Blue	Ly Layer(s)	Tf Traces)
Bn Brown	Mat Material	V Very)
Calc Calcareous	Mica	W. With
Cl Clayey)	Med Medium	W.O.P. Weight Of Pipe
Coa Coarse	Mu Muck	W.O.H. Weight Of Hammer
D Dense	Nod Nodules	Washed
D.C. Driller's	Ol Olive	Wd Wood(en)
Classification	Org Organic	Wh White
Dec Decayed)	Pac Pocket(s)	W.S. Water Surface
Dk Dark	Prt Parting	Y Yellowish)
F Firm	R Red	
Fer Ferrous	S Stiff	
Frag Fragment(s)	Sd Sandy)	
Gy Gray(ish)	Sh Shelly)	
Gv Gravelly)	St Silty)	
Habn Hydrocarbon	Sks Silken Slides	
H Hard	Sms Seams	
Inc Inclusion(s)	So Soft	
G Large	St Stones	

ACT INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS,

CH INORGANIC CLAYS, OF HIGH PLASTICITY, FAT CLAYS.

GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES

GM SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES

POORLY-SORTED GRAVELS OR GRAVEL-SAND MIXTURES. LITTLE OR NO FINES.

MINI INORGANIC SILTS AND VERY FINE SANDS. WITH SLIGHT PLASTICITY.

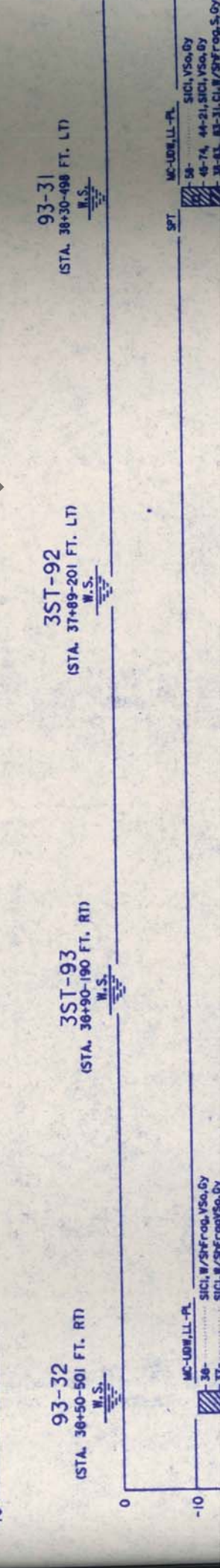
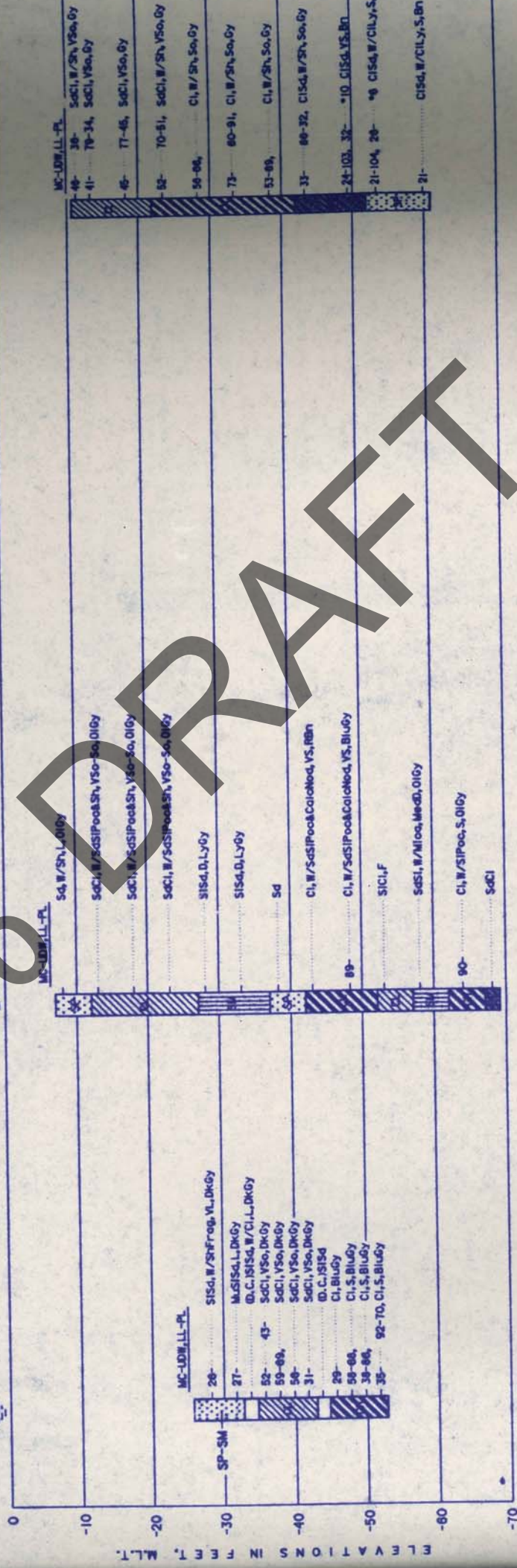
LOW ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY. ORGANIC SILTS.

SC CLAYEY SANDS, SAND-CLAY MIXTURES.

SM SILTY SANDS. SAND-SILT MIXTURES.

CO POORLY GRADED SANDS OR GRAVELLY SANDS. LITTLE OR NO FINES.

REVISION	DATE	DESCRIPTION	
<p>OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPORATION, GALVESTON, TEXAS</p>			
DESIGNED BY *	E. S. R.	HOUSTON-GALVESTON NAVIGATION CHANNEL, 45-FOOT PROJECT DREDGING MID BAY	
CHECKED BY *	E. S. R.	LOGS OF BORINGS STA. 75 + 92 TO STA. 78 + 9	
APPROVED BY *	I. F.	DATE JUNE 20, 1954	
ELABORATED BY *	ISHAO SYED, P.E.	HARRY G. KOHLER, P.E.	
DESIGNED BY *	IST, DISTRICT STRUCTURES SECTION	CHIEF, ENGINEERING AND CONSTRUCTION DIVISION	
APPROVED BY *	D. B. CAMPBELL, P.E.	APPROVED BY *	
DESIGNED BY *	IST, DISTRICT STRUCTURES SECTION	SCALE: A.S. SHOWN	
APPROVED BY *	AS REQUIRED BY ENGINEER REGULATION NO. 119-2-1 USE 3	SPEC. DATE:	
DESIGNED BY *	IST, DISTRICT STRUCTURES SECTION	DRAWING NUMBER	
APPROVED BY *	AS REQUIRED BY ENGINEER REGULATION NO. 119-2-1 USE 3	F-11	
DESIGNED BY *	IST, DISTRICT STRUCTURES SECTION	SHEET 80 OF 96	
APPROVED BY *	AS REQUIRED BY ENGINEER REGULATION NO. 119-2-1 USE 3	SHEET NO. HSC 40-1	
DESIGNED BY *	IST, DISTRICT STRUCTURES SECTION	Prepared under the direction of Nicholas J. Buechler, Col., C.E., District Engineer	



93-30

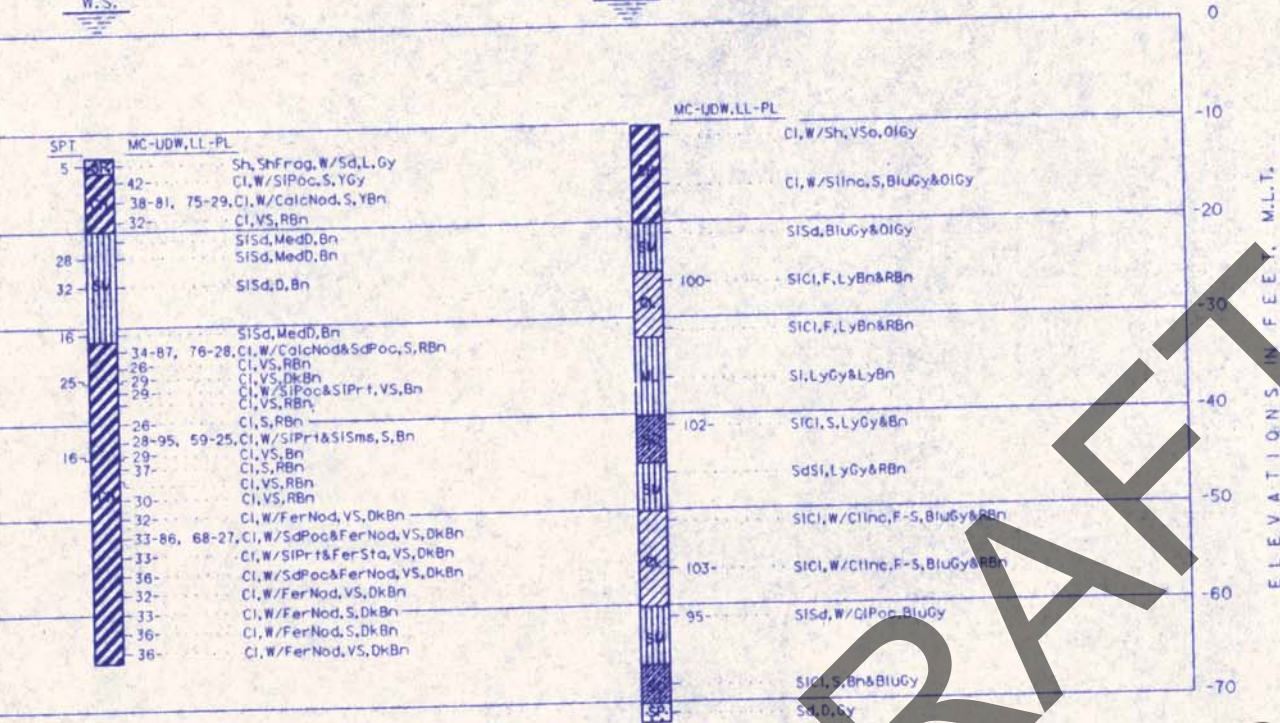
STA. 41+50-498 FT. RT)

W.S.

B19

(STA. 41+97-525 FT. LT)

W.S. at 13 ft.



3ST-86

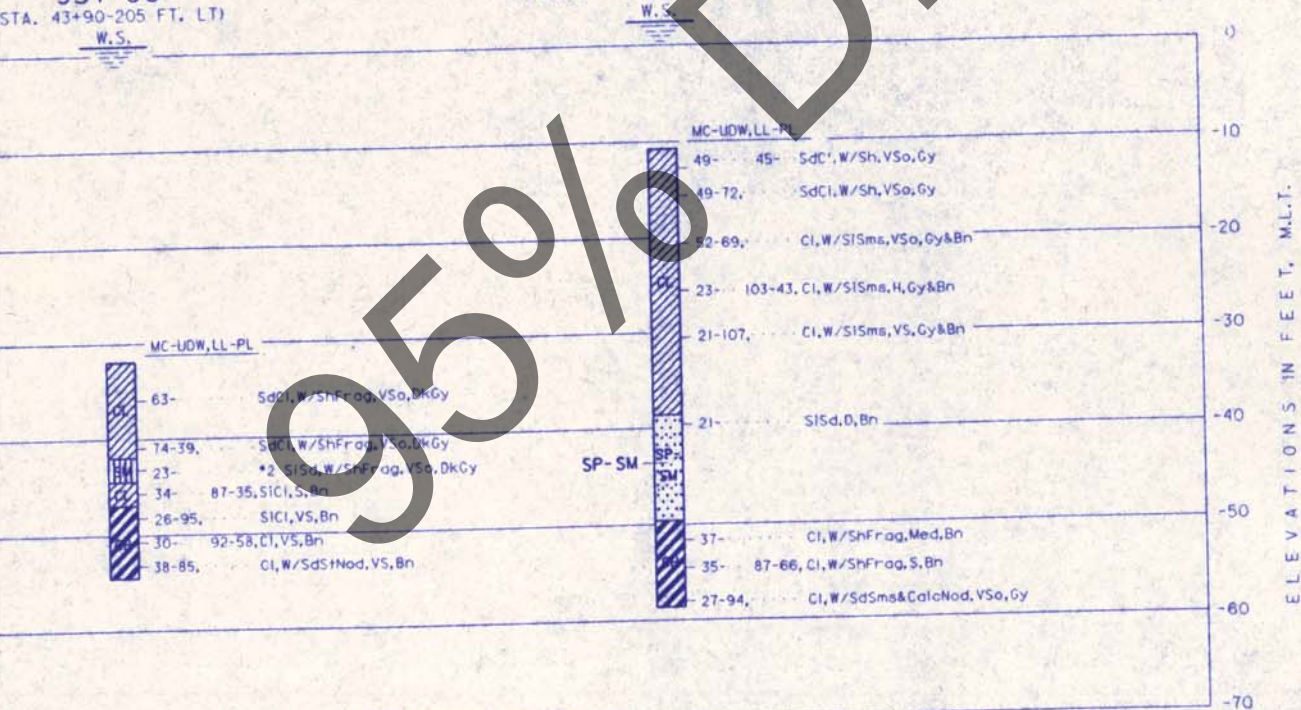
STA. 43+90-205 FT. LT)

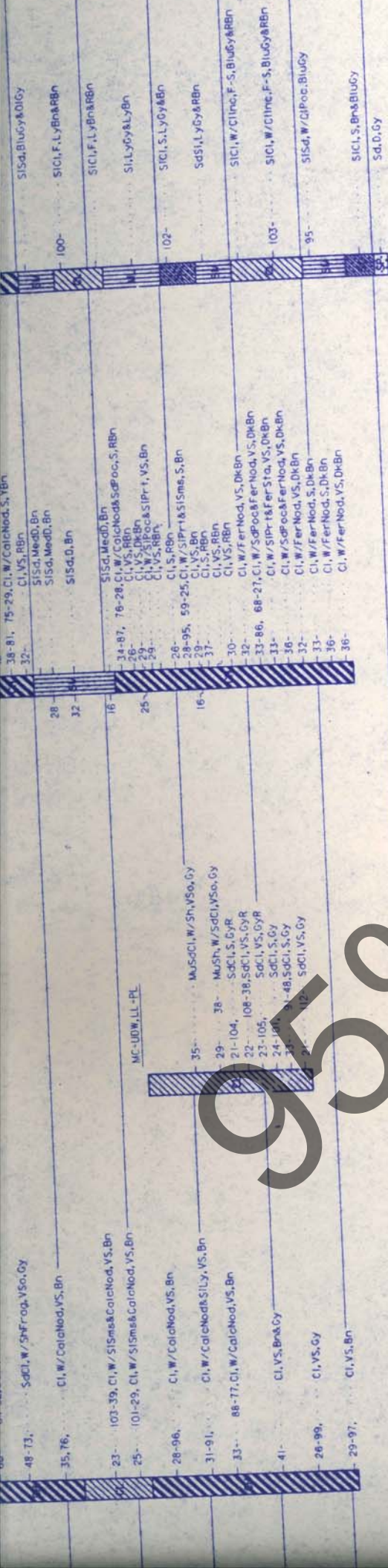
W.S.

72-48

(STA. 44+90-451 FT. RT)

W.S.





72-48
(STA. 44+90-451 FT. RT.)
W.S.

3ST-86
(STA. 43+90-205 FT. LT.)
W.S.

B20
(STA. 43+57-582 FT. RT.)
W.S. of 13' 11"

93-29
(STA. 43+30-498 FT. LT.)
W.S.



MC-UOW, LL-PL
49-45- SdCl, W/Sh, VSo, Gy
49-72- SdCl, W/Sh, VSo, Gy
52-69- Cl, W/SISms, VSo, Gy&Bn
23- 103-43, Cl, W/SISms, H, Gy&Bn
21-107- Cl, W/SISms, VSo, Gy&Bn
21- SdCl, D, Bn

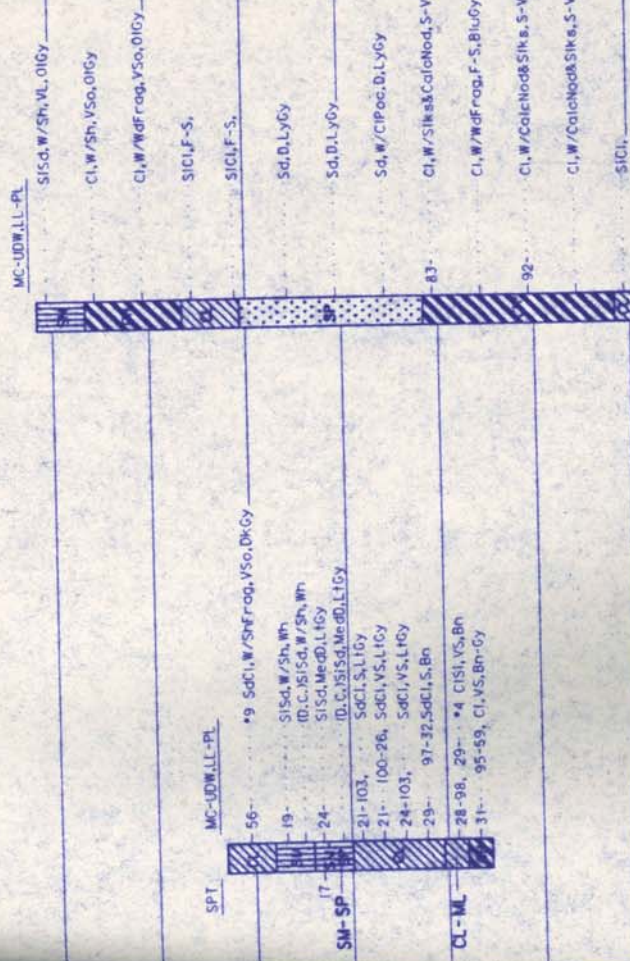
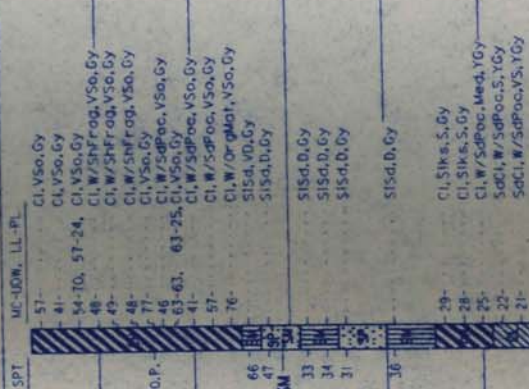
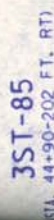
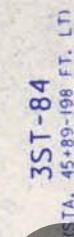
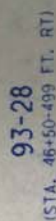
MC-UOW, LL-PL
63- SdCl, W/SNFrq, VSo, DkGy
74-39- SdCl, W/SNFrq, VSo, DkGy
23- 87-36, SdCl, S, Bn
26-95- SdCl, V, Bn
30- 93-58, Cl, V, Bn
38-85- Cl, W/SNFrq, VSo, Bn

MC-UOW, LL-PL
41- Cl, VSo, DkGy
44-74, 84-31, Cl, W/SdPoc, S, YGy
43- Cl, VSo, RBN
33- Cl, VSo, RBN
32- Cl, VSo, RBN
29-96, 69-27, Cl, W/SIPoc, VSo, RBN
24- SdCl, W/CILy, Med, RBN
25- SdCl, D, RBN
31- SdCl, V, RBN
27- SdCl, S, RBN
25- SdCl, Med, RBN
25- SdCl, Med, RBN
20- Sd, MedD, RBN

MC-UOW, LL-PL
31- Cl, W/FerSta, S, RBN
30- Cl, W/FerSta, VSo, DkBn
33-89, 74-28, Cl, S, DkBn
32- Cl, W/FerNod, S, Gy
28- Cl, W/SdSms, VSo, Gy
25- Cl, W/SdPoc, VSo, Gy
25- Cl, W/CatNod, SdPoc, VSo, Gy
20- Cl, W/CatNod, SdPoc, VSo, Gy

93-28
(STA. 46+50-499 FT. RT.)
W.S.

3ST-84
(STA. 45+89-198 FT. LT.)
W.S.



3-27

30-497 FT. LT)
W.S.

3ST-81

(STA. 48+90-203 FT. RT)

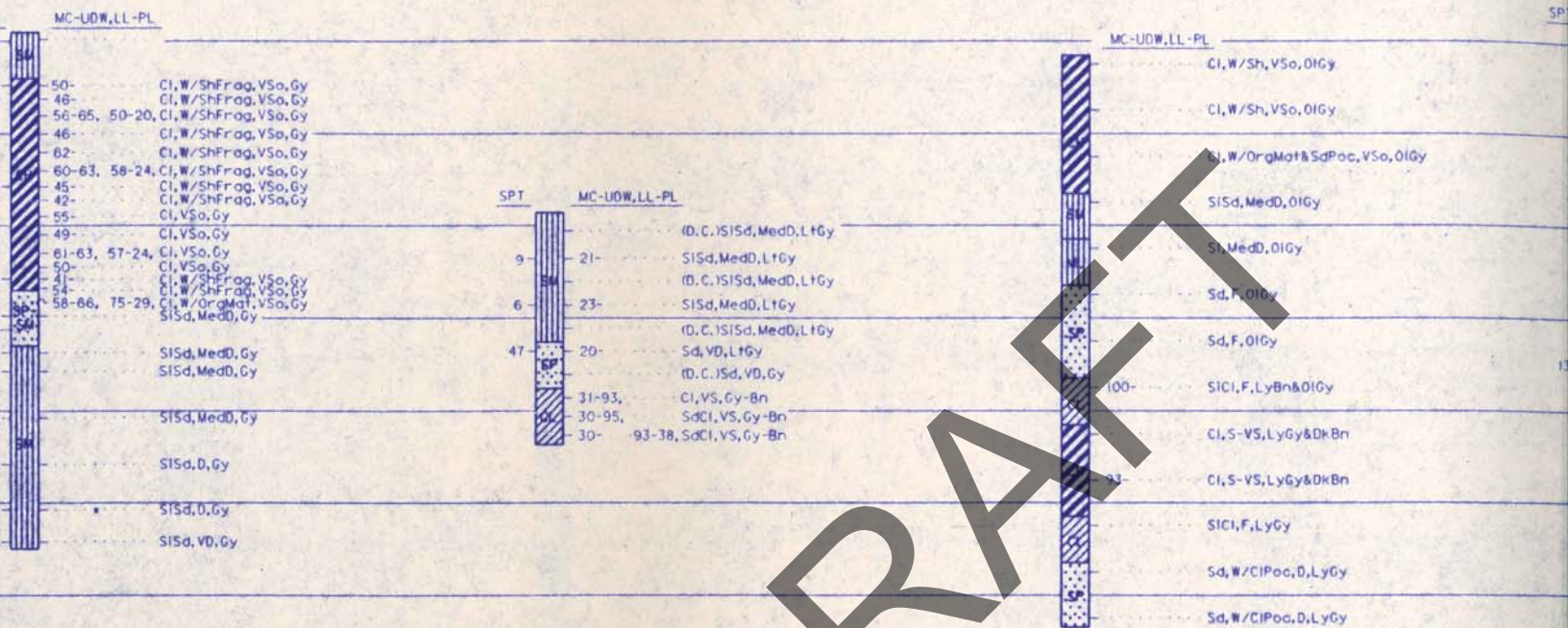
W.S.

B22

(STA. 49+03-63) FT. RT)

W.S. at 14 ft.

(STA. 49



3-26

50-501 FT. RT)
W.S.

3ST-78

(STA. 51+90-198 FT. LT)

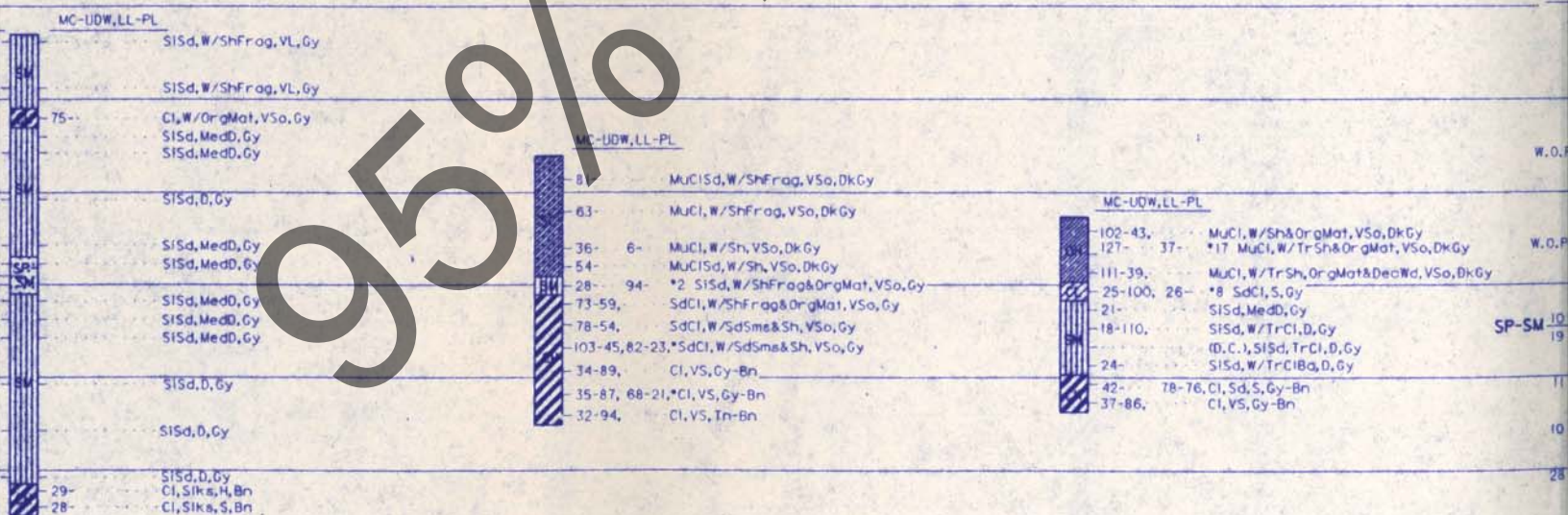
W.S.

3ST-77

(STA. 52+90-200 FT. RT)

W.S.

(STA. 53+



3ST-75

92-195 FT. RT)
W.S.

3ST-74

(STA. 55+89-207 FT. LT)

W.S.

0

-10

3ST-72

(STA. 57+88-206 FT. LT)

W.S.

B23

(STA. 58+02-603 FT. LT)

W.S. at 12 ft.

3ST-71

(STA. 58+91-208 FT. RT)

W.S.

35T

(STA. 59+90)

W

3ST-68

(STA. 61+86-204 FT. LT)

W. S.

B24

DZ4
(STA. 61+99-613 FT. RT)

W.S. at 11 ft.

93-23

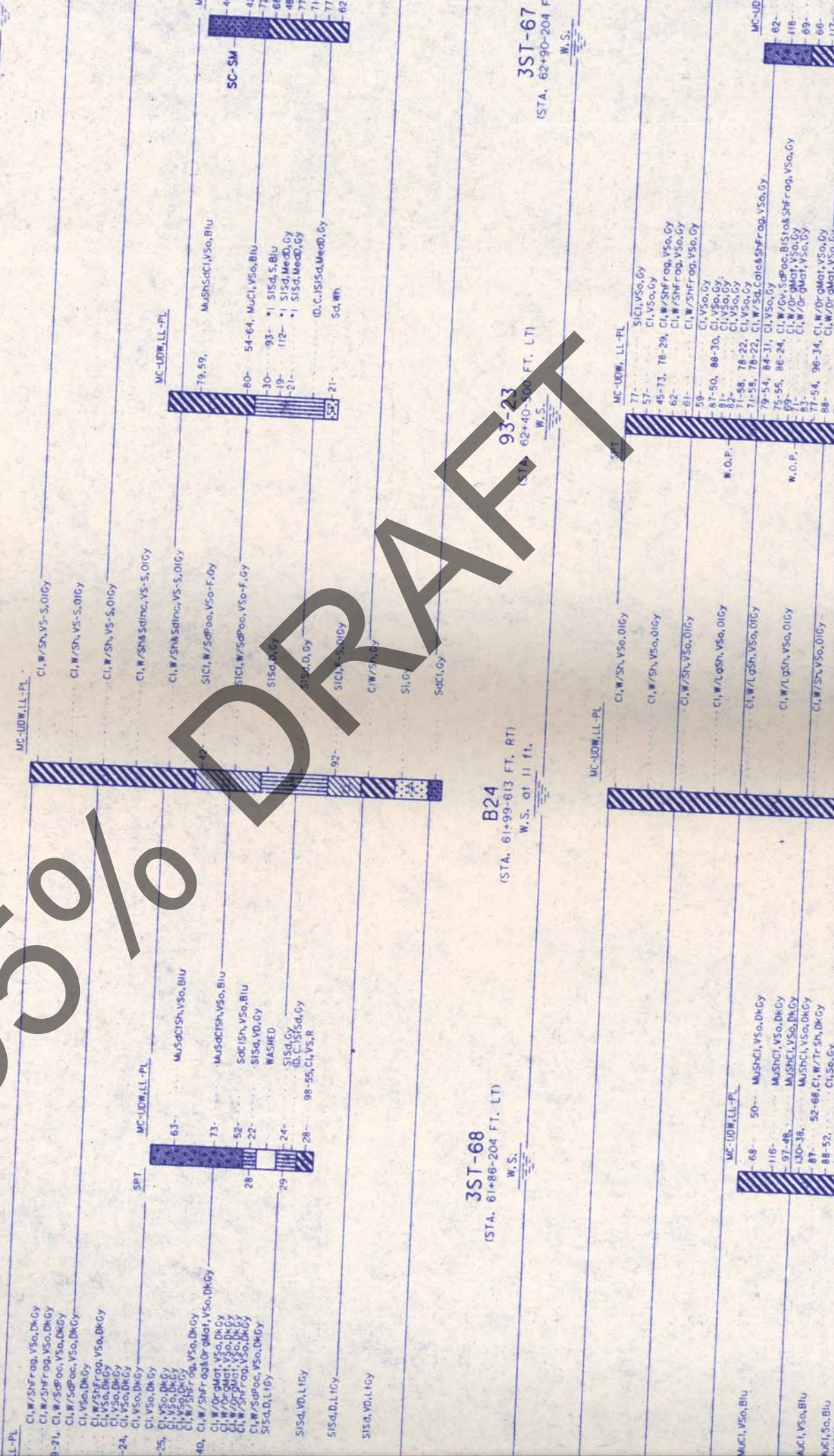
(STA. 62+40-500 FT. LT)

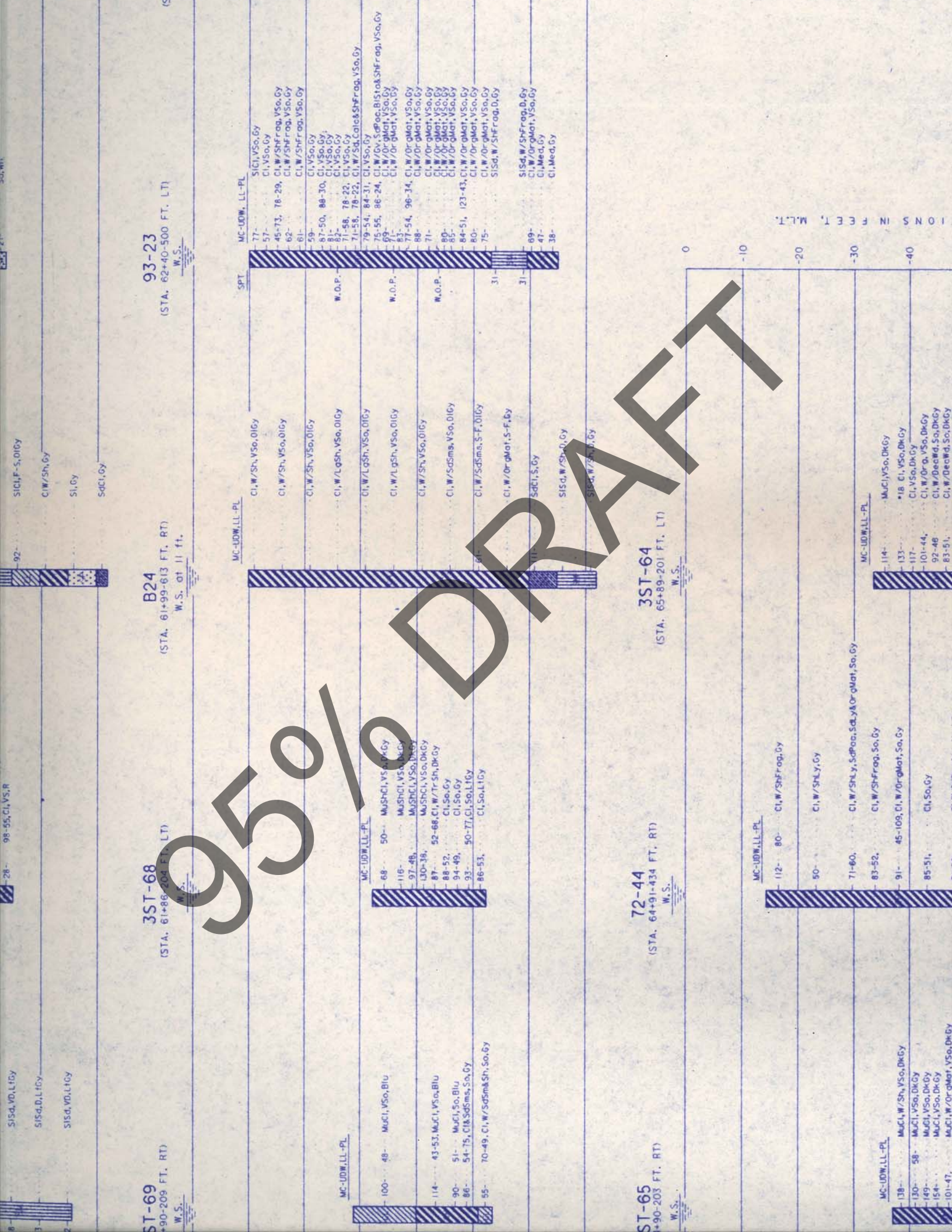
W.S.

3ST-6

STA. 62+90-204

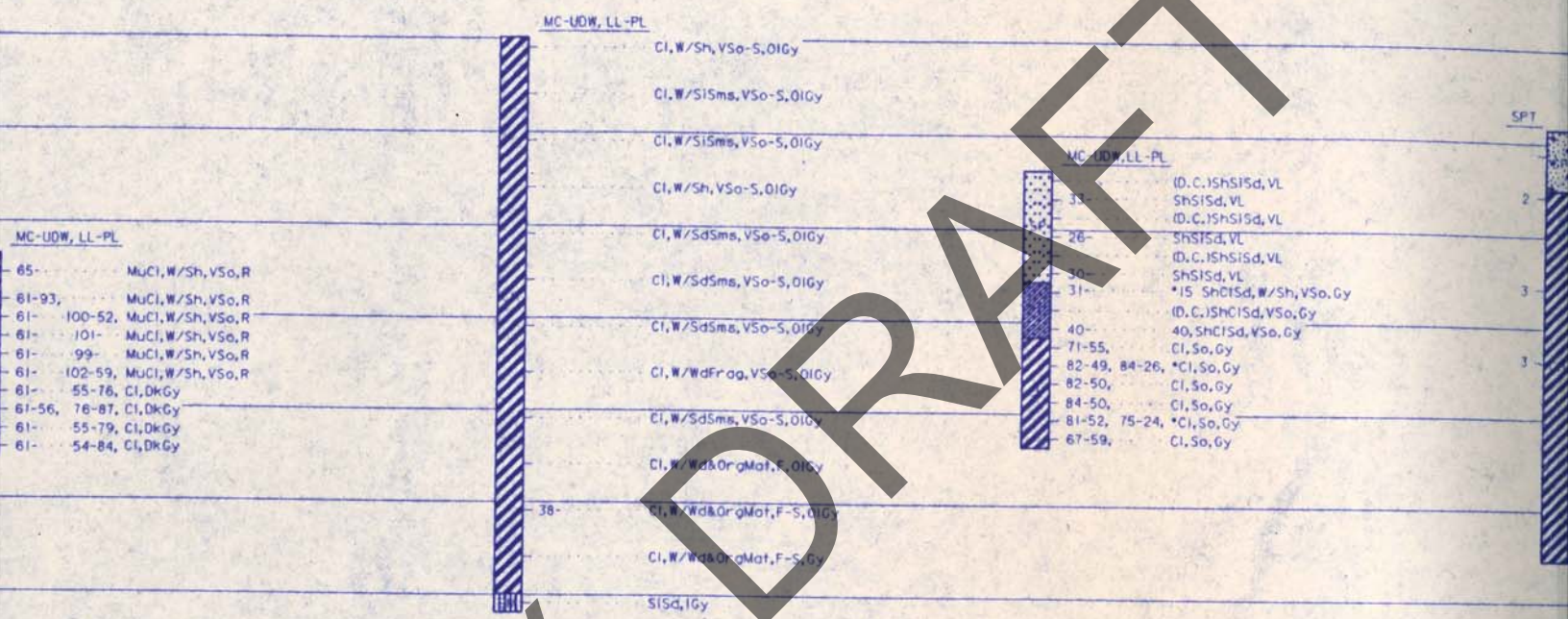
W. S.



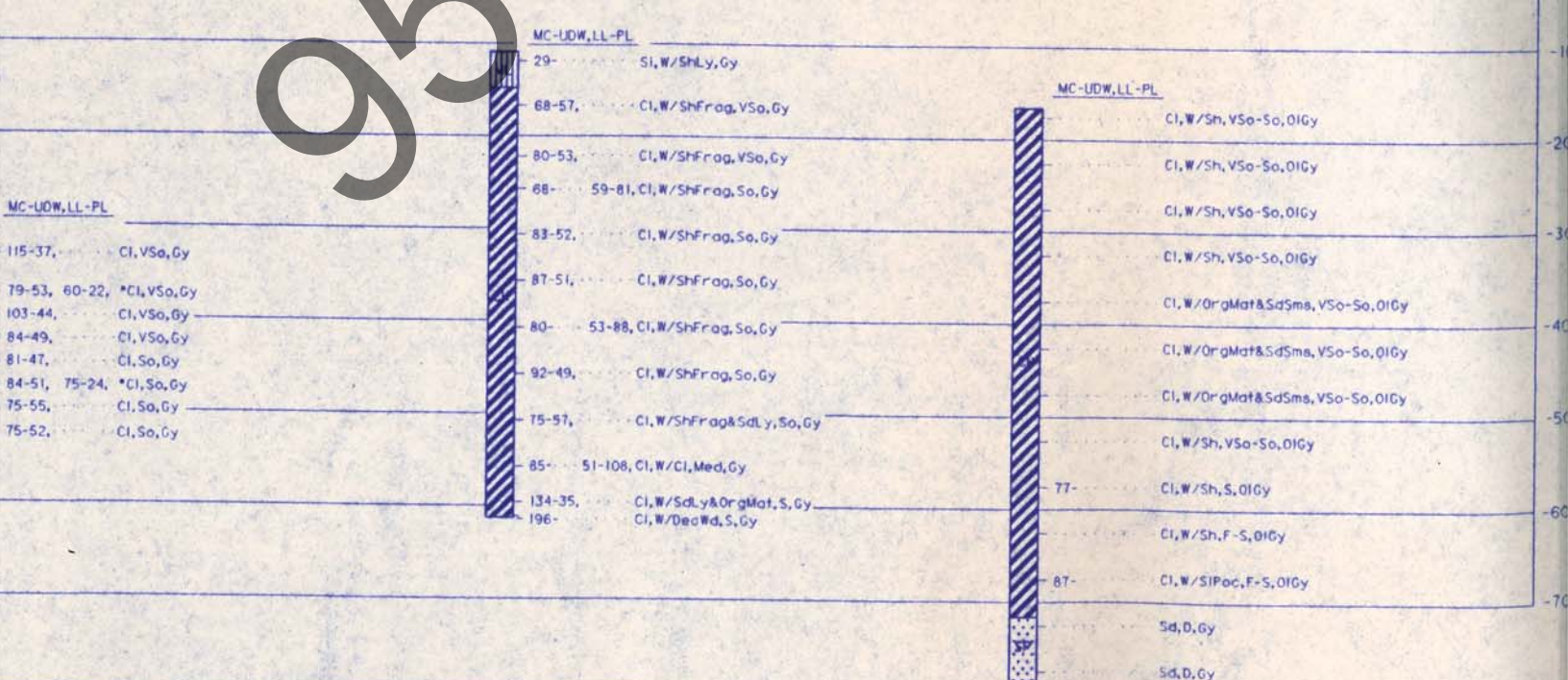


81-	54-73, MuCl, VSo, Gy	120-	MuCl, W/Sh, VSo, DkGy	48-	Cl, W/ShFrag, So, Gy
77-55,	Cl, W/DecWd, Med, Gy	87-	MuCl, W/Sh, VSo, DkGy	46-	Cl, W/ShFrag, VSo, Gy
79-53,	Cl, W/DecWd, Med, Gy	76-	SdCl, VSo, DkGy	70-	Cl, W/ShFrag, VSo, Gy
83-52,	Cl, W/DecWd, Med, Gy	74-	50- SdCl, VSo, DkGy	40-76,	74-20, Cl, W/Sd, Calc&ShFrag, VSo, Gy
84-53,	Cl, W/DecWd, Med, Gy	78-	SdCl, VSo, DkGy	39-83,	47-18, SdCl, W/ShFrag&SdPrt, VS, Gy
82-51,	Cl, W/DecWd, Med, Gy	98-50,	Cl, W/OrgMat, So, Gy	39-	SdCl, W/ShFrag, VSo, Gy
		91-	51-78, Cl, W/OrgMat, So, Gy	67-	Cl, W/ShFrag, VSo, Gy
		103-49,	Cl, W/OrgMat&DecWd, So, Gy	90-	Cl, VSo, Gy
		98-49,	Cl, W/DecWd, So, DkGy	78-	Cl, VSo, Gy
				74-55,	103-37, Cl, W/ShFrag&SdPrt, VSo, Gy
				69-	Cl, W/ShFrag, VSo, Gy
				33-	Cl, W/ShFrag, VSo, Gy
				21-	Cl, W/ShFrag, VSo, Gy
				58-65,	82-25, Cl, W/ShFrag, VSo, Gy
				58-	Cl, W/ShFrag&SdPrt, VSo, Gy
				65-	Cl, W/OrgMat, VSo, Gy
				77-	Cl, W/OrgMat, VSo, Gy

59 (STA. 71+00-571 FT. RT) W.S. at 12 ft. B26 3ST-58 (STA. 71+91-201 FT. LT) W.S. 93 (STA. 72+40- W.S.)



55 (STA. 74+07-459 FT. RT) W.S. 72-42 (STA. 74+92-459 FT. RT) W.S. B27 (STA. 74+96-647 FT. LT) W.S. at 19 ft.

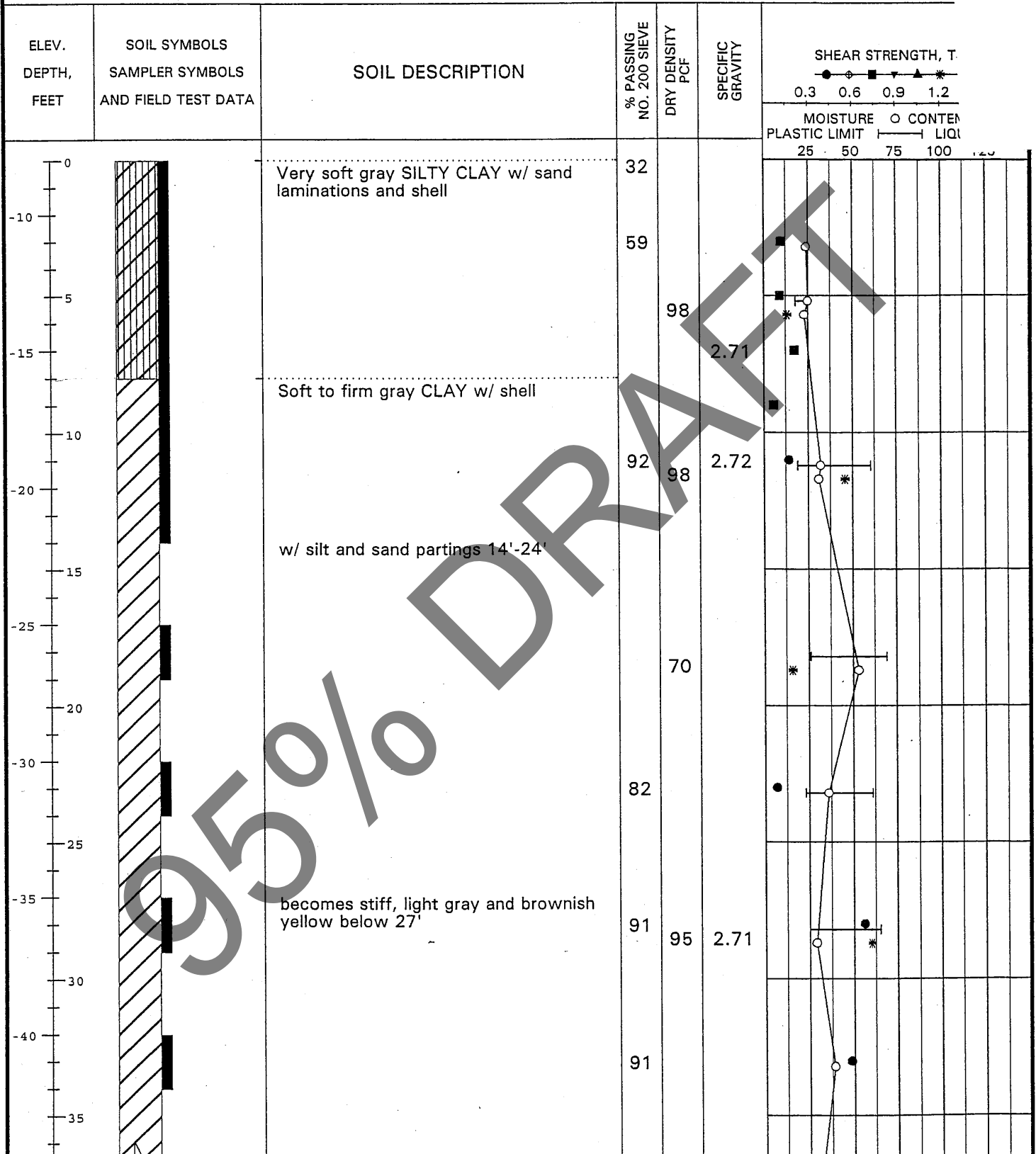


LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-1
Water Depth: 11 feet
Time Water Depth Measured: 11:52

Date: 04-14-98
Northing: 693516
Easting: 3275558

Project No. 97-196
Approx. Elev.: -8.0
Station: ≈ 0+000
Offset:



Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-1A

HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-1
Water Depth: 11 feet
Time Water Depth Measured: 11:52

Date: 04-14-98
Northing: 693516
Easting: 3275558

Project No. 97-196G-00
Approx. Elev.: -8.0 feet
Station: ≈ 0 + 000
Offset:

ELEV. DEPTH, FEET	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	DRY DENSITY PCF	SPECIFIC GRAVITY	<div> <div> SHEAR STRENGTH, TSF 0.3 0.6 0.9 1.2 1.5 </div> <div> MOISTURE CONTENT, % PLASTIC LIMIT LIQUID LIMIT 25 50 75 100 125 </div> </div>
-45						
-40						
-50		w/ calcareous nodules 42'-44'				
-45						
-55						
-50						
-60		light gray, reddish brown and brownish yellow at 52'				
-55						
-65						
-60						
-70						
-65						
-75						
-70						
-80						

Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivane ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-1B

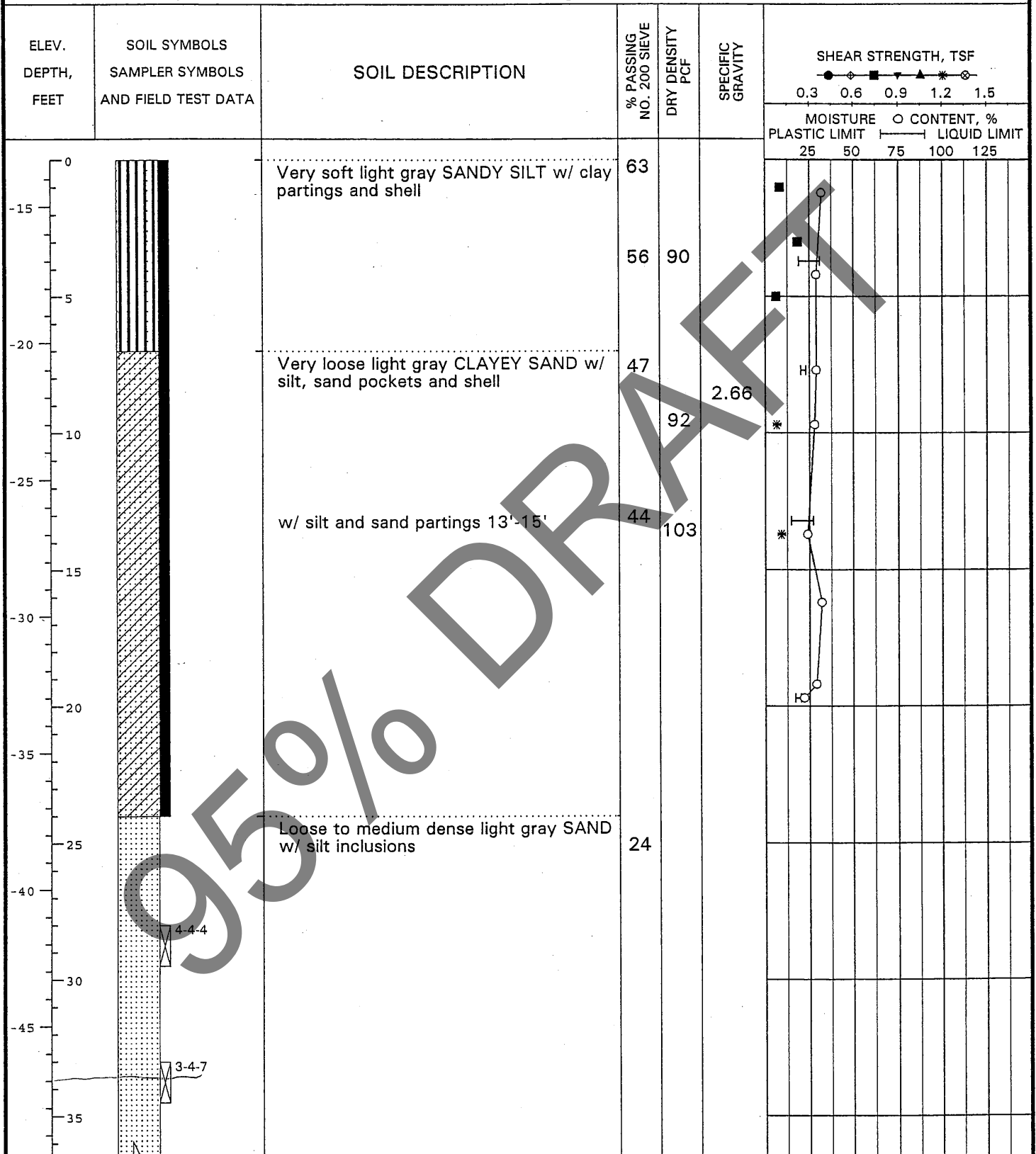
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-2
Water Depth: 15 feet
Time Water Depth Measured: 11:30

Date: 04-17-98
Northing: 689350
Easting: 3277138

Project No. 97-196G-00
Approx. Elev.: -13.3 feet
Station: ≈ 6+000
Offset:



Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-2A

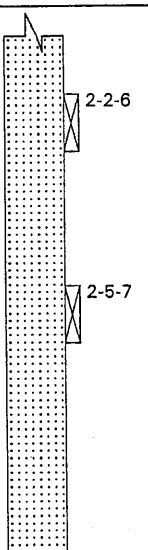
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-2
 Water Depth: 15 feet
 Time Water Depth Measured: 11:30

Date: 04-17-98
 Northing: 689350
 Easting: 3277138

Project No. 97-196G-00
 Approx. Elev.: -13.3 feet
 Station: ≈ 6 + 000
 Offset:

ELEV. DEPTH, FEET	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	DRY DENSITY PCF	SPECIFIC GRAVITY	<div> <div> <div>SHEAR STRENGTH, TSF</div> <div> <div>0.3</div> <div>0.6</div> <div>0.9</div> <div>1.2</div> <div>1.5</div> </div> </div> <div> <div>MOISTURE</div> <div>PLASTIC LIMIT</div> <div>25</div> <div>50</div> <div>75</div> <div>100</div> <div>125</div> </div> <div> <div>CONTENT, %</div> <div>LIQUID LIMIT</div> </div> </div>
-50						
-40						
-55						
-45						
-60						
-50						
-65						
-55						
-70						
-60						
-75						
-65						
-80						
-70						
-85						

Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

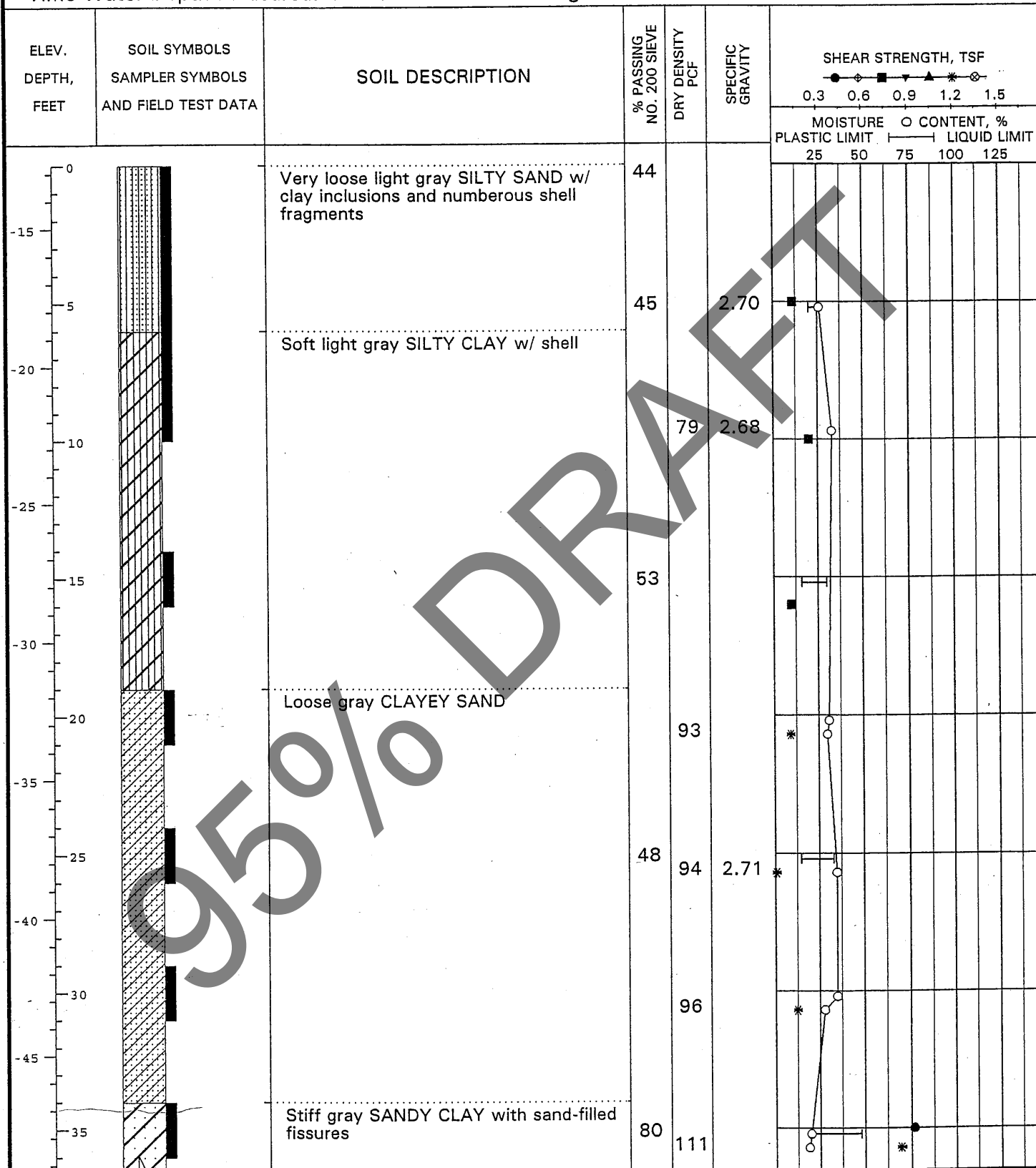
Plate B-2B

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-3
Water Depth: 14 feet
Time Water Depth Measured: 13:10

Date: 04-24-98
Northing: 684019
Easting: 3279083

Project No. 97-196G-00
Approx. Elev.: -12.7 feet
Station: ≈ 11 + 000
Offset:



Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-3A

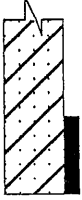
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-3
 Water Depth: 14 feet
 Time Water Depth Measured: 13:10

Date: 04-24-98
 Northing: 684019
 Easting: 3279083

Project No. 97-196G-00
 Approx. Elev.: -12.7 feet
 Station: ≈ 11 + 000
 Offset:

ELEV. DEPTH, FEET	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	DRY DENSITY PCF	SPECIFIC GRAVITY	SHEAR STRENGTH, TSF 0.3 0.6 0.9 1.2 1.5 MOISTURE ○ CONTENT, % PLASTIC LIMIT LIQUID LIMIT 25 50 75 100 125
-50						
-55						
-60						
-65						
-70						
-75						
-80						
-85						

Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

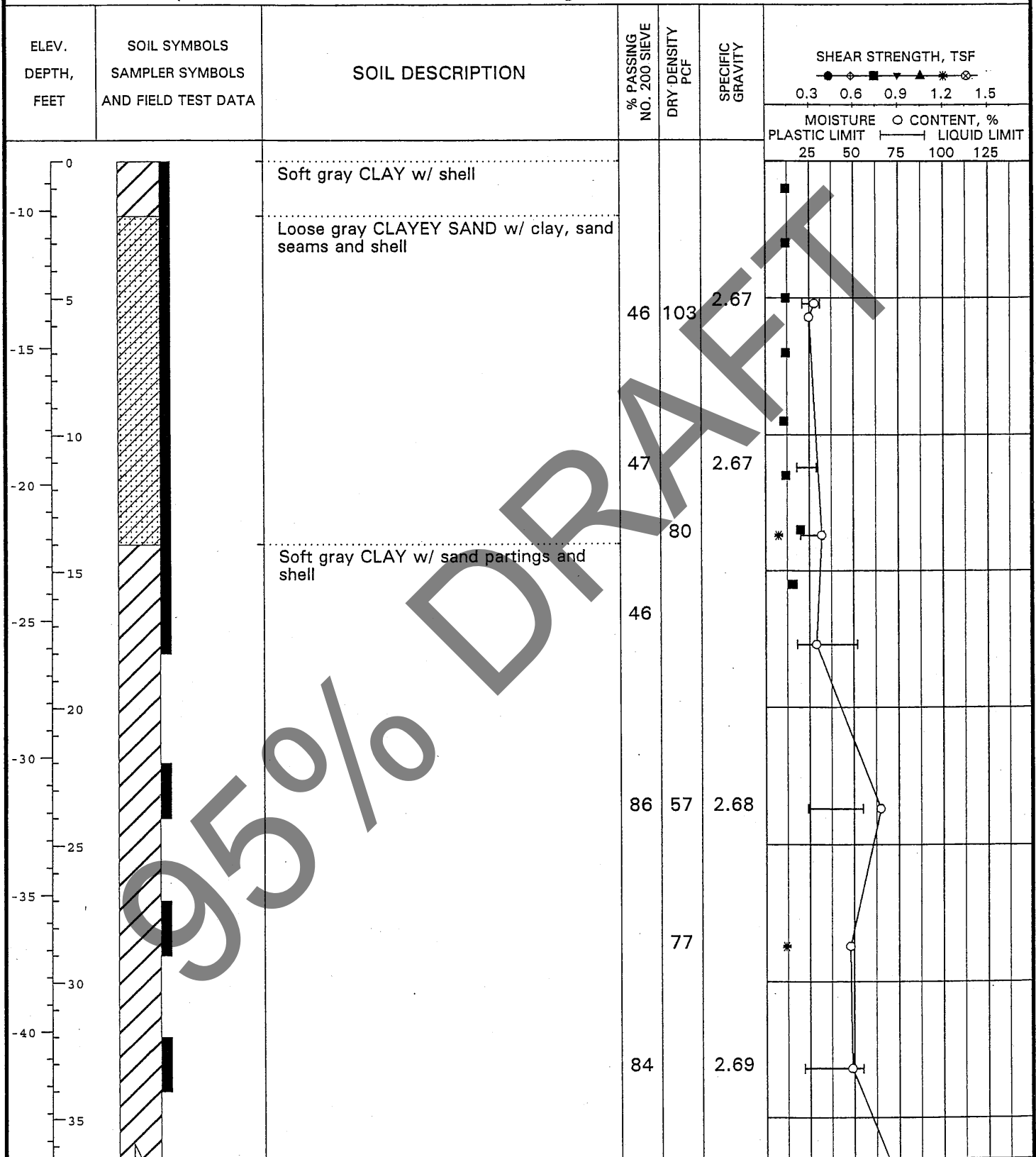
Plate B-3B

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-10
Water Depth: 11 feet
Time Water Depth Measured: 08:50

Date: 04-15-98
 Northing: 690634
 Easting: 3277461

Project No. 97-196G-00
Approx. Elev.: -8.2 feet
Station: $\approx 4+000$
Offset:



Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivanne ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-13A

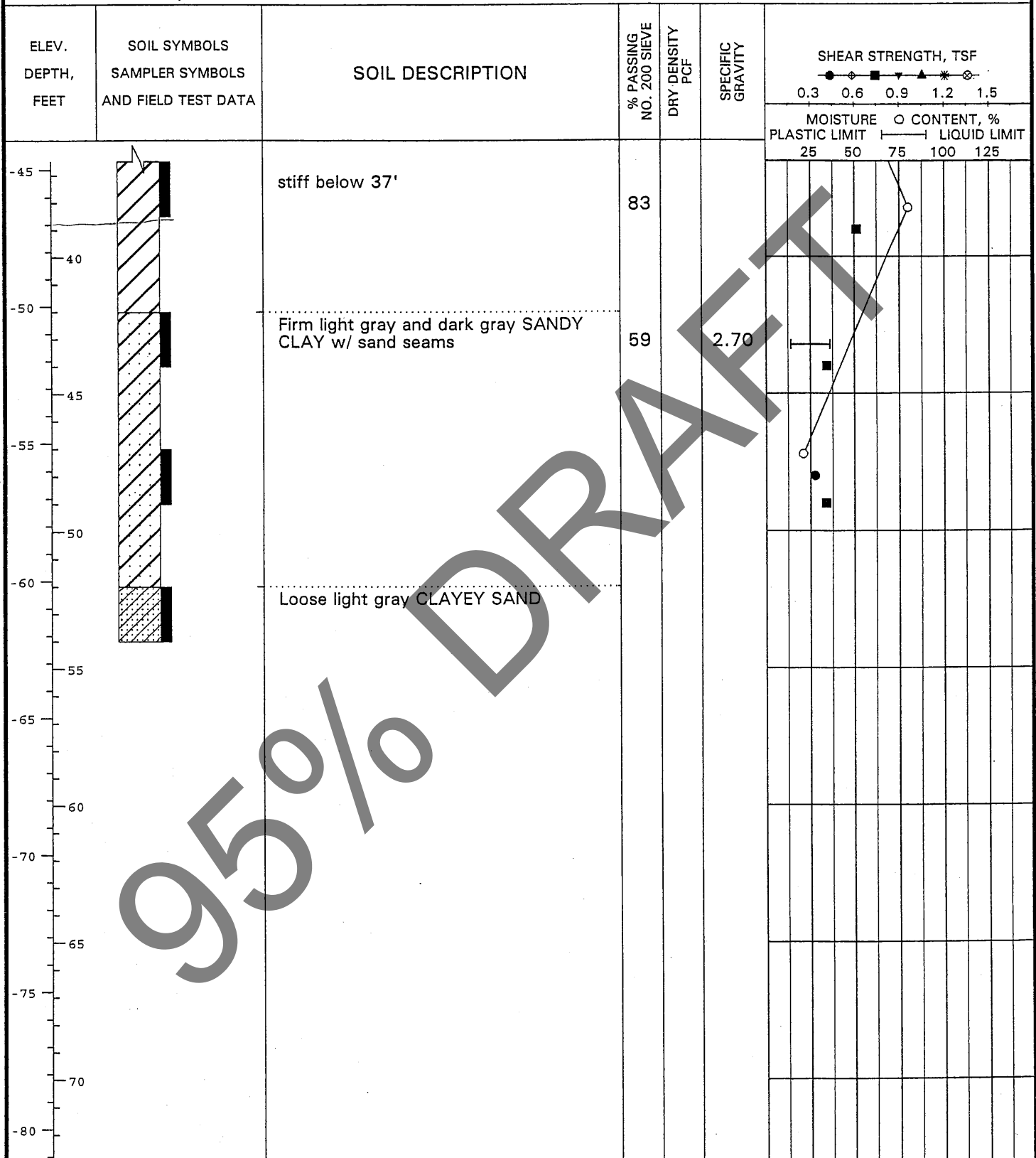
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-10
 Water Depth: 11 feet
 Time Water Depth Measured: 08:50

Date: 04-15-98
 Northing: 690634
 Easting: 3277461

Project No. 97-196G-00
 Approx. Elev.: -8.2 feet
 Station: ≈ 4 + 000
 Offset:



Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊙ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-13B

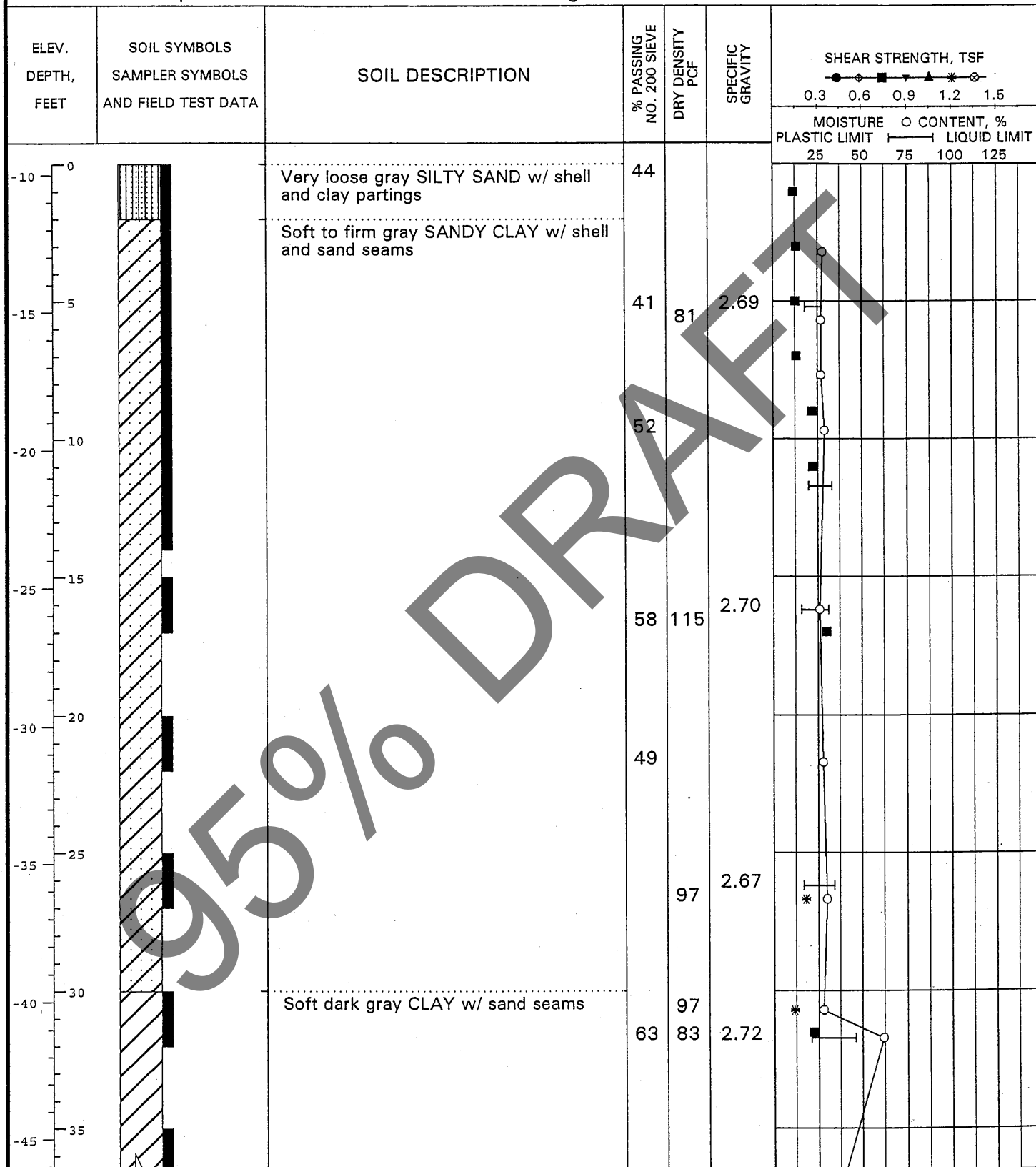
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-11
Water Depth: 13 feet
Time Water Depth Measured: 12:25

Date: 04-15-98
Northing: 686394
Easting: 3279053

Project No. 97-196G-00
Approx. Elev.: -9.6 feet
Station: ≈ 8 + 500
Offset:



Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-14A

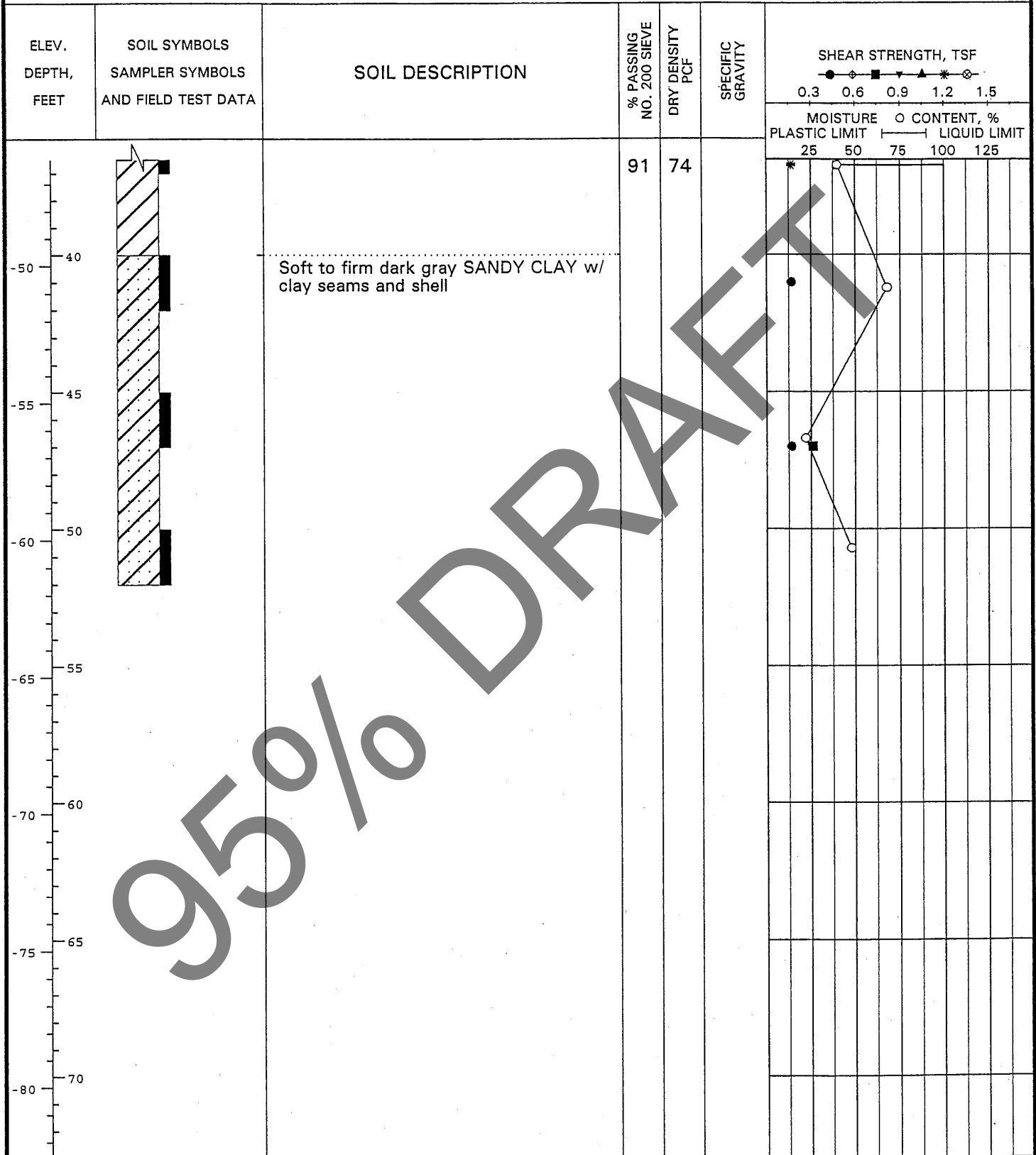
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-11
 Water Depth: 13 feet
 Time Water Depth Measured: 12:25

Date: 04-15-98
 Northing: 686394
 Easting: 3279053

Project No. 97-196G-00
 Approx. Elev.: -9.6 feet
 Station: ≈ 8 + 500
 Offset:



Shear Types: ● = Hand Penetrometer ♦ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

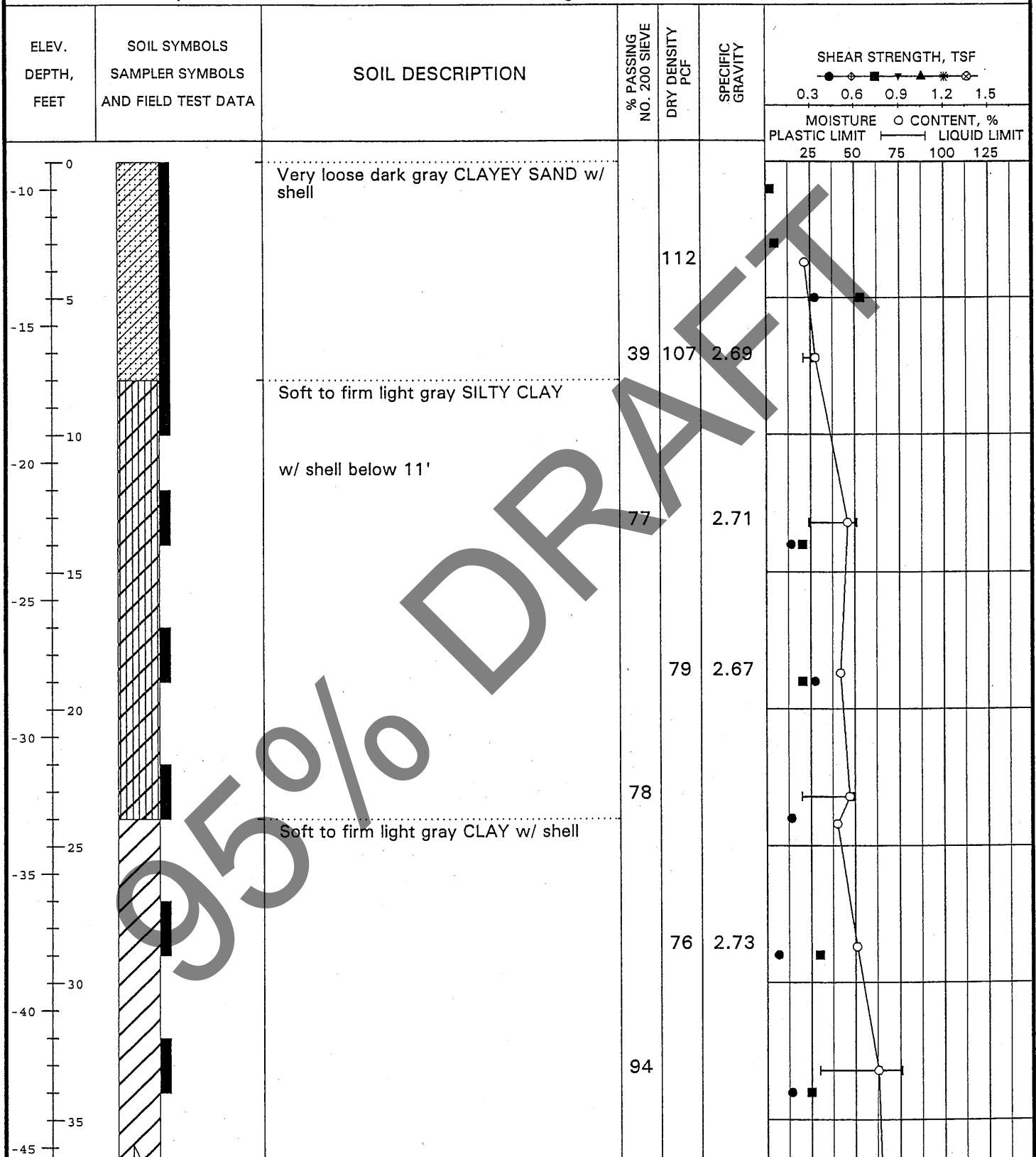
Plate B-14B

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-12
 Water Depth: 11 feet
 Time Water Depth Measured: 10:10

Date: 04-24-98
 Northing: 681326
 Easting: 3280999

Project No. 97-196G-00
 Approx. Elev.: -9.0 feet
 Station: ≈ 14 + 000
 Offset:



Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-15A

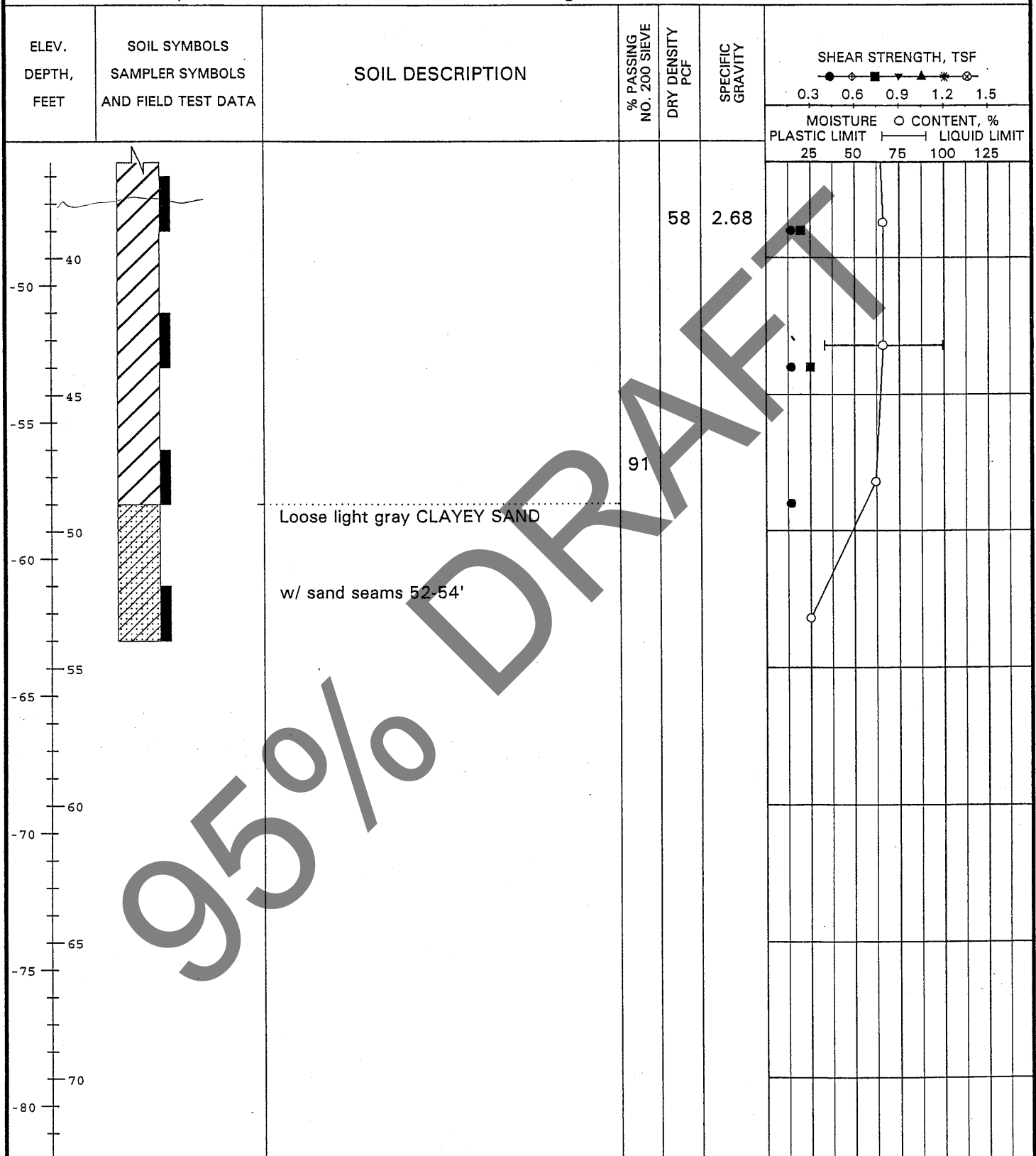
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-12
 Water Depth: 11 feet
 Time Water Depth Measured: 10:10

Date: 04-24-98
 Northing: 681326
 Easting: 3280999

Project No. 97-196G-00
 Approx. Elev.: -9.0 feet
 Station: ≈ 14 + 000
 Offset:



Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-15B

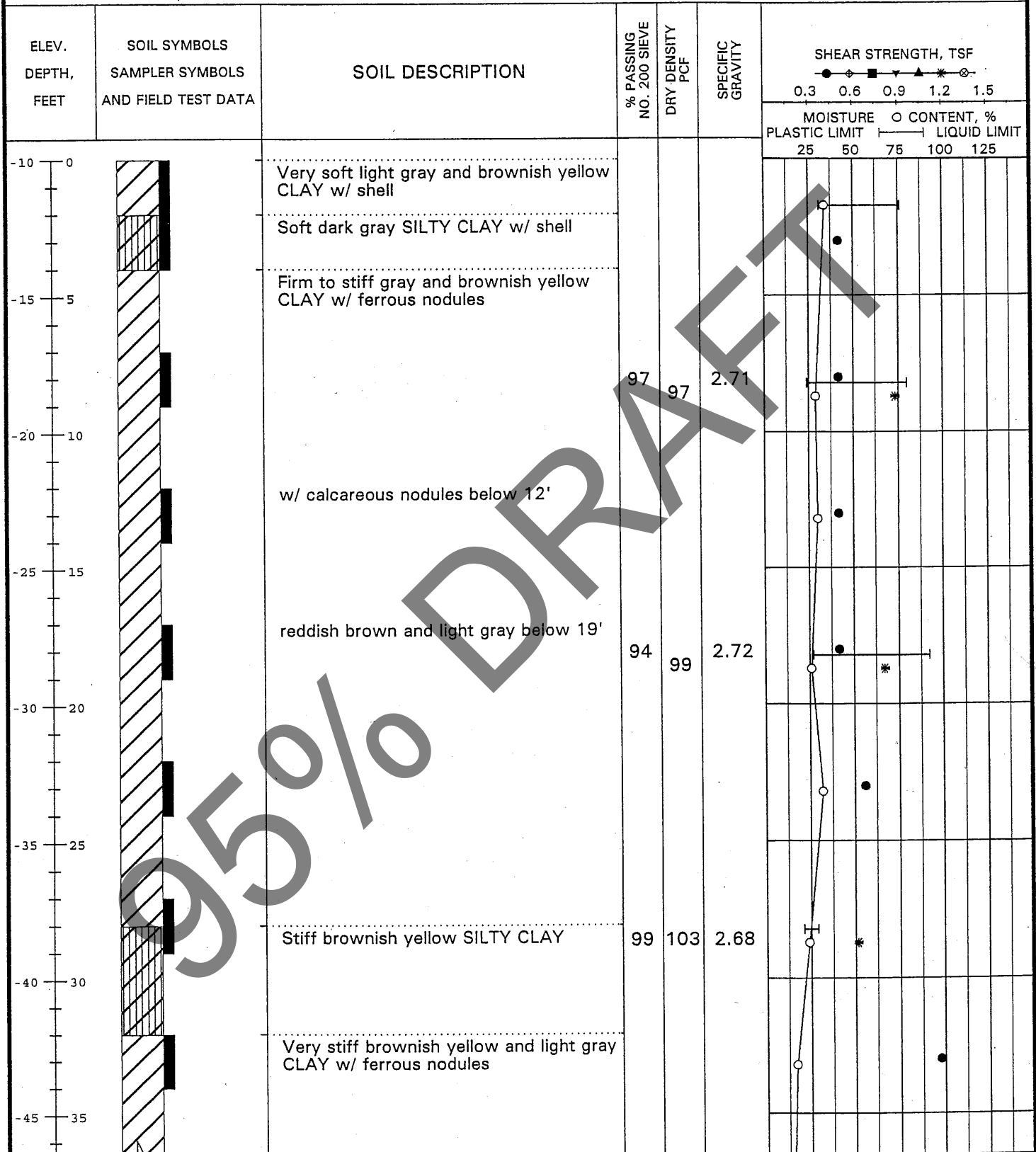
HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
 Boring No.: AM-13
 Water Depth: 11 feet
 Time Water Depth Measured: 11:55

Date: 04-23-98
 Northing: 673784
 Easting: 3283857

Project No. 97-196G-00
 Approx. Elev.: -10.0 feet
 Station: ≈ 22+000
 Offset:



Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivane ▼ = Field Vane
 ▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-16A

HVJ ASSOCIATES, INC.

LOG OF SOIL BORING

Project Name: Atkinson Island Marsh
Boring No.: AM-13
Water Depth: 11 feet
Time Water Depth Measured: 11:55

Date: 04-23-98
 Northing: 673784
 Easting: 3283857

Project No. 97-196G-00
Approx. Elev.: -10.0 feet
Station: $\approx 22 + 000$
Offset:

ELEV. DEPTH, FEET	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	DRY DENSITY PCF	SPECIFIC GRAVITY	<div style="text-align: center;"> SHEAR STRENGTH, TSF </div> <div style="text-align: center;"> MOISTURE CONTENT, % PLASTIC LIMIT — LIQUID LIMIT </div>
-45		Medium dense light gray and brownish yellow CLAYEY SAND	45			
-55			33			
-60		Medium dense to dense light gray SAND				
-75						
-80						

Shear Types: ● = Hand Penetrometer ◆ = Torvane ■ = Minivanne ▼ = Field Vane
▲ = Unconfined Compression * = UU Triaxial Compression ⊗ = CU Triaxial Compression

See Appendix A for boring location.

Plate B-16B

HVJ ASSOCIATES, INC.

BAYOU REACH BAY REACH
H.S.C. H.S.C.

STA. 0+00 (HSC BAYOU)
UPSTREAM LIMIT OF DREDGING
STA. -0+003.94 (HSC BAY)

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

SECTION 6

SECTION 7

SECTION 8

SECTION 9

SECTION 10

SECTION 11

SECTION 12

SECTION 13

SECTION 14

SECTION 15

SECTION 16

SECTION 17

SECTION 18

SECTION 19

SECTION 20

SECTION 21

SECTION 22

SECTION 23

SECTION 24

SECTION 25

SECTION 26

SECTION 27

SECTION 28

SECTION 29



NOTE:
NO DREDGING BETWEEN
STA. 17+775 TO STA. 18+275

18+275
17775
500

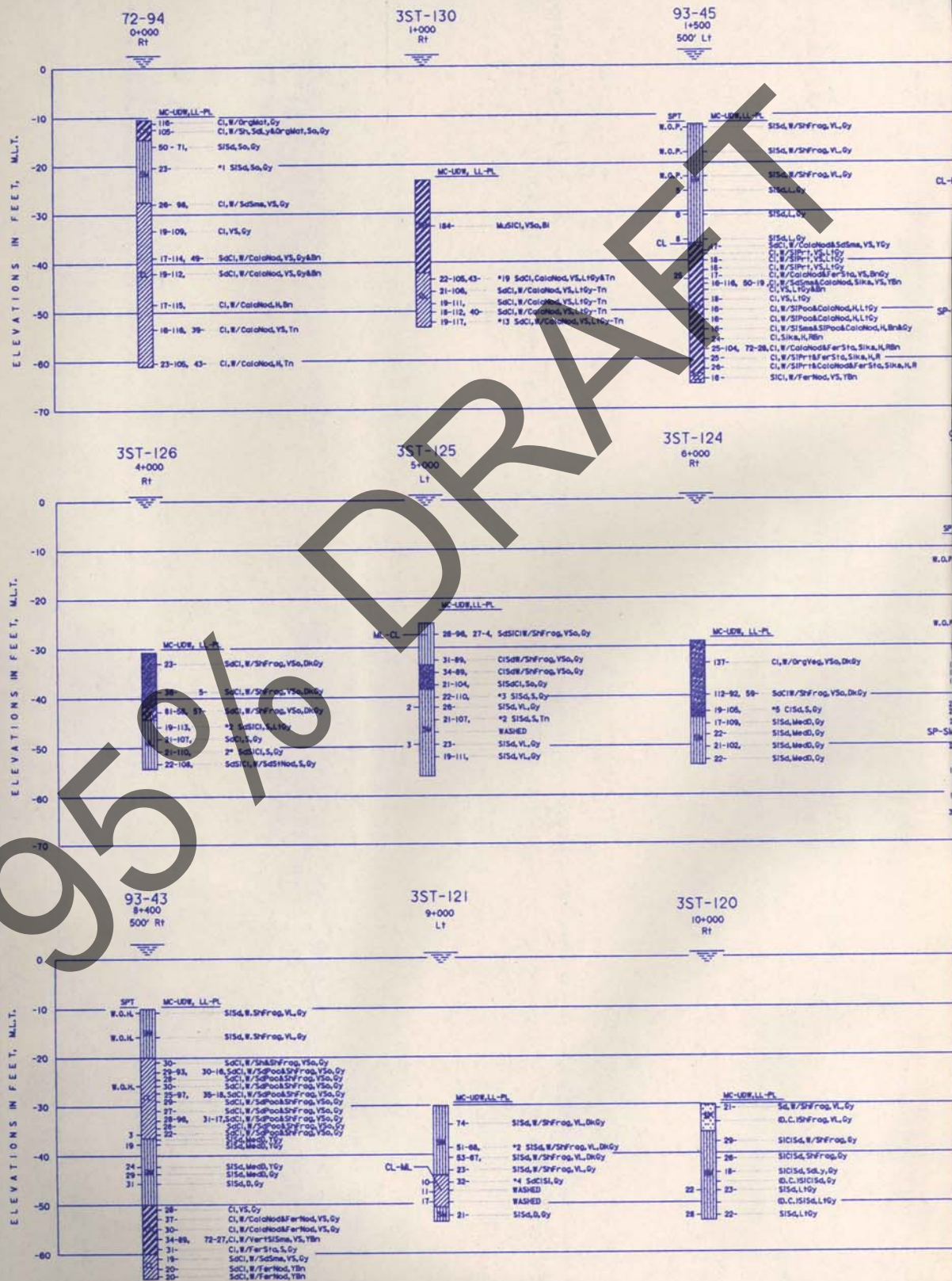
NOTE:
1. SEE DWGS. C-4 THRU C-9 FOR CROSS SECTIONS
2. HORIZONTAL COMPONENTS ARE REFERENCED TO
SOUTH CENTRAL ZONE, AND 27.

25 → on + 10
run yard
full channel

PLAN
SCALE IN FEET
0 1000 2000

EXISTING BOTTOM — STA. 29+000 (TYP. FOR STA. -0+003.94)

DATE	BY	OFFICE OF THE DISTRICT ENGINEER, U.S. ARMY ENGINEER DISTRICT OF CALIFORNIA
DATE	BY	HOUSTON-GALVESTON



3ST-129

2+000

Lt

3ST-128

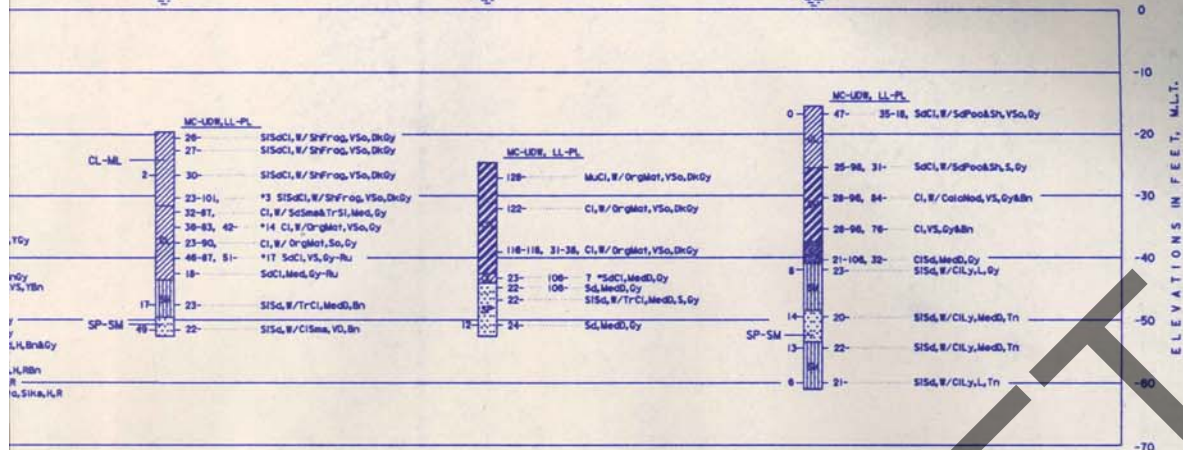
3+000

Rt

72-56

3+000

300' Lt



93-44

6+600

500' Lt

3ST-123

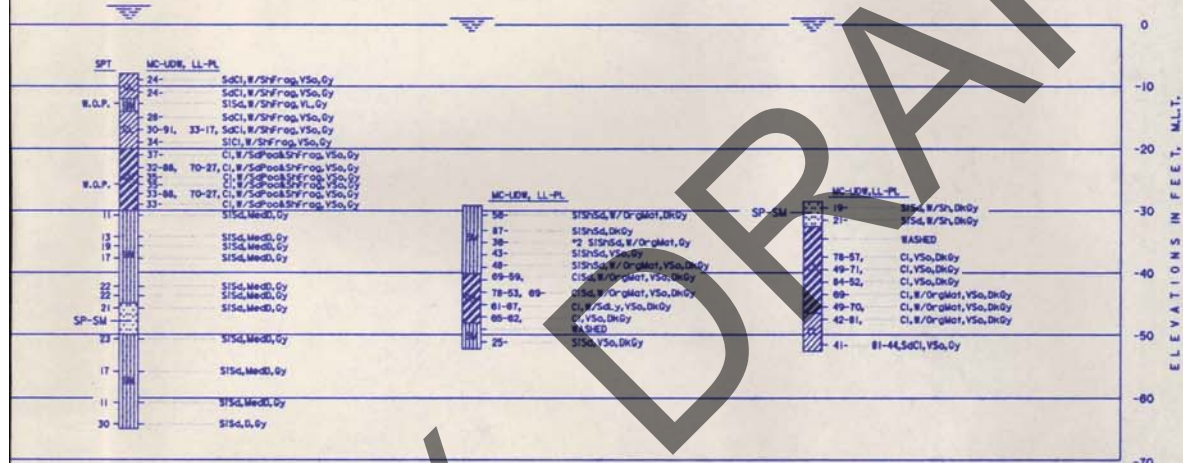
7+000

Lt

3ST-122

8+000

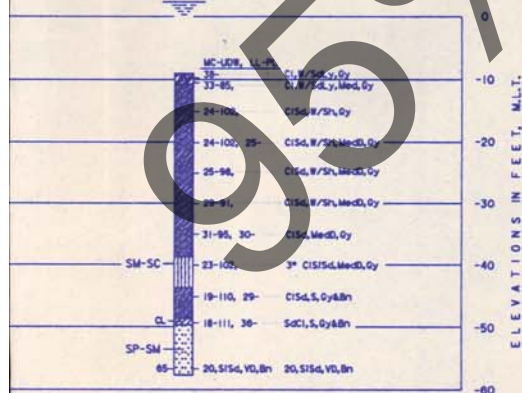
Rt



72-55

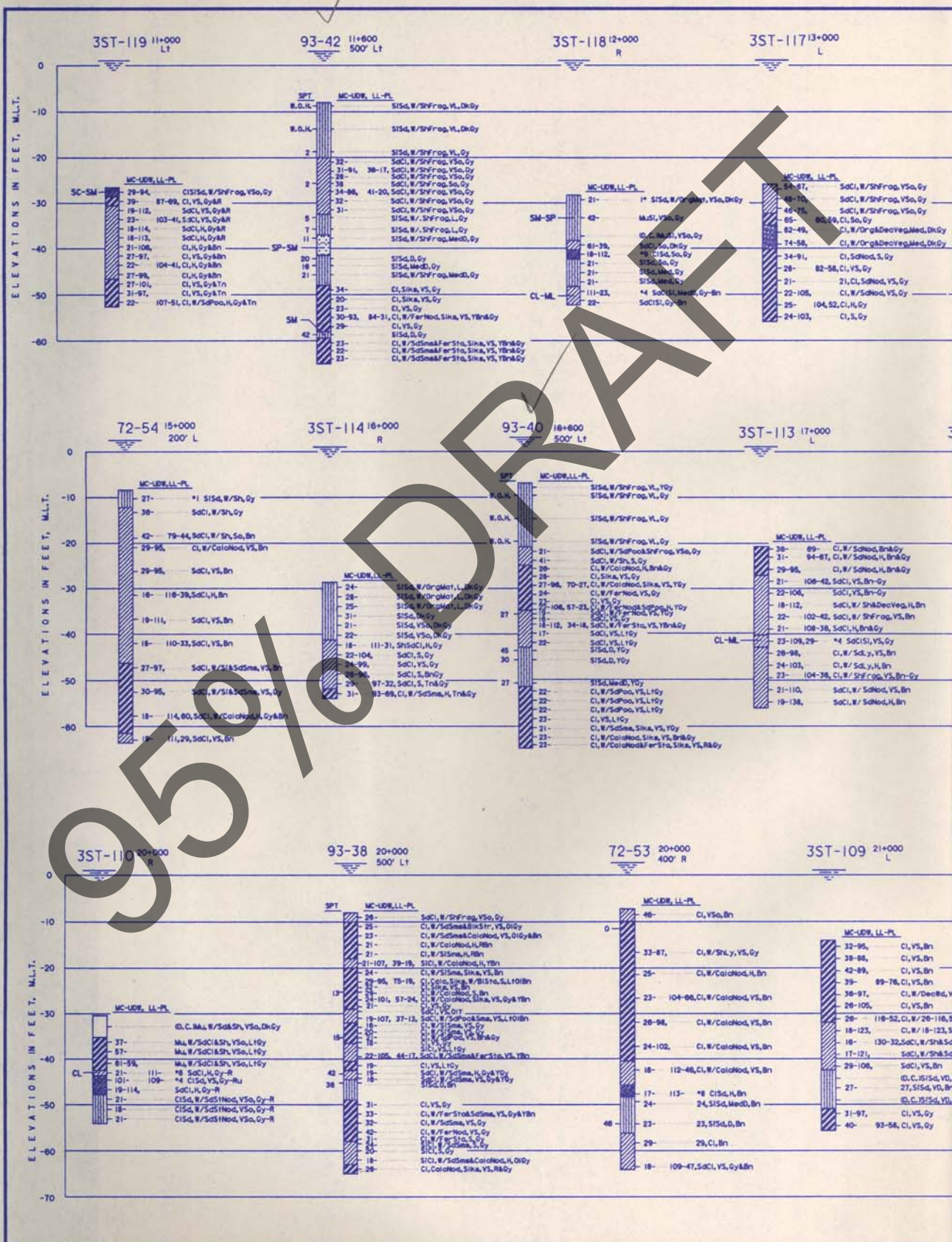
10+000

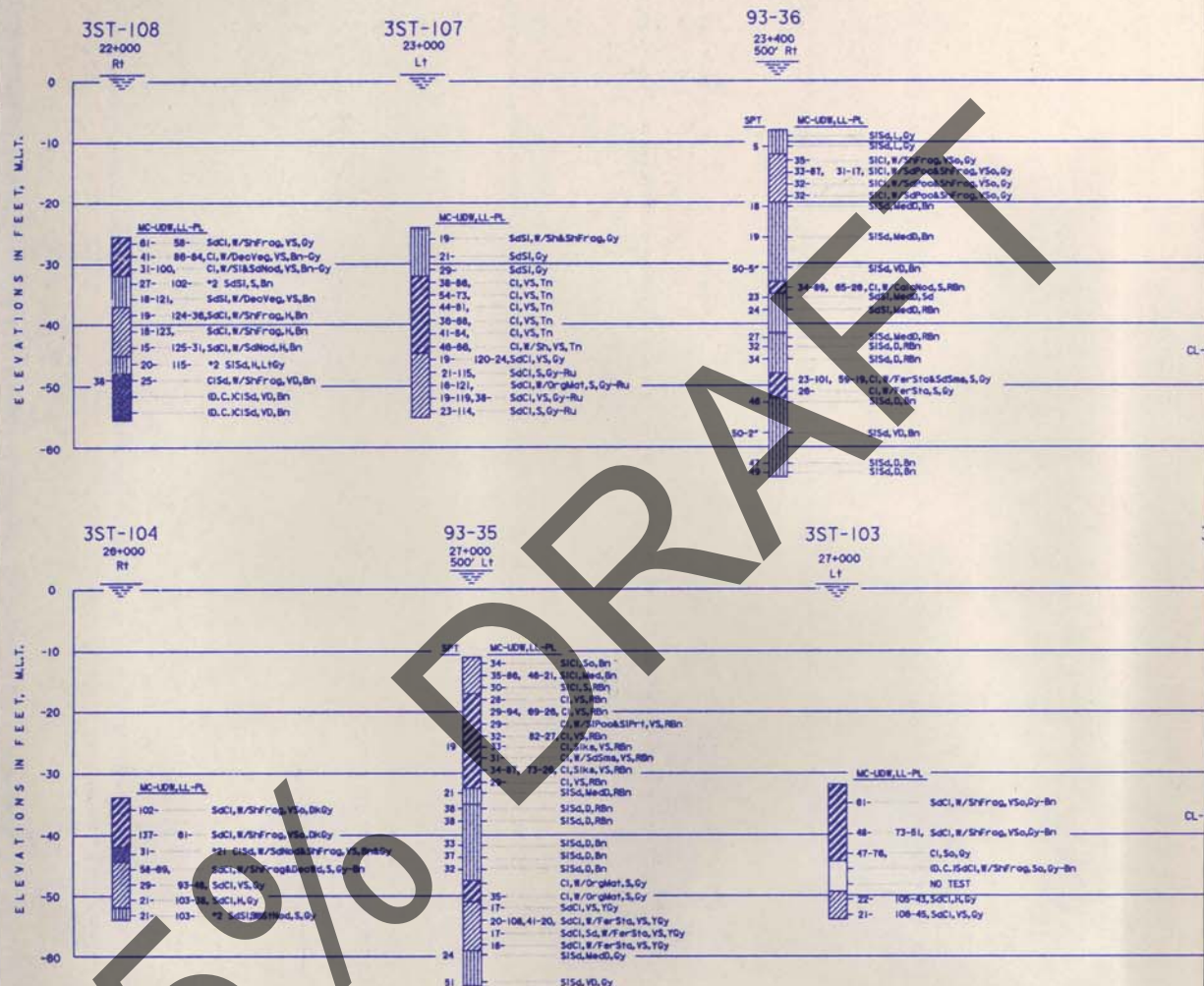
200' Rt



NOTE:
SEE SHEET X OF X FOR BORING NOTES
AND LEGEND.

REVISION	DATE	DESCRIPTION	BY
<p>OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS</p> <p>HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY</p> <p>LOGS OF BORINGS STA. 0+000 TO STA. 10+000</p> <p>DESIGNED BY: P.N. CHECKED BY: T.F. DRAWN BY: T.F. EXAMINED BY: H. SUTCLIFFE, P.E. DIST. ENGINEER DISTRICT</p> <p>APPROVED BY: E. H. WITTING, P.E. DIST. ENGINEER BAY</p> <p>APPROVED BY: HARRY G. KOHLER, P.E. DIST. ENGINEER AND CONSTRUCTION ENGINEER</p> <p>Prepared under the direction of Nicholas J. Buechler, Col., C.E., District Engineer</p> <p>DATE: NOVEMBER 1999 SCALE: AS SHOWN SHEET: 22 OF 39 FILE NO. HSC 401-475</p>			





NOTES

- SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH ASTM 2487-93 "CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (UNIFIED SOILS CLASSIFICATION SYSTEM)". CONSISTENCY OF SOILS SUCH AS SOFT, MEDIUM, HARD, LOOSE, DENSE, ETC., ARE RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH OF THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION POCKET PENETROMETER TESTS AND PENETRATION RESISTANCE DURING SAMPLING.
- FIGURES TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF THE DRY WEIGHT, DRY DENSITY, LIQUID LIMIT, PLASTIC LIMIT, AND BAR LINEAR SHRINKAGE. (MC-Low, LL-PL, (B.L.S.)* FIGURES TO THE LEFT OF BORING LOGS ARE BLOWS PER FOOT OF PENETRATION FROM STANDARD PENETRATION TESTING.
- BORINGS WERE DRILLED USING WET ROTARY DRILLING TECHNIQUES AND UNDISTURBED SAMPLES WERE RECOVERED WITH A 3-INCH DIAMETER THIN WALL SAMPLER WHERE COHESIVE MATERIALS WERE ENCOUNTERED, WHERE COHESIONLESS MATERIALS WERE ENCOUNTERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPOON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.

VISUAL CLASSIFICATIONS

Bl Black	Mat Material	So Soft
Bk Blokey	Med Medium	St Stones
Bn Brown	Mu Muok	St Stalne
Co Calcareous	Nod Nodules	Tn Tonalah
Cem Cemented	NO TEST No test made	Tr Tracela
Cl Clayey	Od Odor	V Very
D Dense	Ol Olive	Veg Vegetation
D.C. Driller's Classification	Org Organic	W/ With
Dec Decayed	Poc Pocket(s)	WASHED Washed
Dk Dark	Prt Parting	W.O.H. Weight of hammer
Fer Ferrous	Ru Rust	W.O.P. Weight of Pipe
Frog Fragmental	R Red	Wd Wooden
Gy Grayish	S Stiff	Y Yellowish
Habn Hydrocarbon	Sd Sandy	
H Hard	Sh Shellty	
L Loose	Sl Silty	
Lt Light	Sik Silken Sides	
Ly Lateral	Sms Seams	
	Str Structure	

LABORATORY CLASSIFICATION

- CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
- CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
- ML INORGANIC SILTS AND VERY FINE SANDS, WITH SLIGHT PLASTICITY.
- OH ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
- SC CLAYEY SANDS, SAND-CLAY MIXTURES.
- SM SILTY SANDS, SAND-SILT MIXTURES.
- SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINE.

3ST-106

24+000

Rt

3ST-105

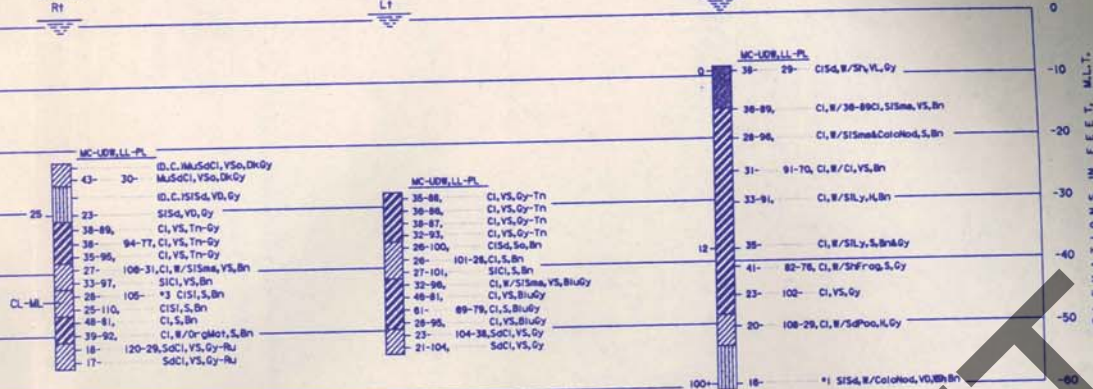
25+000

Lt

72-52

25+000

400' Lt



3ST-102

28+000

Rt

3ST-101

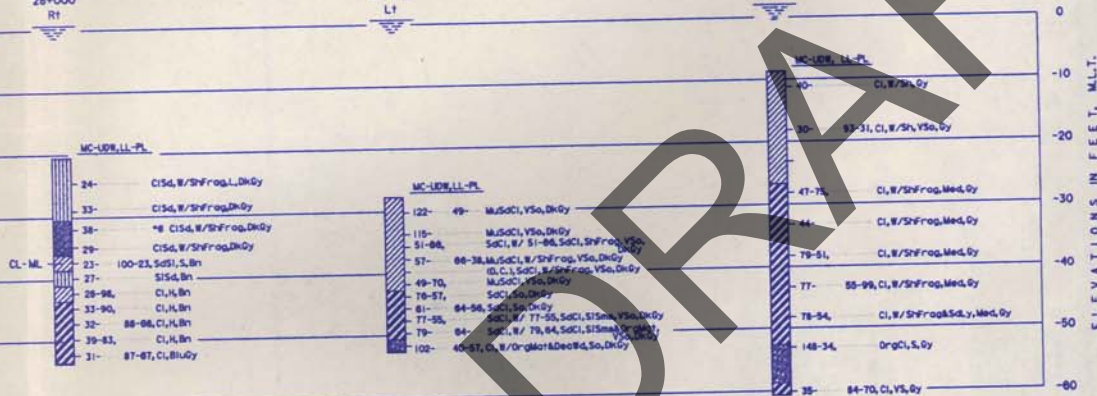
29+000

Lt

72-51

29+000

400' Lt



NOTE:
SEE SHEET X OF X FOR BORING NOTES
AND LEGEND.

TY, LEAN CLAYS.

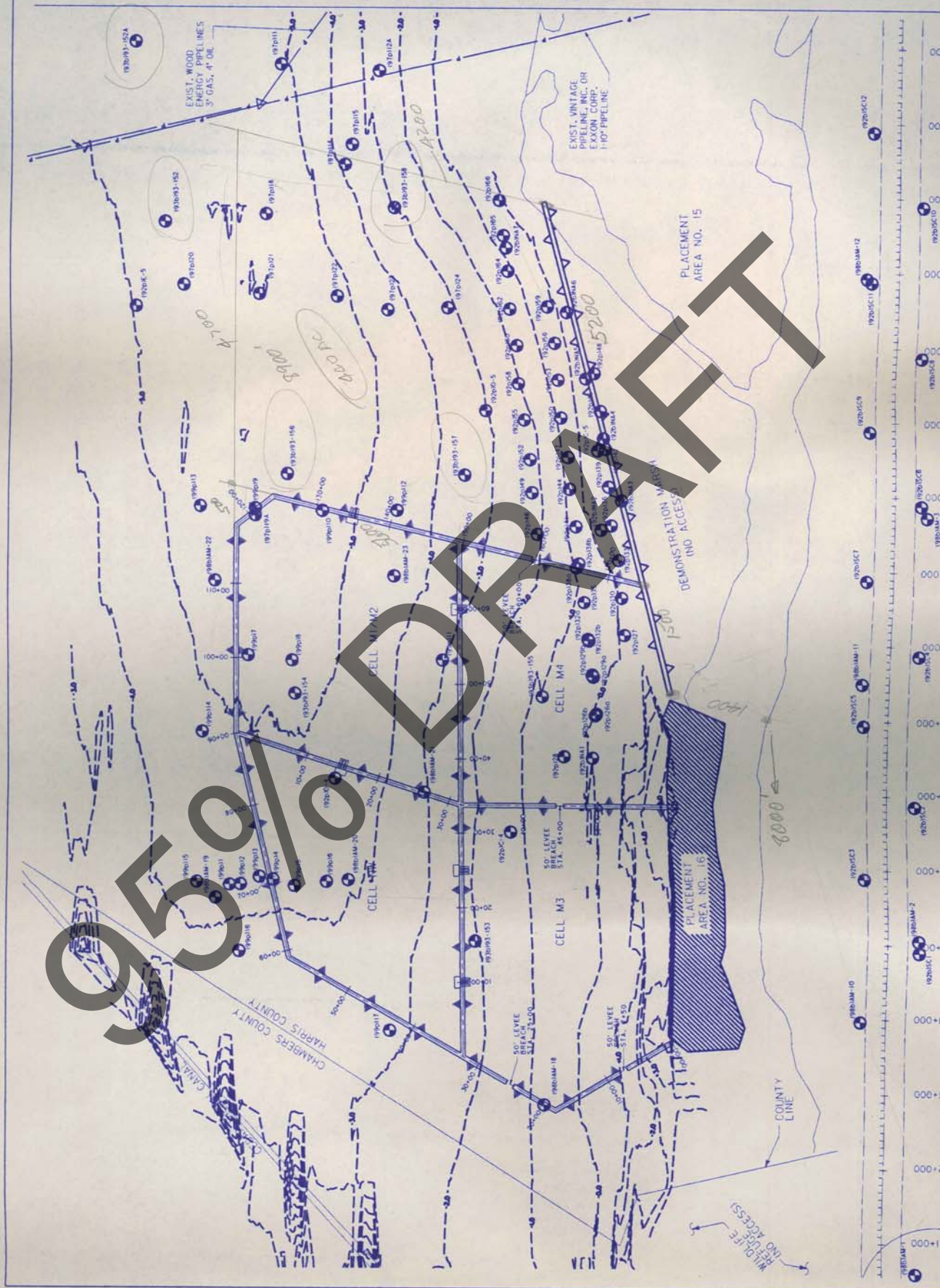
AYS.

SLIGHT PLASTICITY.

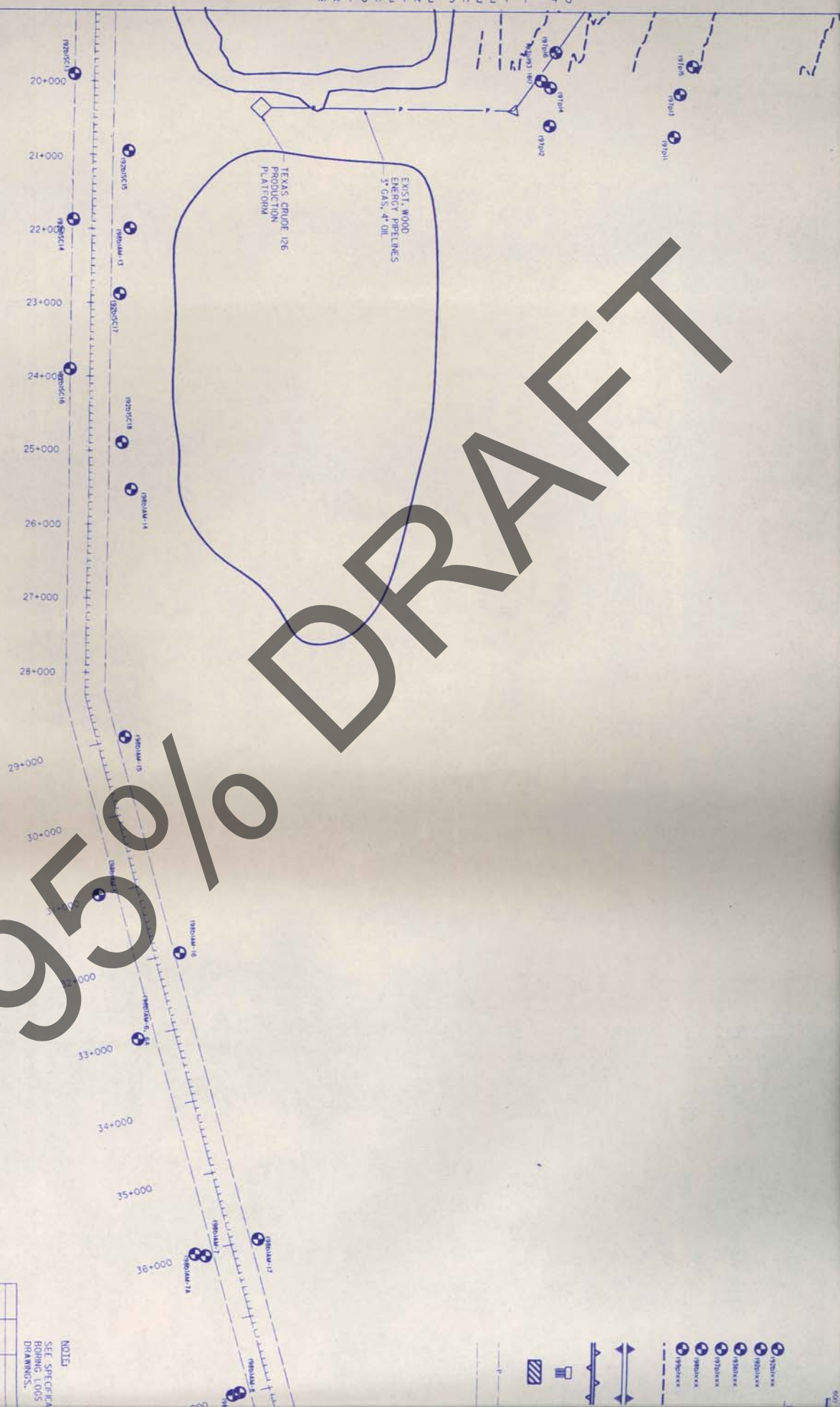
TY, ORGANIC SILTS

LITTLE OR NO FINES.

REVISION		DATE	DESCRIPTION	BY
OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS				
DESIGNED BY *		HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER RAY		
CHECKED BY *		LOGS OF BORINGS STA. 22+000 TO STA. 29+000		
SUBMITTED BY *		APPROVED * HARRY G. KOHLER, P.E. DATE: NOVEMBER 1999		
H. SUTCLIFFE, P.E. CHIEF, DISTRICT ENGINEERING SECTION		E. H. WITTING II, P.E. CHIEF, DISTRICT ENGINEERING SECTION		
PREPARED UNDER THE DIRECTION OF Nicholas J. Buehler, Col., C.E., District Engineer		SCALE: AS SHOWN SHEET NUMBER F-3 SHEET 25 OF 36 (24.6 MB USC 401-173)		

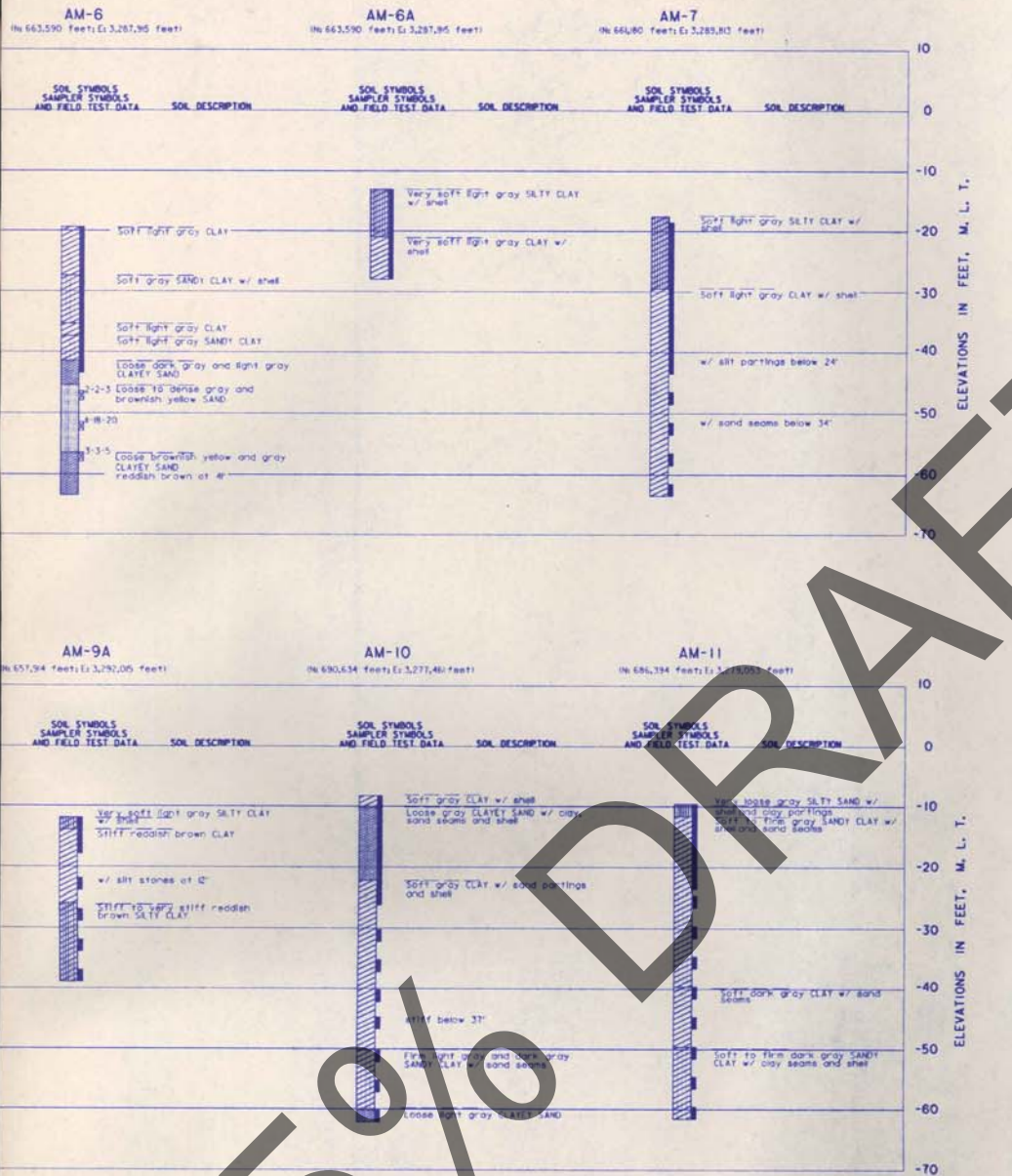


MATCHLINE SHEET F-40



NOTE:
SEE SPECIFIC
BORING LOGS
DRAWINGS.

[illegible]



THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USER. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON WRASIDSKY, P.E., #07342, AND ANTHONY G. SARTORI, P.E., #58351, DATE: OCT. 20, 1999.



REVISION	DATE	DESCRIPTION	BY
TurnerCollins & Braden Inc. GALVESTON & BAYVIEW ASSOCIATES		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS	
Drawn By: *	BF	HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF BORINGS 1 OF 4	
Designed By: *	GEC		
Checked By: *	TS		
Submitted By: *			
Approved - Engineer		Approved - Chief Engineering Officer	DATE: NOVEMBER 1999
C. & AS REQUIRED BY DISTRICT ENGINEER, GALVESTON DISTRICT		SCALE: AS SHOWN	SHEET: 28 OF 36 FILE NO. HSC 401-475
Prepared under the direction of Nicolas J. Buechter, Lt. Col., C.E., District Engineer		DRAWING NUMBER F-5	

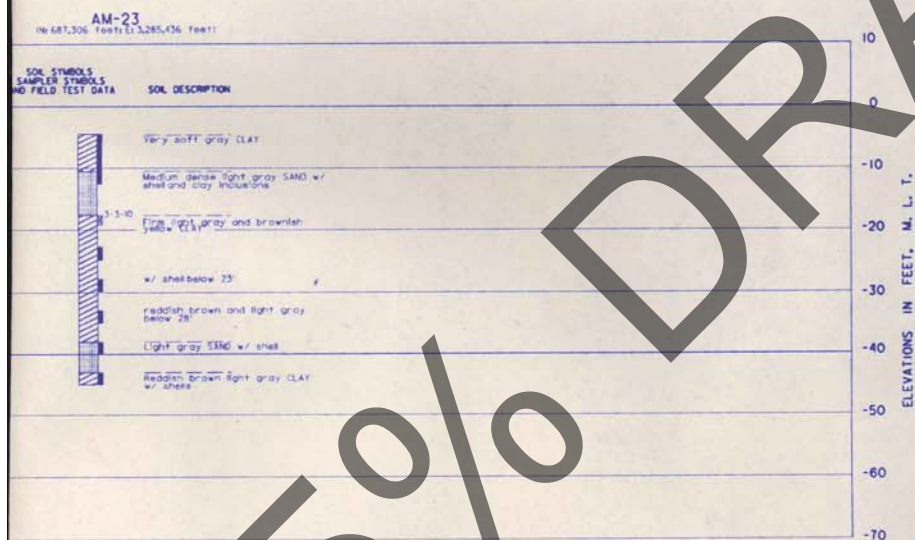
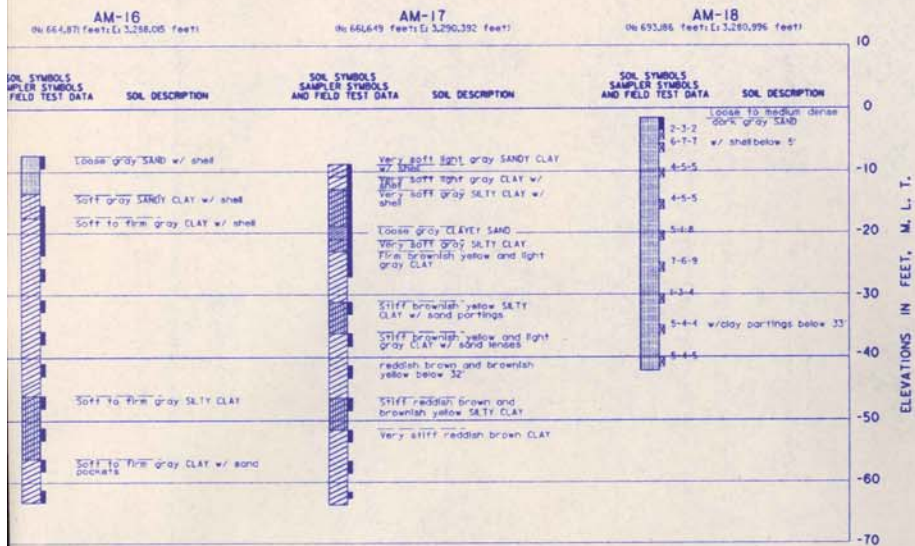


NOTES:

1. SEE DRAWING F-4 FOR BORING LOCATION.
2. THE BORING INFORMATION ON THIS DRAWING IS PROVIDED FOR INFORMATION PURPOSES. LOGS OF BORINGS ARE ATTACHED TO APPENDIX OF SPECIFICATION.

LEGEND:

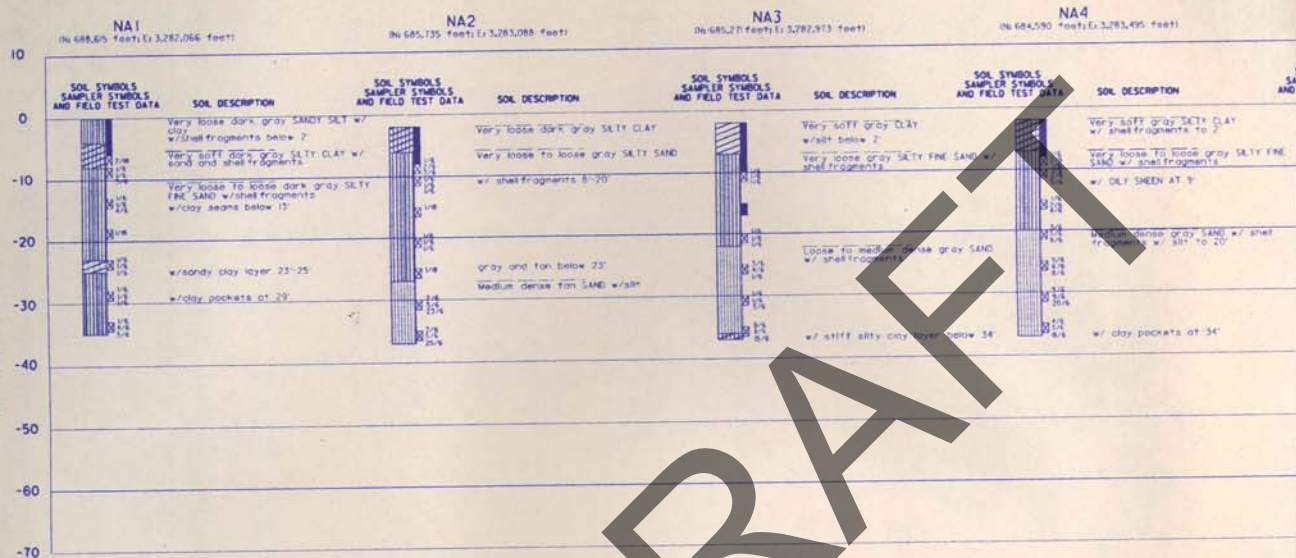
-  SHELBY TUBE SAMPLE
-  SPLIT SPOON SAMPLE WITH BLOW COUNTS PER SIX INCHES



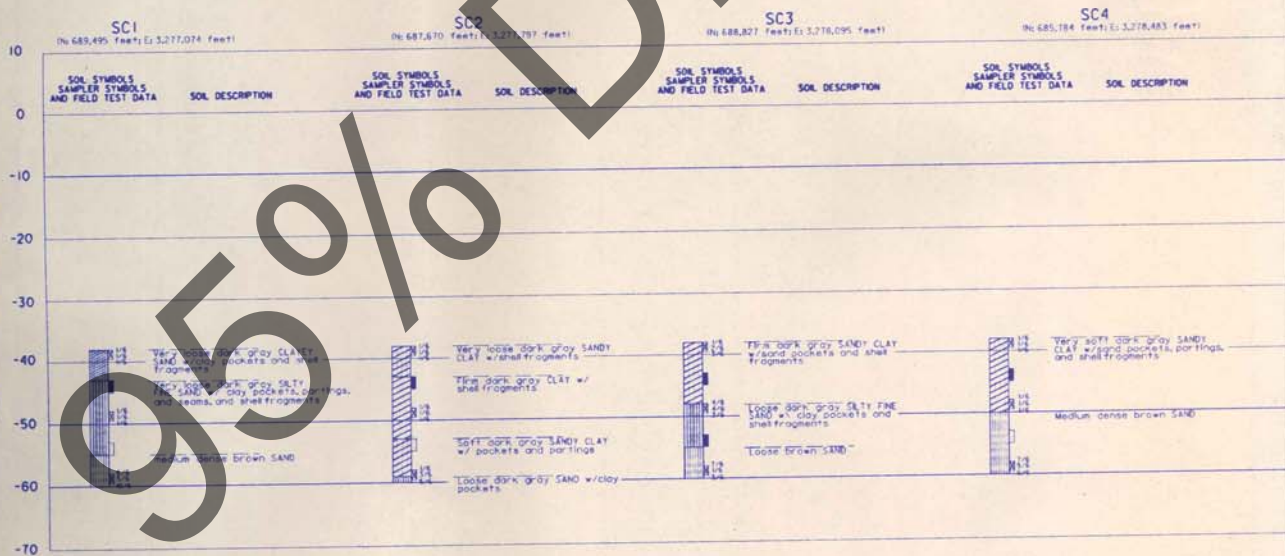
THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USER. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON HIRABOVSKY, P.E., #27342, AND ANTHONY G. SARTORI, P.E., #58251, DATE: OCT. 20, 1999.

REVISION		DATE	DESCRIPTION	BY
Turner Collier & Braden Inc. DAVIDMAN & NEWBY ASSOCIATES				
DRAWING BY: *		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS		
DESIGNED BY: *		HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF BORINGS 2 OF 4		
CHECKED BY: *				
SUBMITTED BY: *				
APPROVED BY: *				
PROJECT ENGINEER		APPROVED BY: *		DATE: NOVEMBER 1999
DESIGN NUMBER		SHEET NUMBER		DRAWING NUMBER
PREPARED UNDER THE DIRECTION OF Nicolae J. Buechler, Lt. Col., C.E., District Engineer		SHEET 29 OF 36 FILE NO. HSC 401-475		F-6

ELEVATIONS IN FEET, M. L. T.



ELEVATIONS IN FEET, M. L. T.



NOTES:

1. SEE DRAWING F-4 FOR BORING LOCATION.
2. THE BORING INFORMATION ON THIS DRAWING IS PROVIDED FOR INFORMATION PURPOSES. LOGS OF BORINGS ARE ATTACHED TO APPENDIX OF SPECIFICATION.

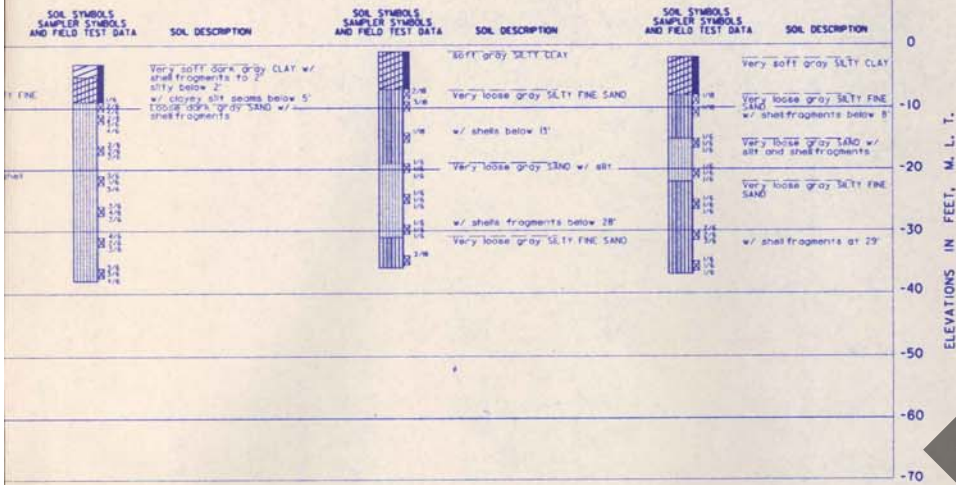
LEGEND:

- SHELBY TUBE SAMPLE
- SPLIT SPOON SAMPLE WITH BLOW COUNTS PER SIX INCHES

NA5
(N 683,923 Feet; E 3,284,009 Feet)

NA6
(N 683,88 Feet; E 3,284,575 Feet)

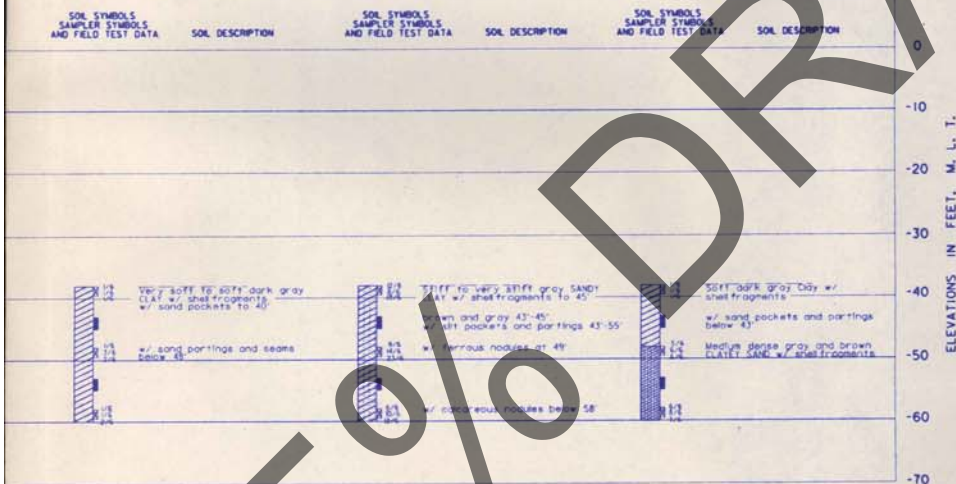
NA7
(N 682,686 Feet; E 3,285,638 Feet)



SC5
(N 686,905 Feet; E 3,278,878 Feet)

SC6
(N 685,502 Feet; E 3,279,320 Feet)

SC7
(N 685,096 Feet; E 3,278,822 Feet)



95%

THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USACE. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON HRABOVSKY, P.E., #27342, AND ANTHONY G. SARTORI, P.E., #58351. DATE: OCT. 20, 1999.

REVISION	DATE	DESCRIPTION	BY
<div style="display: flex; justify-content: space-between;"> <div> <p>TurnerCollins & Braden Inc. MARSH & BENTLEY ASSOCIATES</p> </div> <div> <p>OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS</p> </div> </div>			
<p>HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF BORINGS 3 OF 4</p>			
DRAWN BY: BF DESIGNED BY: GEC CHECKED BY: TS SUBMITTED BY:	ARCHITECT - ENGINEER APPROVED:		
DIST. DESIGN NUMBER:	CHIEF, ENGINEERING DIVISION:	DATE: NOVEMBER 1999	
PREPARED UNDER THE DIRECTION OF Nicolas J. Buehler, Lt. Col., C.E., District Engineer		DRAWING NUMBER: F-7 SHEET 30 OF 36 FILE NO. HSC 401-475	

SC12

(N: 679,462 Feet; E: 3,286,607 Feet)

SC13

(N: 675,467 Feet; E: 3,282,406 Feet)

SC14

(N: 673,622 Feet; E: 3,283,308 Feet)

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

10

0

-10

-20

-30

-40

-50

-60

-70

ELEVATIONS IN FEET, M. L. T.



STIFF TO VERY STIFF gray and brown CLAY w/ calcareous nodules w/ shell fragments to 40'

STIFF gray and brown SANDY CLAY w/ sand pockets and partings w/ shell fragments below 50'



VERY STIFF brown CLAY w/ calcareous and ferrous nodules

VERY STIFF gray SANDY CLAY w/ partings and calcareous and ferrous nodules

Medium dense TO dense brownish gray SAND w/ clay to 50'



STIFF gray clay w/ shell fragments to 40'

platy w/ ferrous nodules below 40'

Medium dense gray SAND

10

0

-10

-20

-30

-40

-50

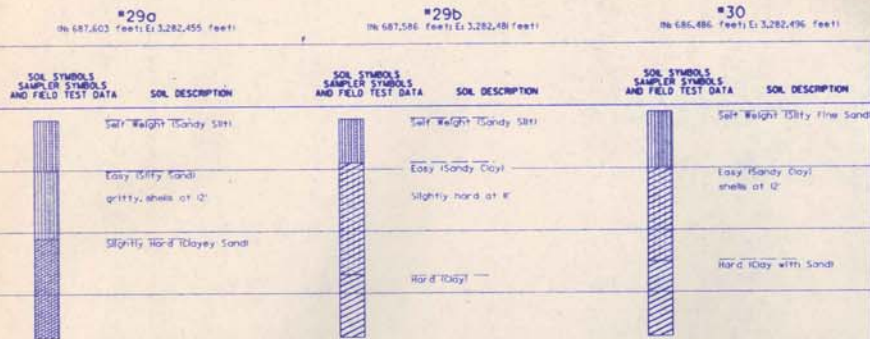
-60

-70

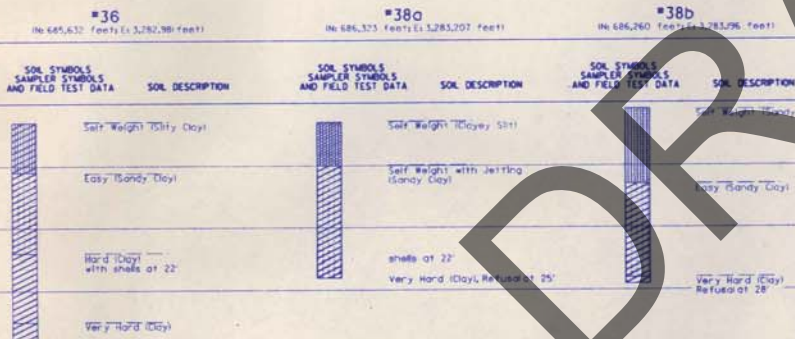
ELEVATIONS IN FEET, M. L. T.

REVISION	DATE	DESCRIPTION	BY
Turner Cole & Boden Inc. BAHAMAS & BAHAMA ASSOCIATES		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS	
DRAWN BY: * DESIGNED BY: * CHECKED BY: * SUBMITTED BY: *		HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF BORINGS 4 OF 4	
ARCHITECT - ENGINEER APPROVED: *		DATE: * NOVEMBER 1999	
DESIGNED BY: * CHECKED BY: * SUBMITTED BY: *		SCALE: AS SHOWN SPEED: DATE:	
Prepared under the direction of Nicolas J. Buehler, Lt. Col., C.E., District Engineer		F-8 SHEET 31 OF 36 FILE NO. HSC 401-475	

THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USACE. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY, UNDER THE AUTHORITY OF LEON HRABOVSKY, P.E., #07342, AND ANTHONY G. SARTORI, P.E., #08351. DATE: OCT. 20, 1999.



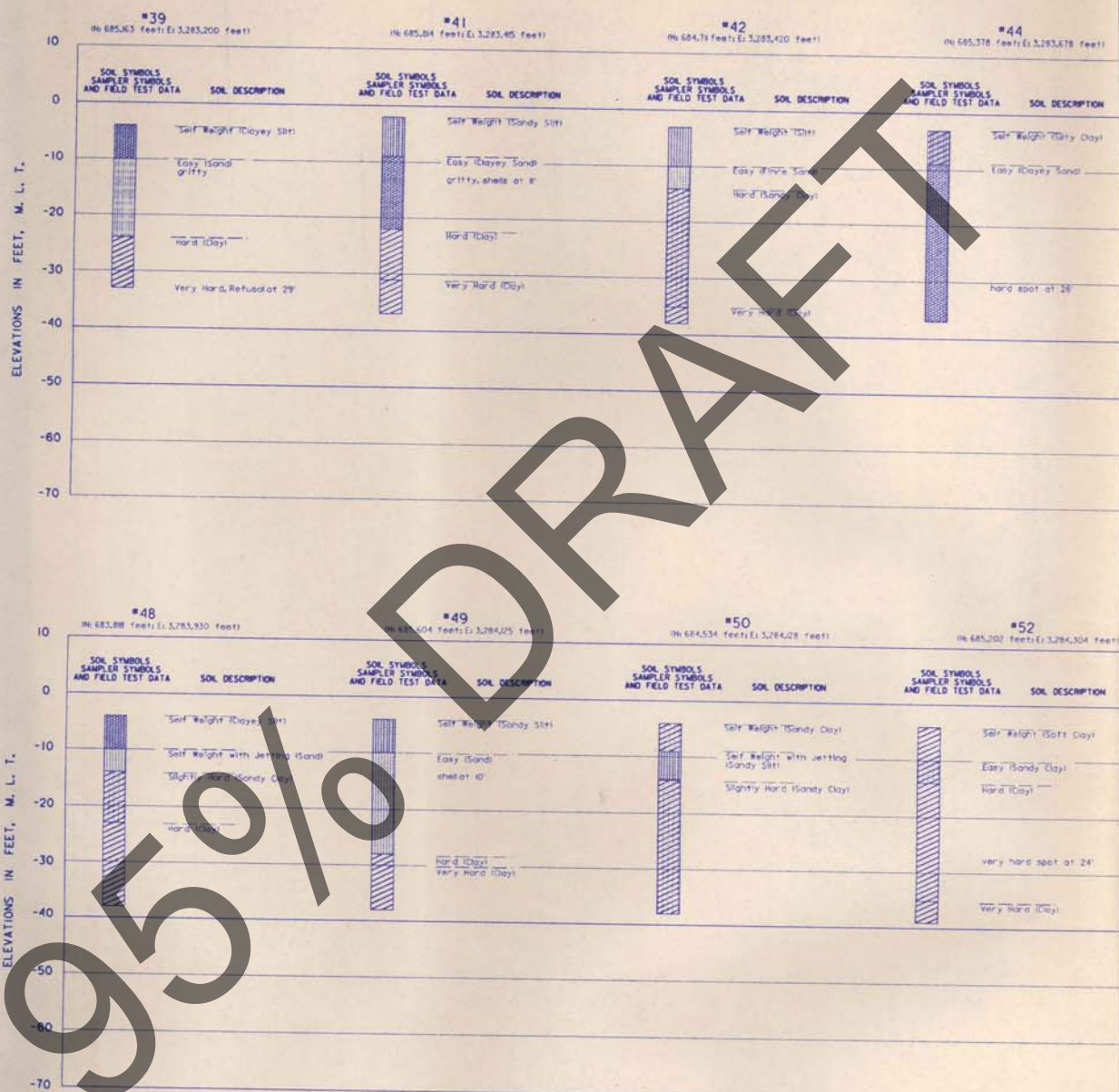
ELEVATIONS IN FEET, M. L. T.



ELEVATIONS IN FEET, M. L. T.

THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USER. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON HRABOVSKY, P.E., #07342, AND ANTHONY G. SARTORI, P.E., #58351. DATE: OCT. 30, 1999.

REGION	DATE	DESCRIPTION	BY
		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS	
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF PROBINGS 1 OF 3			
DESIGNED BY *	BF	APPROVED BY *	DATE: NOVEMBER 1999
CHECKED BY *	GEC	APPROVED BY *	
ENGINEER BY *	TS	APPROVED BY *	
ARCHITECT - ENGINEER		APPROVED BY *	
CHIEF, DESIGN BRANCH * AS REQUIRED BY ENGINEER CIRCULAR NO. 110-1-1001		CHIEF, ENGINEERING DIVISION SCALED AS SHOWN SPEC. DATA	
Prepared under the direction of Nicolas J. Buehler, Lt. Col., C.E., District Engineer		DRAWING NUMBER F-9 SHEET 32 OF 36 FILE NO. HSC 401-475	



NOTES:

1. SEE DRAWING F-4 FOR BORING LOCATION.
2. THE BORING INFORMATION ON THIS DRAWING IS PROVIDED FOR INFORMATION PURPOSES. LOGS OF BORINGS ARE ATTACHED TO APPENDIX OF SPECIFICATION.

LEGEND:

- SHELBY TUBE SAMPLE
 SPLIT SPOON SAMPLE WITH BLOW COUNTS PER SIX INCHES

#45
(N 684,250 Feet; E 3,283,667 Feet)

#46
(N 686,095 Feet; E 3,283,858 Feet)

#47
(N 684,398 Feet; E 3,283,847 Feet)

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION



Soft Weight (Clayey Silt)
Easy (Sandy Clay)
Slightly Hard (Clay)



Soft Weight (Sandy Silt)
Easy (Sand)
Slightly Hard (Sandy Clay)
Hard (Clay)
Refusal at 32'



Soft Weight (Silty Clay)
Self Weight with Jetting (Clayey Sand)
Slightly Hard (Sandy Clay)
Very Hard (Clay)
Refusal at 20'

ELEVATIONS IN FEET, M. L. T.

#53
(N 684,074 Feet; E 3,284,349 Feet)

#55
(N 684,136 Feet; E 3,284,573 Feet)

#56
(N 683,628 Feet; E 3,284,517 Feet)

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION



Soft Weight (Silty Clay)
Easy (Sandy Clay)
with shale at 1'
Hard (Clay)
Refusal at 34'



Soft Weight (Clayey Sand)
Easy (Sandy Clay)
with shale at 10'
Hard (Clay)
Refusal at 32'



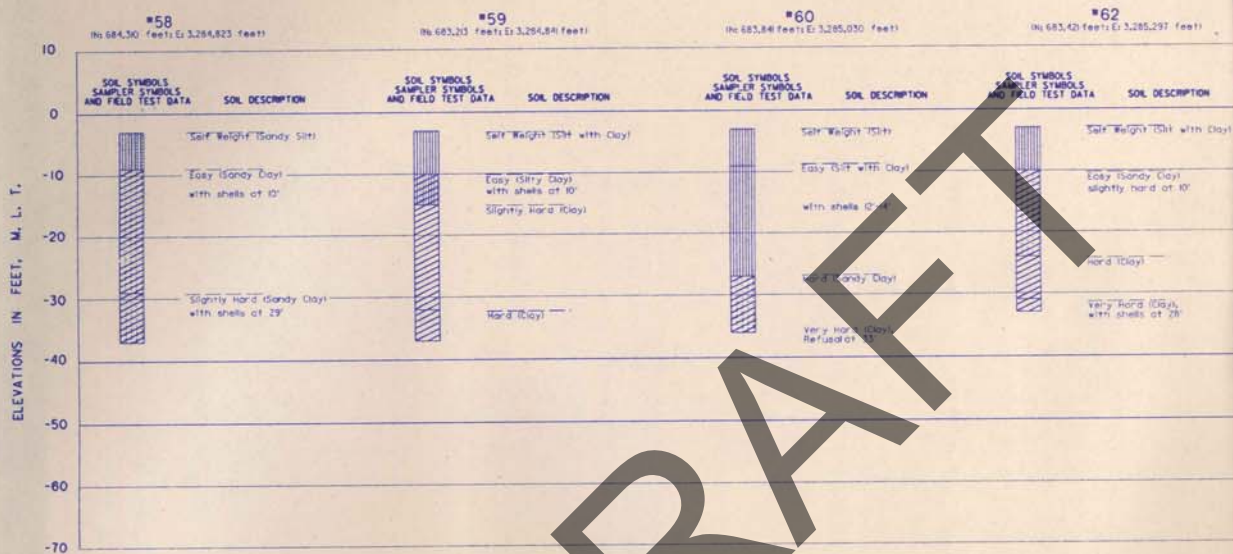
Soft Weight (Silt with Clay)
Easy (Silty Clay)
Slightly Hard (Sandy Clay)
Hard (Clay)
Very Hard (Clay)

ELEVATIONS IN FEET, M. L. T.

95% DRAFT

REVISION	DATE	DESCRIPTION	BY
 TURNER COLLIER & BEADEN INC. 6000 WEST 19TH AVE HOUSTON, TEXAS 77058-0001		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS	
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF PROBINGS 2 OF 3			
DESIGNED BY *	BF		
DETAINED BY *	GEC		
CHECKED BY *	TS		
SUBMITTED BY *			
APPROVED BY *			
DIST. DESIGN REVIEW (* AS REQUIRED BY ENGINEER CIRCULAR NO. 1050-1-80)		DESIGNED AS SHOWN SPECIAL NOTES F-10	DATE: NOVEMBER 1999
Prepared under the direction of Nicolas J. Buechler, Lt. C., C.E., District Engineer		SHEET 33 OF 36 FILE NO. HSC 401-475	



THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USER. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON HRABOVSKY, P.E., #27342, AND ANTHONY G. SARTORI, P.E., #58351, DATE: OCT. 20, 1999.



NOTES:

1. SEE DRAWING F-4 FOR BORING LOCATION.
2. THE BORING INFORMATION ON THIS DRAWING IS PROVIDED FOR INFORMATION PURPOSES. LOGS OF BORINGS ARE ATTACHED TO APPENDIX OF SPECIFICATION.

LEGEND:

-  SHELBY TUBE SAMPLE
-  SPLIT SPOON SAMPLE WITH BLOW COUNTS PER SIX INCHES

DATE

BY

FOR

PROJECT

#64
(N 682,963 feet) E: 3,285,503 feet

#65
(N 682,544 feet) E: 3,285,729 feet

#66
(N 682,226 feet) E: 3,285,953 feet

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION

SOIL SYMBOLS
SAMPLER SYMBOLS
AND FIELD TEST DATA

SOIL DESCRIPTION



Self Weight (Sand)
Easy (Sandy Clay)
Slightly Hard (Clay)
with shells
Very Hard (Clay)



Self Weight (Sand)
Self Weight with Jetting
(Sandy Clay)
Easy (Sandy Clay)
Very Hard (Clay)
Refusal at 33'



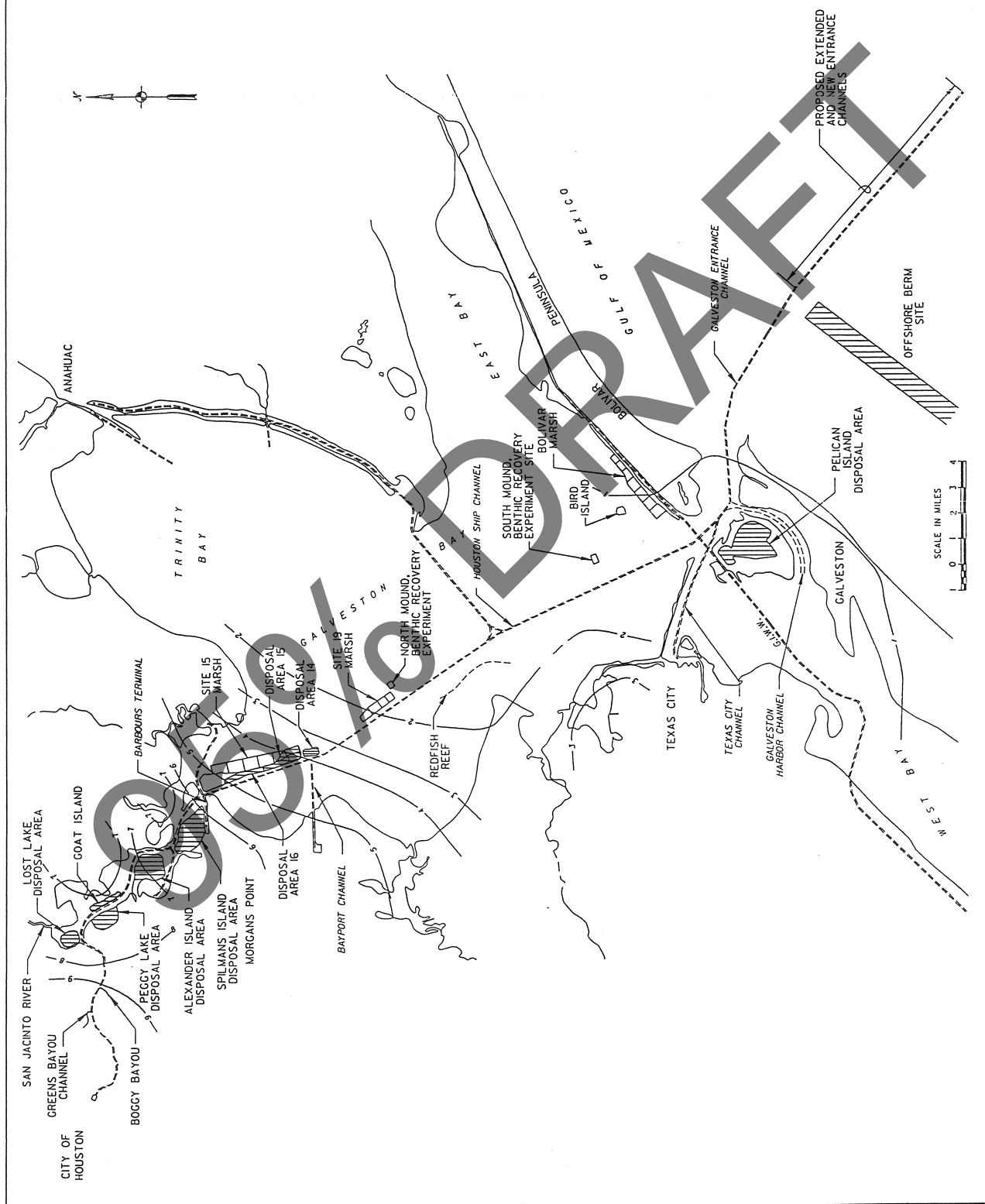
Self Weight (Silt with Clay)
Easy (Silty Clay)
with shell at 10'
Slightly Hard (Silty Clay)
Very Hard (Clay)
Refusal at 31'

ELEVATIONS IN FEET, M. L. T.
10
0
-10
-20
-30
-40
-50
-60
-70

95% DRAFT

THE ORIGINAL SEALED DOCUMENTS HAVE BEEN TRANSMITTED PREVIOUSLY TO THE USACE. PRINTS ARE AVAILABLE UPON REQUEST. THIS ELECTRONIC VERSION OF THE DRAWING IS RELEASED FOR BIDDING PURPOSES ONLY. UNDER THE AUTHORITY OF LEON HRADYSKY, P.E., #07342, AND ANTHONY G. SARTORI, P.E., #08351. DATE: OCT. 20, 1999.

REVISION		DATE	DESCRIPTION	BY
Turner Collier & Braden Inc. BAGANIAN & BRADY ASSOCIATES		OFFICE OF THE DISTRICT ENGINEER U.S. ARMY ENGINEER DISTRICT, GALVESTON CORPS OF ENGINEERS GALVESTON, TEXAS		
DRAWN BY: * BF		HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS 45-FOOT PROJECT DREDGING UPPER BAY ATKINSON ISLAND MARSH LOGS OF PROBINGS 3 OF 3		
DESIGNED BY: * CEC				
CHECKED BY: * TS				
SUBMITTED BY: *				
ARCHITECT - ENGINEER APPROVED: *		APPROVED: *		DATE: NOVEMBER 1999
CHIEF, DESIGN BRANCH		CHIEF, ENGINEERING DIVISION		SCALE: AS SHOWN
* AS REQUIRED BY ENGINEER DISCUSS UP NO. 1100-1-002-1		Prepared under the direction of Nicolas J. Buechler, Lt. C., C.E., District Engineer		SHEET 34 OF 36 FILE NO. HSC 401-475



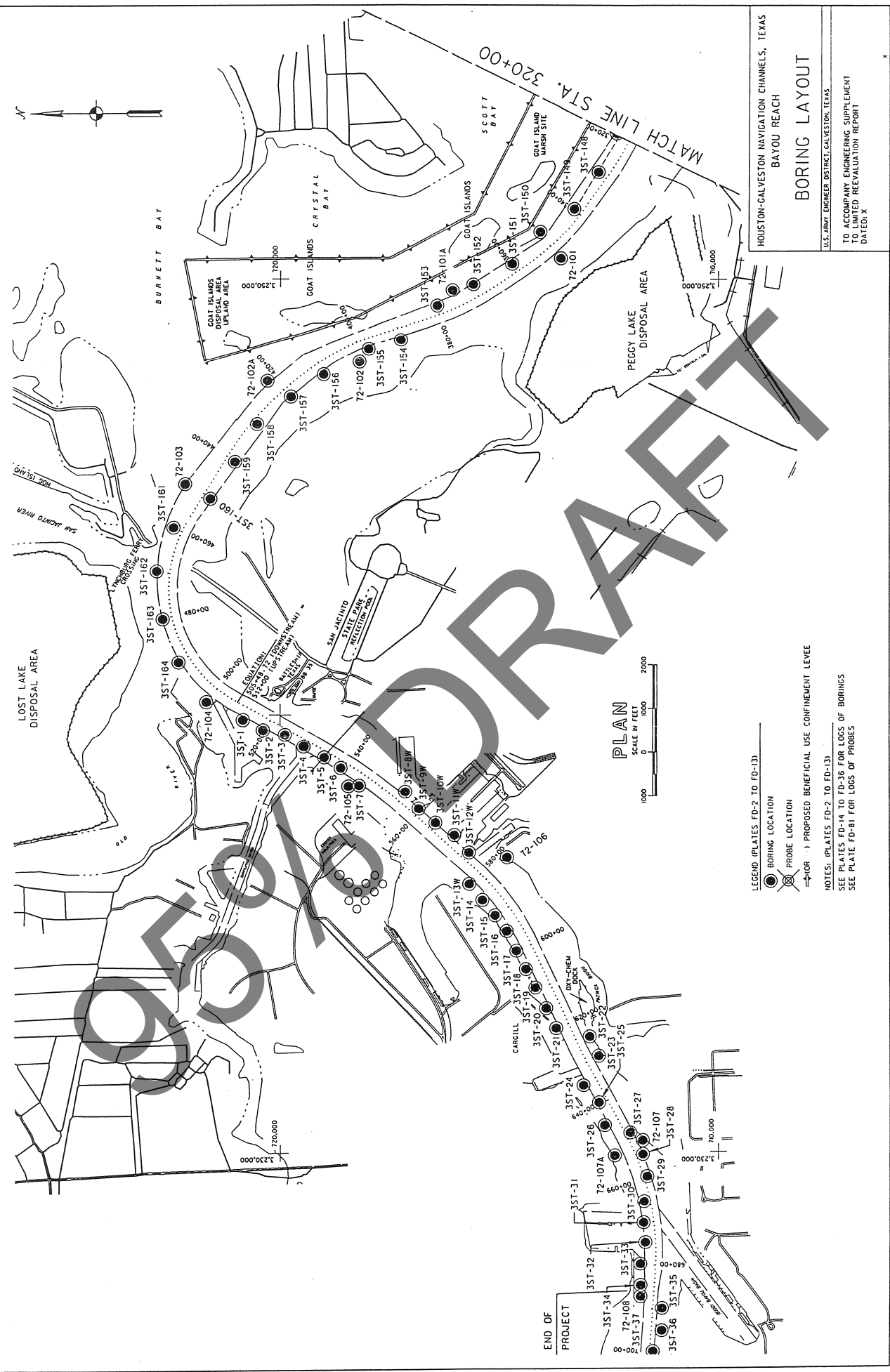
NOTE: CONTOUR LINES INDICATE APPROXIMATE LAND SURFACE SUBSIDENCE (1906-1978).

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS

STUDY AREA AND
LAND SUBSIDENCE MAP

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



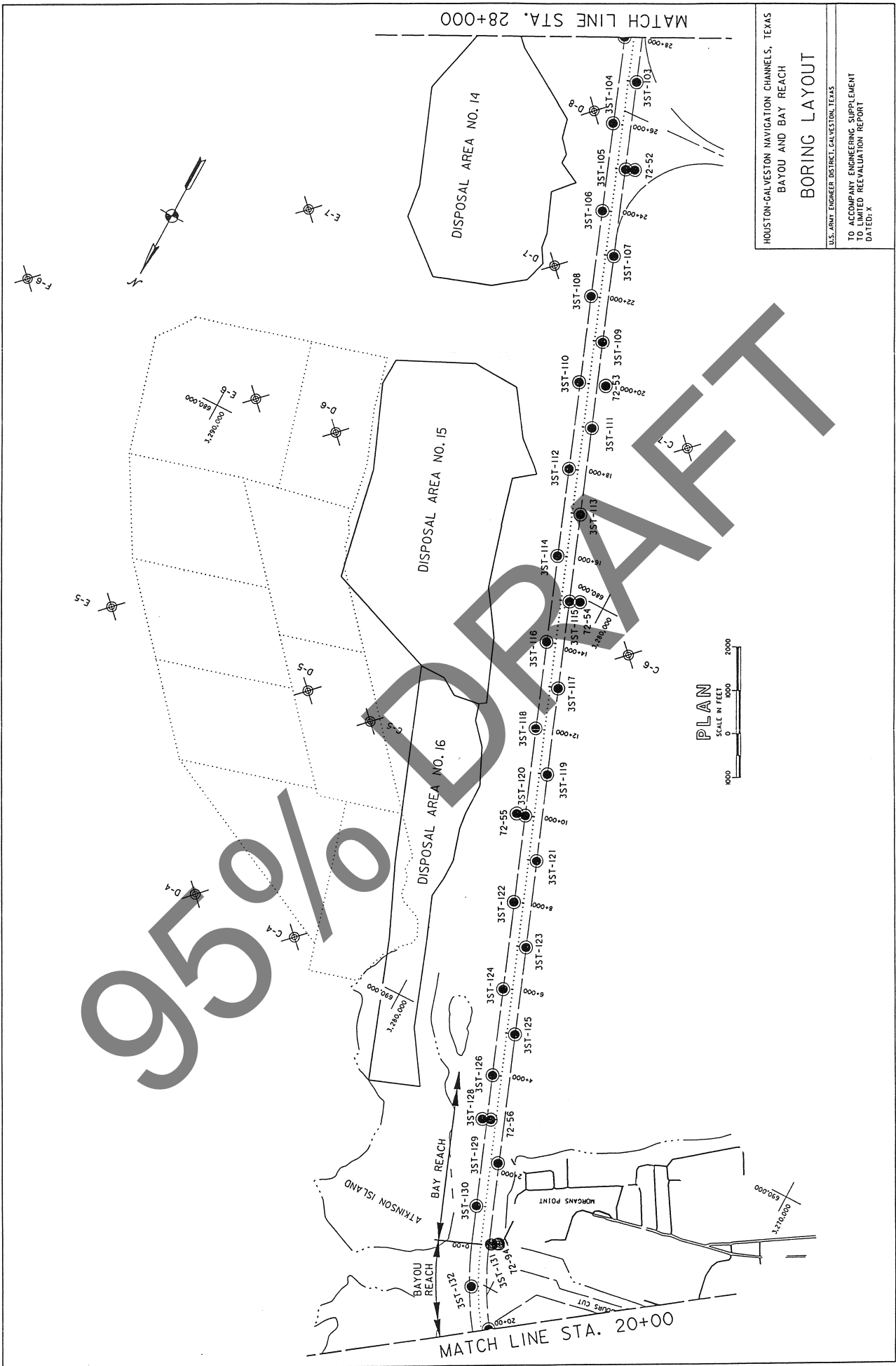
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
BAYOU REACH

BORING LAYOUT

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO COMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



PLATE FD-3



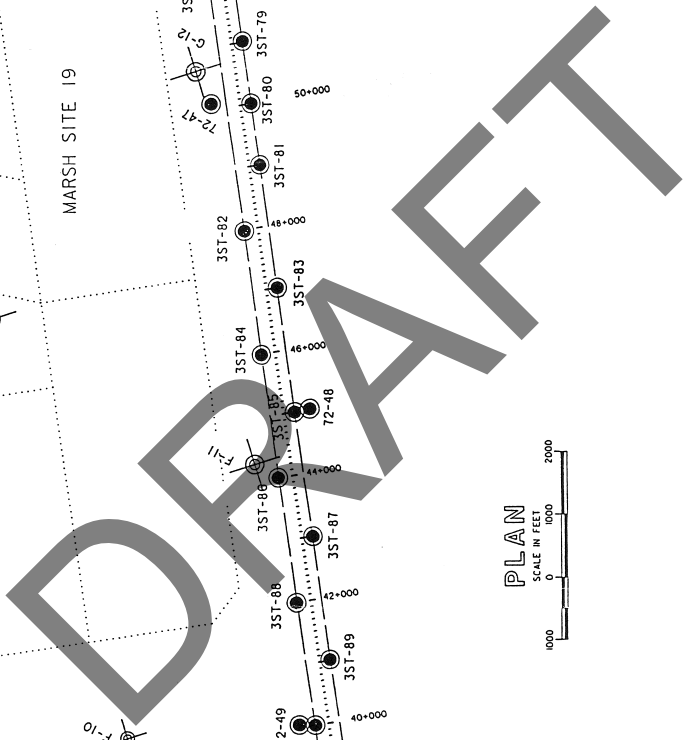
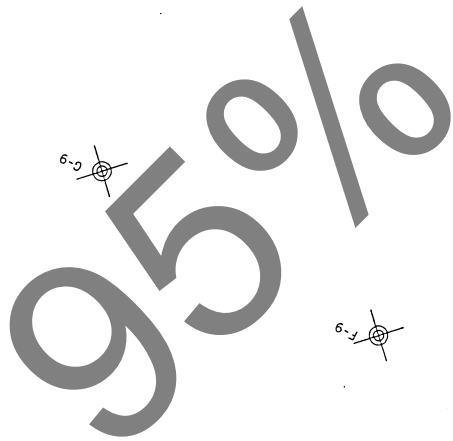
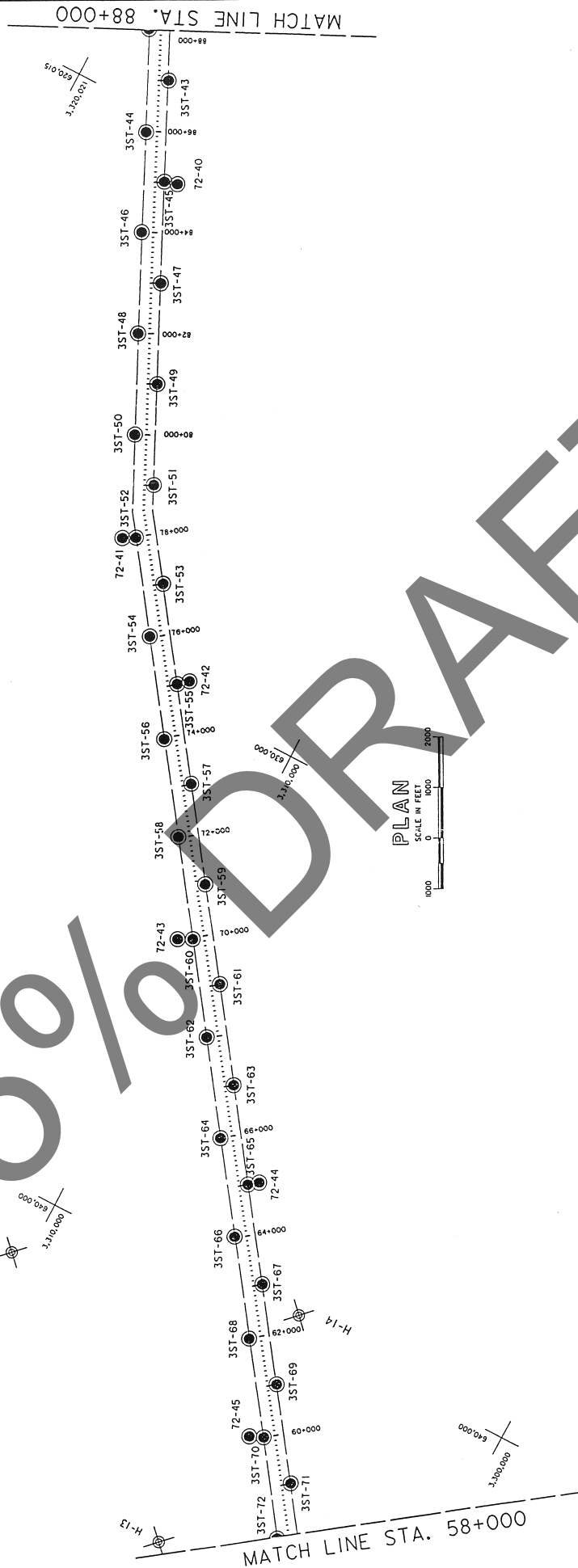


PLATE FD-5



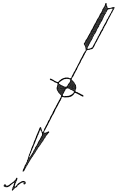
95% DRAFT



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
BAY REACH
BORING LAYOUT
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



95% DRAFT

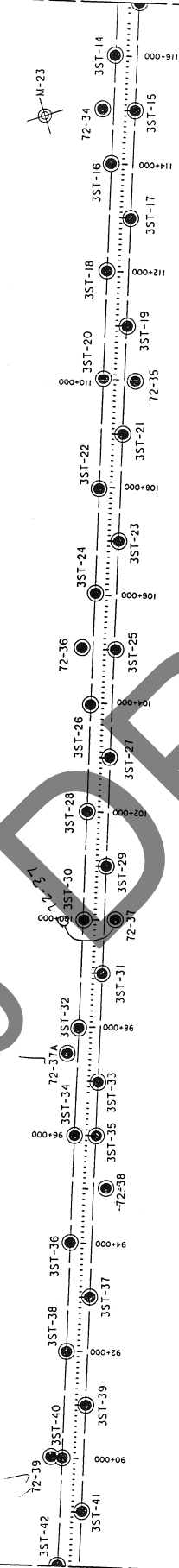


BENTHIC RECOVERY
MOUND



MATCH LINE STA. 88+000

MATCH LINE STA. 117+000



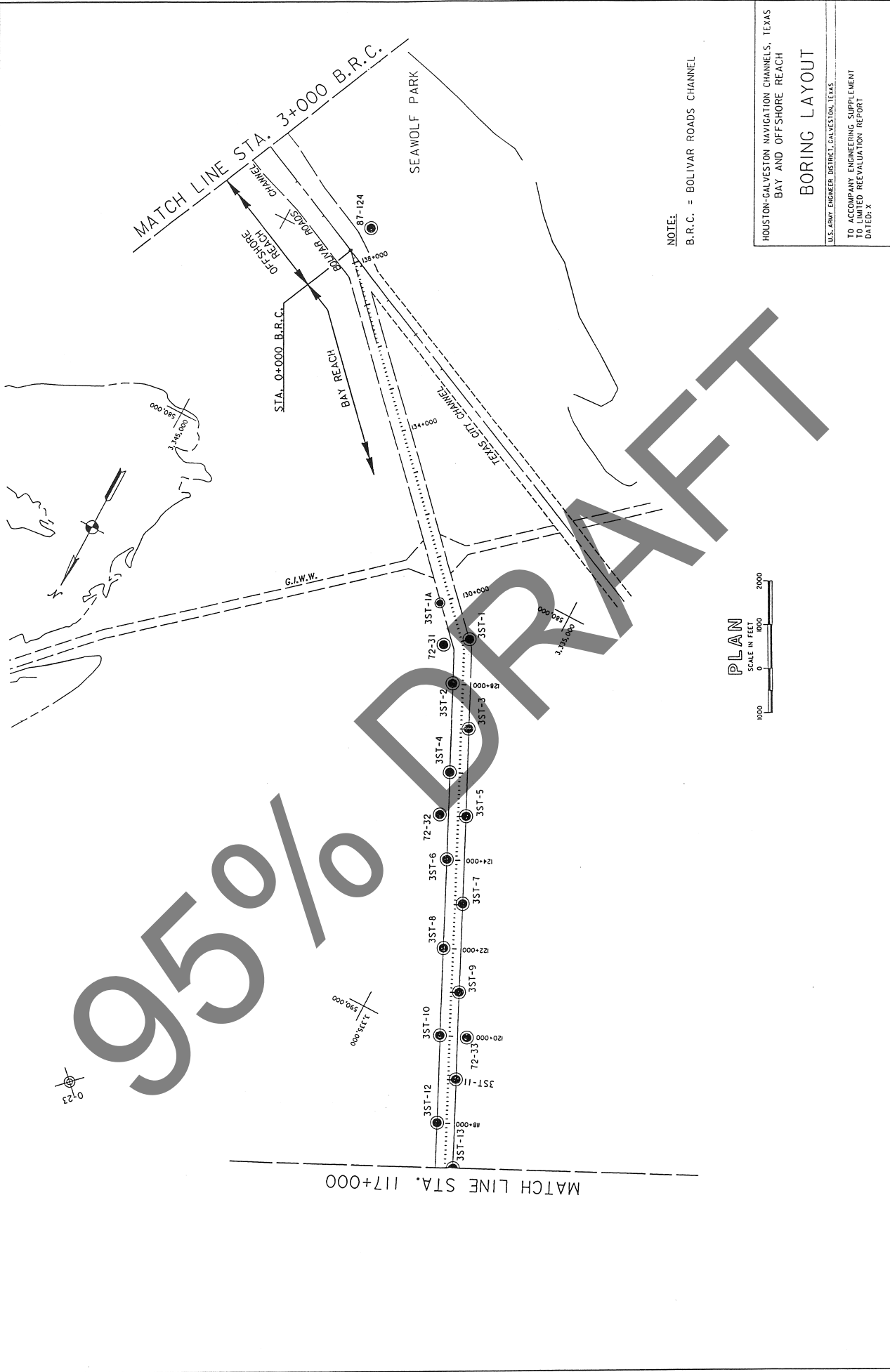
1,100,000
10,000

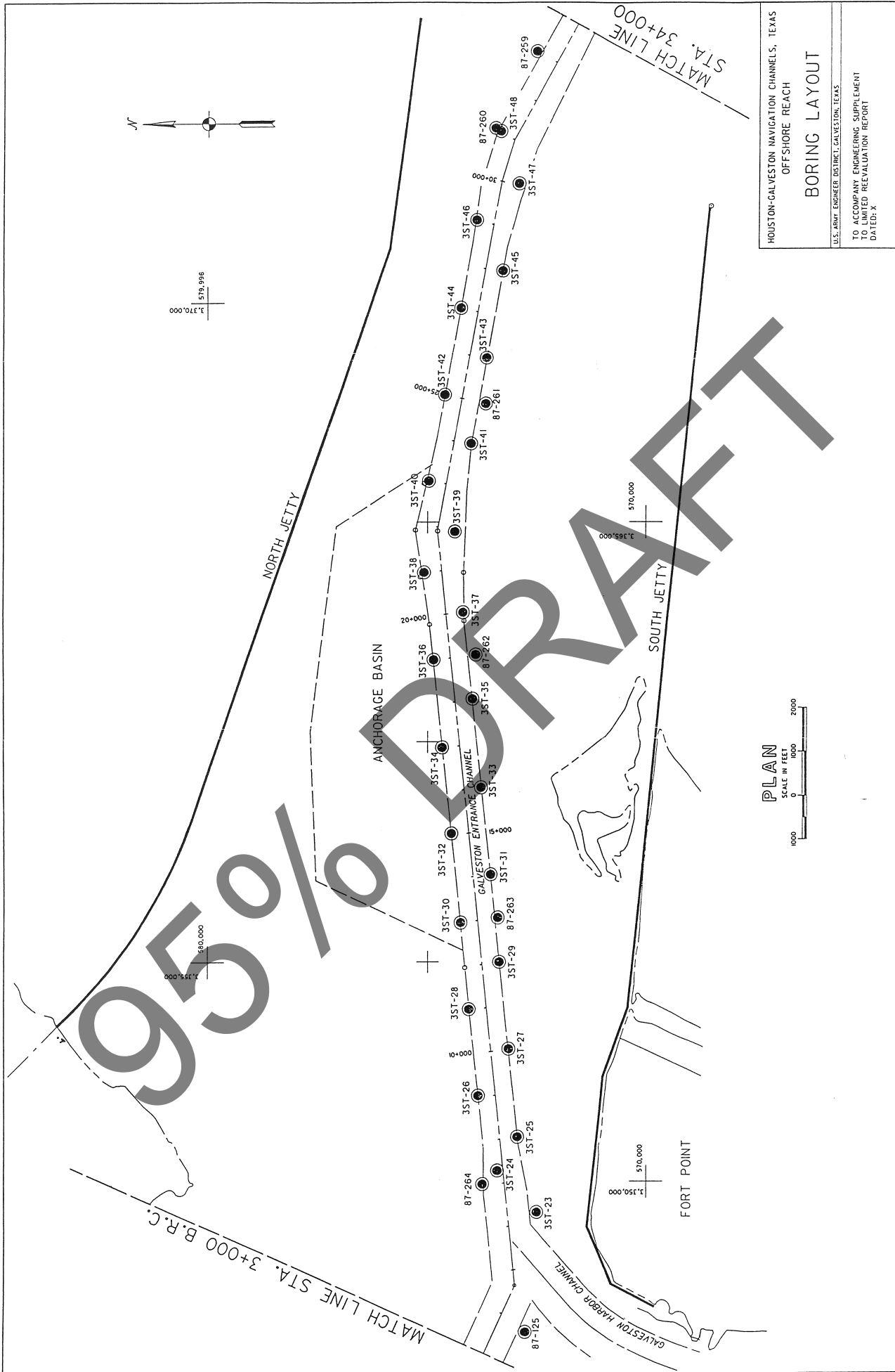
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10,000



PLAN
SCALE IN FEET

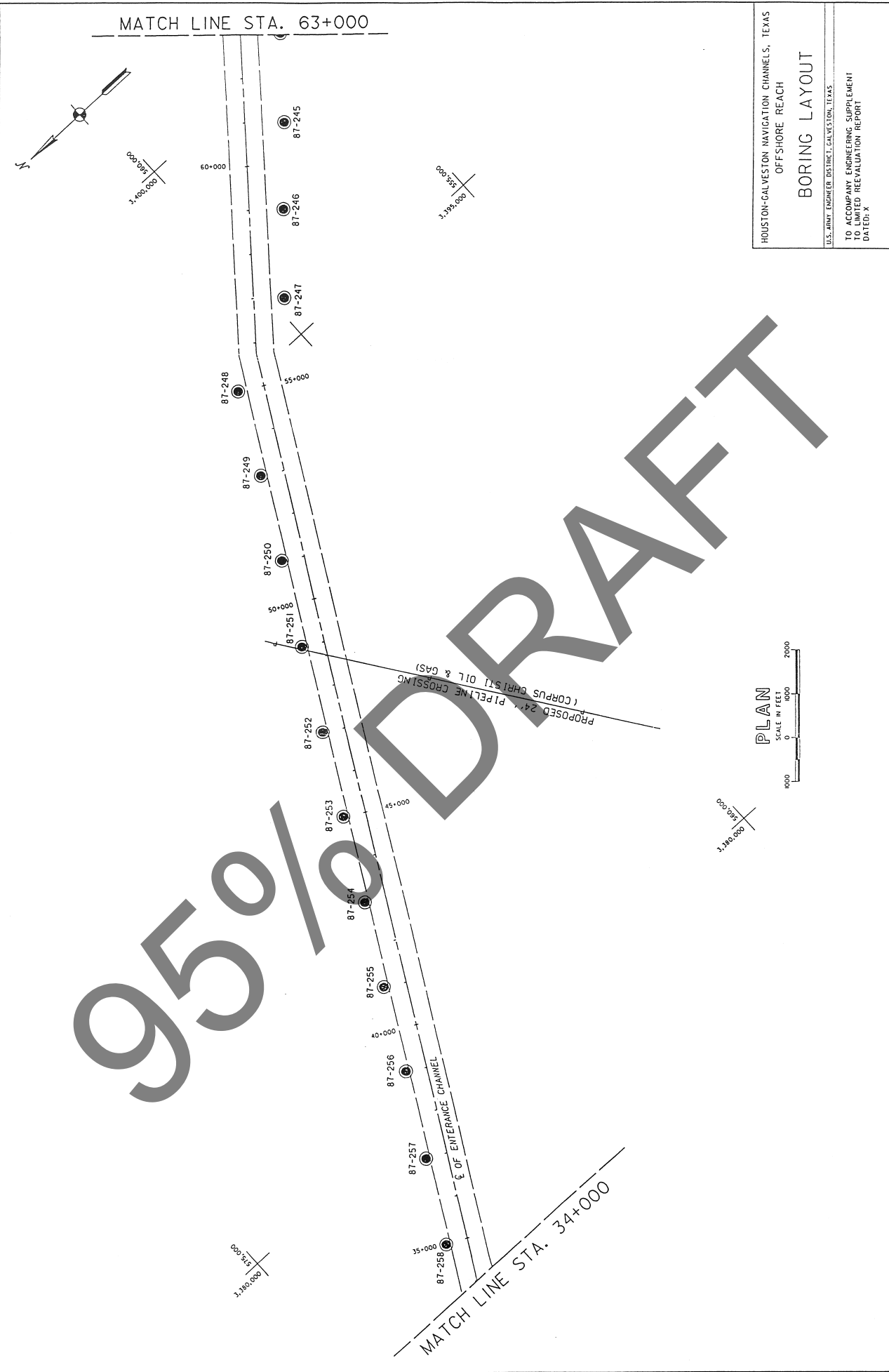
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
BAY REACH
BORING LAYOUT
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X





HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
OFFSHORE REACH
BORING LAYOUT

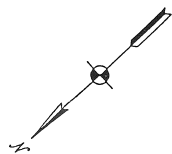
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
OFFSHORE REACH

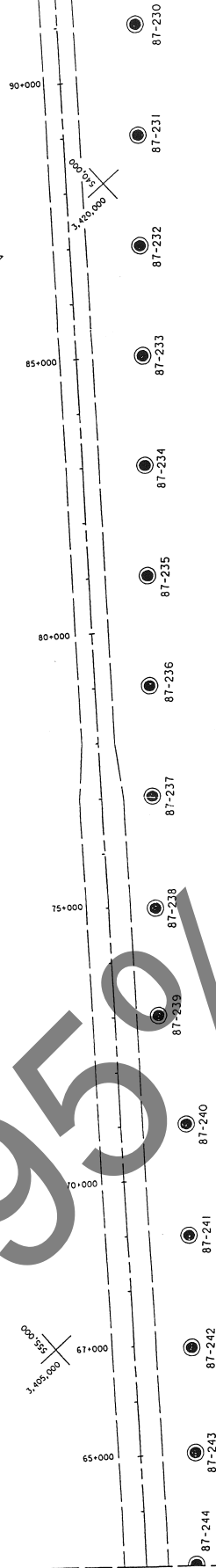
BORING LAYOUT

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



MATCH LINE STA. 92+500

MATCH LINE STA. 63+000



0+000
1:400,000

70+000

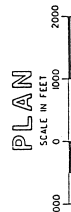
75+000

80+000

90+000

0+000
1:400,000

0+000
1:400,000



PLAN
SCALE IN FEET

0+000
1:400,000

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
OFFSHORE REACH

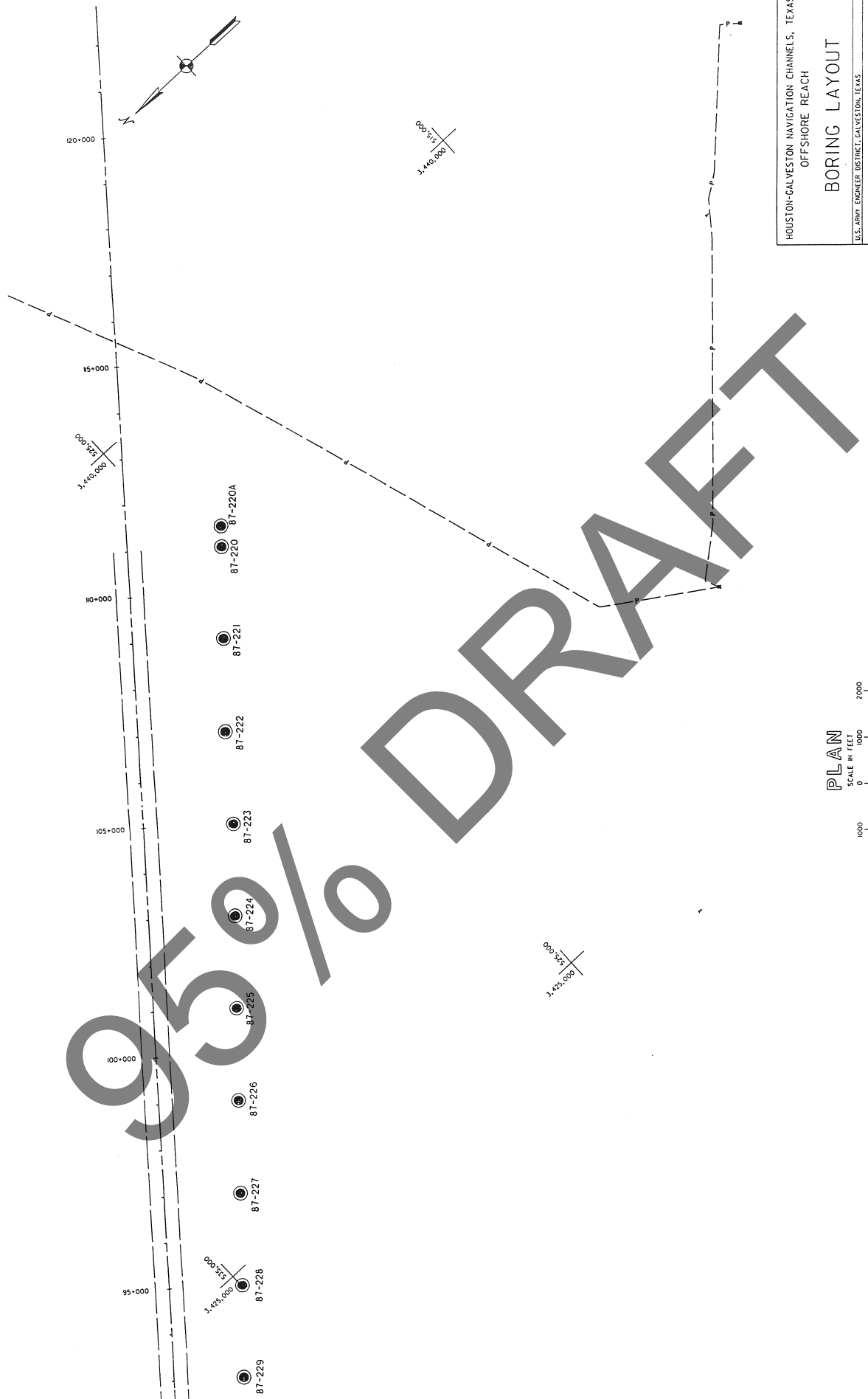
BORING LAYOUT

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



MATCH LINE STA. 92+500



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
OFFSHORE REACH
BORING LAYOUT
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X





N-22

N-23

O-22

P-21

O-20

O-23

P-22

O-21

P-23

O-22

R-21

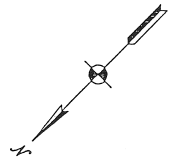
R-22

1:24,000
1:90,000

1:24,000
1:90,000

1:24,000
1:90,000
R-20

1:24,000
1:90,000



BIRD ISLAND

BOLIVAR MARSH SITE

APPROXIMATE SHORELINE LOCATION

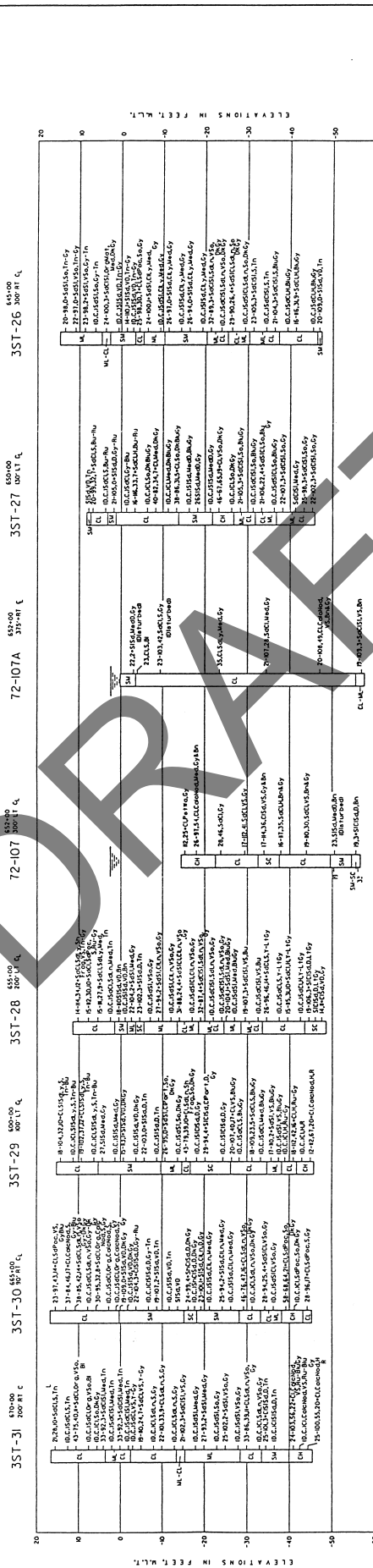
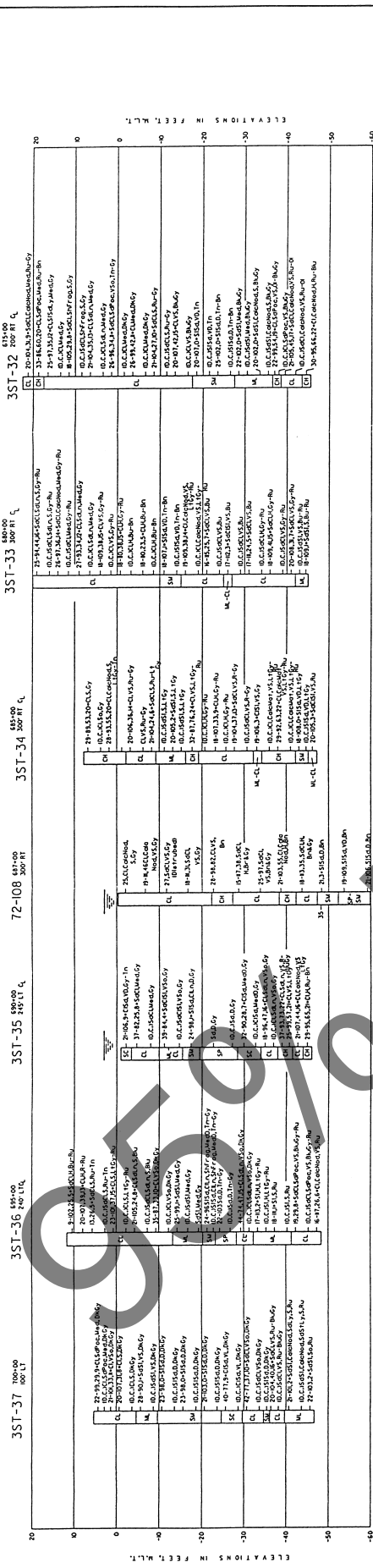
EXISTING G.I.W. DISPOSAL AREAS

G.I.W.

PLAN

SCALE IN FEET
0 1000 2000

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
BOLIVAR ROADS
BORING LAYOUT
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAYOU REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATES FD-2 TO FD-4 FOR BORING LOCATIONS.
SEE PLATE FD-20 FOR BORING NOTES AND LEGEND.



3ST-25 350 FT CL

3ST-24 350 FT CL

3ST-23 350 FT CL

3ST-22 350 FT CL

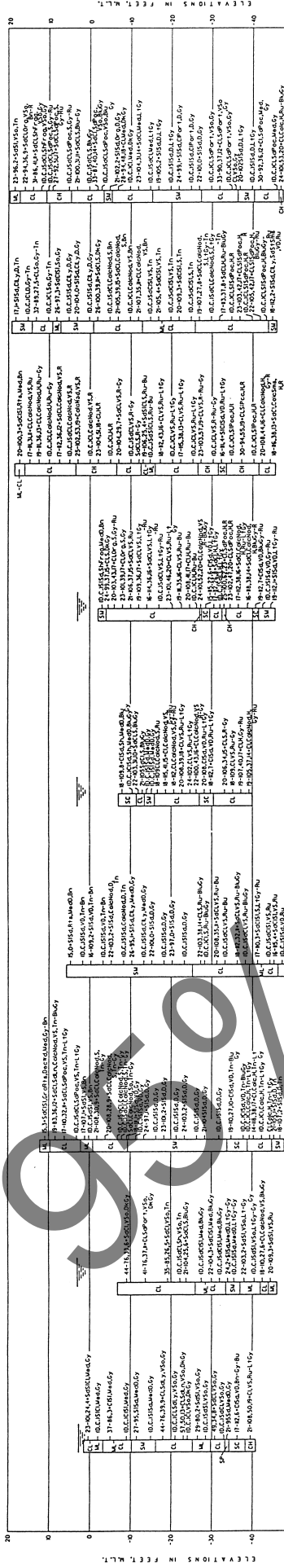
3ST-21 350 FT CL

3ST-20 350 FT CL

3ST-19 350 FT CL

3ST-18 350 FT CL

3ST-17 350 FT CL



3ST-16 350 FT CL

3ST-15 350 FT CL

3ST-14 350 FT CL

3ST-13 350 FT CL

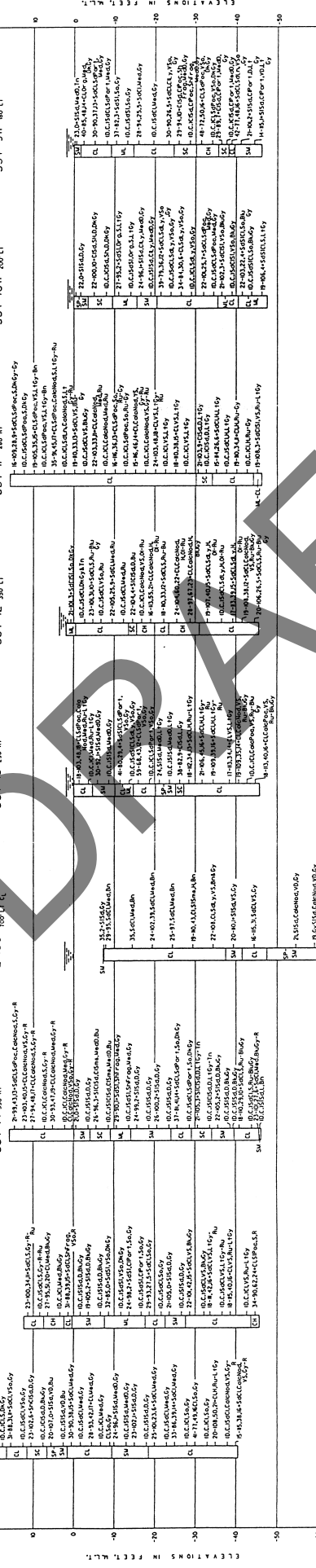
3ST-12 350 FT CL

3ST-11 350 FT CL

3ST-10 350 FT CL

3ST-9 350 FT CL

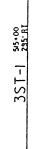
3ST-8 350 FT CL



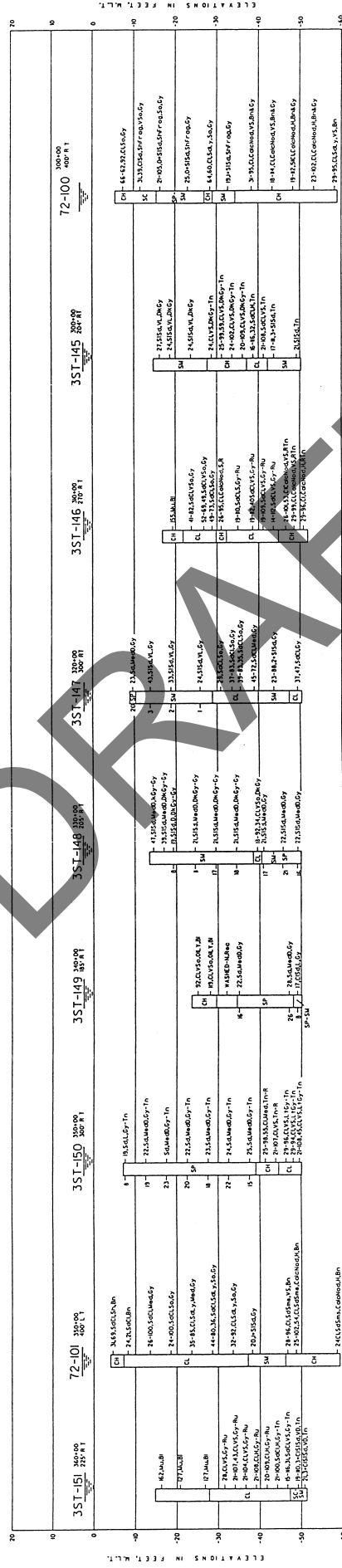
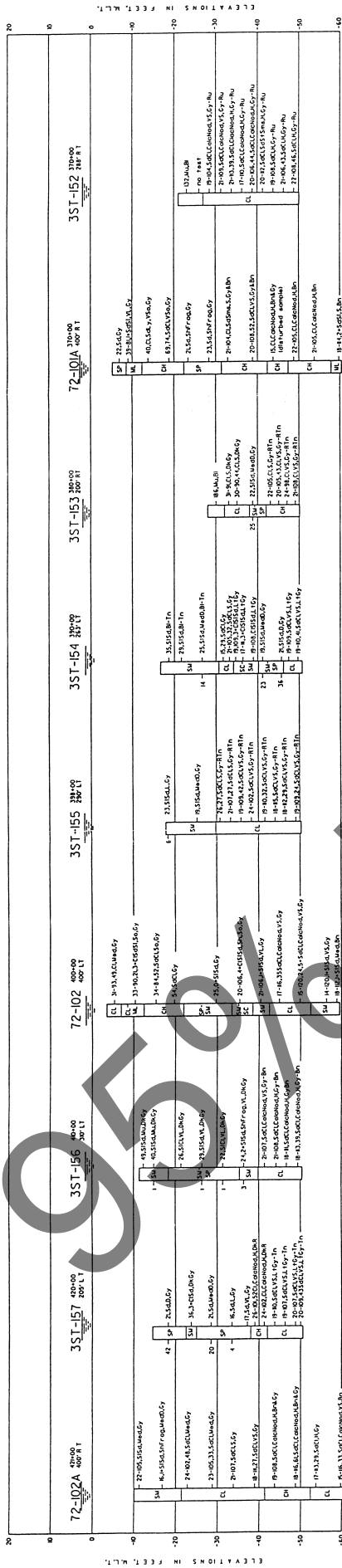
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAYOU REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATE FD-2 TO FD-4 FOR BORING LOCATIONS.
SEE PLATE FD-20 FOR BORING NOTES AND LEGEND.



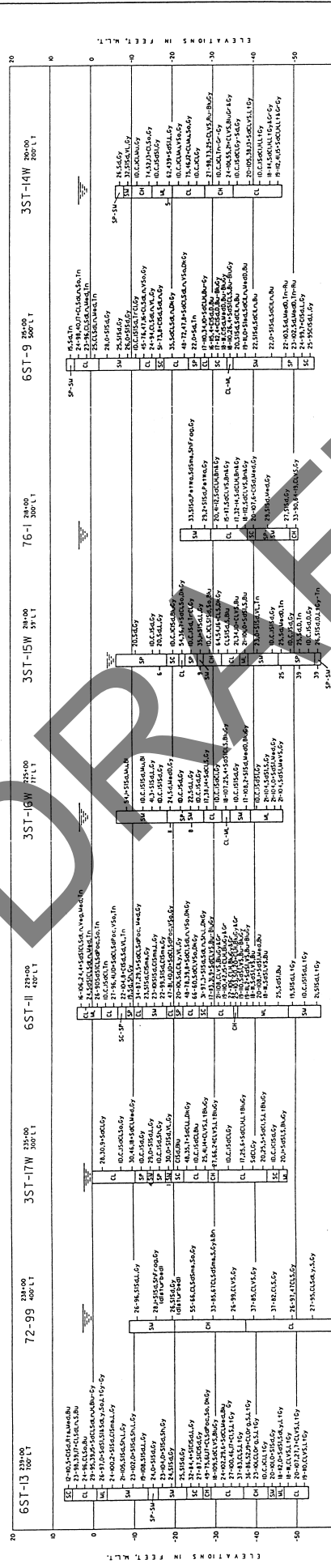
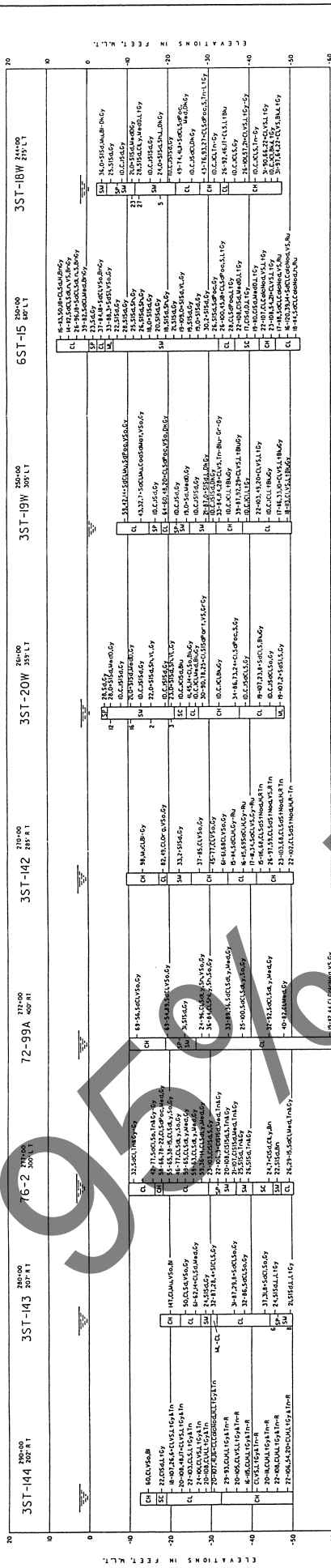
NOTES:
SEE PLATES FD-2 TO FD-4 FOR BORING LOCATIONS.
SEE PLATE FD-20 FOR BORING NOTES AND LEGEND.



U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT

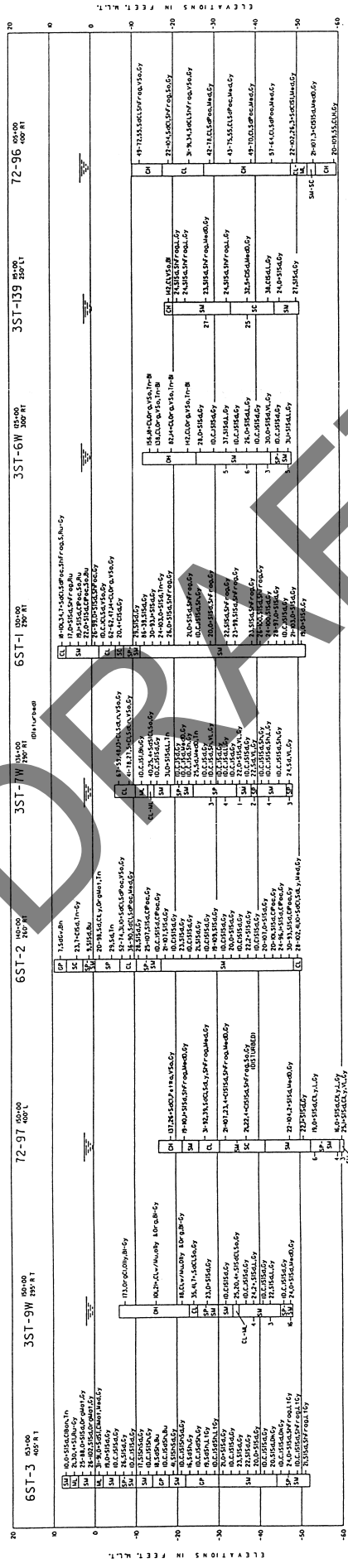
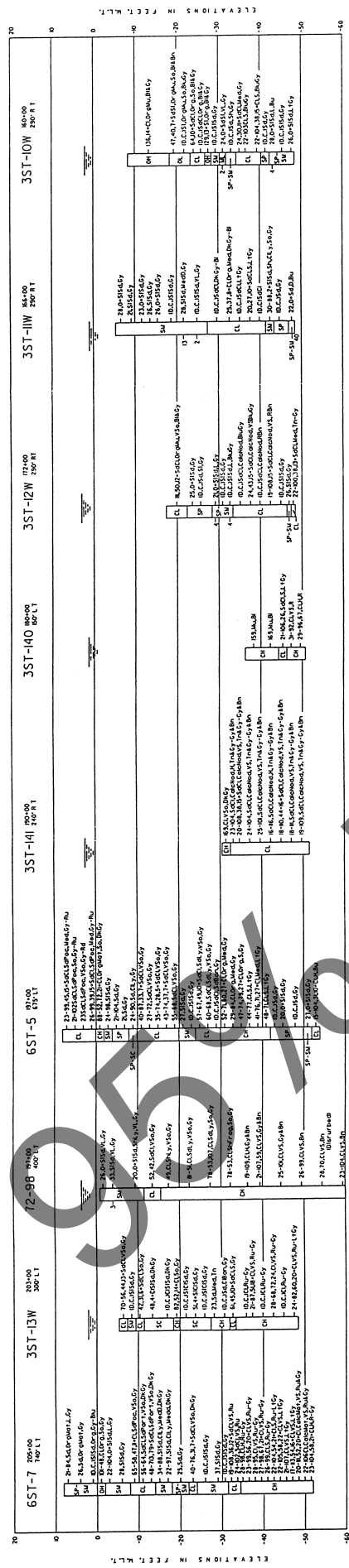
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HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAYOU REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
7. PREPARED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATES FD-2 TO FD-4 FOR BORING LOCATIONS.
SEE PLATE FD-20 FOR BORING NOTES AND LEGEND.

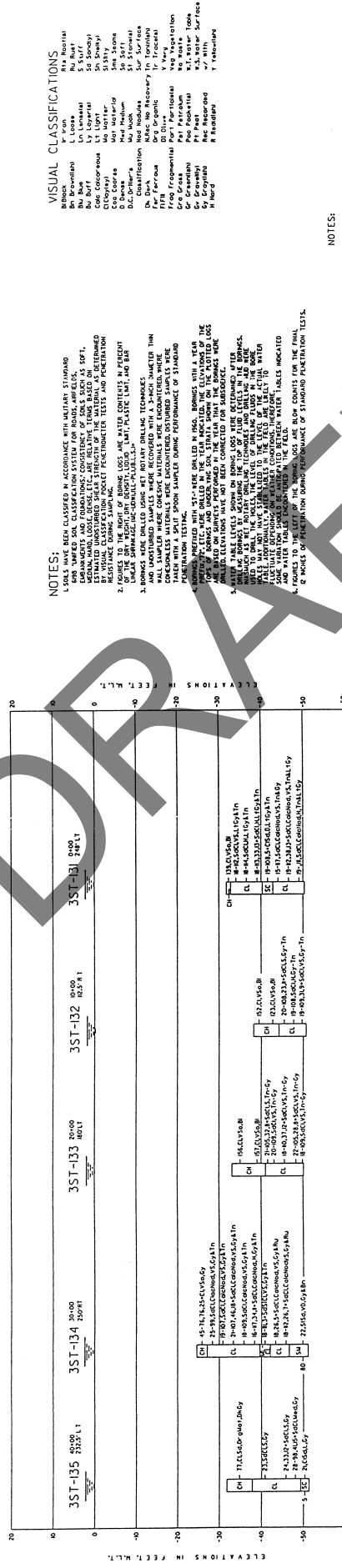
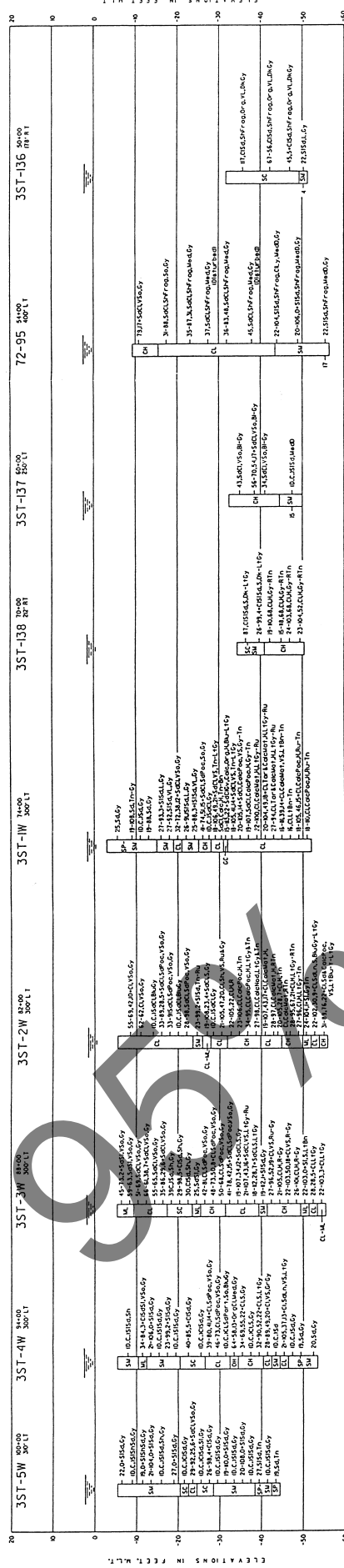


HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAYOU REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATE FD-2 TO FD-4 FOR BORING LOCATIONS.
SEE PLATE FD-20 FOR BORING NOTES AND LEGEND.



VISUAL CLASSIFICATIONS

[illegible]

water with a 500- μ m screen during pumping or standing. Sediment collected with 10- μ m sieves in 1980, borings with a year later, and with 10- μ m sieves in 1981 were analyzed for PCBs, DDTs, HCBs, PCP, Dieldrin, and other pesticides. The locations of the 100- μ m sieves were marked on the map. The 100- μ m sieves were used to collect sediment from the water column. The 100- μ m sieves were used to collect sediment from the water column. The 100- μ m sieves were used to collect sediment from the water column. The 100- μ m sieves were used to collect sediment from the water column.

LABORATORY CLASSIFICATIONS

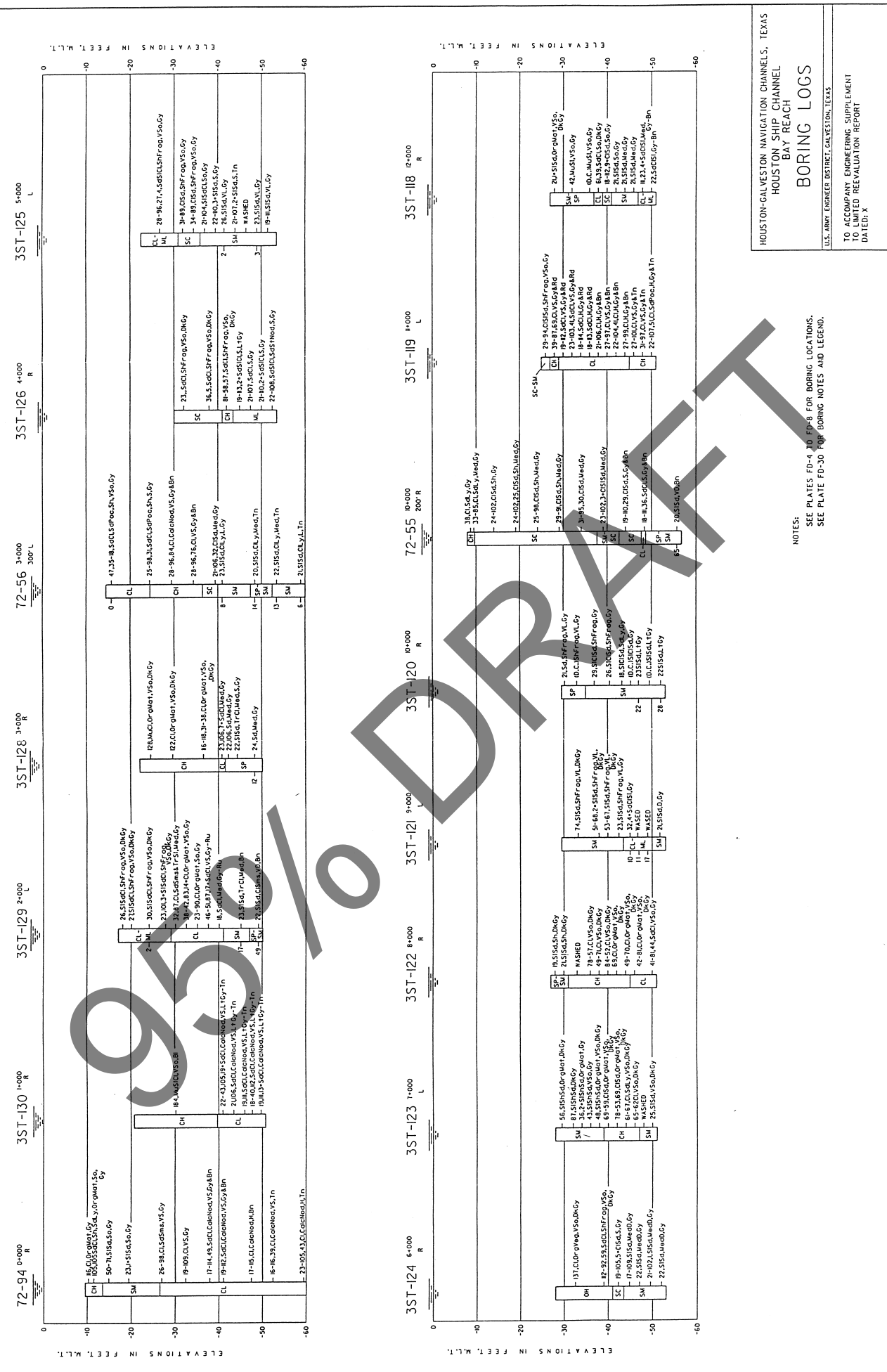
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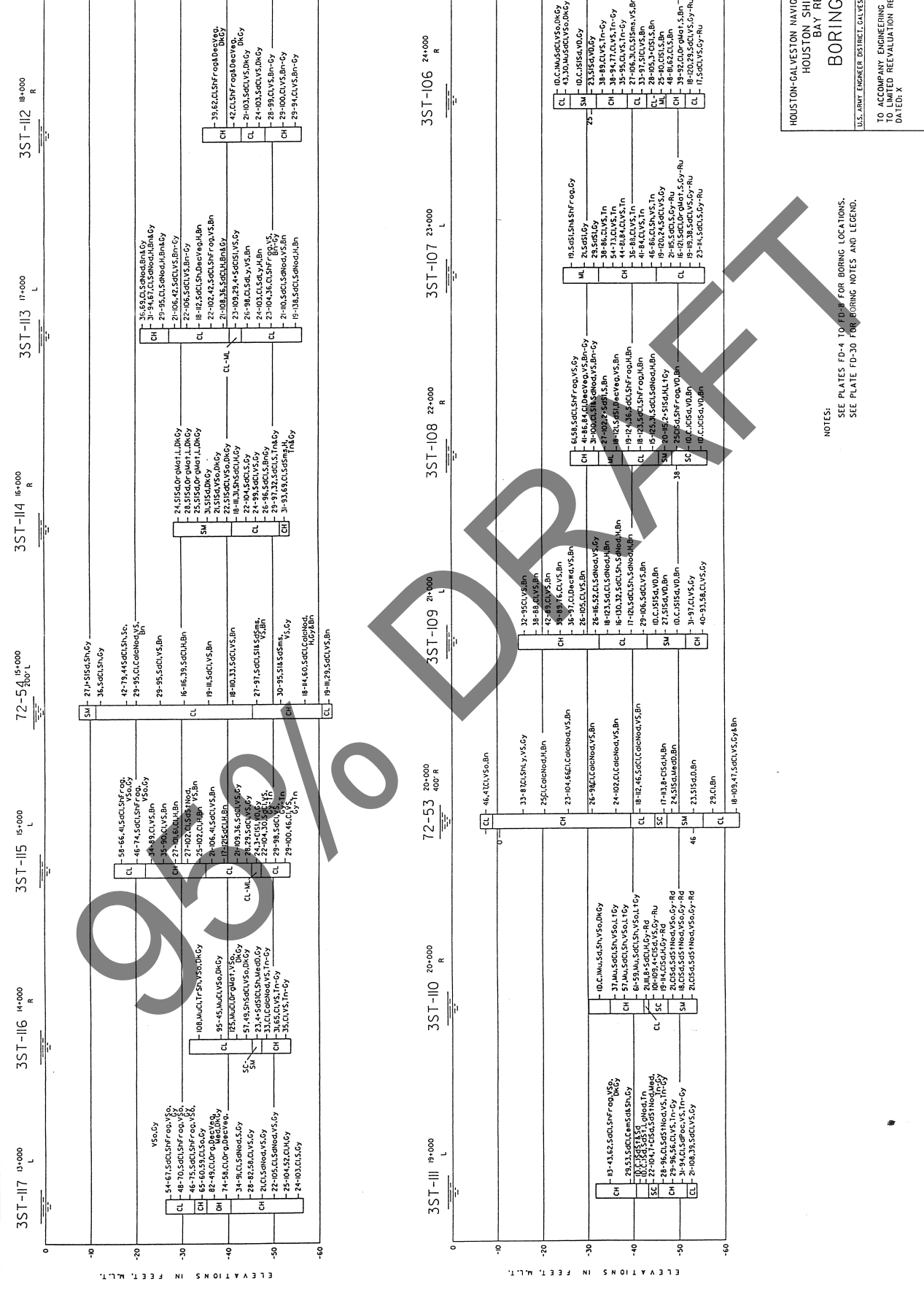
NOTES:
SEE PLATES FD-2 TO FD-4 FOR BORING LOCATIONS.

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAYOU REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT GALVESTON TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

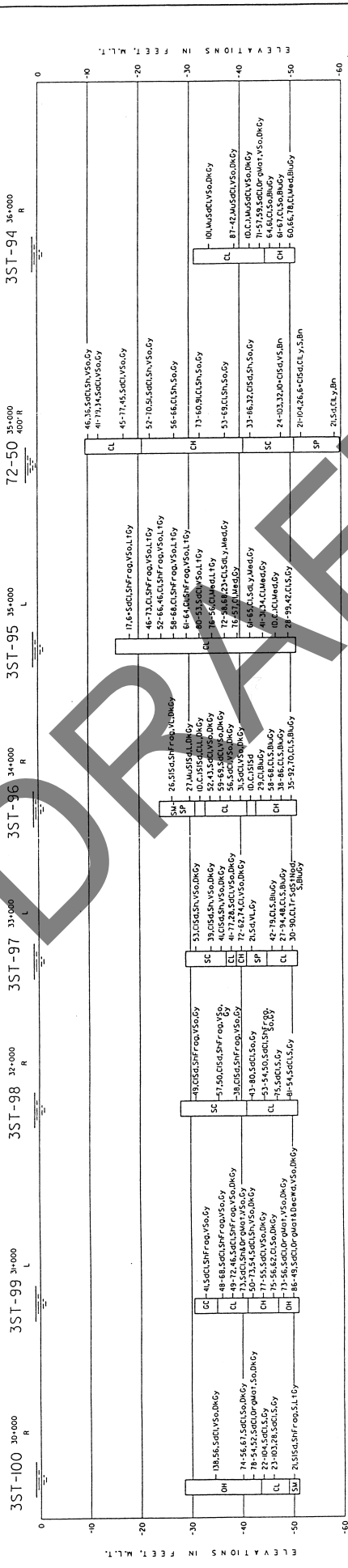
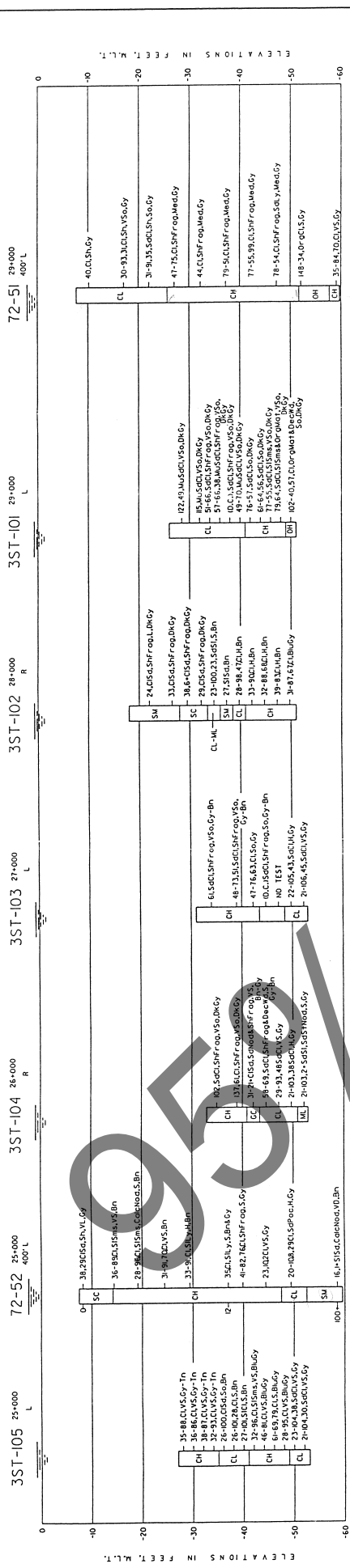




HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAY REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAY REACH

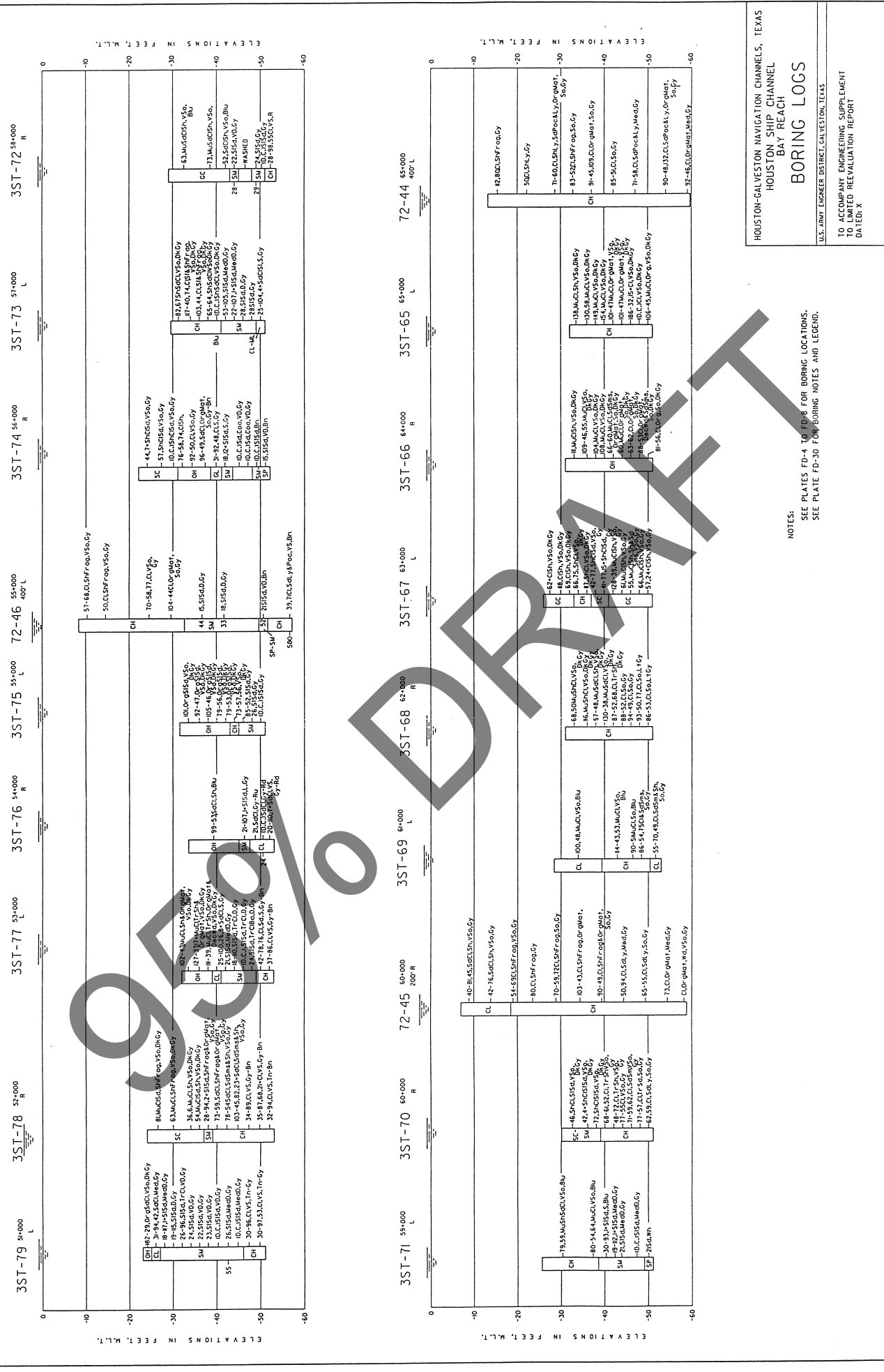
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO COMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATE FD-4 TO FD-8 FOR BORING LOCATIONS.
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.

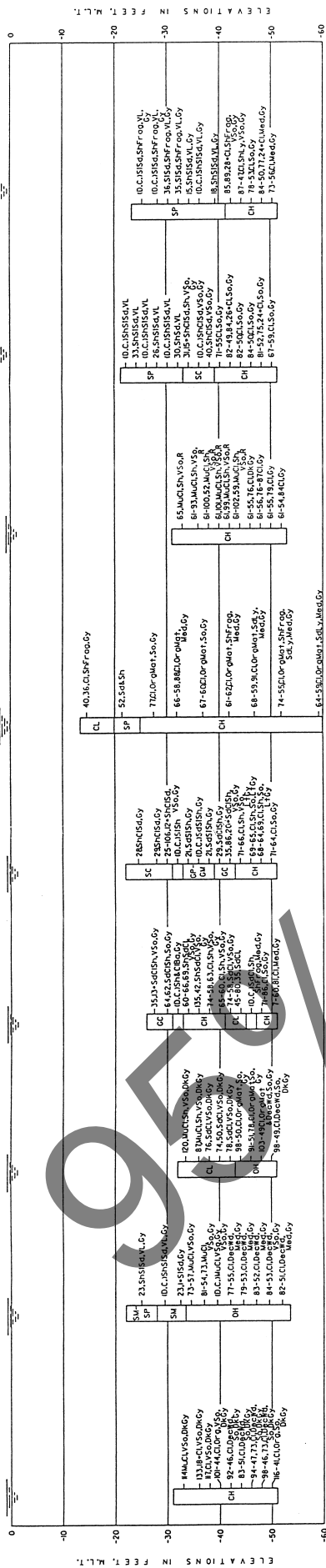


NOTES:
SEE PLATES FD-4 TO FD-8 FOR BORING LOCATIONS.
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.

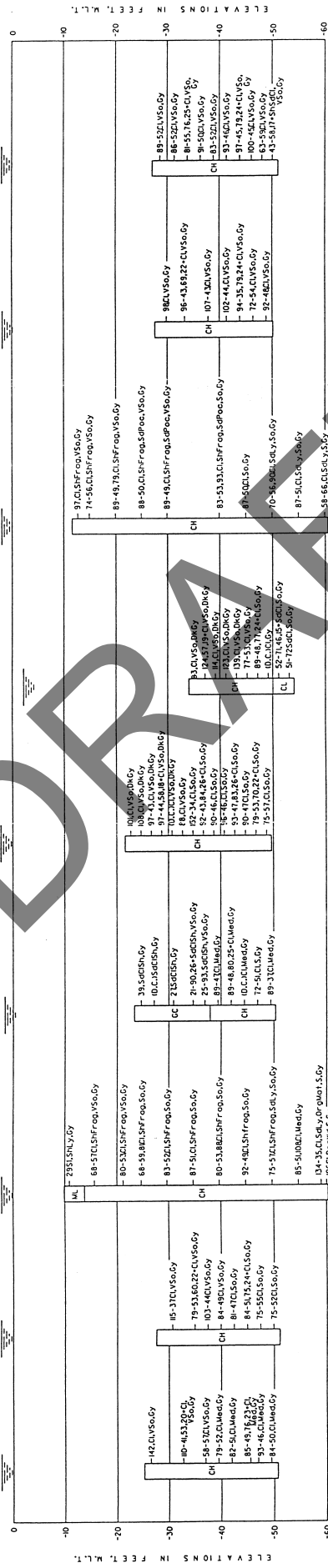




3ST-64 66+000 R 3ST-63 67+000 L 3ST-62 68+000 R 3ST-61 69+000 L 3ST-60 70+000 R 72-43 70+000 400' R 3ST-59 71+000 L 3ST-58 72+000 R 3ST-57 73+000 L



3ST-56 74+000 R 3ST-55 75+000 L 72-42 75+000 400' L 3ST-54 76+000 R 3ST-53 77+000 L 3ST-52 78+000 R 72-41 78+000 400' R 3ST-51 79+000 L 3ST-50 80+000 R



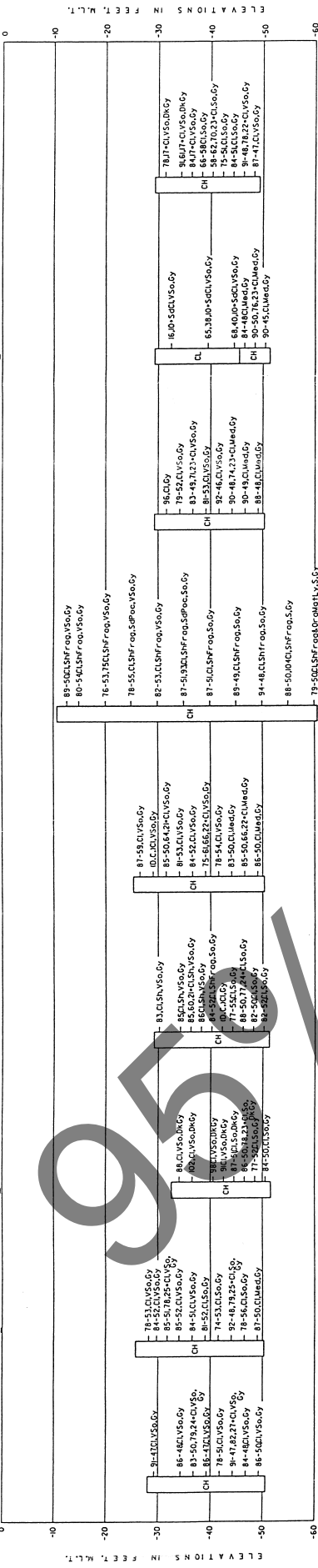
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAY REACH

NOTES:
SEE PLATES FD-4 TO FD-8 FOR BORING LOCATIONS.
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.

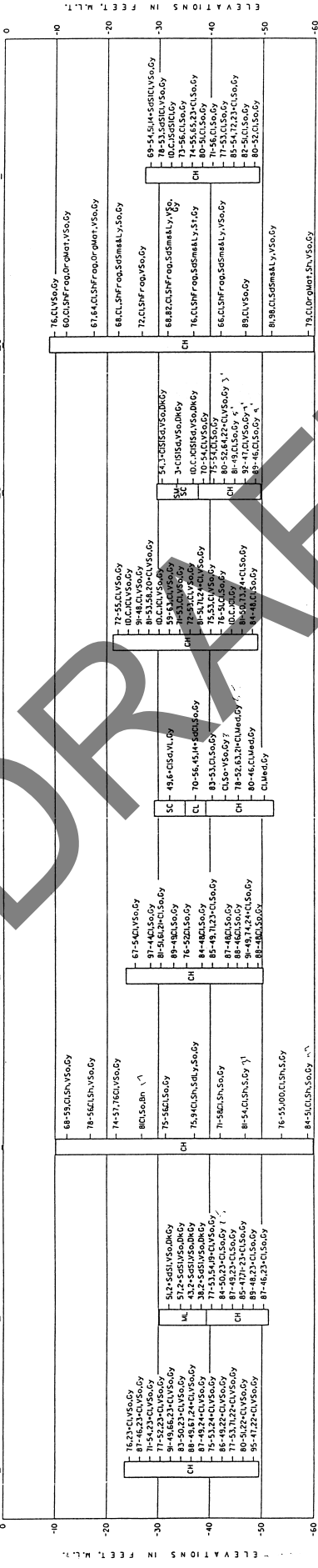
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED X



3ST-49 81+000 L 3ST-48 82+000 R 3ST-47 83+000 L 3ST-46 84+000 R 3ST-45 85+000 L 72-40 85+000 400' L 3ST-44 86+000 R 3ST-43 87+000 L 3ST-42 88+000 R



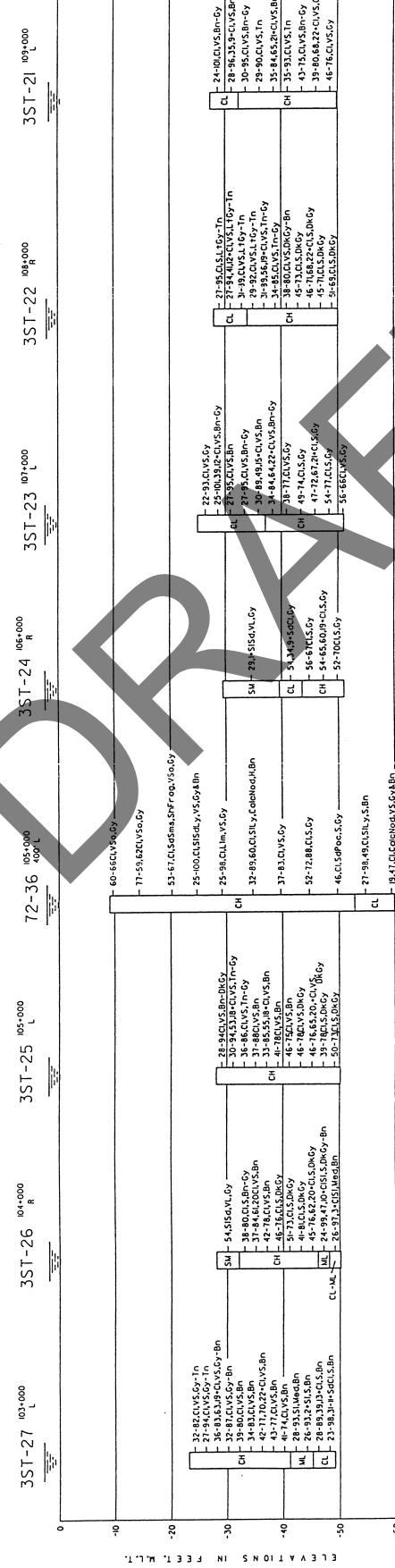
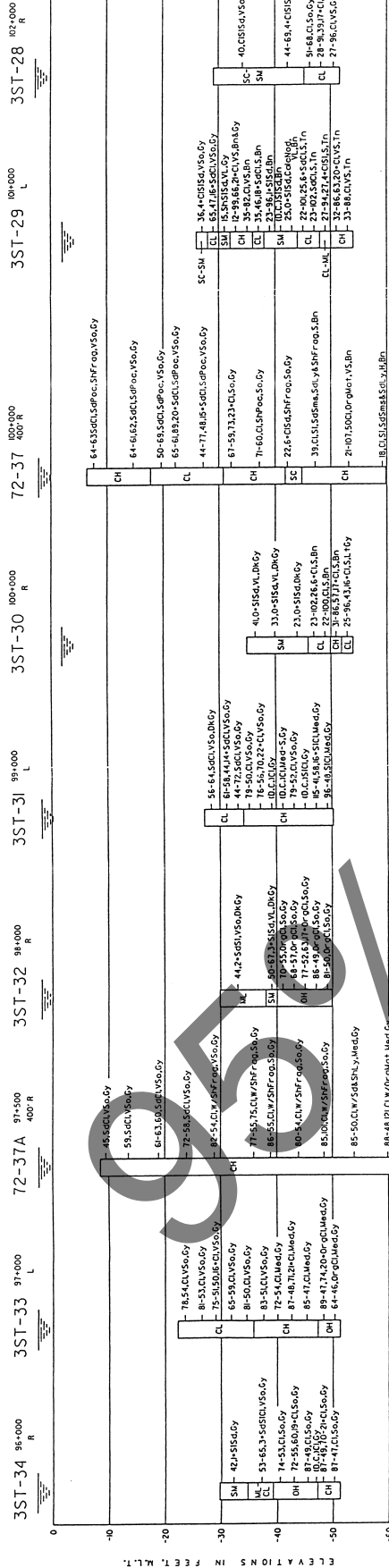
3ST-41 89+000 L 3ST-40 90+000 R 72-39 90+000 400' L 3ST-39 91+000 L 3ST-38 92+000 R 3ST-37 93+000 L 3ST-36 94+000 R 72-38 95+000 R 3ST-35 96+000 L



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
HOUSTON SHIP CHANNEL
BAY REACH
BORING LOGS

NOTES:
SEE PLATES FD-4 TO FD-8 FOR BORING LOCATIONS.
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

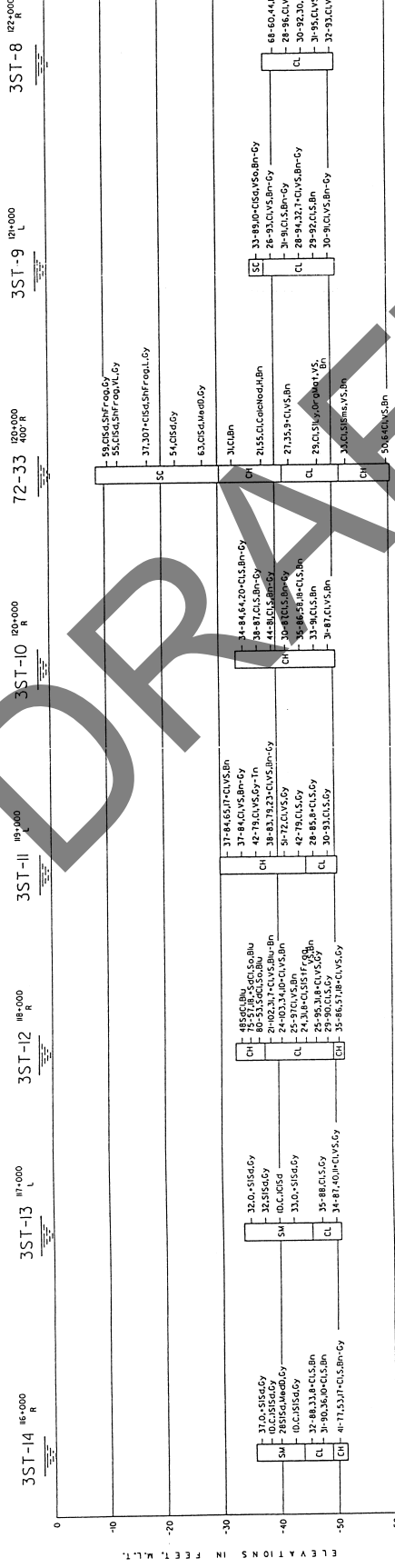
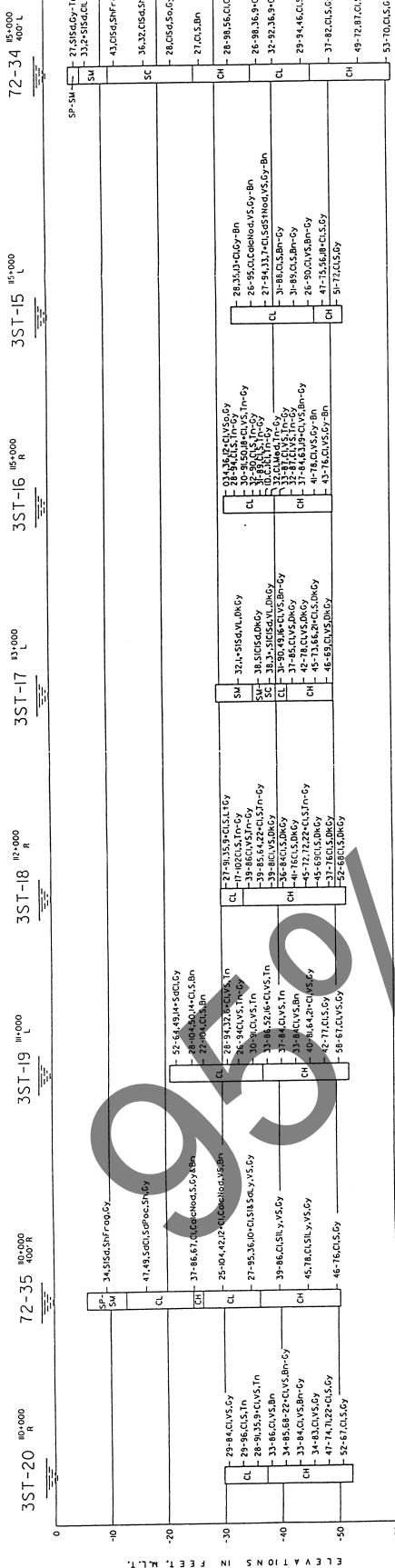


DENSE
 S. NORTHERN
 VS # THEN
 L. WILCOX
 SO CORP
 VILVERA
 L. BOOLS

HOUSTON-GALVESTON NAVIGATION CHANNEL,
 HOUSTON SHIP CHANNEL
 BAY REACH
 BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
 TO: ACCOMPANY ENGINEERING SUPPLEMENT
 FROM: REEVALUATION REPORT
 DATED: X

NOTES:
SEE PLATES FD-4 TO FD-8 FOR BORING LOCATIONS.
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.



NOTES:

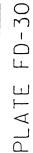
SEE PLATES FD-4 TO FD-8 FOR BORING LOCATIONS.

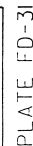
SEE PLATE FD-30 FOR BORING NOTES AND LEGEND.

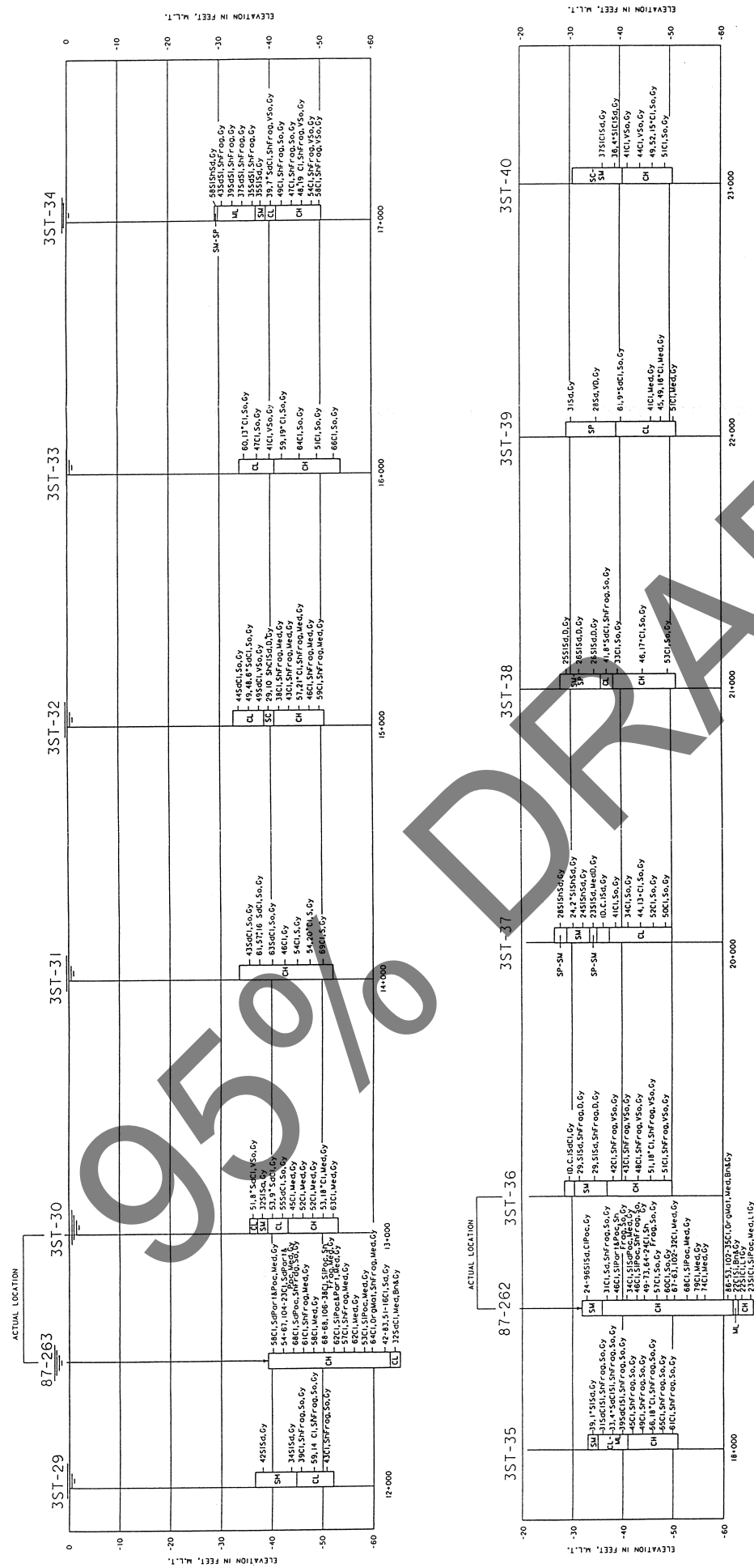
HOUSTON-GALVESTON NAVIGATION CHANNEL S, TEXAS
HOUSTON SHIP CHANNEL
BAY REACH
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATE: X





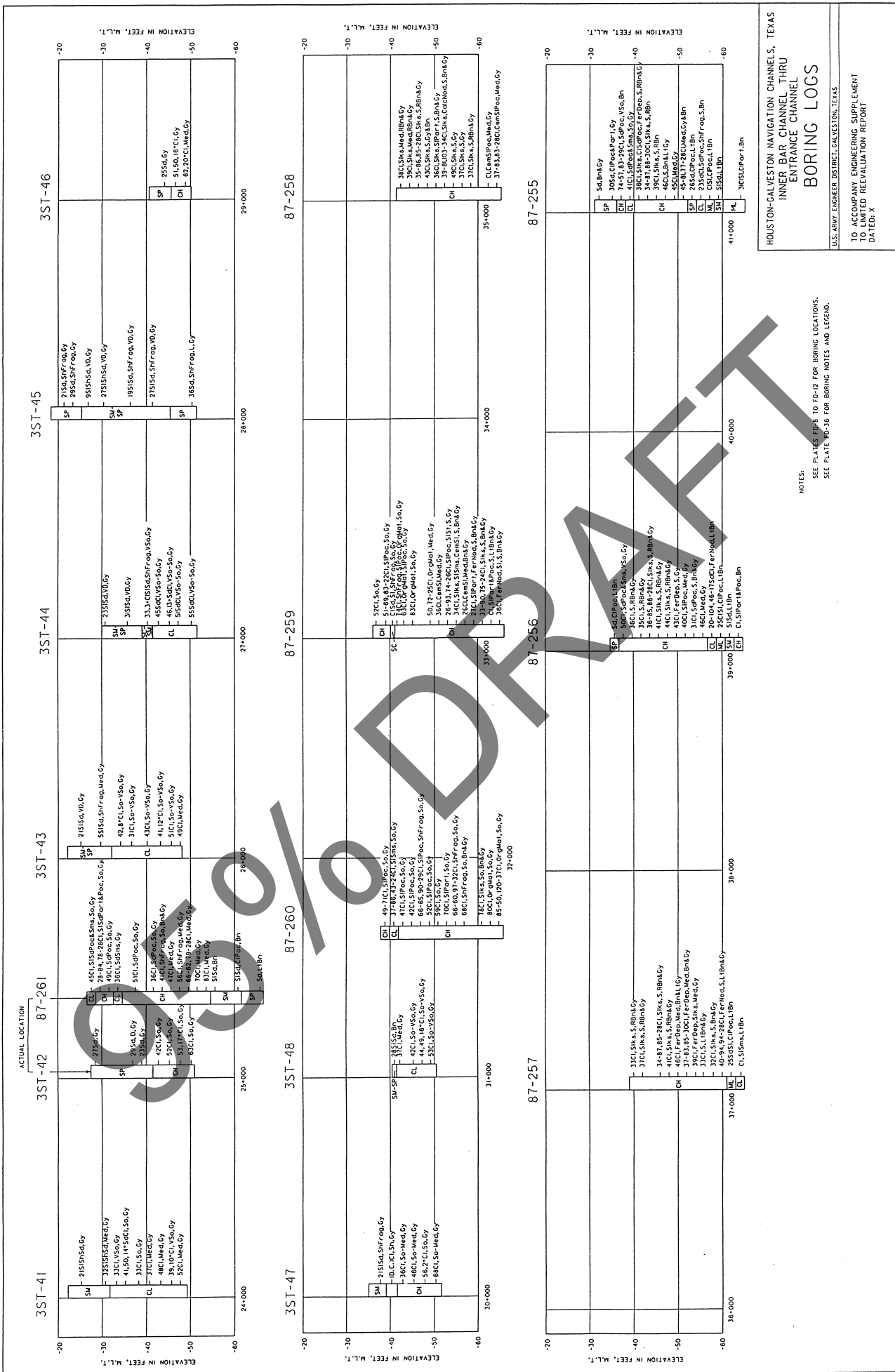


HOUSTON-CALVESTON NAVIGATION CHANNELS, TEXAS
INNER BAR CHANNEL THRU
ENTRANCE CHANNEL
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATES FD-8 TO FD-12 FOR BORING LOCATIONS.
SEE PLATE FD-36 FOR BORING NOTES AND LEGEND.



NOTES:

SEE PLATES FD-8 TO FD-12 FOR BORING LOCATIONS.

SEE PLATE FD-36 FOR BORING NOTES AND LEGEND.

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO COMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



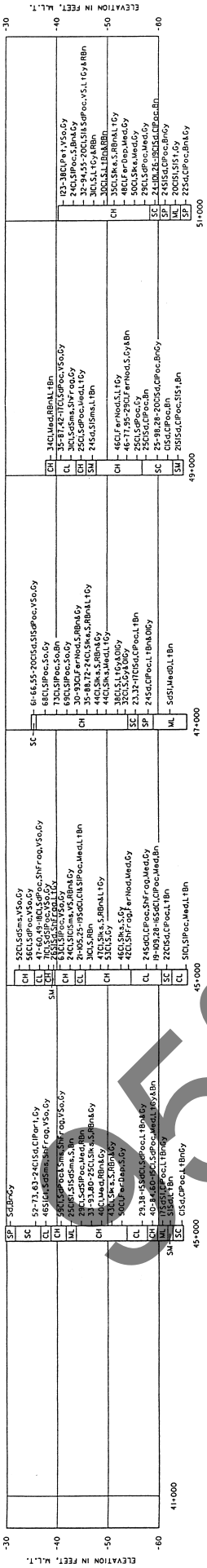
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87-253

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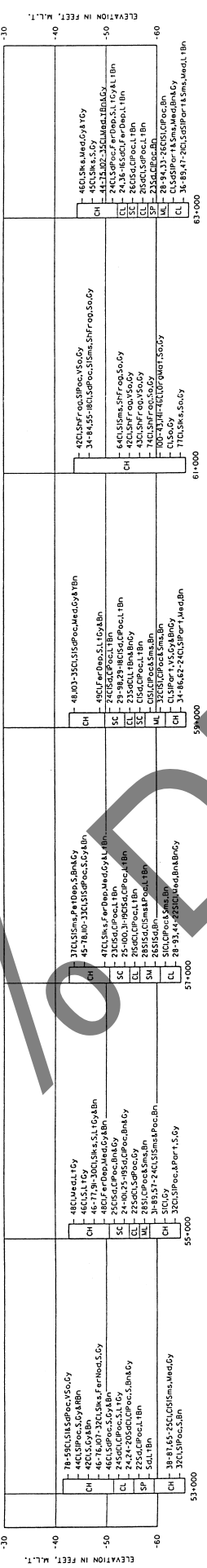
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87-243

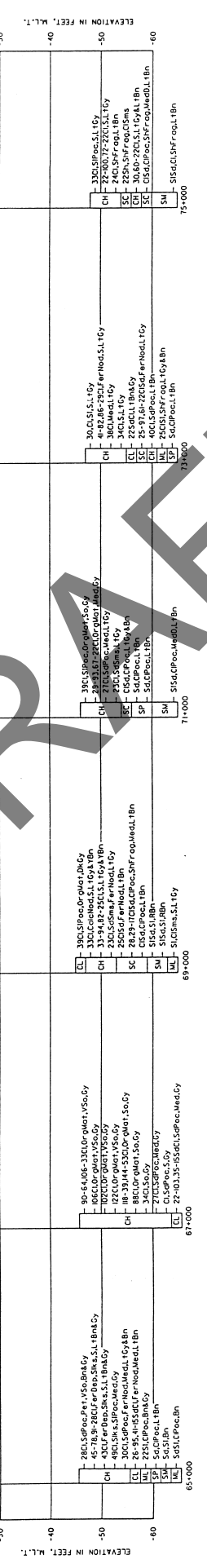
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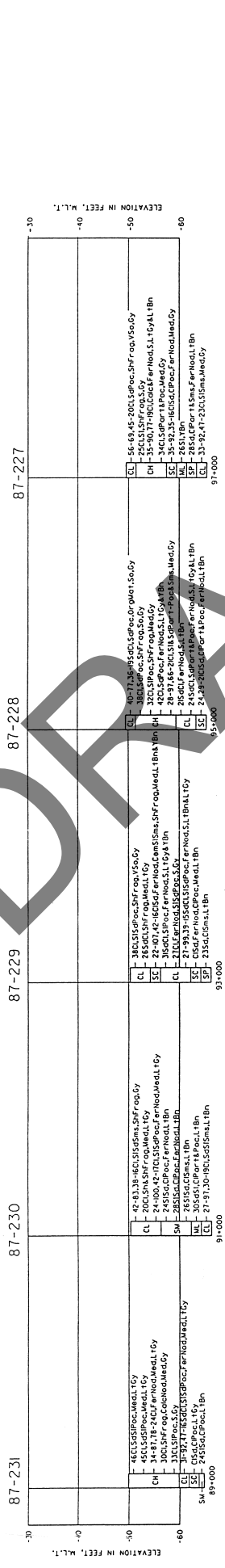
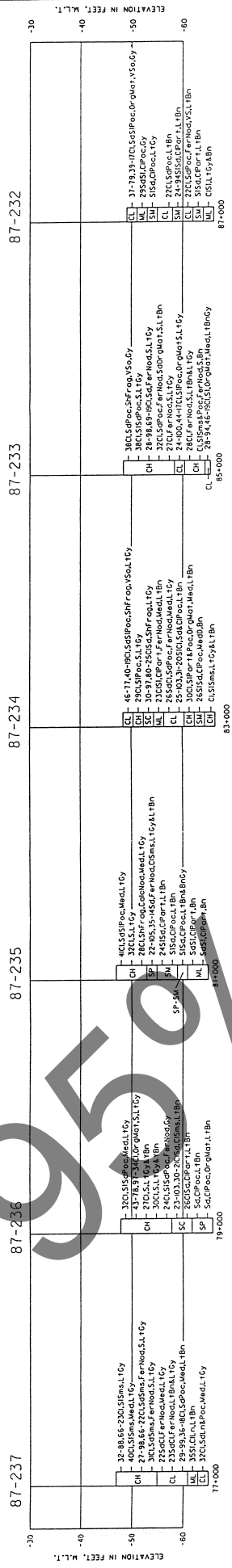
87-239

87-238



HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
ENTRANCE CHANNEL THRU
NEW ENTRANCE CHANNEL
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



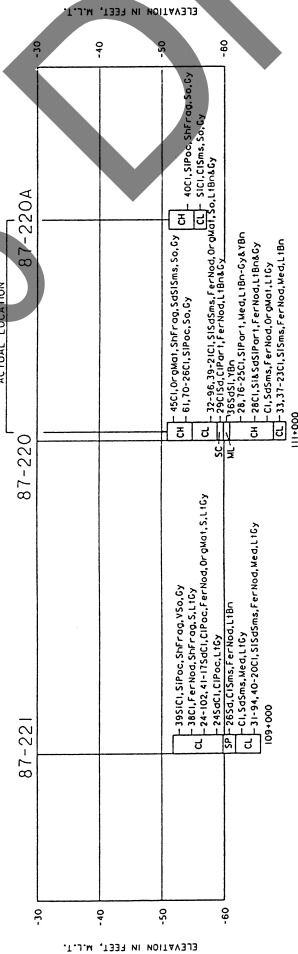
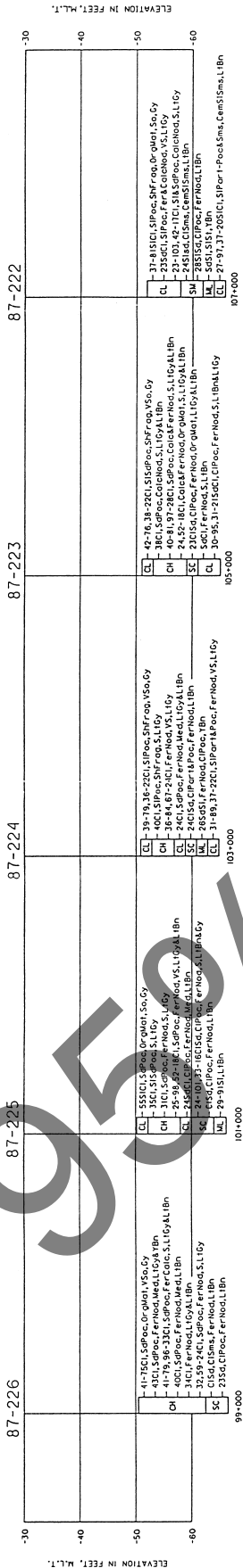
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
NEW ENTRANCE CHANNEL
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:

SEE PLATES FD-8 TO FD-12 FOR BORING LOCATIONS.
SEE PLATE FD-36 FOR BORING NOTES AND LEGEND.



LABORATORY CLASSIFICATION

VISUAL CLASSIFICATIONS

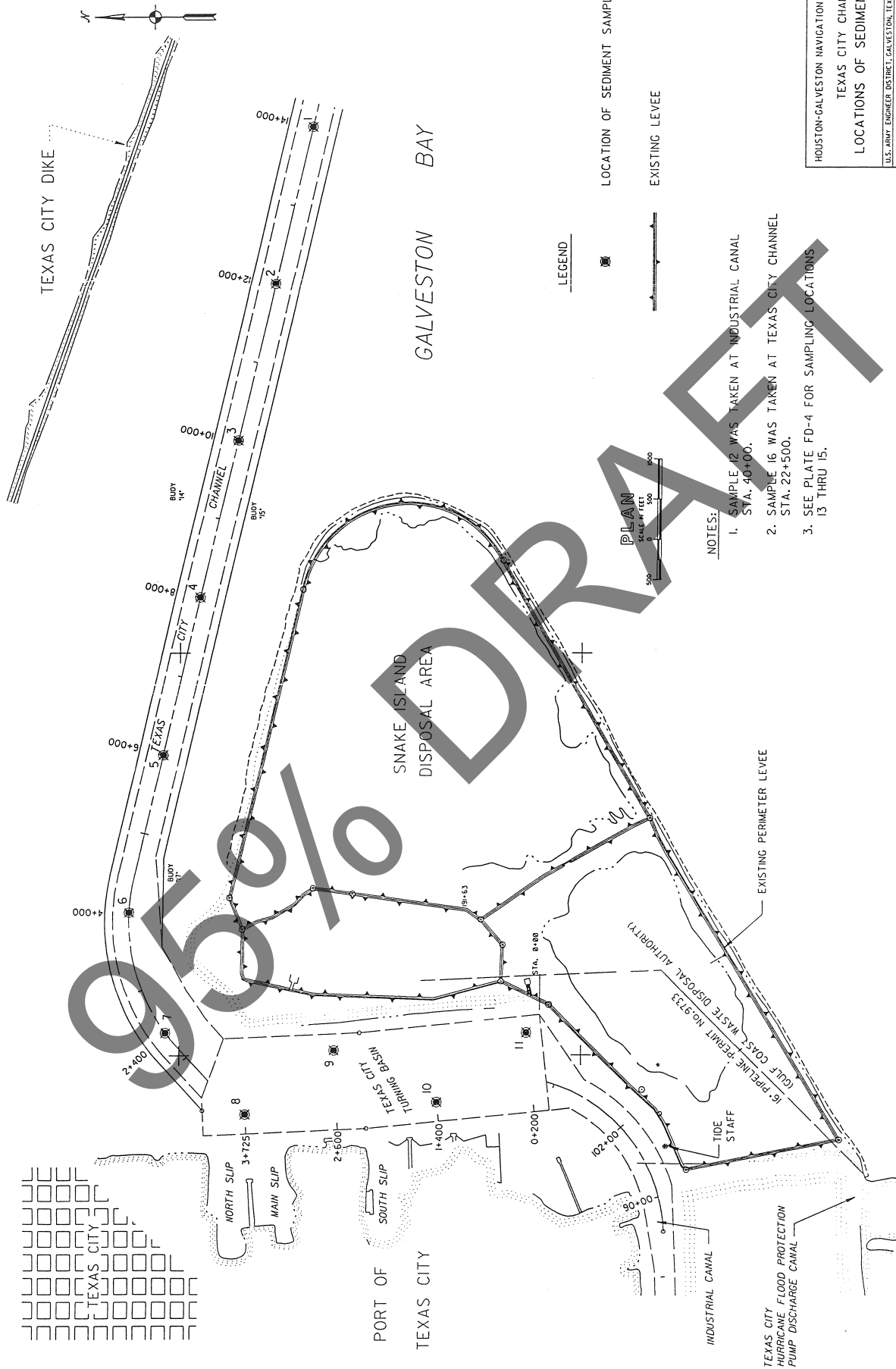
NOTES:

1. SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH MILITARY STANDARD 990 "UNIFIED SOIL CLASSIFICATION SYSTEM" FOR ROADS, AIRFIELDS, EMBANKMENTS AND FILLING MATERIALS. CLASSIFICATIONS OF SOILS SUCH AS SOFT, MEDIUM, AND HARD ARE BASED ON THE MEASUREMENT OF TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH OF THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION, POCKET PENETROMETER TESTS AND POIERTATION RESISTANCE DURING DRILLING.
2. FIGURES TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS OF THE SOIL SAMPLES. THE LOGS SHOW THE TYPE OF SOIL, UNIT, PLASTIC LIMIT, AND DAM LOGIC SHRINKAGE.
3. BORINGS WERE DRILLED USING WET ROTARY DRILLING TECHNIQUES. SAMPLES WERE RECOVERED WITH A 3-INCH DIAMETER THIN WALL SAMPLER. THE SAMPLES WERE RECOVERED WITH CORRECTION FACTORS WERE DETERMINED. UNDISTURBED SAMPLES WERE OBTAINED. SAMPLER DRIVING PERFORMANCE OF STANDARD PENETRATION TESTING.
4. BAY WATER SURFACE IS APPROXIMATELY +2.0 METER NOT SHOWN.

NOTE:
SEE PLATES FD-8 TO FD-12 FOR BORING LOCATIONS.

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
NEW ENTRANCE CHANNEL
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

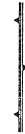


- NOTES:
1. SAMPLE 12 WAS TAKEN AT INDUSTRIAL CANAL STA. 40+00.
 2. SAMPLE 16 WAS TAKEN AT TEXAS CITY CHANNEL STA. 22+500.
 3. SEE PLATE FD-4 FOR SAMPLING LOCATIONS 13 THRU 15.

LEGEND

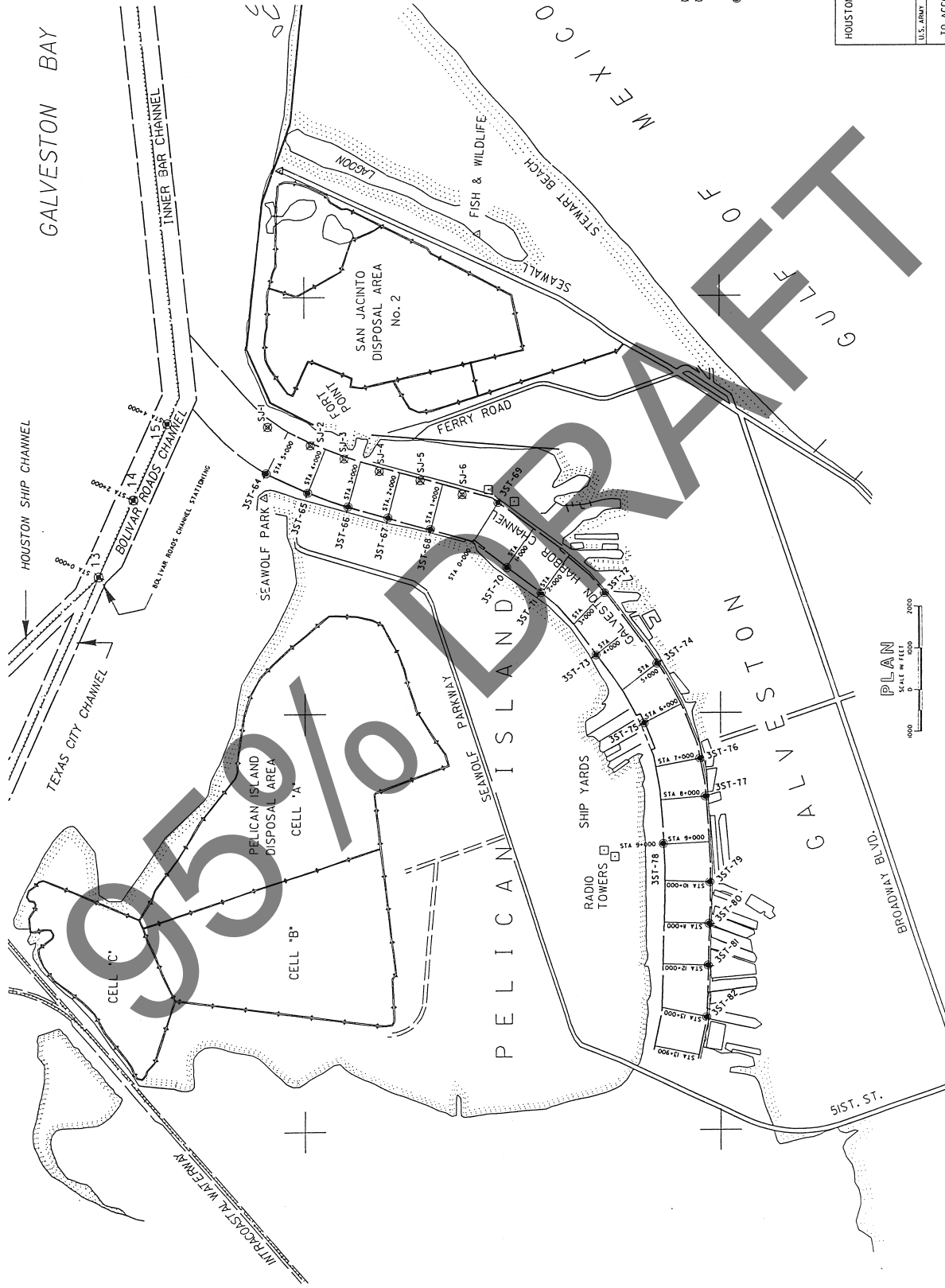


LOCATION OF SEDIMENT SAMPLING



EXISTING LEVEE

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
TEXAS CITY CHANNEL
LOCATIONS OF SEDIMENT SAMPLING
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

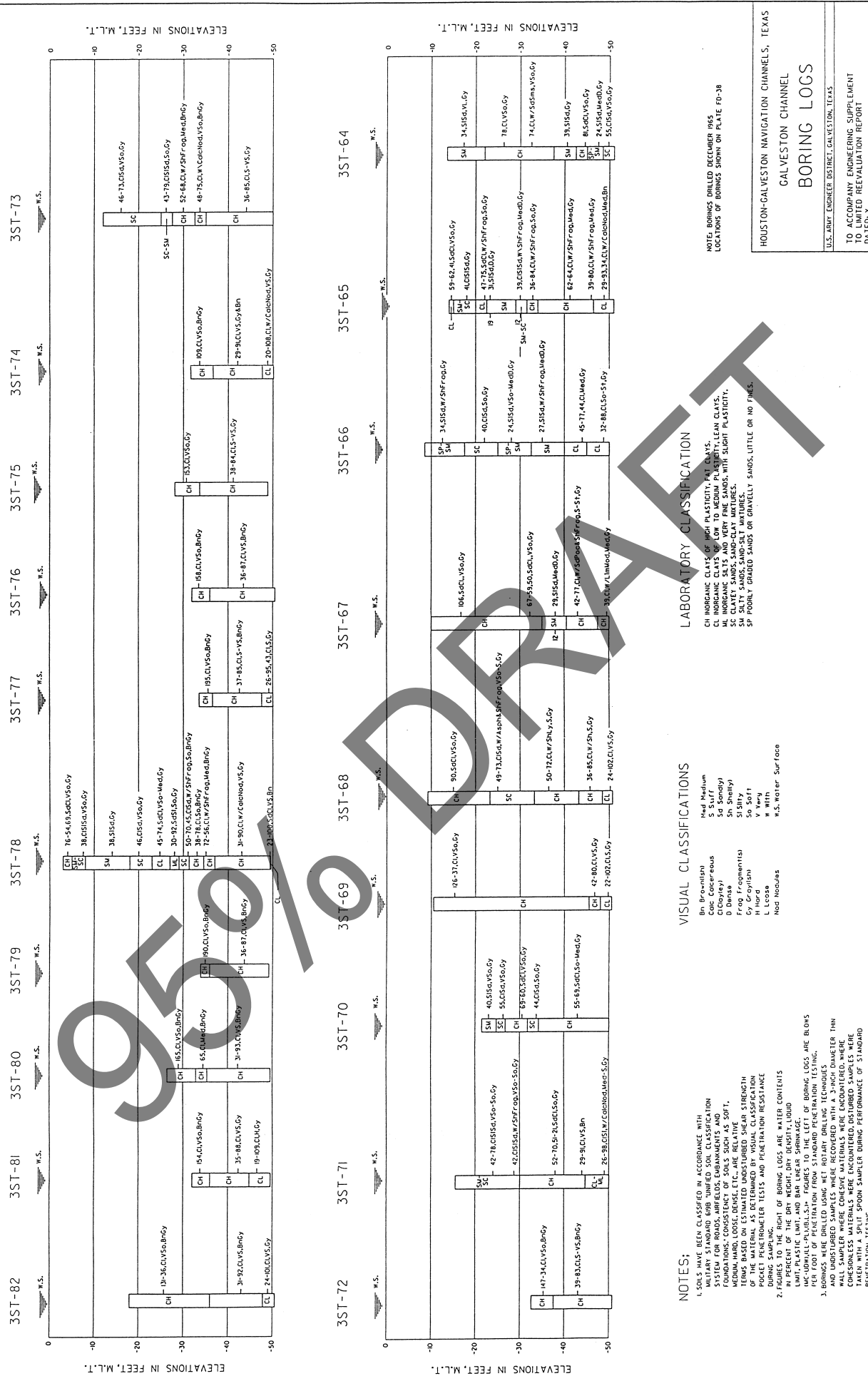


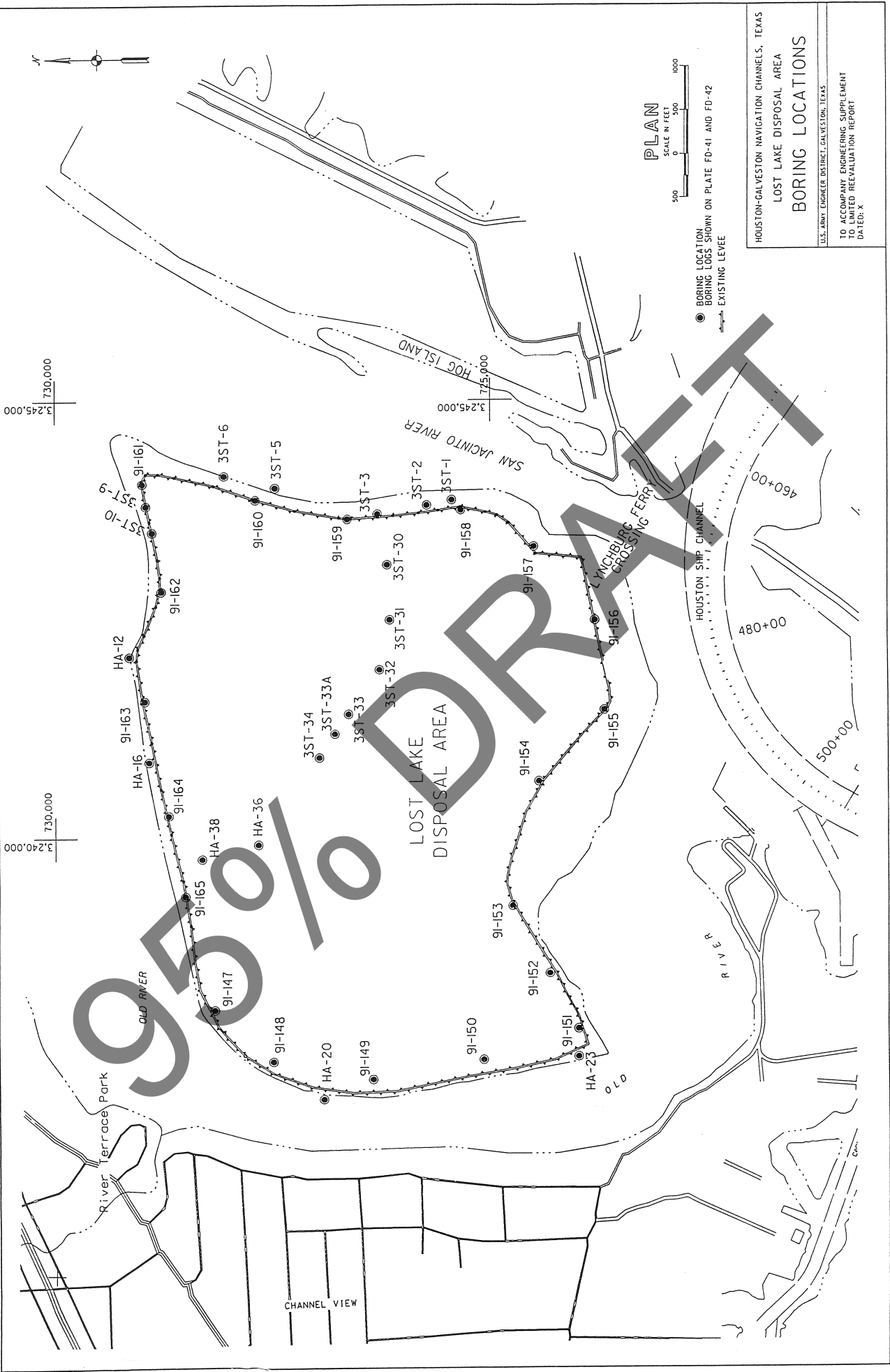
- LEGEND**
- 1989 SAMPLING
 - SAMPLING ASSOCIATED WITH TEXAS CITY CHANNEL STUDY (SEE PLATE FD-31)
 - BORING LOCATIONS
 - BORING LOGS ON PLATE FD-39

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
GALVESTON HARBOR CHANNEL
LOCATIONS OF BORINGS &
SEDIMENT SAMPLING

U.S. ARMY ENGINEER DISTRICT GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

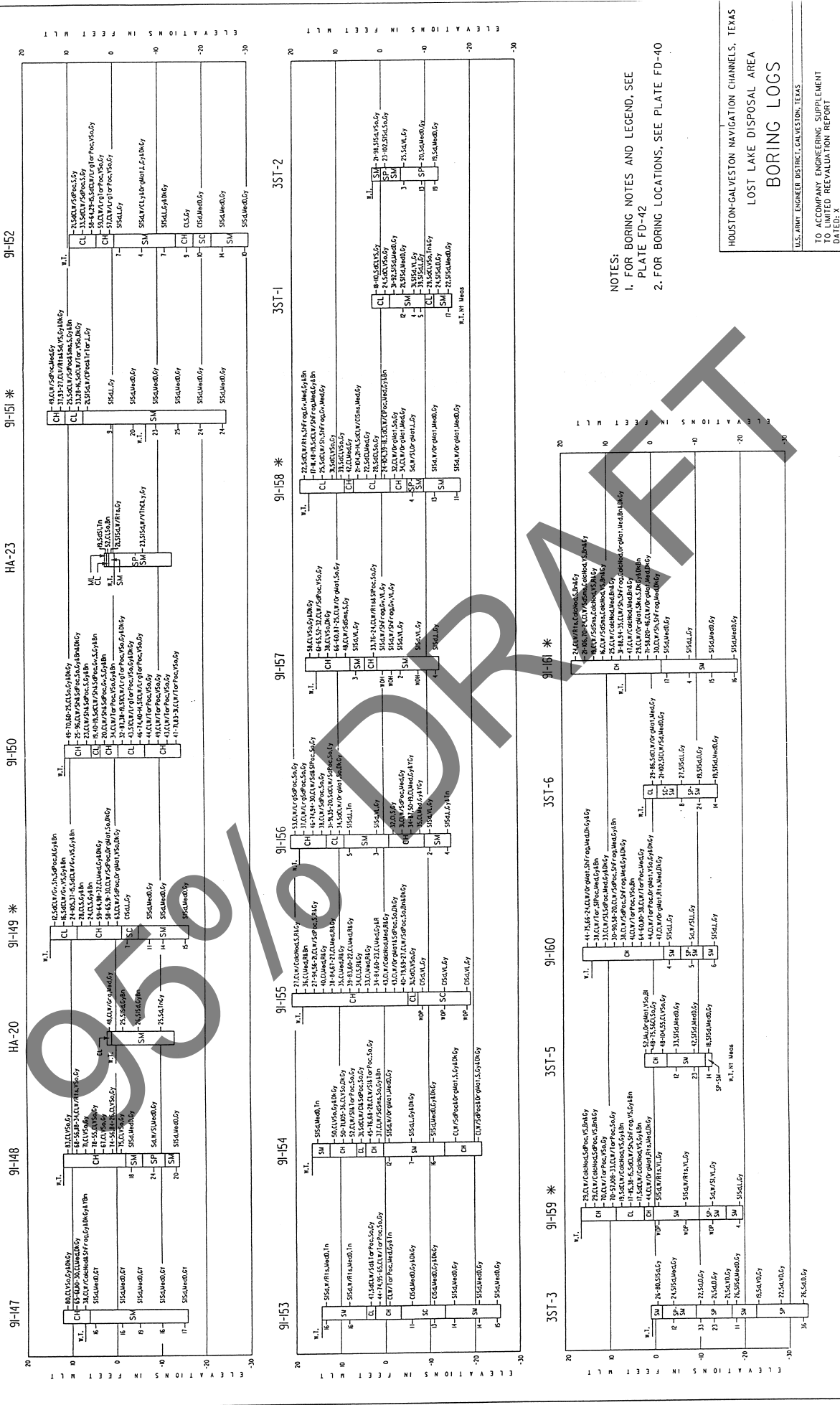


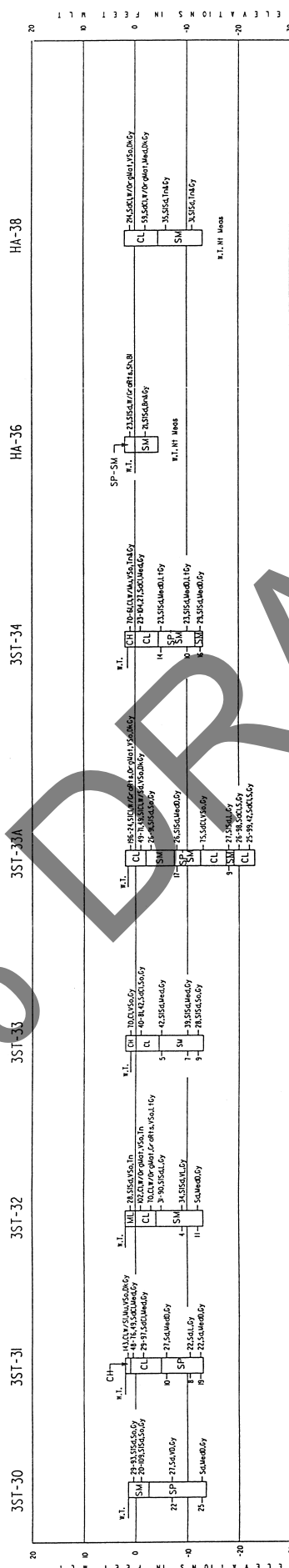


HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
LOST LAKE DISPOSAL AREA
BORING LOCATIONS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED X





SOLS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH MILITARY STANDARD G80 UNIFIED SOIL CLASSIFICATION SYSTEMS (MSTC) INTO THREE GENERAL CATEGORIES: FOUNDATIONS; CONSISTENCY OF SOLS SUCH AS SOFT, MEDIUM HARD, LOOSE, GRANULAR, ETC.; AND RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH OF THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION OF POCKET PENETROMETER TESTS AND PENETRATION RESISTANCE

4. WATER TABLE LEVELS SHOWING LOGS WERE DETERMINED AFTER DRILLING BORINGS BY MEASURING THE TOP OF FLUID LEVELS IN THE BORINGS. WATER TABLE DEPTHS WERE DETERMINED USING A PRESSURE TRANSDUCER (NASHUACH) AS WELL AS ROTARY CHANGING TECHNIQUES AND DRILLING WAS USED TO DETECT THE HOLES. THE LEVEL OF DRILLING LOGS IN THE HOLE HOLES MAY NOT HAVE STABILIZED TO THE LEVEL OF THE ACTUAL WATER TABLE. ADDITIONALLY, WATER TABLES IN THE FIELD ARE LIKELY TO VARY OVER TIME. SOME VARIATION SHOULD BE ANTICIPATED BETWEEN WATER TABLES INDICATED

LABORATORY CLASSIFICATION

CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
ML INORGANIC SILTS AND VERY FINE SANDS, WITH SLIGHT PLASTICITY.
SC CLAYEY SANDS, SAND-CLAY MIXTURES.
SM SILTY SANDS, SAND-SILT MIXTURES.
SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

* NOTE: BORINGS DRILLED ON PERIMETER LEVEE CROWN.

NOTE: BORINGS PREFIXED WITH "35T" WERE DRILLED IN 1963. BORINGS PREFIXED WITH "85" WERE DRILLED IN 1985. BORINGS PREFIXED WITH "91" WERE DRILLED IN 1991. THE ELEVATIONS OF THE TOPS OF THE BORINGS, AND THE UNDERLYING SOIL STRATA, SHOWN ON THE PLOTTED LOGS, ARE BASED ON SURVEYS PERFORMED DURING THE YEAR THAT THE BORINGS WERE DRILLED. ELEVATIONS HAVE NOT BEEN CORRECTED FOR SUBSIDENCE.

NOTE: FOR BORING LOCATIONS, SEE PLATE FD-40

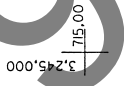
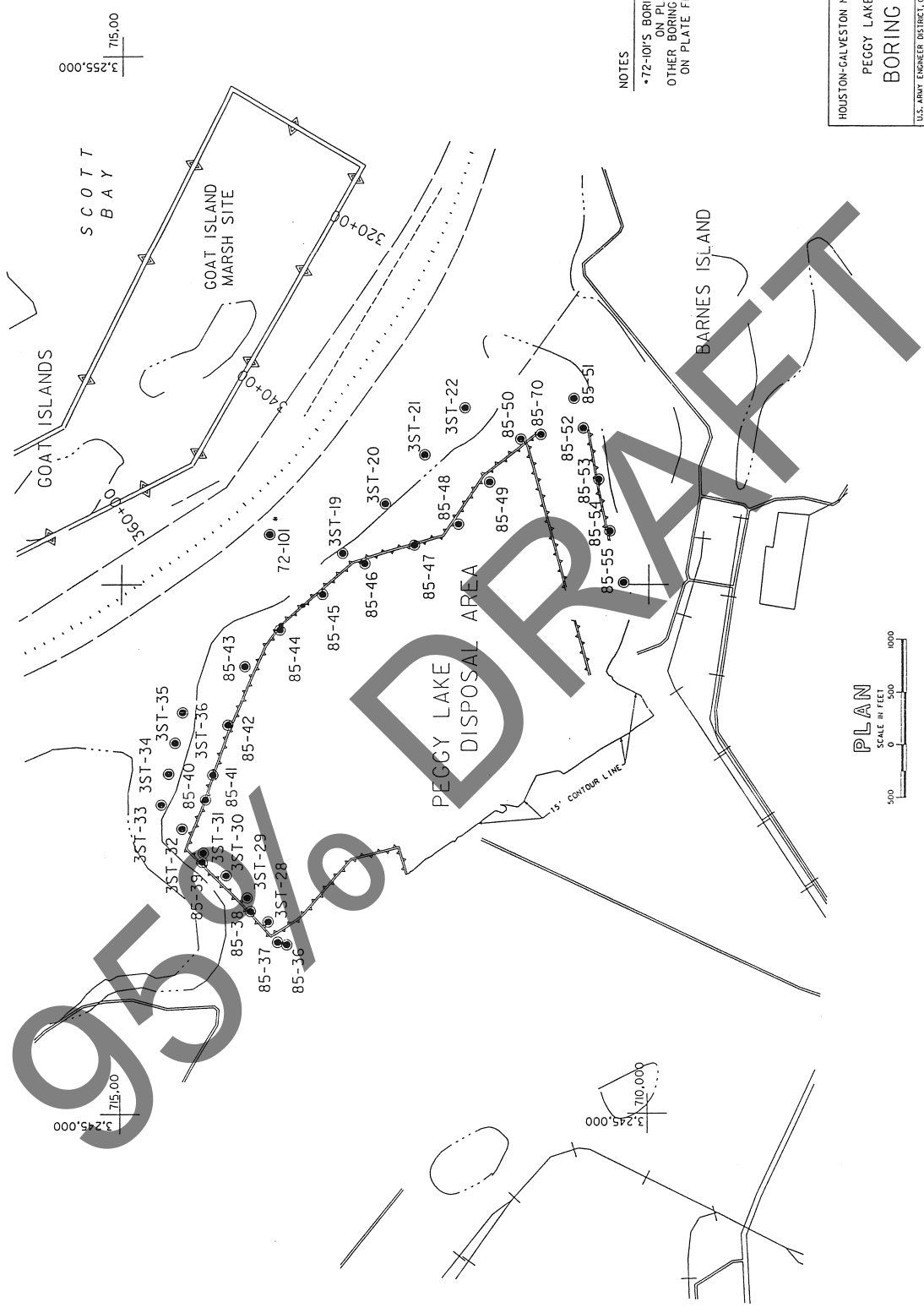
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS

LOST LAKE DISPOSAL AREA

BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



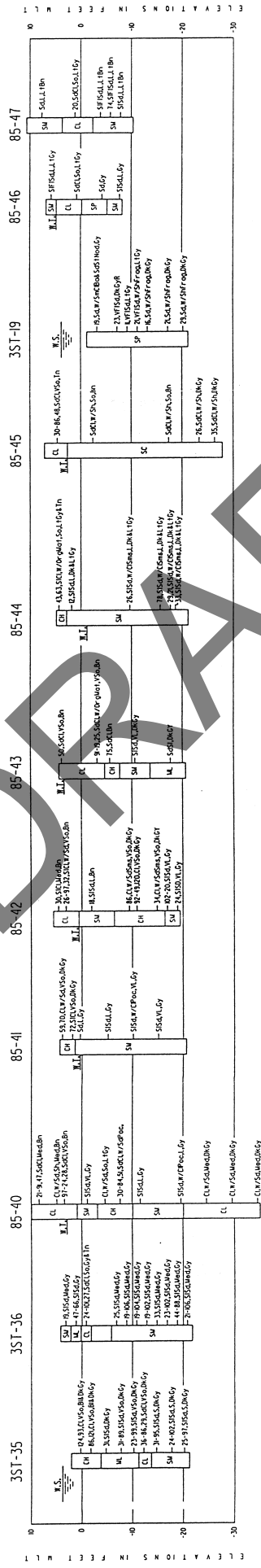
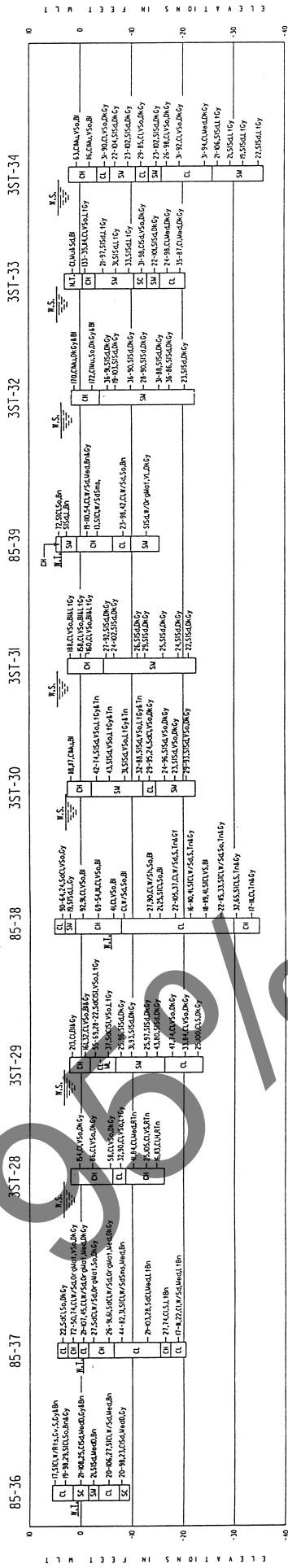
PLAN
SCALE IN FEET

NOTES

- 72-101'S BORING LOG IS SHOWN ON PLATE FD-17
- OTHER BORING LOGS ARE SHOWN ON PLATE FD-44 AND FD-45

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
PEGGY LAKE DISPOSAL AREA
BORING LOCATIONS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



NOTES:
SEE PLATE FD-43 FOR BORING LOCATIONS.
SEE PLATE FD-45 FOR BORING NOTES AND LEGEND.

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
PEGGY LAKE DISPOSAL AREA
BORING LOGS
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



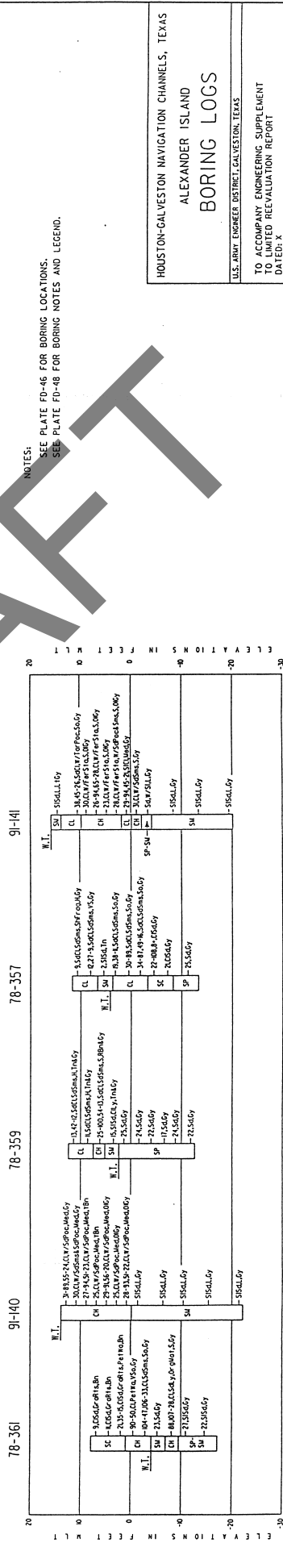
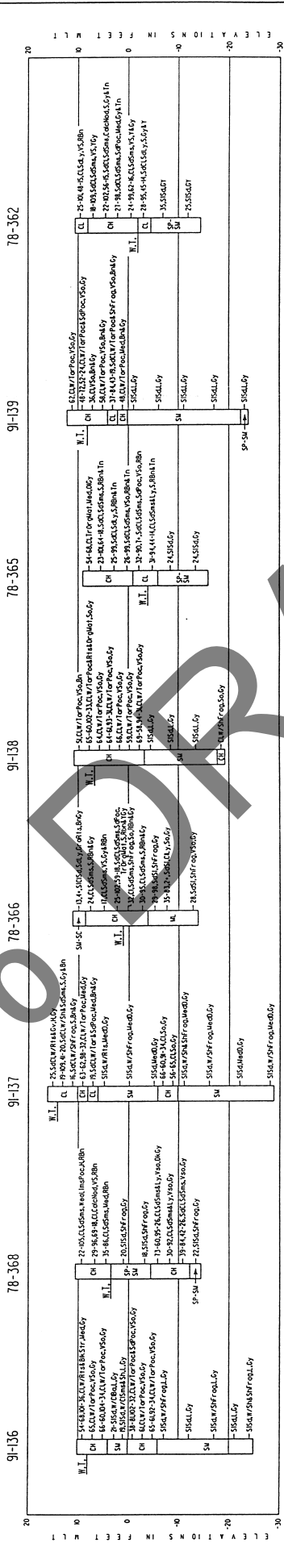
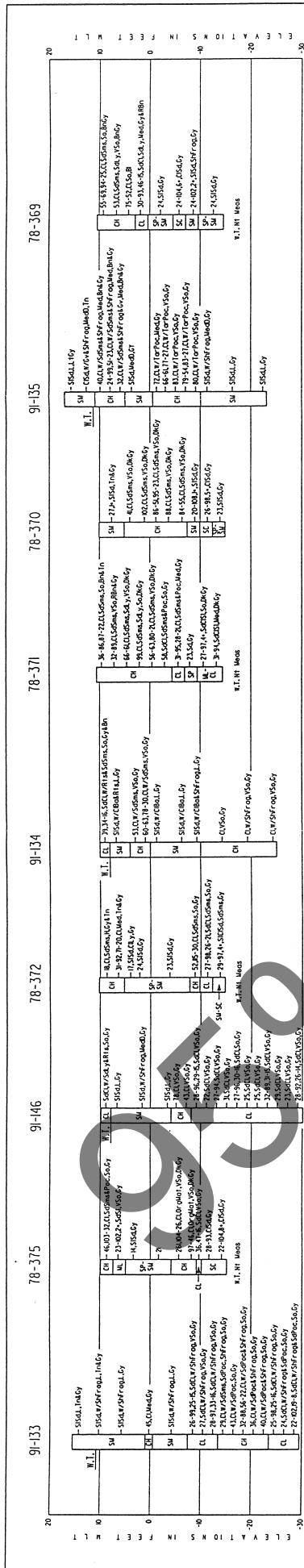
A horizontal scale bar labeled "SCALE IN FEET" with markings at 500, 0, 500, and 1000.

NOTES:
LOGS OF BORINGS SHOWN ON PLATES FD-47 AND FD-48.

BOILING LOCATIONS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

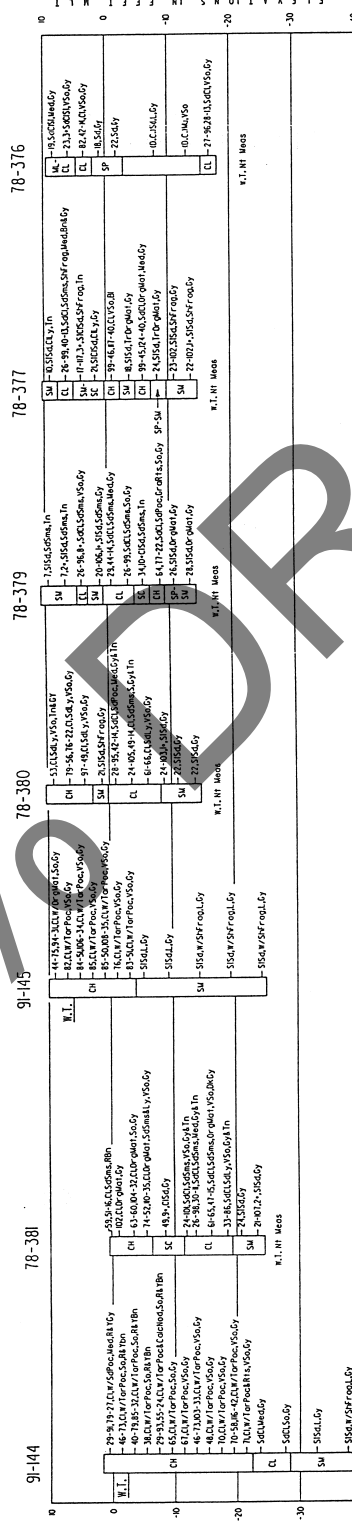
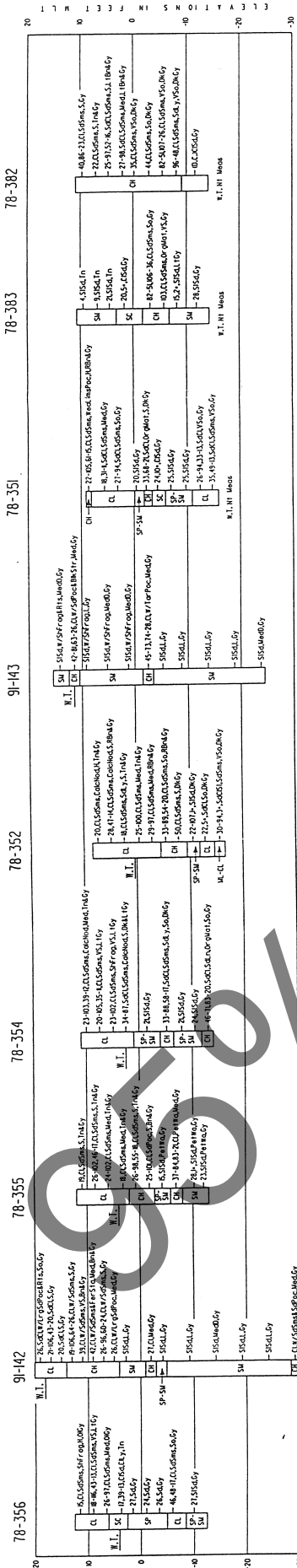


OTES:
SEE
335

HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
ALEXANDER ISLAND
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X



1. SONS HAVE STANDARD 6RB-UNIFIED SOIL CLASSIFICATION. MILITARY STANDARD 68B-UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND AIRPORTS. THE FOLLOWING ARE THE DEFINITIONS OF THE TERMS: GRAIN SIZE, MOISTURE, PLASTICITY, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX, ORGANIC MATTER, MOISTURE DENSITY, ETC. ARE RELATIVE TO THE STANDARD.
2. NUMBER 21000 OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF THE DRY WEIGHT, DRY DENSITY, LIQUID LIMIT, PLASTIC LIMIT, AND BAR SHALE SHRINKAGE. (LOW-PHASE-PLASTICITY).^{2,3,4} FIGURES TO THE LEFT OF BORING LOGS ARE BLOWS PER FOOT OF PENETRATION TO STANDARD PENETRATION TESTING.
3. BORINGS WERE DRILLED USING ROTARY DRILLING TECHNIQUES. THE DRILLING LOGS WERE OBTAINED USING A 2-1/2" DIAMETER "WIN" WELL SAMPLER WHERE CONVECTIVE MATERIALS WERE ENCOUNTERED. WHERE CONVECTILESS MATERIALS WERE DISCOVERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPOON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.
4. WATER TABLE LEVELS SHOWN ON BORING LOGS WERE DETERMINED AFTER THE BORING WAS COMPLETED. THE WATER TABLE WAS DETERMINED BY PUMPING WATER TO THE SURFACE OF THE BORING. THE WATER TABLE WAS USED TO DRILL THE HOLES. THE LEVEL OF DRILLING FLUIDS IN THE BORE HOLES MAY NOT HAVE STABILIZED TO THE LEVEL OF THE ACTUAL WATER TABLE. ADDITIONALLY, WATER TABLES IN THE FIELD ARE LIKELY TO VARY WITH TIME. THEREFORE, THE WATER TABLES SHOWN ON SOME VARIATION SHOULD BE INTERPRETED BETWEEN WATER TABLES INDICATED ON THE BORING LOGS AND WATER TABLES ENCOUNTERED IN THE FIELD.

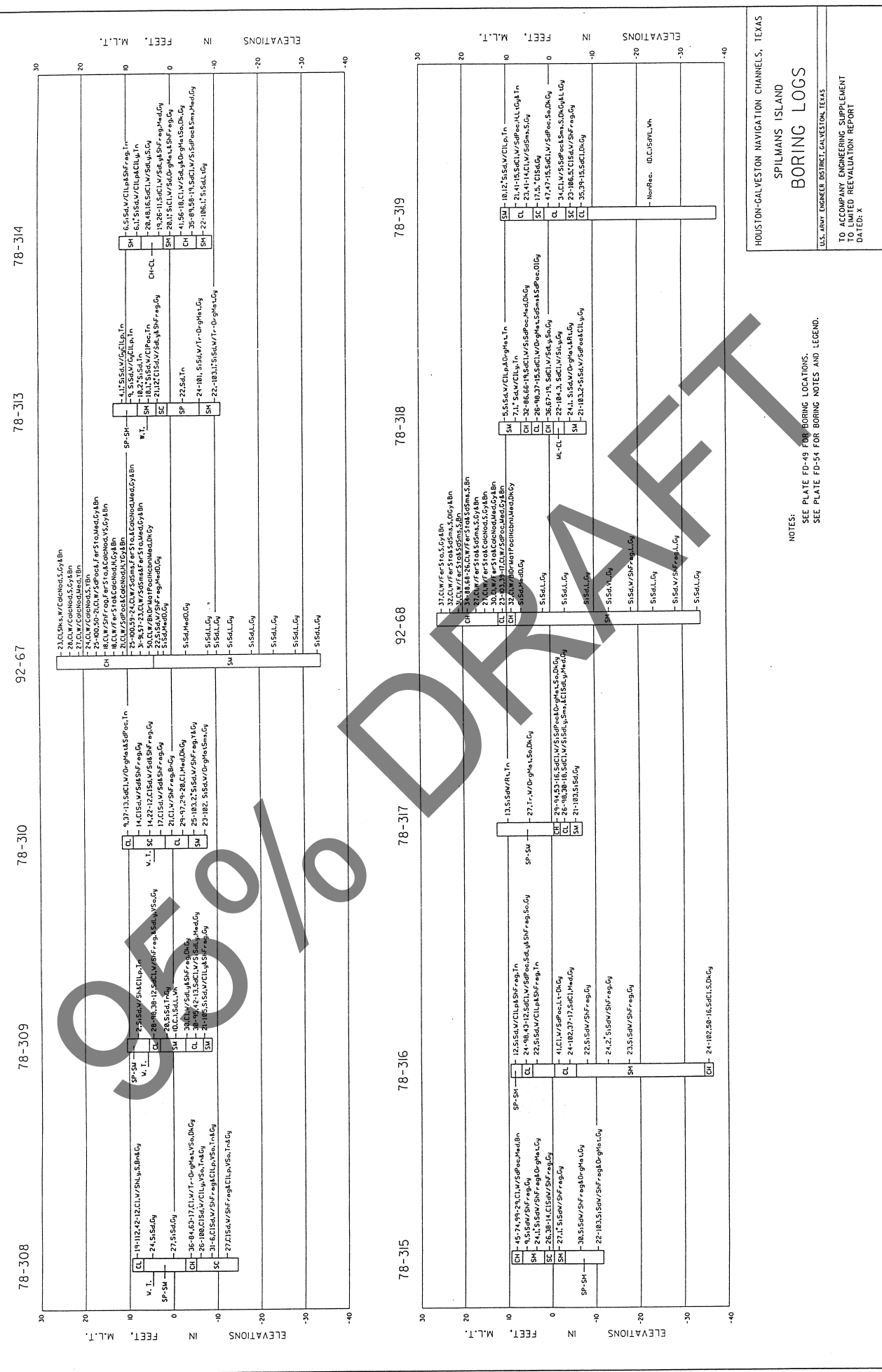
Ba Baita	Gro Gross	N.T. No Test	Sms Soms
Black	Gv Greavily	Or G Organic	So Soft
Blk Blocky	Gr Groylth	Ol Olive	Sr Structu
Bn Brown	H Hard	Pst Petrolleum	Tor Tor
Cac Calcerous	L Loose	Poc Pockholes	Un Unthin
Clo Cloysy	L Loyal	R Riddian	Wg Wether
D Dense	Lm Limstone	S Sprots	Xo Xoste
Dc Drillers	Lg Large	Sd Sandly	Wt Water T
Classification	Mat Material	Sn Shelly	W/ With
Dk Dark	Med Medium	Sl Silty	Y Yellowish
Fer Ferrous	Nod Nodules		
Frog Frogmental			

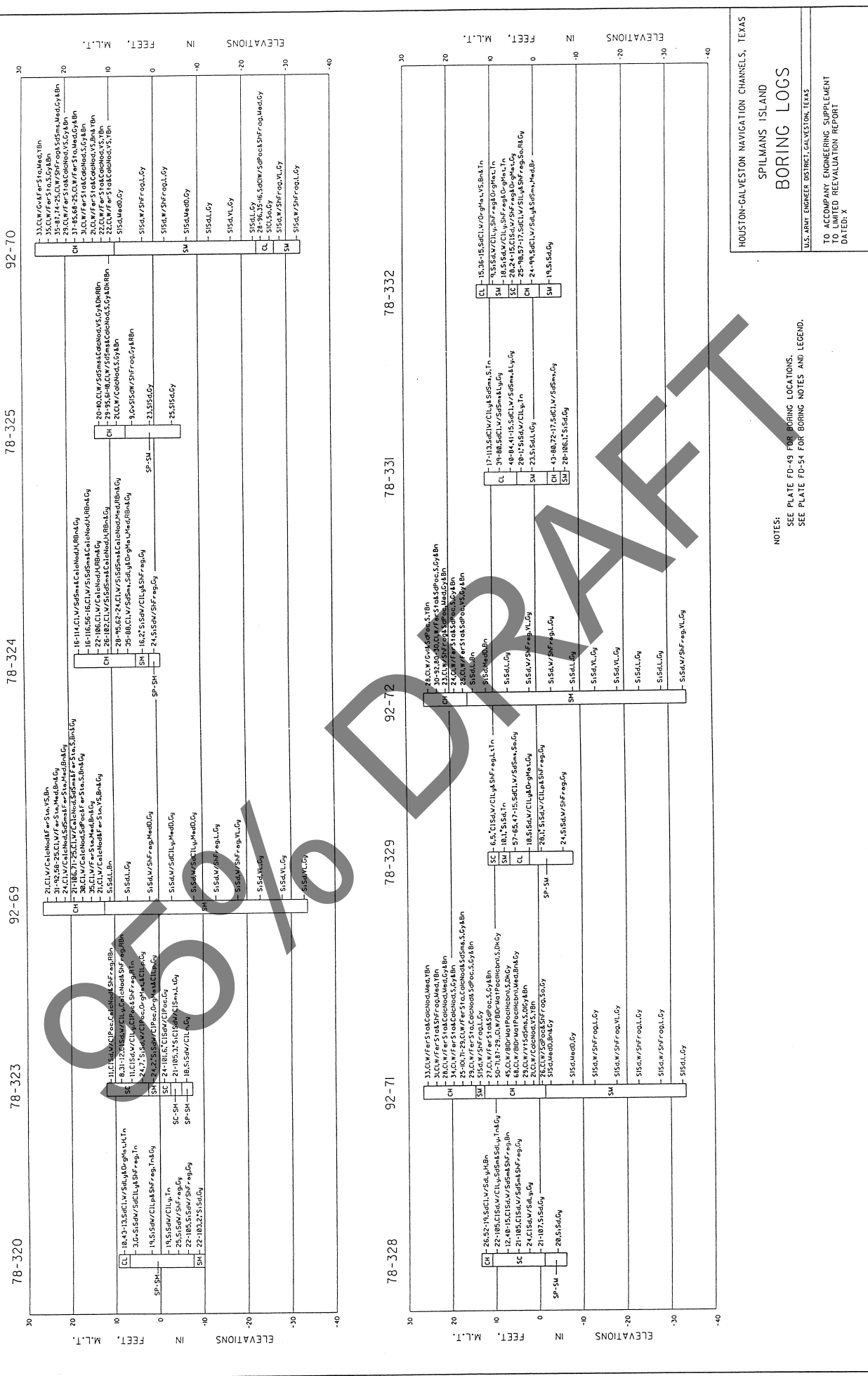
CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
ML INORGANIC SLTS AND VERY FINE SANDS, WITH SLIGHT PLASTICITY.
SC CLAYEY SANDS, SAND-CLAY MIXTURES.
SM SILTY SANDS, SAND-SILT MIXTURES.
SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES

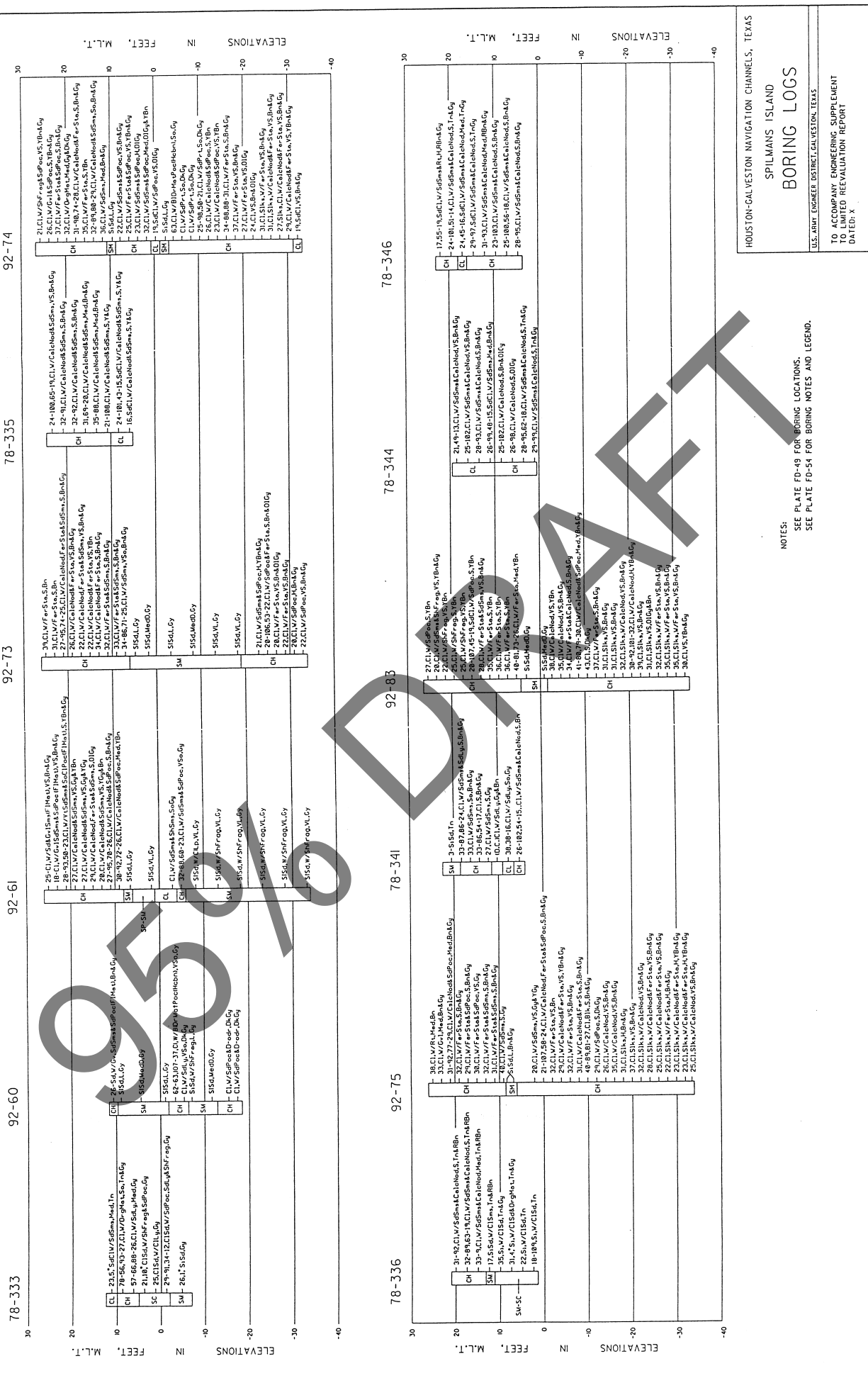
HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
ALEXANDER ISLAND
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

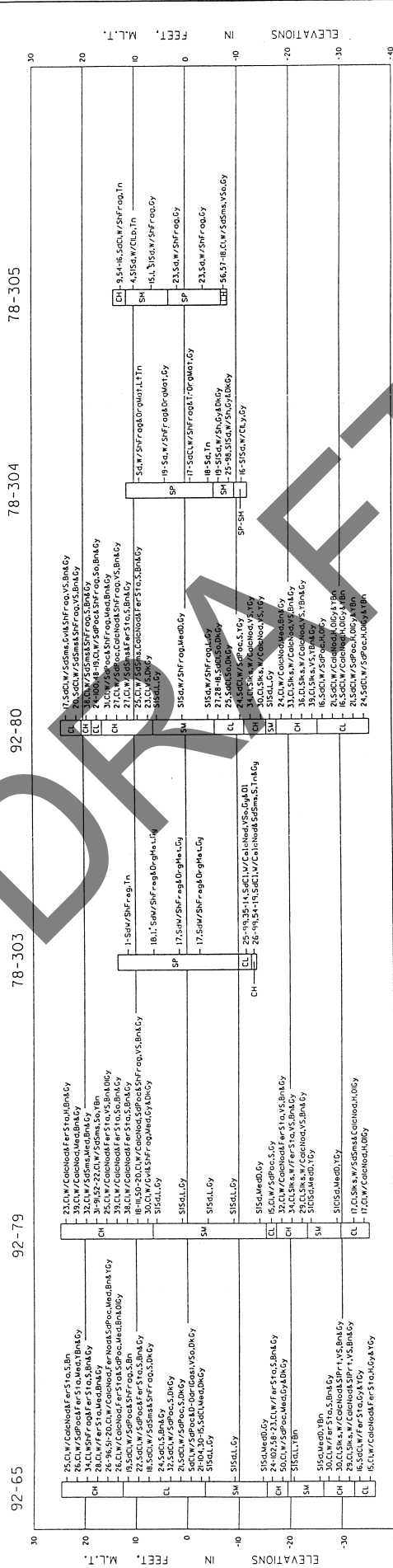
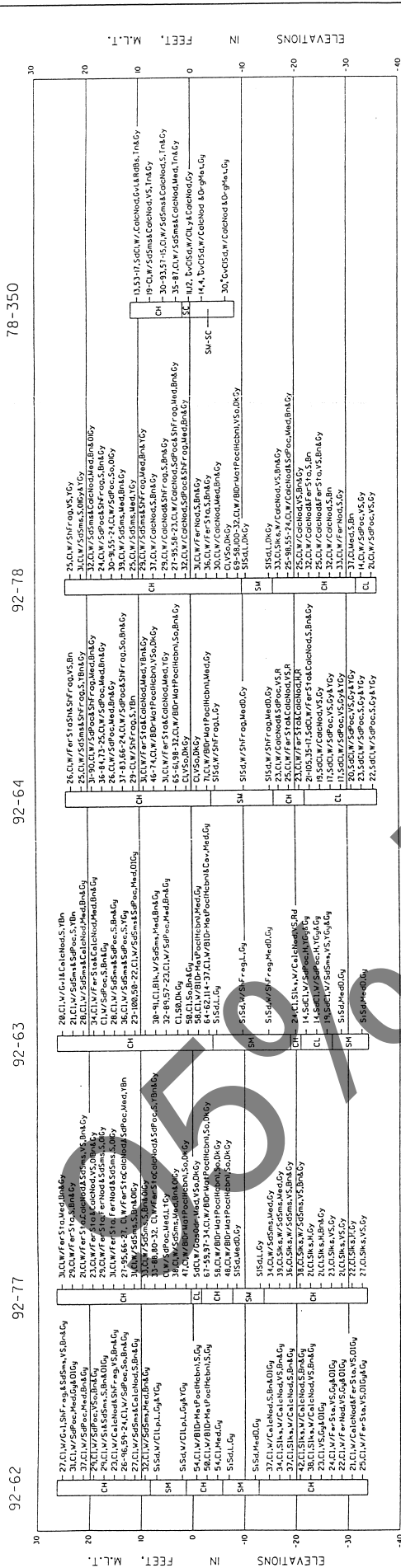
TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X







NOTES:
SEE PLATE FD-49 FOR BORING LOCATIONS.
SEE PLATE FD-54 FOR BORING NOTES AND LEGEND.

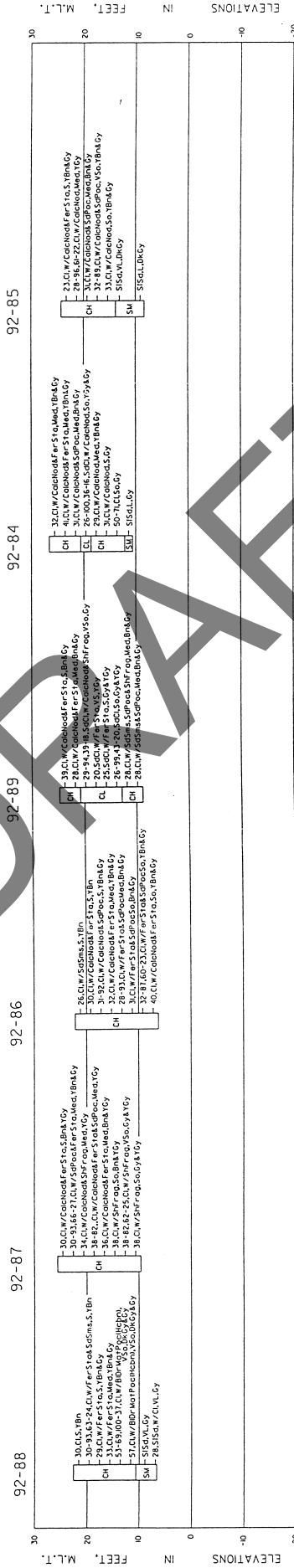


HOUSTON-GALVESTON NAVIGATION CHANNELS, TEXAS
SPILLMANS ISLAND
BORING LOGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: X

NOTES:
SEE PLATE FD-49 FOR BORING LOCATIONS.
SEE PLATE FD-54 FOR BORING NOTES AND LOGS.



SEE PLATE TD-49 FOR BORINGS LOCATIONS.

SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH MILITARY STANDARD CODES. CLASSIFICATION SYSTEM FOR BORINGS, AIRFILLS, EMBANKMENTS AND FOUNDATIONS. CONSISTENCY: SOFT, SAND, SANDY SILT, MEDIUM, HARD, DENSE. ETC., ARE RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH. THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION CODED. PENETROMETER TESTS AND PENETRATION RESISTANCE DURING SAMPLING.

TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF THE DRY WEIGHT. DRY DENSITY, LIQUID LIMIT, PLASTIC LIMIT, AND LOAN LINE SHRINKAGE. MC-100 (PL-100) IS PERCENT.

BORINGS WERE DRILLED USING WET ROTARY DRILLING TECHNIQUES AND UNDISTURBED SAMPLES WERE OBTAINED WITH A 3-INCH DIAMETER THIN WALL SAMPLER WHERE DRILLING TECHNIQUES WERE OVERLOOKED. WHERE COHESIVE MATERIALS WERE ENCOUNTERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.

5. WATER TABLE LEVELS SHOWN ON BORING LOGS WERE DETERMINED AFTER CORRECTIONS WERE MADE FOR CAPILLARY RISE. IN SITUATION AS WET ROTARY DRILLING TECHNIQUES AND DRILLING MUD WERE USED TO DRILL THE HOLES, THE LEVEL OF DRILLING FLUIDS IN THE BORE HOLES MAY NOT HAVE BEEN STABILIZED. WATER TABLES IN THE FIELD ARE LIKELY TO FLUCTUATE DEPENDING ON WEATHER CONDITIONS. THEREFORE, SOME VARIATION SHOULD BE ANTICIPATED BETWEEN WATER TABLES INDICATED AND WATER TABLES ENCOUNTERED IN THE FIELD.

LABORATORY CLASSIFICATION

CH INORGANIC CLAYS OF HIGH PLASTICITY, FAY CLAYS.
CI INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
SC CLAYEY SANDS, SAND-CLAY MIXTURES.
SP SANDS, GRAVELLY SANDS, OR GRAVELLY SANDS, LITTLE OR NO FINES.
PO POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

Mod Modules	Recorded	Siks Sticks/Sides
Non Rec Non	Sms Seams	
On C Organic	So Soft	
Oil Dive	Siz Stralis	
Poc Pocket(s)	Siz Structure(s)	
Prt Porling	In Tonlin	
R Rad(dish)	Vt Verticed	
Rts Root(s)	V Very	
S Surf	Wt. Water Table	
So Sandy()	W With	
Sn Shelly()	Y Yellowish	
Sl Stry		

HOUSTON-CALVESTON NAVIGATION CHANNELS, TEXAS
SPILMANS ISLAND
BORING LOGS
U.S. ARMY ENGINEER DISTRICT, CALVESTON, TEXAS

TO ACCOMPANY ENGINEERING SUPPLEMENT
TO LIMITED REEVALUATION REPORT
DATED: Y

