

REFERENCE: W-5600

PROJECT: 50056

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY JOHNSTON
 PROJECT DESCRIPTION US 70 FROM EAST OF US 70
BUSINESS TO WEST OF NEUSE RIVER

RECOMMENDATIONS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5600	1	35

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

M. ARNOLD

S. WOOD

M. DURWAY

S. DAVIS

D. AIELLO

T. SHARPE

A. STURCHIO

INVESTIGATED BY F&R, Inc.

DRAWN BY T.T. WALKER

CHECKED BY C. WANG

SUBMITTED BY P. ALTON

DATE MAY 2019

SINCE **Prepared in the Office of:**
F&R FROEHLING & ROBERTSON, INC.
 Engineering Stability Since 1881
 310 Hubert Street
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SIGNATURE _____ DATE _____

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 UNLESS ALL SIGNATURES COMPLETED**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

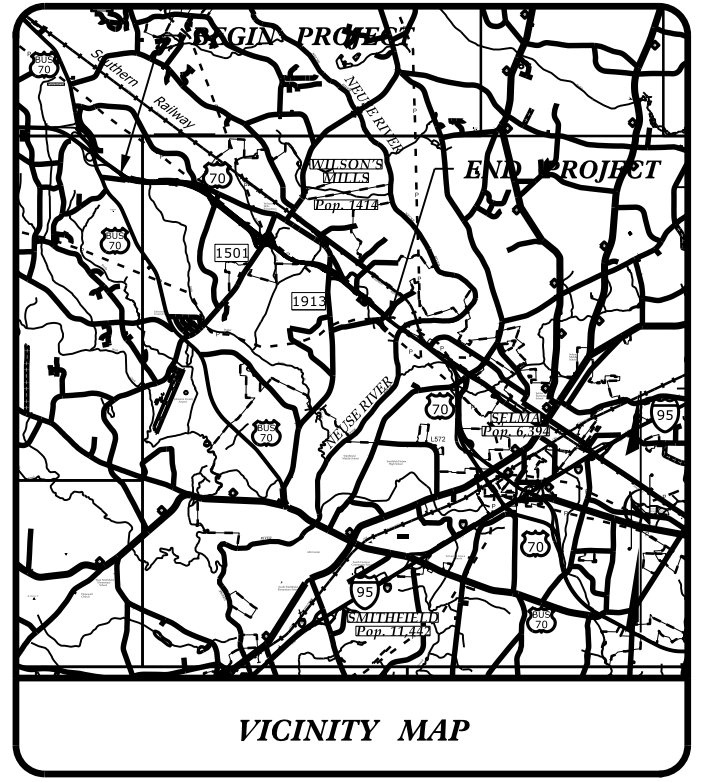
Table with 4 main columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, and TERMS AND DEFINITIONS. Includes sub-sections like SOIL LEGEND AND AASHTO CLASSIFICATION, CONSISTENCY OR DENSENESS, TEXTURE OR GRAIN SIZE, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, and COLOR.

09/08/99

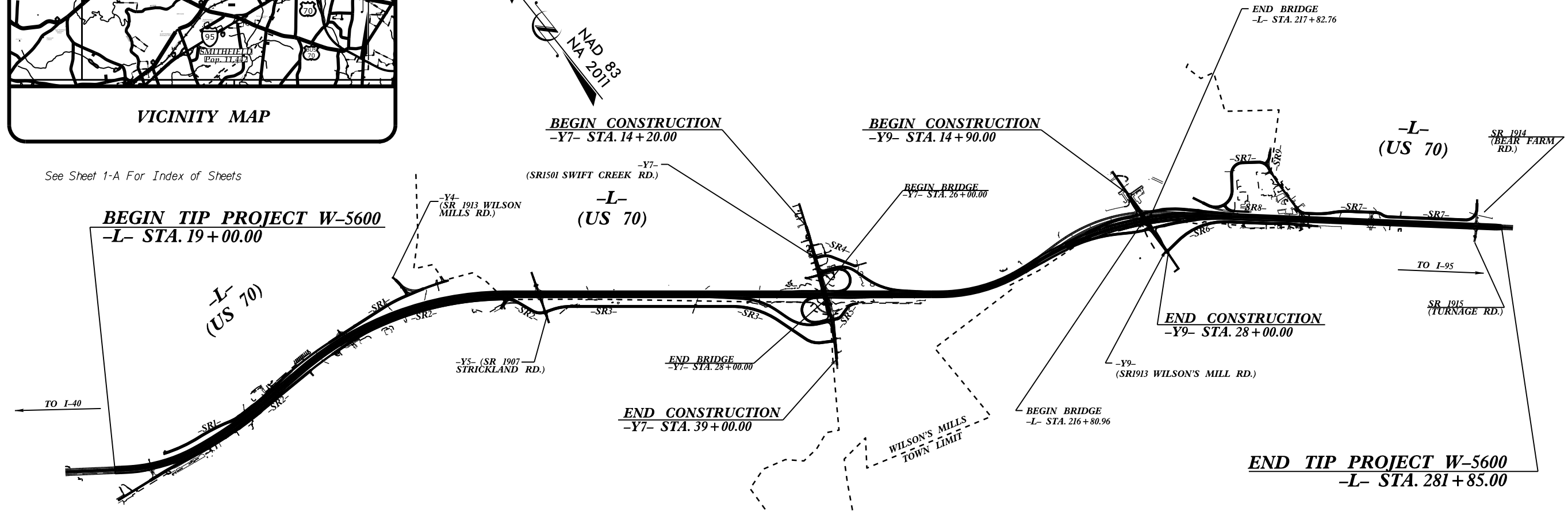
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TIP PROJECT: W-5600

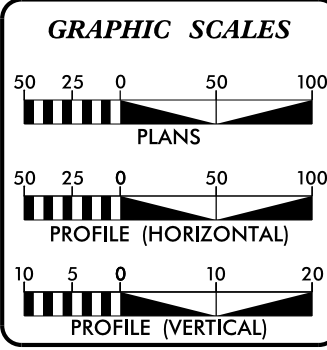
CONTRACT:



See Sheet 1-A For Index of Sheets



THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.
 CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ____.
 A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF WILSON'S MILLS.



DESIGN DATA

ADT 2020 =	30,700
ADT 2040 =	45,400
K =	8 %
D =	55 %
T =	14 % *
V =	70 MPH
* TTST =	8% DUAL = 6%
FUNC. CLASS =	INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT W-5600	=	4.959 MILES
LENGTH STRUCTURE TIP PROJECT W-5600	=	0.019 MILES
TOTAL LENGTH TIP PROJECT W-5600	=	4.978 MILES

Prepared in the Office of:
ETHERILL ENGINEERING
 1223 Jones Franklin Rd. Raleigh, N.C. 27606
 License No. F-0377
 Bus: 919.851.8077 Fax: 919.851.8107
 2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

NCDOT CONTACT:

Prepared for:
DIVISION OF HIGHWAYS
 DIVISION 4
 509 Ward Boulevard
 Wilson NC, 27895

BOB A. MAY, PE
PROJECT ENGINEER

JONATHAN HEFNER, PE
PROJECT DESIGN ENGINEER

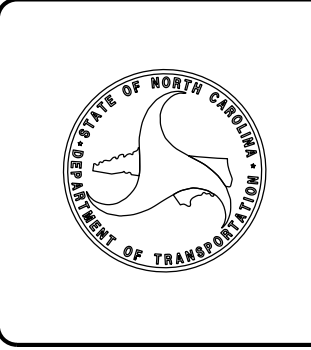
MATT CLARK, PE
DIVISION PROJECT MANAGER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



INCOMPLETE PLANS
 DO NOT USE FOR R/W ACQUISITION
 DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
 DIVISION OF HIGHWAYS
JOHNSTON COUNTY

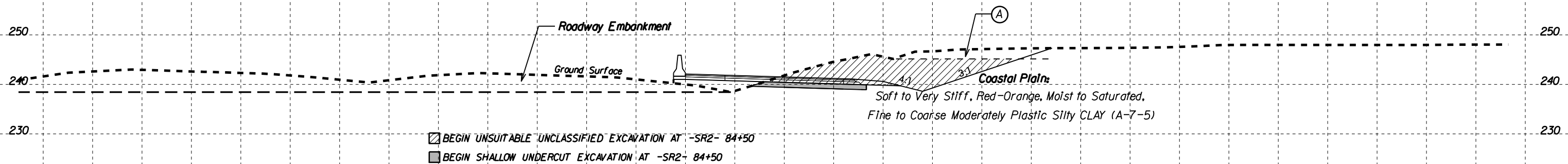
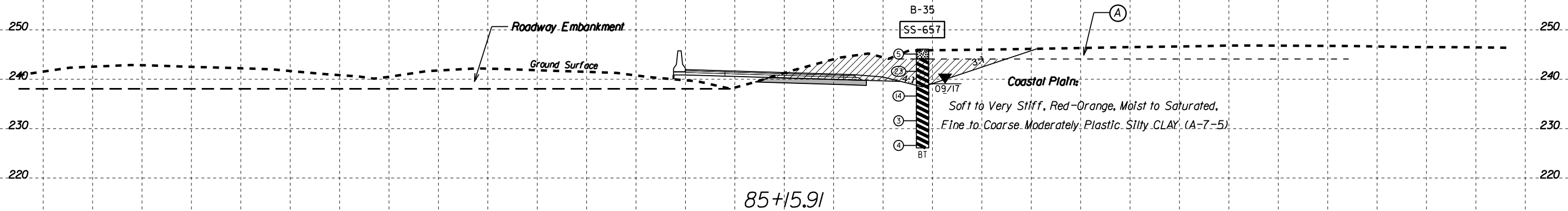
LOCATION: US 70 FROM EAST OF US 70 BUSINESS TO WEST OF NEUSE RIVER.

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, RETAINING WALLS, & CULVERTS.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5600	3	35
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
50056.1.1	HISP-0070(163)	PE	

(A) Coastal Plain: Loose, Gray, Moist, Silty Fine SAND (A-2-4) with Trace Organics (Roots)

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-657	28' RT	85+00	3.5-5.0	A-7-5(5)	54	22	34.1	20.0	5.6	40.3	86.4	75.0	49.0	14.2	-



GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 11/02/2017. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.
W-5600

SHEET NO.
5

140

120

100

80

60

40

20

0

20

40

60

80

260

250

240

230

260

250

240

230

END UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR2- 85+75
END SHALLOW UNDERCUT EXCAVATION AT -SR2- 85+75

Roadway Embankment

(A) Coastal Plain: Loose, Gray, Moist, Silty Fine SAND (A-2-4) with Trace Organics (Roots)

Ground Surface

Coastal Plain

Soft to Very Stiff, Red-Orange, Moist to Saturated,
Fine to Coarse Moderately Plastic Silty CLAY (A-7-5)

85+65.18
-SR2-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

80

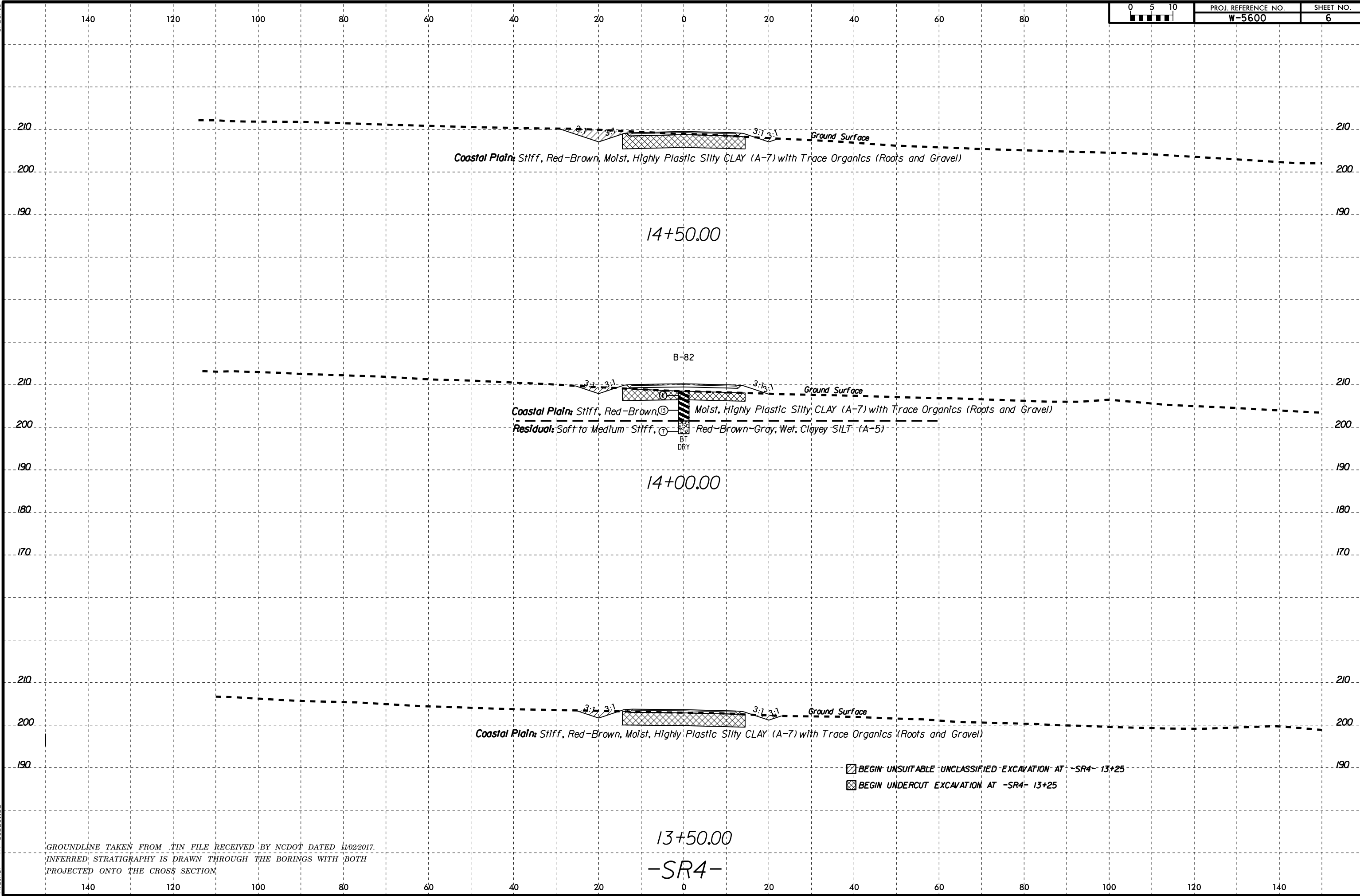
100

120

140

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Projects\66026102\Walker-A

6/23/16



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
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 PROJECTED ONTO THE CROSS SECTION.

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 Projects_660261102 Walker_A

6/23/16

140

120

100

80

60

40

20

0

20

40

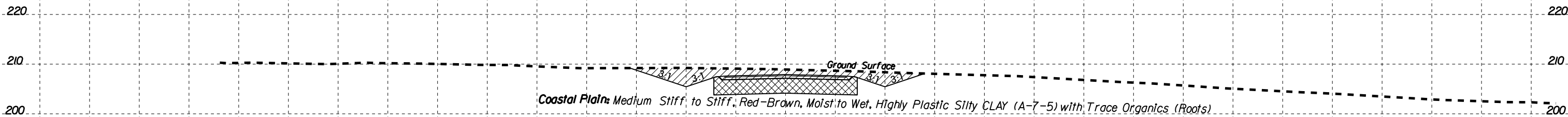
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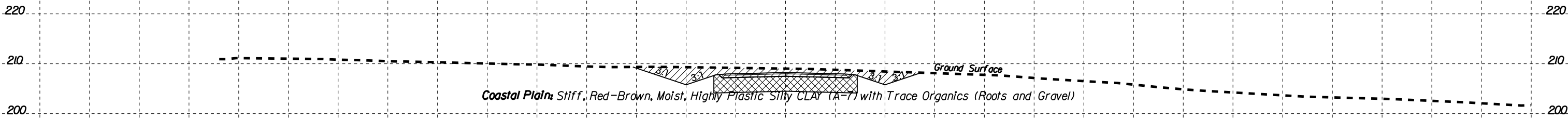


PROJ. REFERENCE NO.
W-5600

SHEET NO.
7



15+10.00



15+00.00

-SR4-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

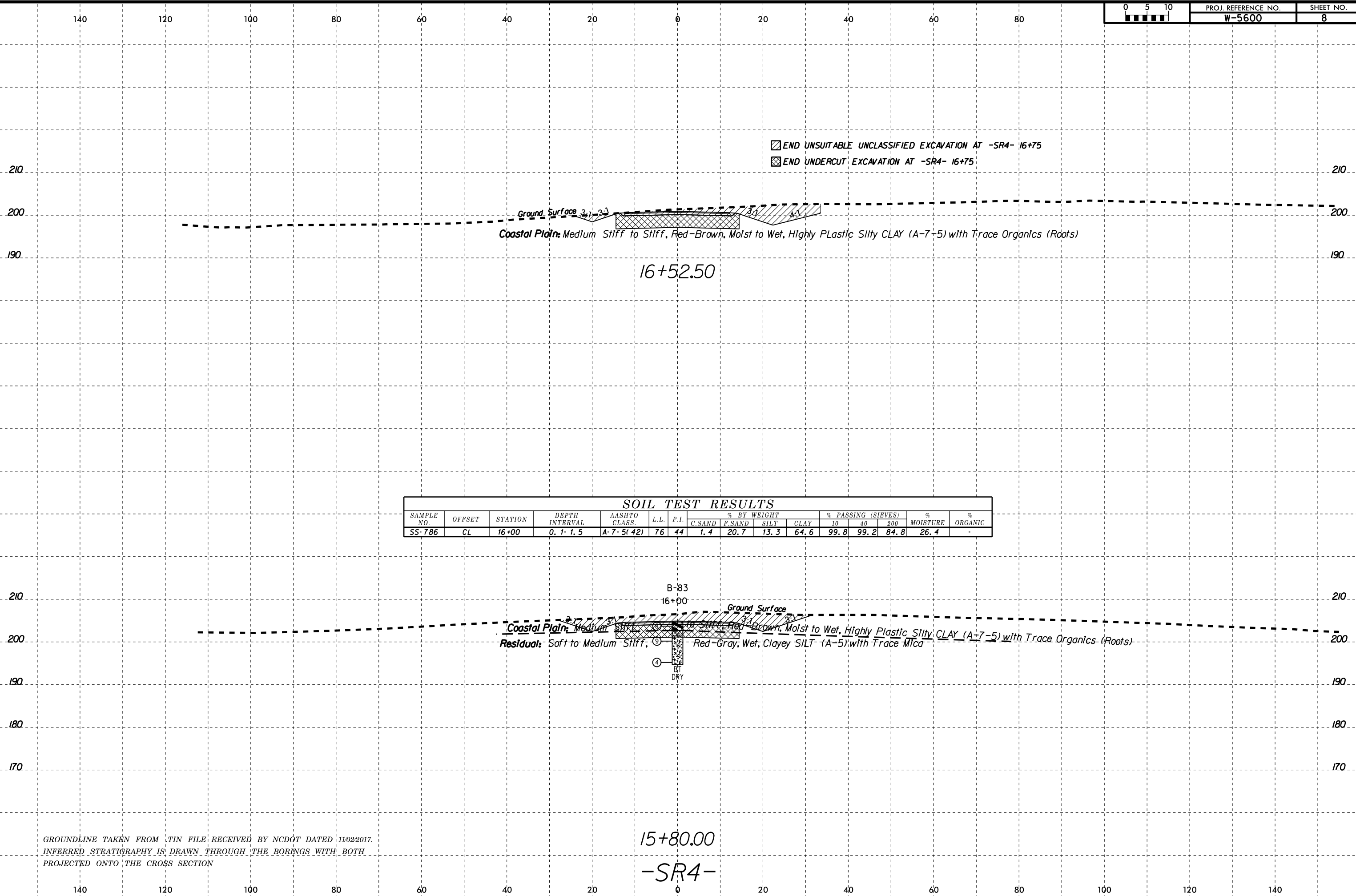
80



100

120

140

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 END UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR4- 16+75
 END UNDERCUT EXCAVATION AT -SR4- 16+75

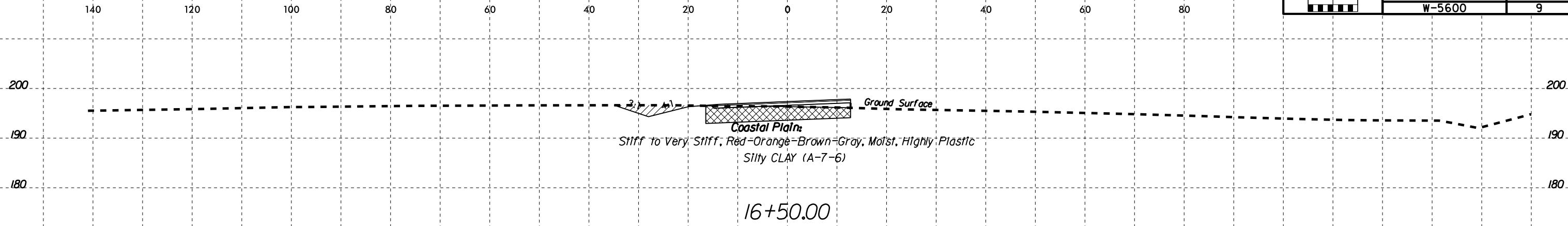
Ground Surface 3.1-3.3
 Coastal Plain: Medium Stiff to Stiff, Red-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-5) with Trace Organics (Roots)
 16+52.50

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-786	CL	16+00	0.1-1.5	A-7-5(42)	76	44	1.4	20.7	13.3	64.6	99.8	99.2	84.8	26.4	-

B-83
 16+00
 Ground Surface
 Coastal Plain: Medium Stiff to Stiff, Red-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-5) with Trace Organics (Roots)
 Residual: Soft to Medium Stiff, Red-Gray, Wet, Clayey SILT (A-5) with Trace Mica
 BT DRY

15+80.00
 -SR4-

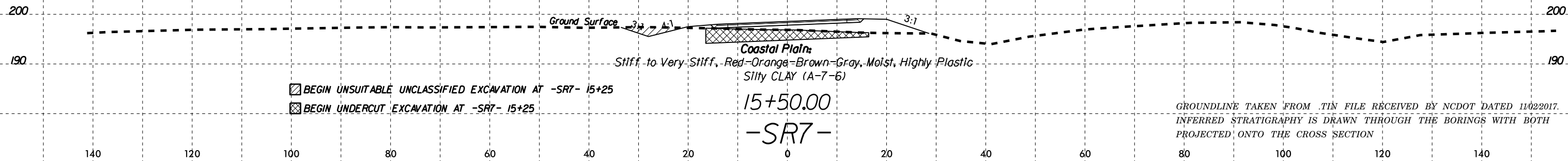
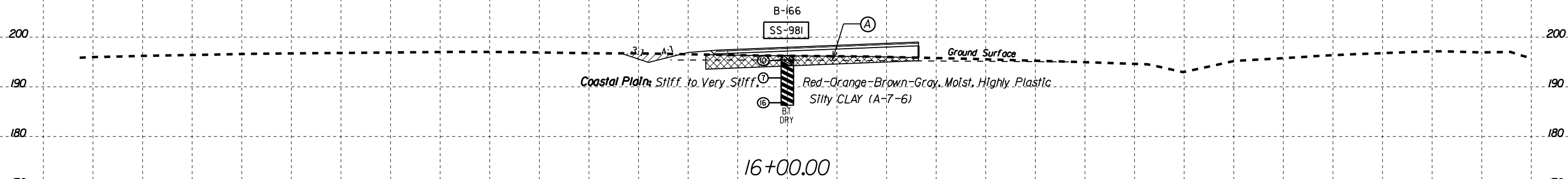
GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-981	CL	16+15	0.9-1.5	A-7-6(27)	63	34	12.0	17.9	8.6	61.5	99.9	93.5	73.5	19.1	-

Ⓐ Coastal Plain: Loose to Medium Dense, Brown, Moist, Silty Fine SAND (A-2-4) with Trace Organics (Roots)

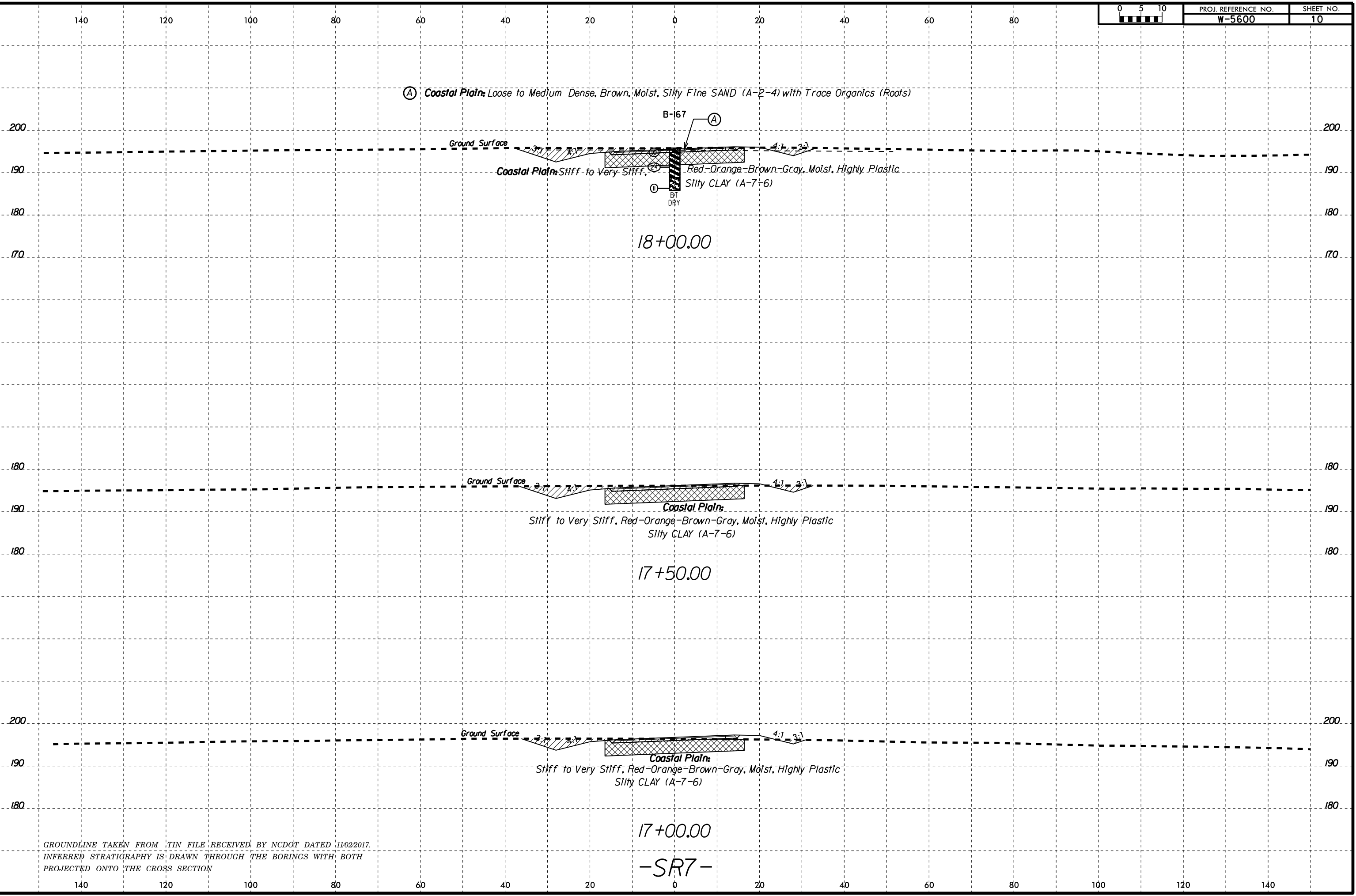


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INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.	SHEET NO.
W-5600	10



02-MAY-2019 12:01:66J-0197 WEI-W-5600 US 70 Johnston Co\CAADD_GEO\TECH\5600_geo_xsr_SR7.dgn

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

-SR7-

140

120

100

80

60

40

20

0

20

40

60

80

200

190

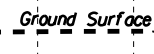
180

200

190

180

Ground Surface



Coastal Plain: Stiff to Very Stiff, Red-Orange-Brown-Gray, Moist, Highly Plastic Silty CLAY (A-7-6)

END UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR7- 18+75

END UNDERCUT EXCAVATION AT -SR7- 18+75

18+50.00

-SR7-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

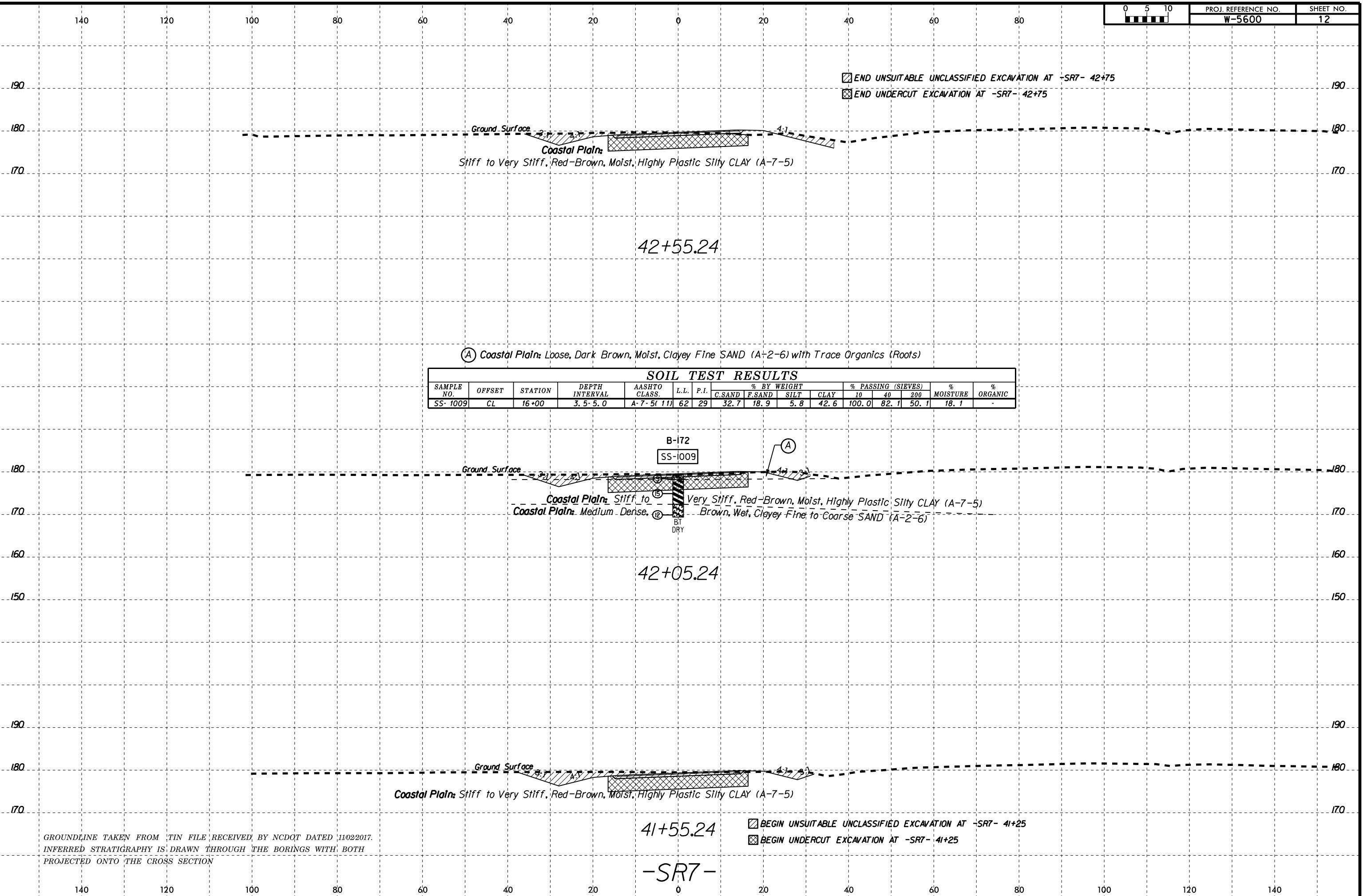
80

100

120

140

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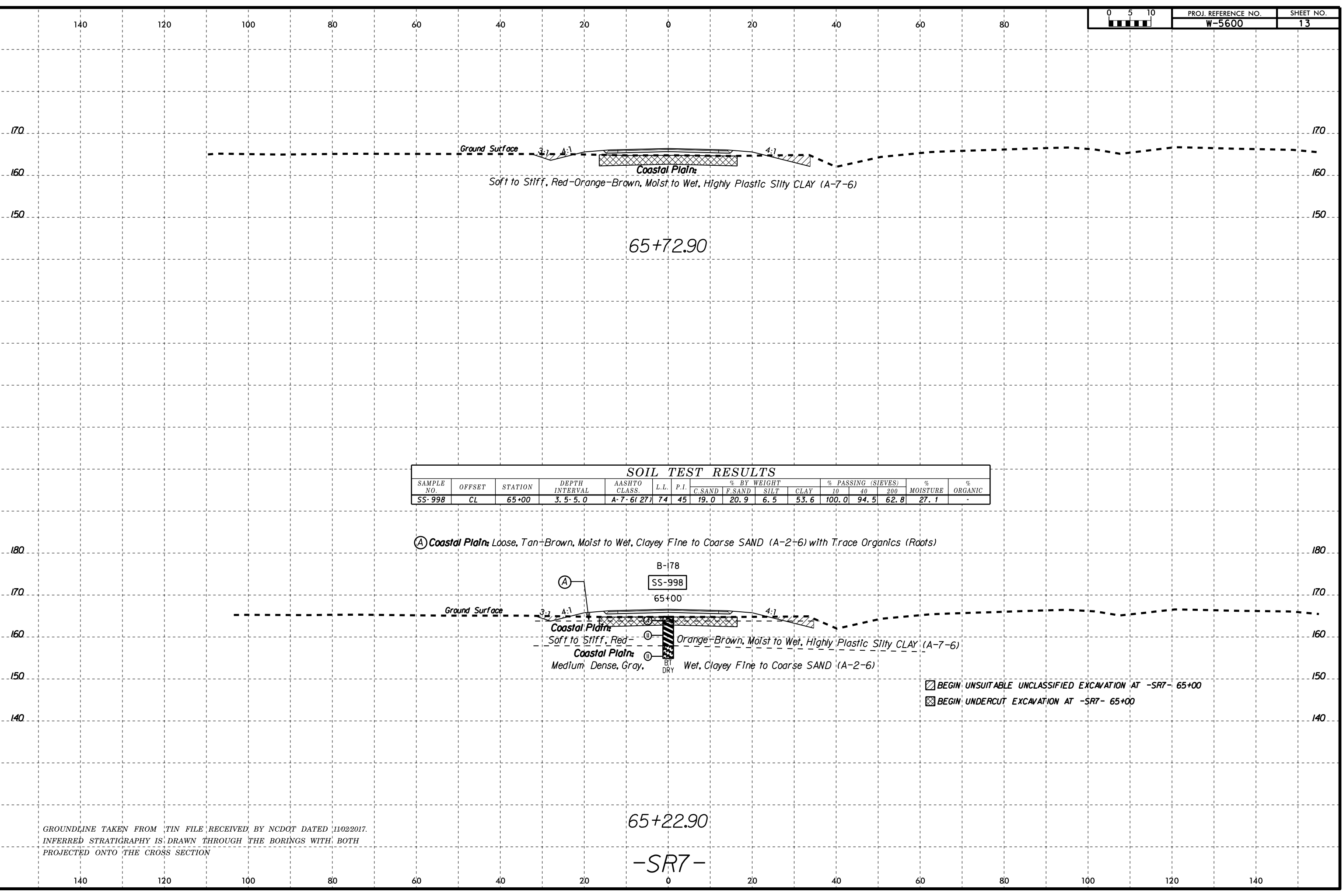
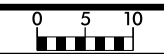
(A) Coastal Plain: Loose, Dark Brown, Moist, Clayey Fine SAND (A-2-6) with Trace Organics (Roots)

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1009	CL	16+00	3.5-5.0	A-7-5(11)	62	29	32.7	18.9	5.8	42.6	100.0	82.1	50.1	18.1	-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

41+55.24
-SR7-
 [Hatched] BEGIN UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR7- 41+25
 [Cross-hatched] BEGIN UNDERCUT EXCAVATION AT -SR7- 41+25

6/23/16
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Walker



SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-998	CL	65+00	3.5-5.0	A-7-6(27)	74	45	19.0	20.9	6.5	53.6	100.0	94.5	62.8	27.1	-

- BEGIN UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR7- 65+00
- BEGIN UNDERCUT EXCAVATION AT -SR7- 65+00

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

65+22.90
-SR7-

6/23/16

140

120

100

80

60

40

20

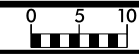
0

20

40

60

80



PROJ. REFERENCE NO.
W-5600

SHEET NO.
14

170

150

Ground Surface

3:1 4:1

Coastal Plain

Soft to Stiff, Red-Orange-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-6)

67+72.90

170

150

Ground Surface

3:1 4:1

Coastal Plain

Soft to Stiff, Red-Orange-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-6)

67+22.90

170

150

Ground Surface

3:1 4:1

Coastal Plain

Soft to Stiff, Red-Orange-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-6)

66+72.90

170

150

Ground Surface

3:1 4:1

Coastal Plain

Soft to Stiff, Red-Orange-Brown, Moist to Wet, Highly Plastic Silty CLAY (A-7-6)

66+22.90

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

-SR7-

140

120

100

80

60

40

20

0

20

40

60

80

100

120

140

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6/23/16

140

120

100

80

60

40

20

0

20

40

60

80



PROJ. REFERENCE NO. W-5600

SHEET NO. 15

170

160

150

170

160

150

Ground Surface 3:1 4:1
 Coastal Plain:
 Medium Stiff to Stiff, Orange-Dark Brown, Moist, Highly Plastic Silty CLAY (A-7)

69+22.90

170

160

150

170

160

150

Ground Surface 3:1 4:1
 Coastal Plain:
 Medium Stiff to Stiff, Orange-Dark Brown, Moist, Highly Plastic Silty CLAY (A-7)

68+72.90

(A) Coastal Plain: Loose, Dark Brown, Wet, Clayey Fine SAND (A-2-6) with Trace Organics (Roots)

180

170

160

150

180

170

160

150

Ground Surface 3:1 4:1
 Coastal Plain:
 Medium Stiff to Stiff, Orange-Dark Brown, Moist, Highly Plastic Silty CLAY (A-7)
 Coastal Plain:
 Loose, Gray, Wet, Clayey Fine to Coarse SAND (A-2-6)

B-179

68+22.90

-SR7-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

80

100

120

140

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6/23/16

140

120

100

80

60

40

20

0

20

40

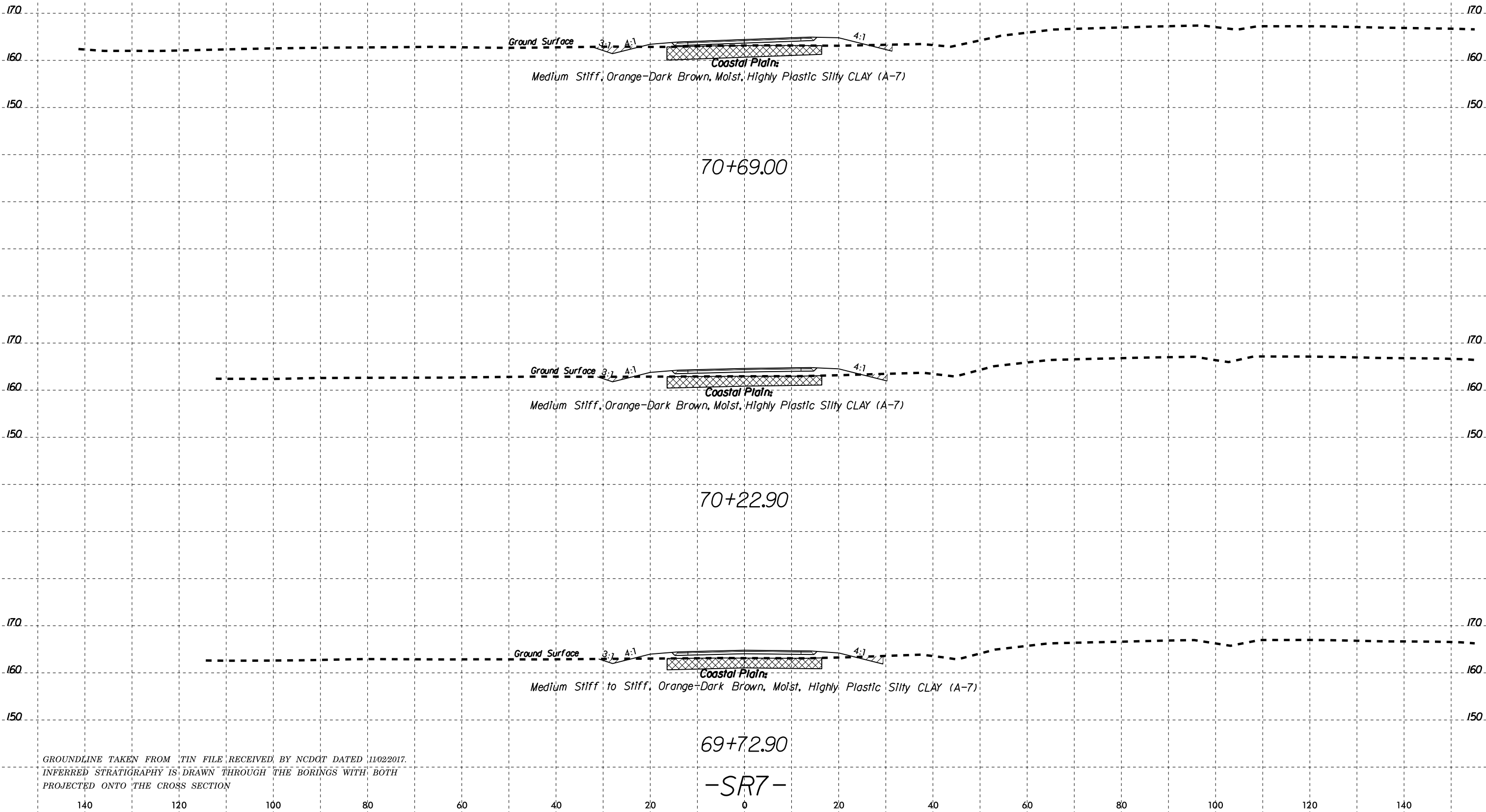
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80



PROJ. REFERENCE NO.
W-5600

SHEET NO.
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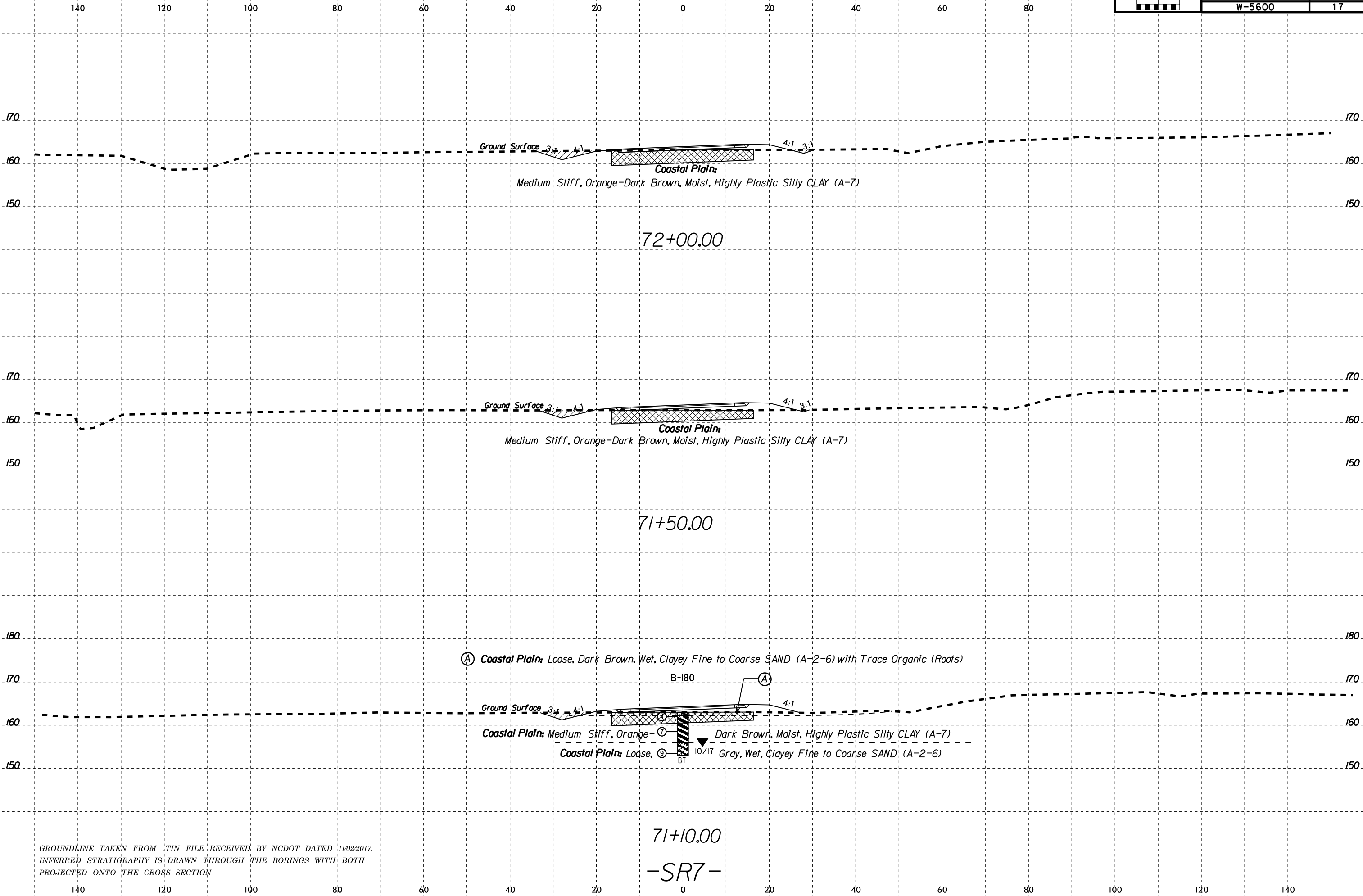


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GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

69+72.90
-SR7-

6/23/16



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

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 Walker

6/23/16



PROJ. REFERENCE NO.
W-5600

SHEET NO.
18

140

120

100

80

60

40

20

0

20

40

60

80

180

170

160

150

140

180

170

160

150

140

- END UNSUITABLE UNCLASSIFIED EXCAVATION AT -SR7- 72+75
- END UNDERCUT EXCAVATION AT -SR7- 72+75

4:1

4:1

Ground Surface

Coastal Plains

Medium Stiff, Orange-Dark Brown, Moist, Highly Plastic Silty CLAY (A-7)

72+50.00

-SR7-

140

120

100

80

60

40

20

0

20

40

60

80

100

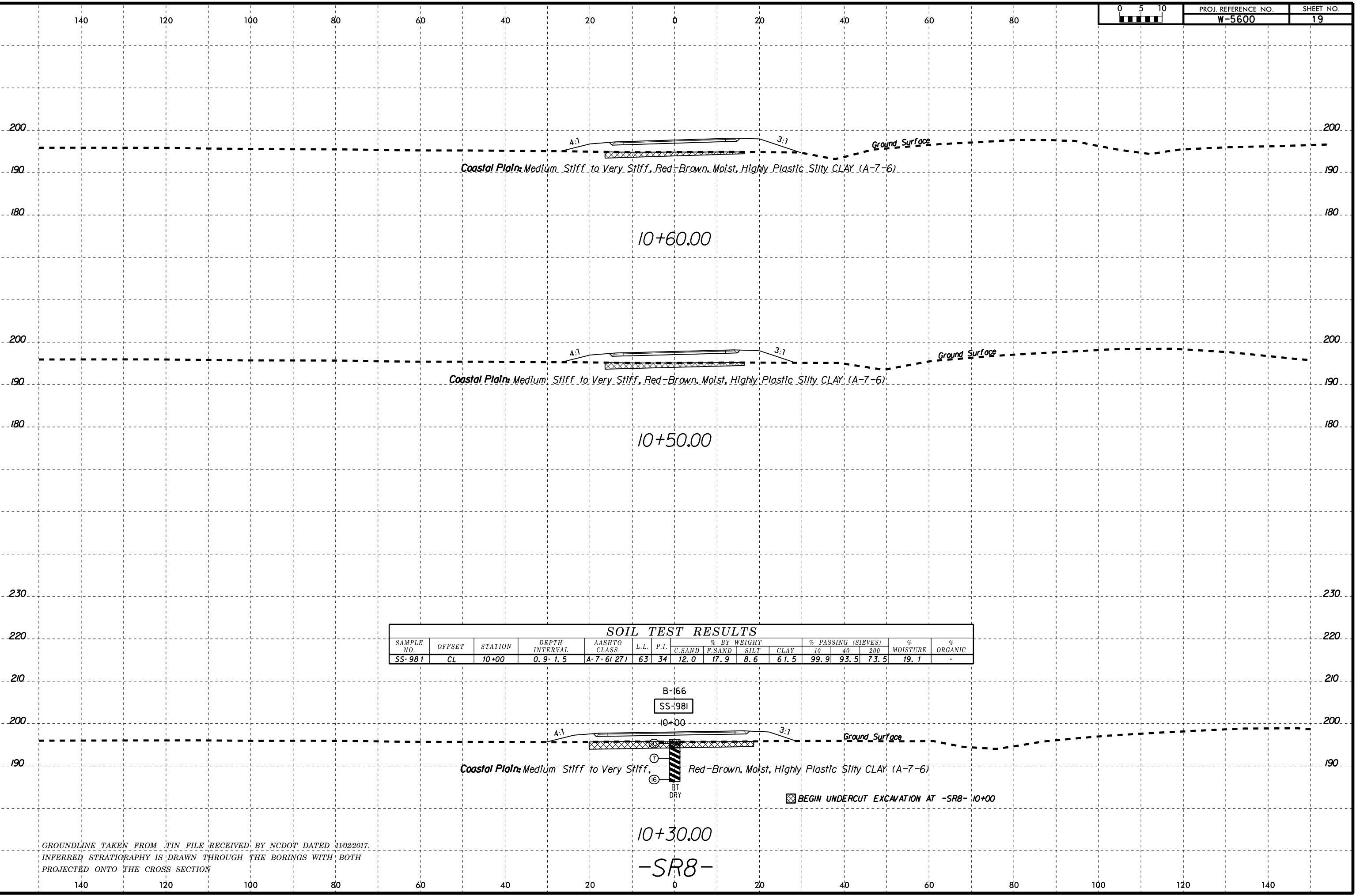
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140

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INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

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 Walker-A 66026102



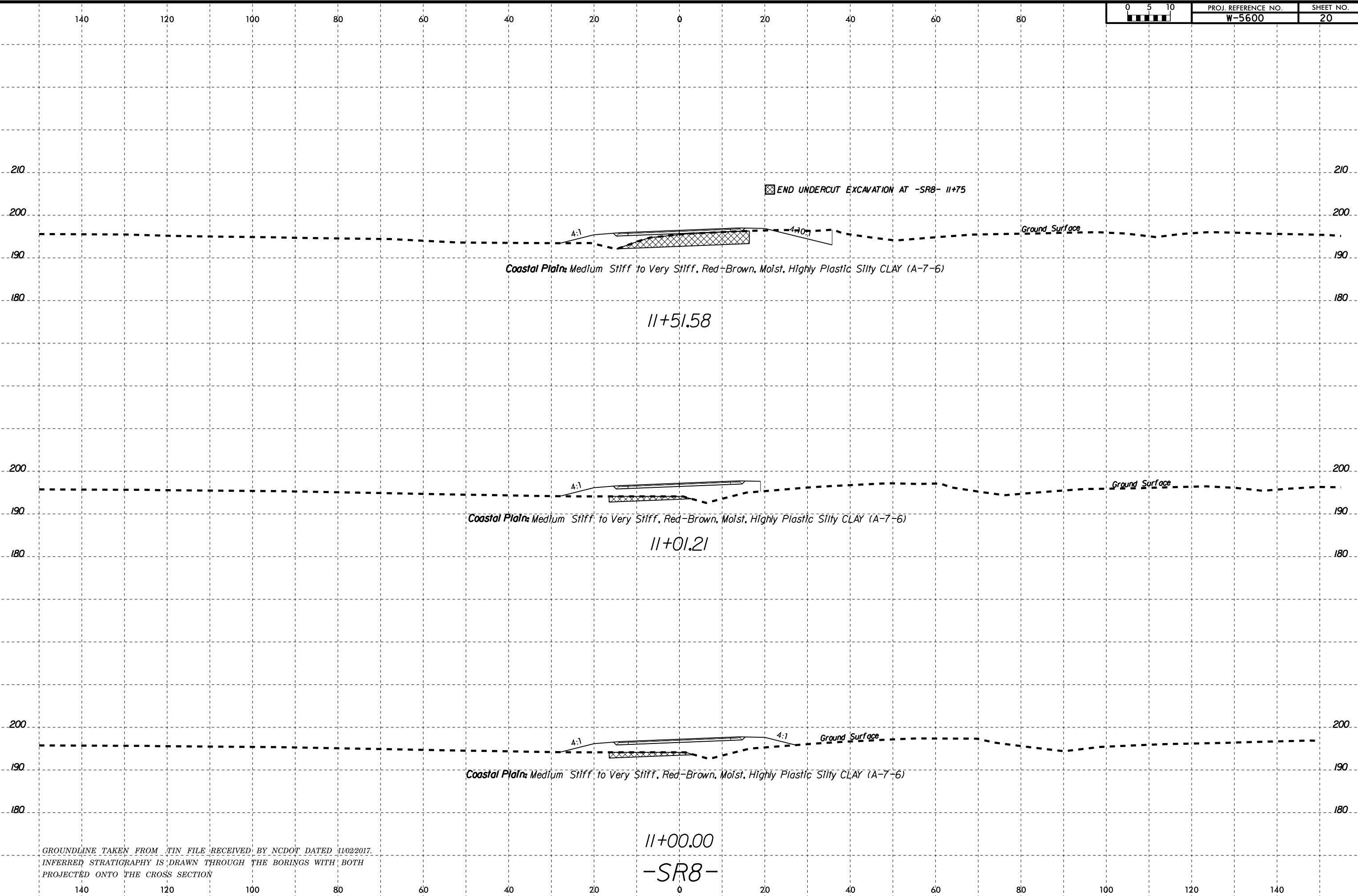
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							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-981	CL	10+00	0.9- 1.5	A-7-6(27)	63	34	12.0	17.9	8.6	61.5	99.9	93.5	73.5	19.1	-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.	SHEET NO.
W-5600	20

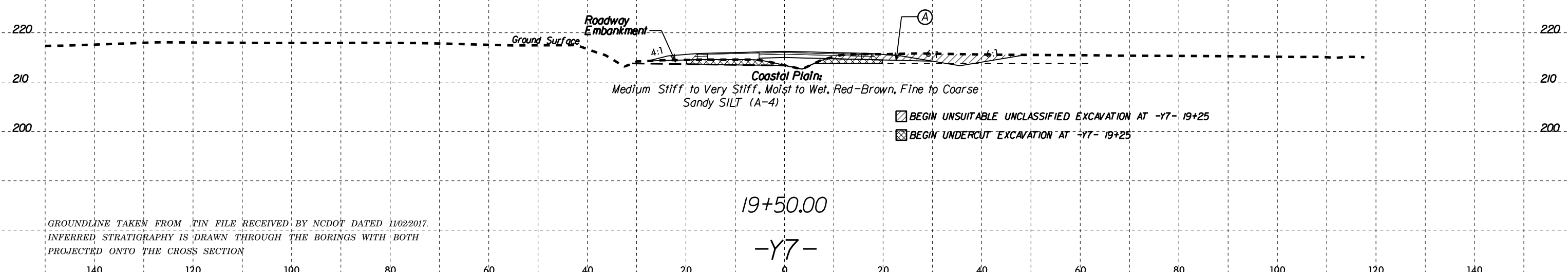
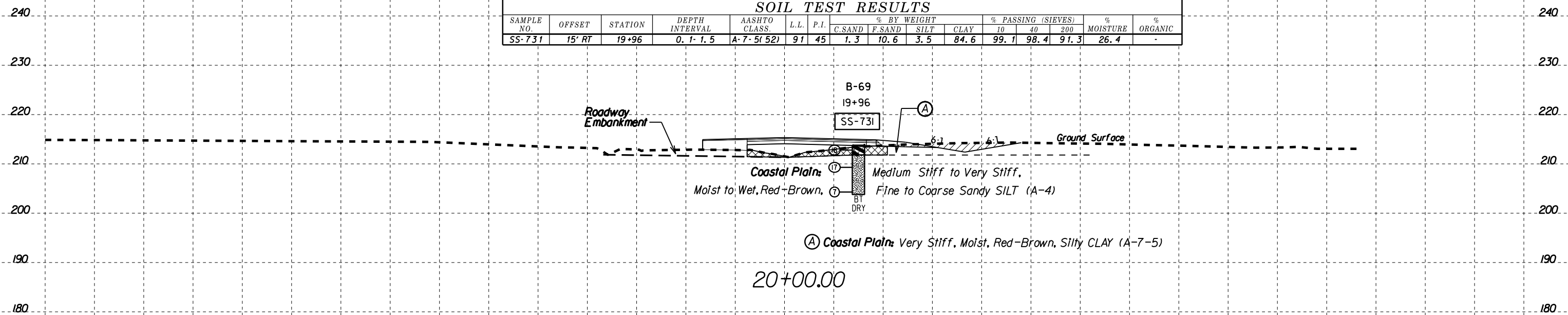


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Walker A 660261102

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

11+00.00
-SR8-

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
							SS-731	15' RT	19+96	0.1- 1.5	A-7-5(52)	91	45		



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

6/23/16



PROJ. REFERENCE NO.
W-5600

SHEET NO.
22

140

120

100

80

60

40

20

0

20

40

60

80

220

210

200

190

220

210

200

190

6:1

6:1

Ground Surface

Coastal Plain:

Medium Stiff to Very Stiff, Moist to Wet, Red-Brown, Fine to Coarse Sandy SILT (A-4)

END UNSUITABLE UNCLASSIFIED EXCAVATION AT -Y7- 20+75

END UNDERCUT EXCAVATION AT -Y7- 20+75

21+00.00

220

210

200

220

210

200

Roadway Embankment

(A) Coastal Plain: Very Stiff, Moist, Red-Brown, Silty CLAY (A-7-5)

Coastal Plain:

Medium Stiff to Very Stiff, Moist to Wet, Red-Brown, Fine to Coarse Sandy SILT (A-4)

(A)

6:1

Ground Surface

20+50.00

-Y7-

GROUNDLINE TAKEN FROM .TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

80

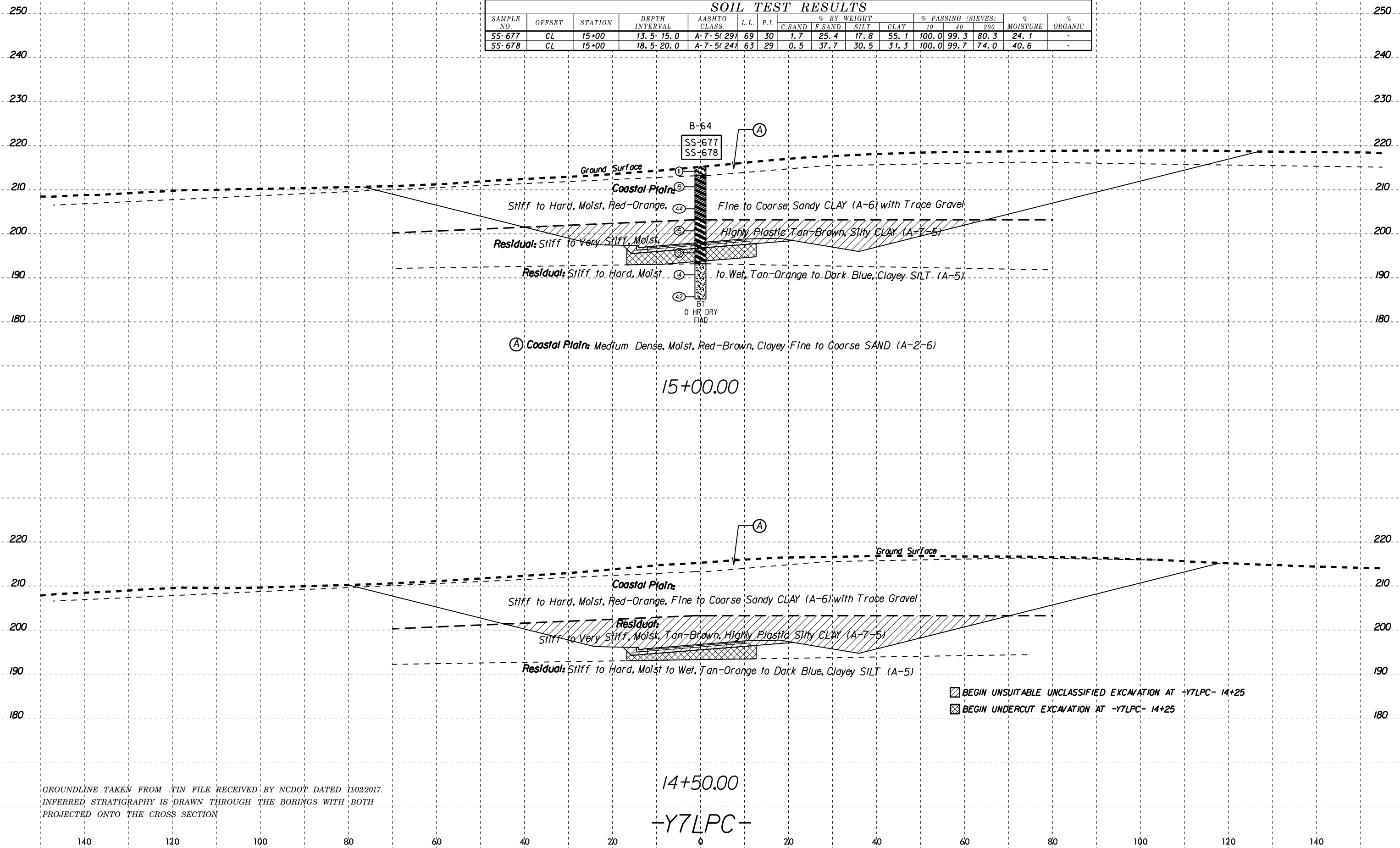
100

120

140

02-MAY-2019 12:02
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Walker-A 660261102

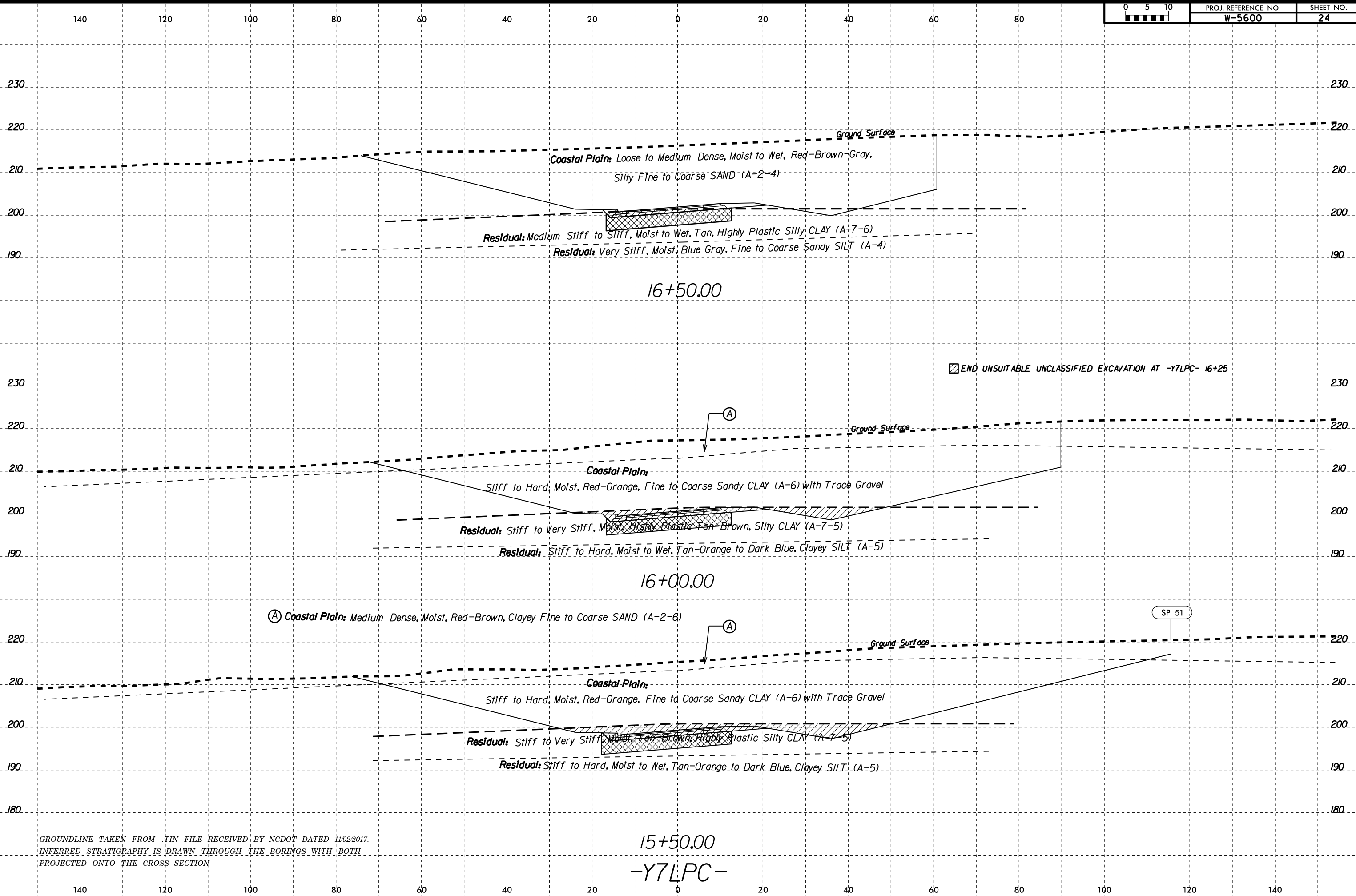
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							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-677	CL	15+00	13.5-15.0	A-7-5(29)	69	30	1.7	25.4	17.8	55.1	100.0	99.3	80.3	24.1	-
SS-678	CL	15+00	18.5-20.0	A-7-5(24)	63	29	0.5	37.7	30.5	31.3	100.0	99.7	74.0	40.6	-



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

02-MAY-2019 12:02
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 T.Walker
 660261102

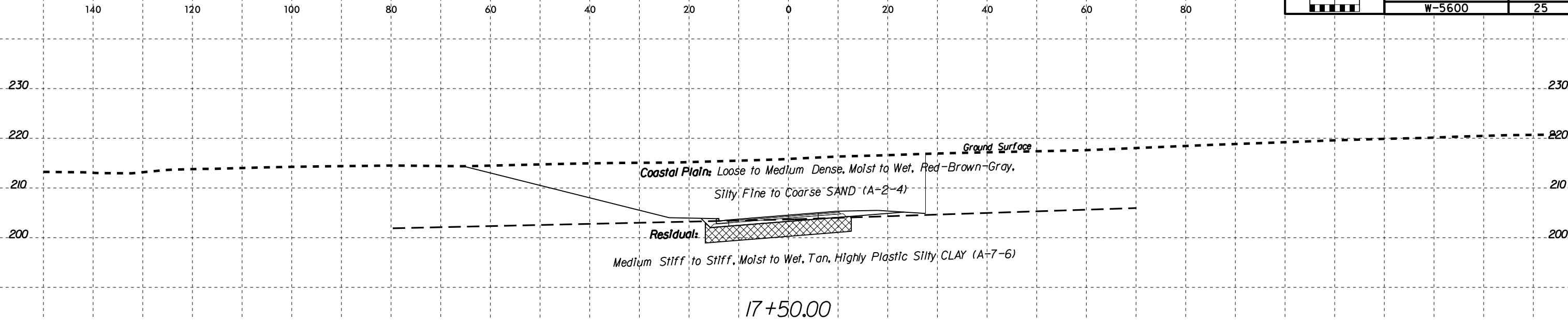
6/23/16



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
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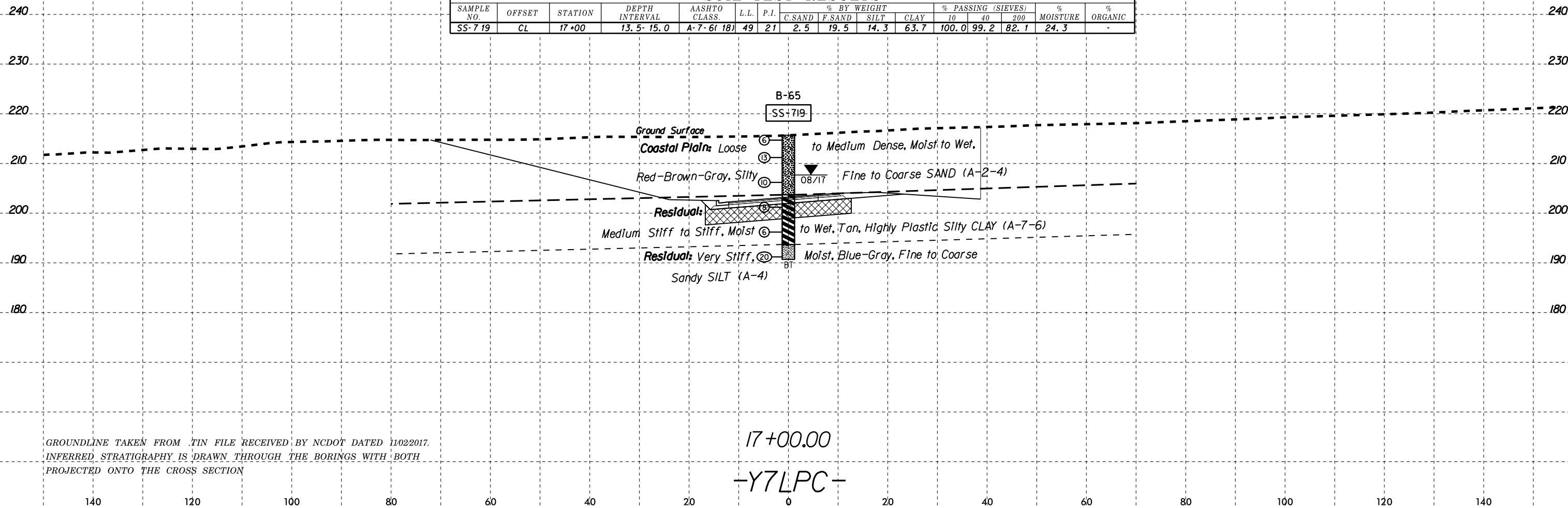
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 Walker

6/23/16



SOIL TEST RESULTS

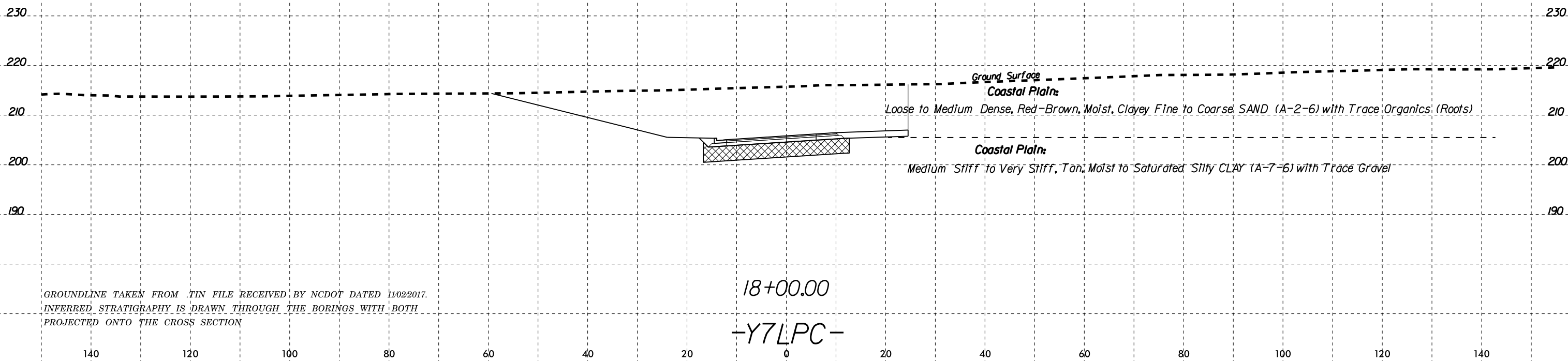
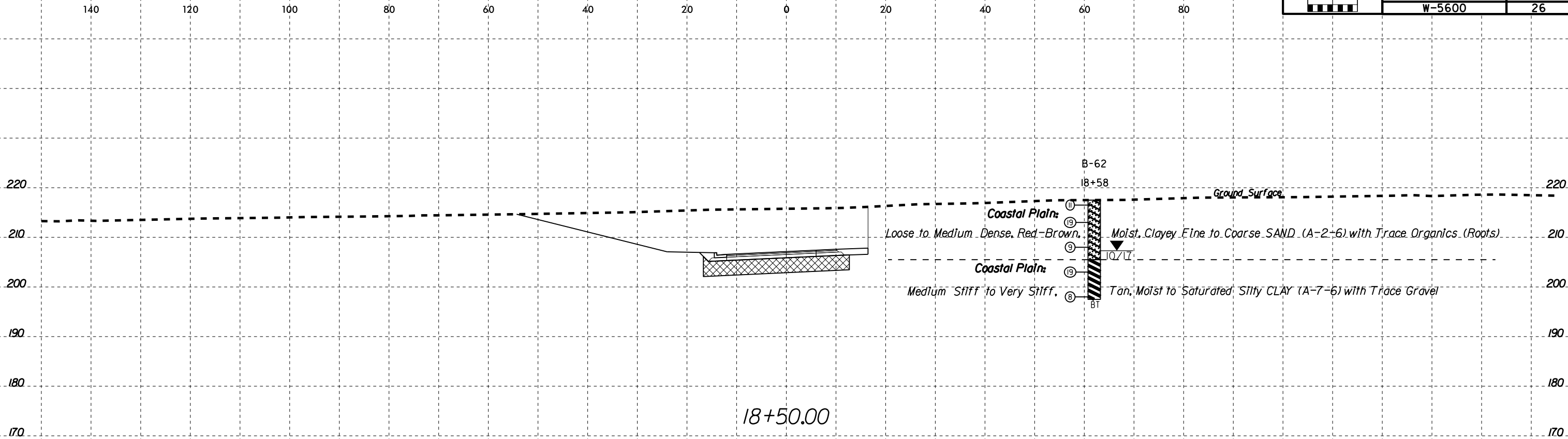
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							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-719	CL	17+00	13.5-15.0	A-7-6(18)	49	21	2.5	19.5	14.3	63.7	100.0	99.2	82.1	24.3	-



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

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 TWalker-A 660261102

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GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

-Y7LPC-

02-MAY-2019 12:02
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Walker

6/23/16



PROJ. REFERENCE NO.
W-5600

SHEET NO.
27

140

120

100

80

60

40

20

0

20

40

60

80

220

210

200

190

220

210

200

190

Ground Surface

END UNDERCUT EXCAVATION AT -Y7LPC- 19+25

Coastal Plain:

Loose to Medium Dense, Red-Brown, Moist, Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots)

Coastal Plain:

Medium Stiff to Very Stiff, Tan, Moist to Saturated Silty CLAY (A-7-6) with Trace Gravel

19+00.00
-Y7LPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

140

120

100

80

60

40

20

0

20

40

60

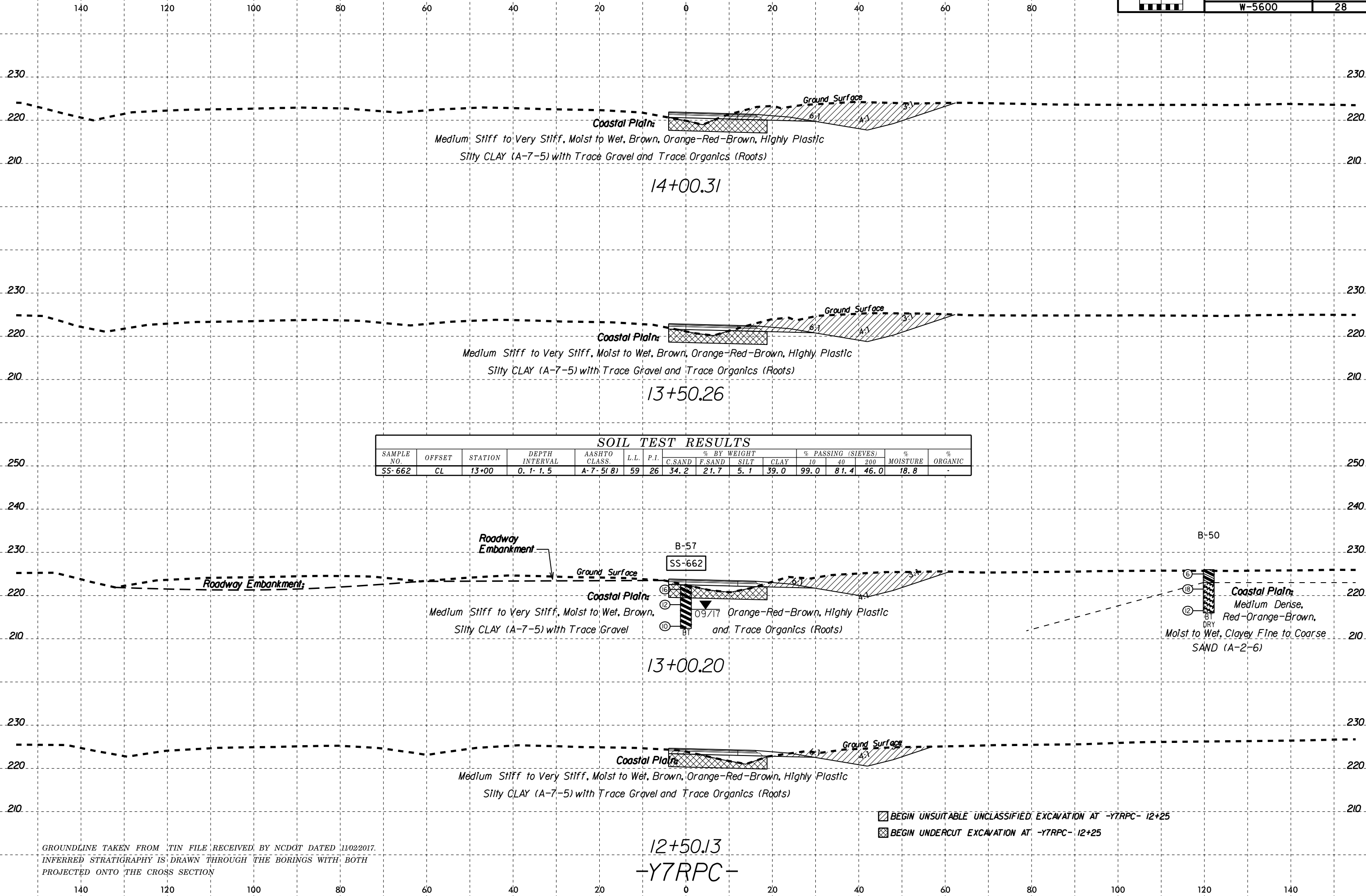
80

100

120

140

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Walker-A 66026102



SOIL TEST RESULTS

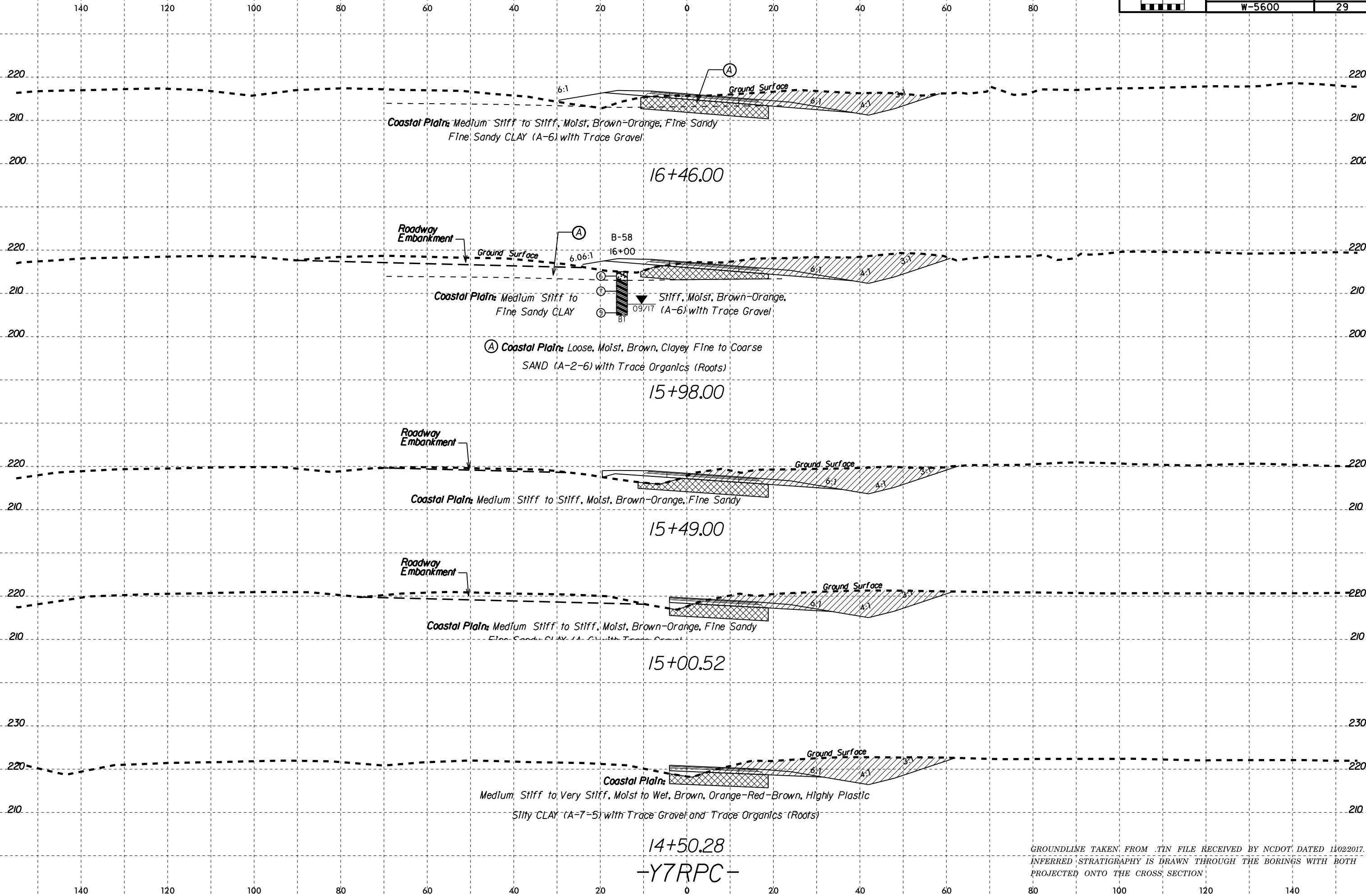
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							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-662	CL	13+00	0.1-1.5	A-7-5(8)	59	26	34.2	21.7	5.1	39.0	99.0	81.4	46.0	18.8	-

02-MAY-2019 12:03
 E:\Projects\660\660-0197 WEI-W-5600 US 70 Johnston Co\CADD_GEO\TECH\XSEC\5600_geo_xsr_1\07-RPC.dgn
 T.Walker

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

[Hatched Pattern] BEGIN UNSUITABLE UNCLASSIFIED EXCAVATION AT -Y7RPC- 12+25
 [Cross-hatched Pattern] BEGIN UNDERCUT EXCAVATION AT -Y7RPC- 12+25

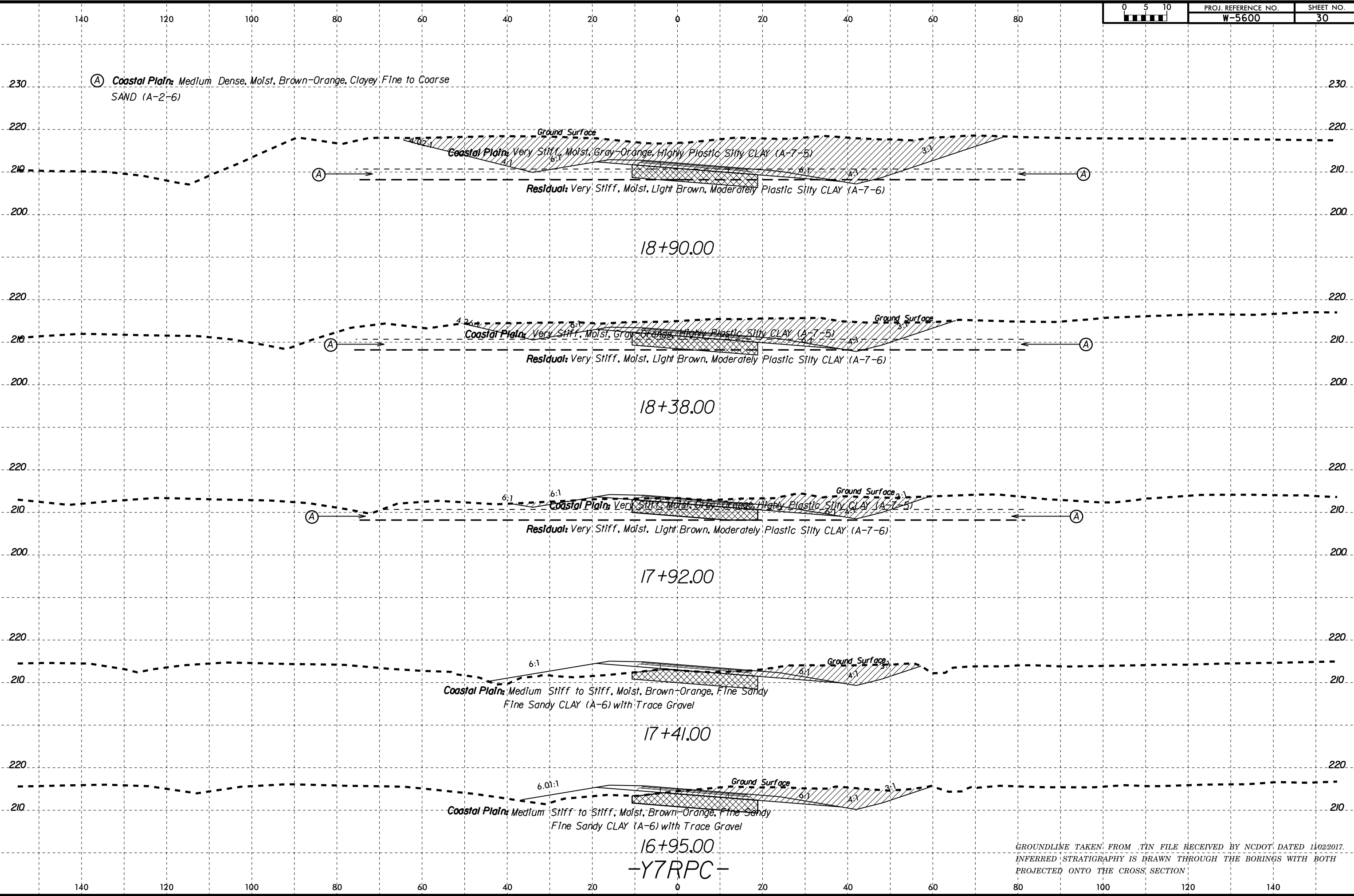
6/23/16



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Walker-A 66026102

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

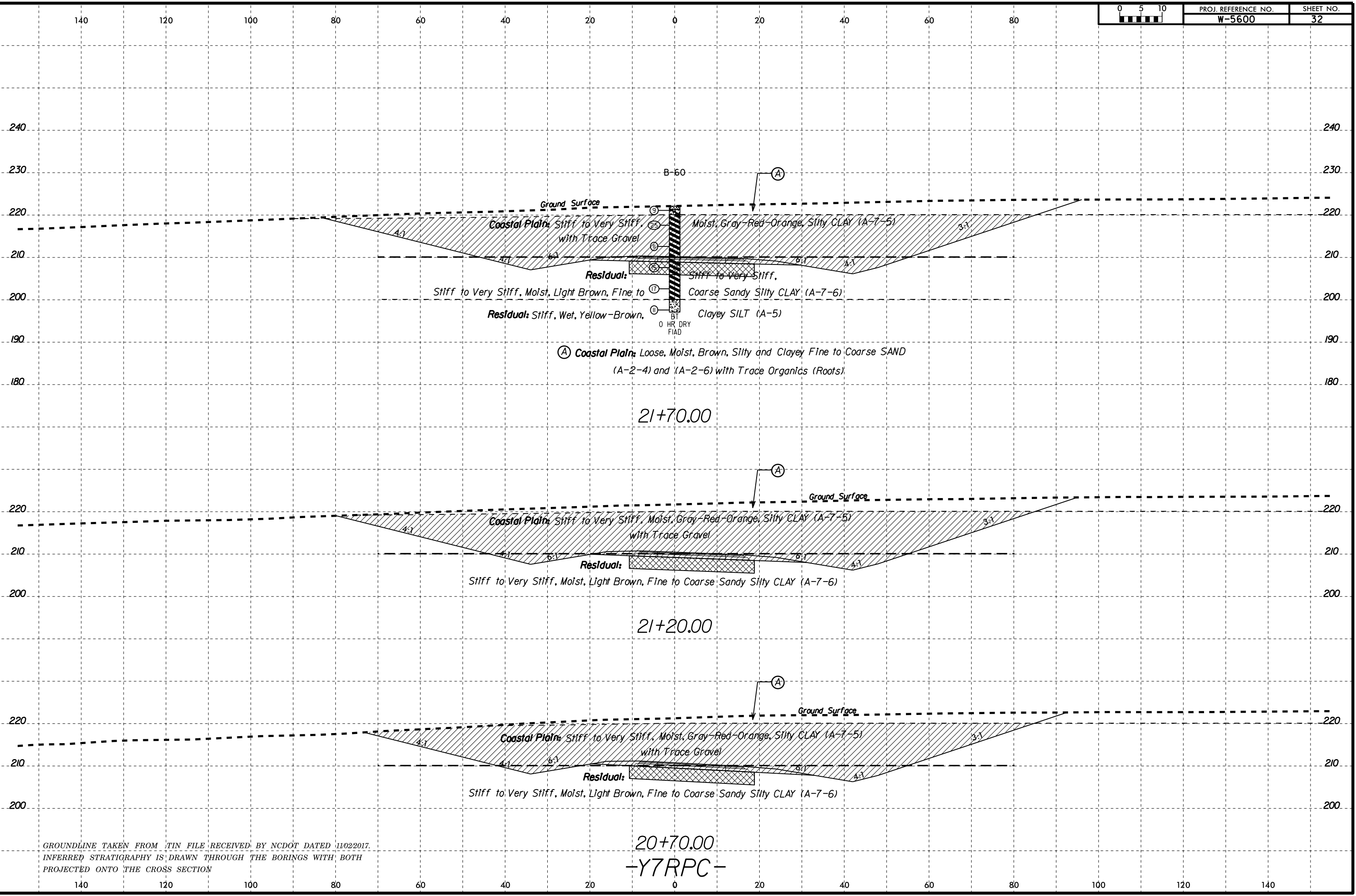
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Walker



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

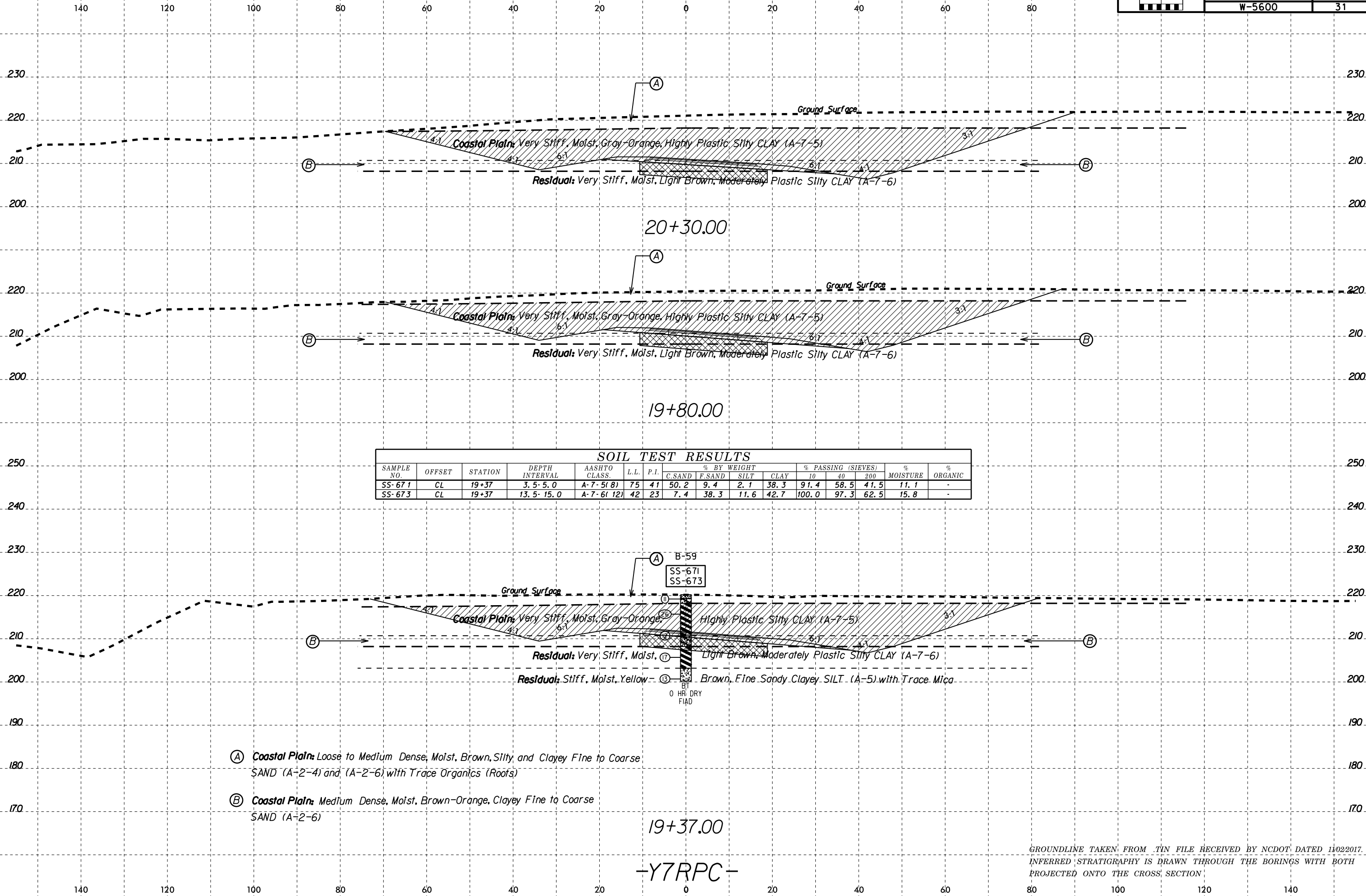
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02-MAY-2019 12:02
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Walker-A 660261102



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION

20+70.00
-Y7RPC-

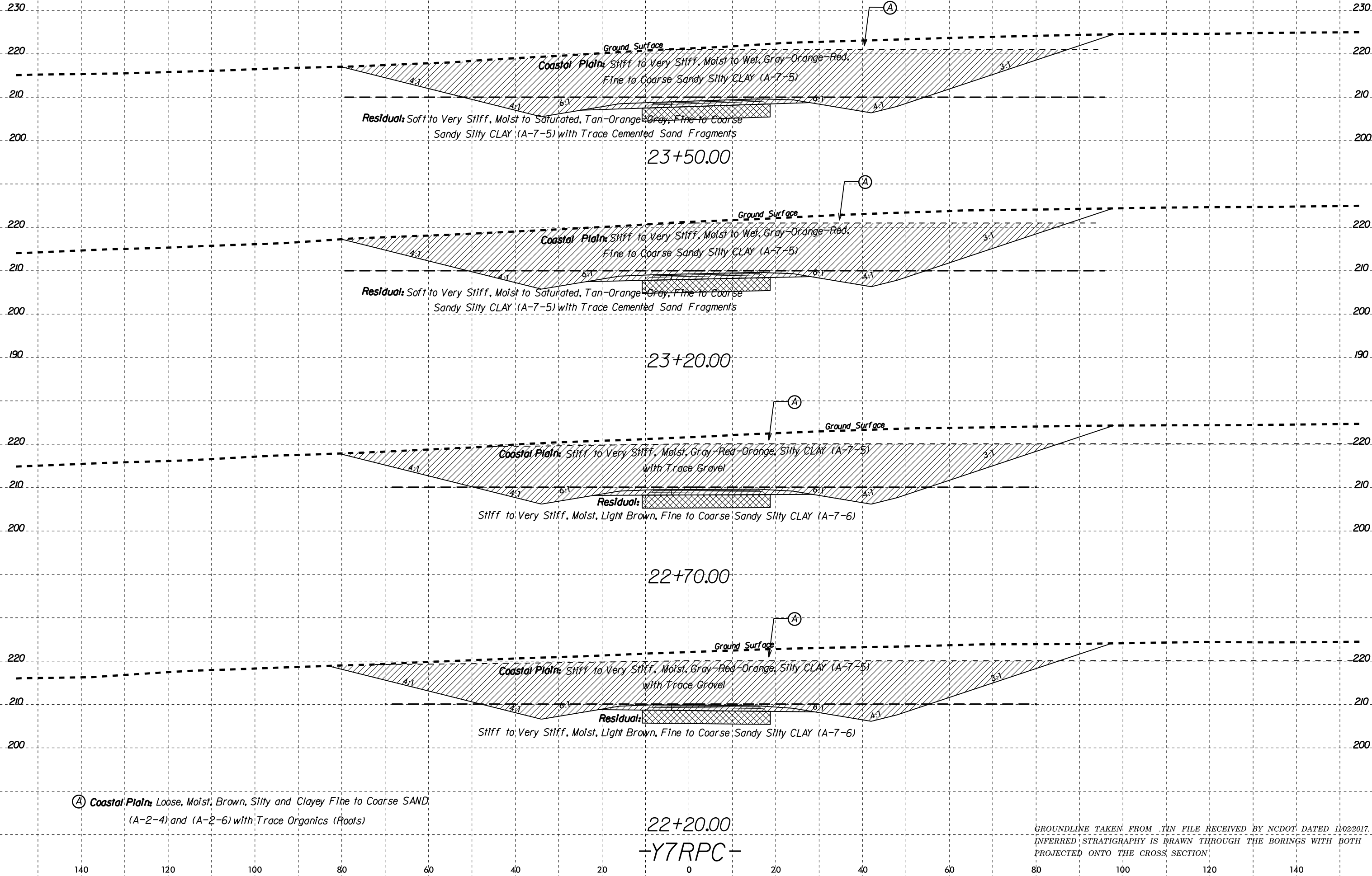


- Ⓐ Coastal Plain: Loose to Medium Dense, Moist, Brown, Silty, and Clayey Fine to Coarse SAND (A-2-4) and (A-2-6) with Trace Organics (Roots)
- Ⓑ Coastal Plain: Medium Dense, Moist, Brown-Orange, Clayey Fine to Coarse SAND (A-2-6)

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

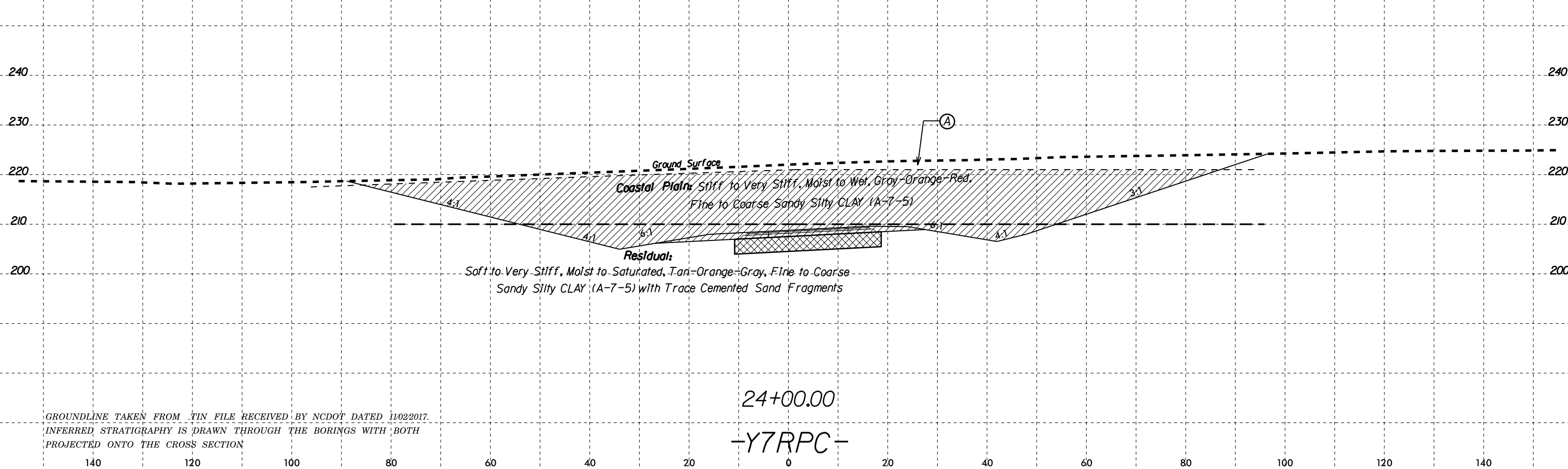
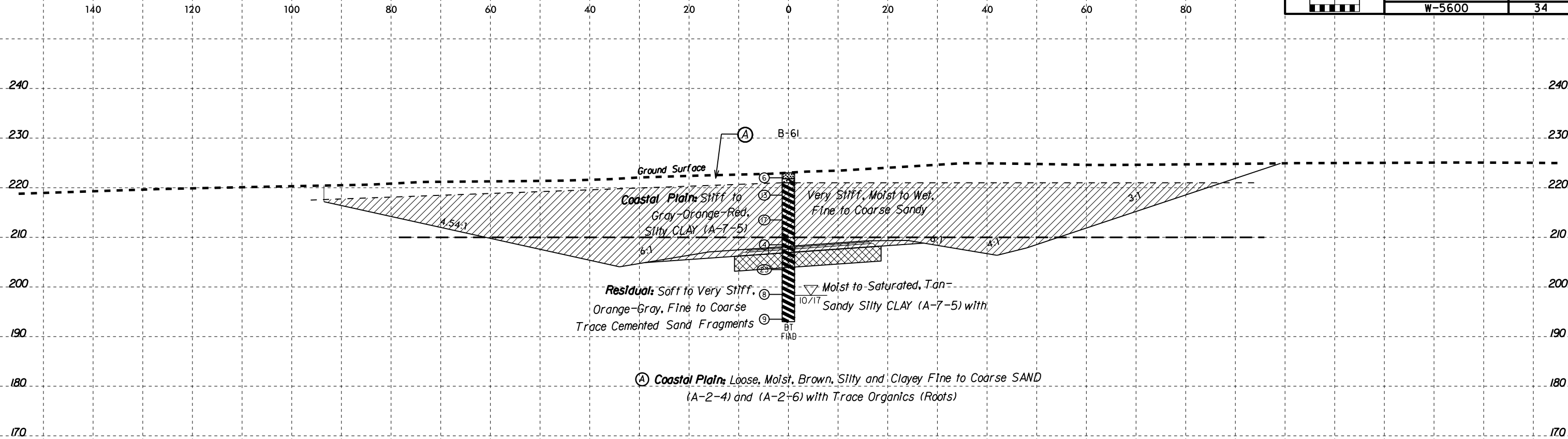
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6/23/16



02-MAY-2019 12:03
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 Walker

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION



GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS SECTION

-Y7RPC-



Ⓐ Coastal Plain: Loose, Moist, Brown, Silty and Clayey Fine to Coarse SAND (A-2-4) and (A-2-6) with Trace Organics (Roots)

▨ END UNSUITABLE UNCLASSIFIED EXCAVATION AT -Y7RPC- 26+00
▩ END UNDERCUT EXCAVATION AT -Y7RPC- 26+00

230
220
210
200

230
220
210
200

02-MAY-2019 12:03
F:\Projects\660\660-0197 WEI-W-5600 US 70 Johnston Co\CADD_GEO\TECH\asc\w5600_geo_xsr_1\07-RPC.dgn
Walker-A 660261102

Coastal Plain: Stiff to Very Stiff, Moist to Wet, Gray-Orange-Red, Fine to Coarse Sandy Silty CLAY (A-7-5)
Residual: Soft to Very Stiff, Moist to Saturated, Tan-Orange-Gray, Fine to Coarse Sandy Silty CLAY (A-7-5) with Trace Cemented Sand Fragments

Ground Surface

4:1

6:1

8:1

4:1

3:1

25+80.00
-Y7RPC-

GROUNDLINE TAKEN FROM TIN FILE RECEIVED BY NCDOT DATED 11/02/2017.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH
PROJECTED ONTO THE CROSS SECTION



FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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Raleigh, North Carolina 27603-2302
T 919.828.3441 | F 919.828.5751
NC Engineering License # F-0266

June 25, 2019

WBS Element No.: 50056.1.1
TIP No.: W-5600
Federal Aid No.: HISP-0070(163)
County: Johnston
Description: US-70 Improvements from US 70 Business to the Neuse River Bridge

SUBJECT: Geotechnical Report – Recommendations

Froehling & Robertson, Inc. has completed the subsurface investigation of the above referenced project based on plans dated 11/2/17 and submits the following recommendations.

(I) Slope/Embankment Stability

A) Slope Design

Slope Recommendations were previously submitted by F&R per “Geotechnical Slope Recommendations” report dated March 5, 2019 and approved by NCDOT on March 6, 2019. Per this previously-submitted report, it was typically recommended that cut and fill slopes be constructed at a ratio of 3:1 (H:V) or flatter with the exception of the areas from -L- station 158+50 to 167+50, -Y7- station 25+00 to 29+00, and -Y7- 28+00 to 29+50, where 1.5:1 slopes with Rock Plating slope protection are proposed. The estimated total area of Rock Plating is 4,400 square yards.

B) Undercut for Embankment Stability

We recommend a contingency item of 2,000 cubic yards be included in the contract to be used at the discretion of the Engineer.

C) Geotextile for Soil Stabilization

We recommend a contingency item of 2,000 square yards be included in the contract to be used at the discretion of the Engineer.



(II) Subgrade Stability

A) Subsurface Drainage – Underdrain

Groundwater is present within 6 feet of proposed subgrade at the following areas hence Pipe Underdrain, per Roadway Standard Drawing 815.03, is recommended. The estimated quantity for Pipe Underdrains is approximately 11,000 linear feet which includes additional footage for estimated outfalls.

<u>Alignment</u>	<u>Station (±)</u>
-SR1-	51+50 to 52+50
-SR2-	81+50 to 85+50, right
-SR2-	92+00 to 93+50
-Y7LPC-	12+00 to 19+00
-Y7RPC-	10+00 to 31+77.21
-Y9-	22+50 to 23+50, left
-Y9RPC-	23+50 to 24+50

We also recommend a contingency item of 1,000 linear feet of Subsurface Drain, per Roadway Standard Drawing 815.02, to be used at the discretion of the Engineer.

We also recommend a contingency item of 1,000 linear feet of Pipe Underdrains, per Roadway Standard Drawing 815.03, to be used at the discretion of the Engineer.

B) Grade Point Undercut

We recommend a contingency item of 250 cubic yards of Undercut Excavation be included in the contract to be used at the discretion of the Engineer.

C) Undercut for Subgrade Stability

Soft, wet, and highly plastic soils were encountered at the ground surface at the following areas and have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-SR4-	13+25 to 16+75
-SR7-	15+25 to 18+75
-SR7-	41+25 to 42+75
-SR7-	65+00 to 72+75



-SR8-	10+00 to 11+75
-Y7-	19+25 to 20+75
-Y7LPC-	14+25 to 19+25
-Y7RPC-	12+25 to 26+00

F&R recommends undercutting these areas a minimum of 3 feet below proposed subgrade, placing a geotextile for soil stabilization onto the resulting excavation, and backfilling with Class II or III select granular material. The estimated quantity of Undercut for Subgrade Stability is approximately 11,200 cubic yards. See section II-E for the estimated quantity of Geotextile for Soil stabilization and section III-C for the estimated quantity of Select Granular Materials.

We also recommend a contingency item of 1,000 cubic yards be included in the contract to be used at the discretion of the Engineer.

D) Aggregate Subgrade

Highly plastic soils were encountered at the ground surface at the following area and have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-SR2-	84+50 to 85+75

Due to traffic control concerns in this area, F&R recommends undercutting this area a maximum of 1 foot below proposed subgrade, placing a geotextile for soil stabilization onto the resulting excavation, and backfilling with Class IV select granular material. The estimated quantity of Shallow Undercut is approximately 150 cubic yards.

The estimated quantity of Class IV Select Material (Subgrade Stabilization) is approximately 300 tons.

The estimated quantity of Geotextile for Soil Stabilization is approximately 450 square yards.

We also recommend a contingency item of 1,000 cubic yards of Shallow Undercut be included in the contract to be used at the discretion of the Engineer.

We recommend a contingency item of 2,000 tons of Class IV Select Material (Subgrade Stabilization) be included in the contract to be used at the discretion of the Engineer.



We recommend a contingency item of 3,000 square yards of Geotextile for Soil Stabilization be included in the contract to be used at the discretion of the Engineer.

E) Geotextile for Soil Stabilization

The estimated quantity of Geotextile for Soil Stabilization is approximately 11,200 square yards due to undercut for subgrade stability. See section II-C for complete recommendations.

We recommend a contingency item of 5,000 square yards be included in the contract to be used at the discretion of the Engineer.

(III) Borrow Specifications

A) Borrow Criteria

Common borrow for embankment construction to subgrade shall meet Coastal Plain Borrow Criteria outlined in the Standard Specifications, Article 1018-2 (B).

B) Shrinkage Factor

We recommend a 25% soil Shrinkage Factor be used in Johnston County for earthwork calculations.

C) Select Granular Material

The estimated quantity of Select Granular Material is 11,200 cubic yards. The select granular material should meet the criteria outlined in the Standard Specifications, Article 1016-3, Class II or III. The select material should be placed to a height of three (3) feet above the geotextile-for-soil-stabilization or water level, whichever is greater. Above the select granular material, common borrow may be used. See section II-C for complete recommendations.

We also recommend a contingency item of 7,000 cubic yards of Select Granular Material meeting the criteria outlined in the Standard Specifications, Article 1016-3, Class II or Class III.



(IV) Miscellaneous

A) Reduction of Unclassified Excavation – Clearing and Grubbing

A loss of 2,000 cubic yards is estimated on the project due to Clearing and Grubbing of cut sections.

B) Reduction of Unclassified Excavation - Unsuitable Unclassified Excavation

The following areas of unclassified excavation contain soils with a Plasticity Index more than 20 and are not to be used in the construction of embankments and should be wasted:

<u>Alignment</u>	<u>Station (±)</u>
-SR2-	84+50 to 85+75
-SR4-	13+25 to 16+75
-SR7-	15+25 to 18+75
-SR7-	41+25 to 42+75
-SR7-	65+00 to 72+75
-Y7-	19+25 to 20+75
-Y7LPC-	14+25 to 16+25
-Y7RPC-	12+25 to 26+00

A quantity of approximate 50,000 cubic yards of Unclassified Excavation, which is unsuitable for construction and is recommended to be wasted, has been estimated from the cross sections. The soils are shown by the single hatch pattern on the attached cross sections.

C) Ponds

A pond is located within the proposed construction limits at the following location and will be drained during construction.

<u>Alignment</u>	<u>Station (±)</u>
-Y7RPA-	17+75 to 18+50



We appreciate the opportunity to be of service to you on this project. Please contact us should you have any questions concerning this report or if you need additional information.

Sincerely,

FROEHLING & ROBERTSON, INC.



Cheng Wang, Ph.D., P.E.
Geotechnical Project Manager

W. Patrick Alton, P.E.
Transportation Services Manager

Attachments: 1) Summary of Quantities



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
 Summary of Quantities

WBS Number: 47802.1.1
 TIP Number: W-5600
 Description: US-70 Improvements from US 70 Business to the Neuse River Bridge

County: Johnston
 Field Office: F&R

Project Engineer: P. Alton
 Project Geologist: S. Woods

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
003600000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	2,000	CY
003600000-E	Undercut Excavation	225 - Roadway Excavation	II. B	Contingency	N/A	N/A	250	CY
003600000-E	Undercut Excavation	225 - Roadway Excavation	II. C	Contingency	N/A	N/A	1,000	CY
003600000-E	Undercut Excavation	225 - Roadway Excavation	II. C	Varies	N/A	N/A	11,200	CY
Total Quantity of Undercut Excavation =							14,450	CY
019500000-E	Select Granular Material	265 - Select Granular Material	III. C	Varies	N/A	N/A	11,200	CY
019500000-E	Select Granular Material	265 - Select Granular Material	III. C	Contingency	N/A	N/A	7,000	CY
Total Quantity of Select Granular Material =							18,200	CY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	2,000	SY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. D	Contingency	N/A	N/A	3,000	SY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. D	-SR2-	84+50.00	85+75.00	450	SY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	Varies	N/A	N/A	11,200	SY
019600000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	Contingency	N/A	N/A	5,000	SY
Total Quantity of Geotextile for Soil Stabilization =							21,650	SY
022300000-E	Rock Plating	275 - Rock Plating	I. A	Varies	N/A	N/A	4,400	SY
Total Quantity of Rock Plating =							4,400	SY
109950000-E	Shallow Undercut	505 - Aggregate Subgrade	II. D	Contingency	N/A	N/A	1,000	CY
109950000-E	Shallow Undercut	505 - Aggregate Subgrade	II. D	-SR2-	84+50.00	85+75.00	150	CY
Total Quantity of Shallow Undercut =							1,150	CY
109970000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. D	Contingency	N/A	N/A	2,000	TON
109970000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. D	-SR2-	84+50.00	85+75.00	300	TON
Total Quantity of Class IV Subgrade Stabilization =							2,300	TON
204400000-E	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. A	Varies	N/A	N/A	11,000	LF
204400000-E	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. A	Contingency	N/A	N/A	2,000	LF
Total Quantity of 6" Perforated Subdrain Pipe =							13,000	LF

These Items Only Impact Earthwork Totals								
N/A	Loss Due to Clearing & Grubbing	200 - Clearing and Grubbing	IV. A	N/A	N/A	N/A	2,000	CY
N/A	Shrinkage Factor	235 - Embankments	III. B	N/A	N/A	N/A	25	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. B	N/A	N/A	N/A	50,000	CY