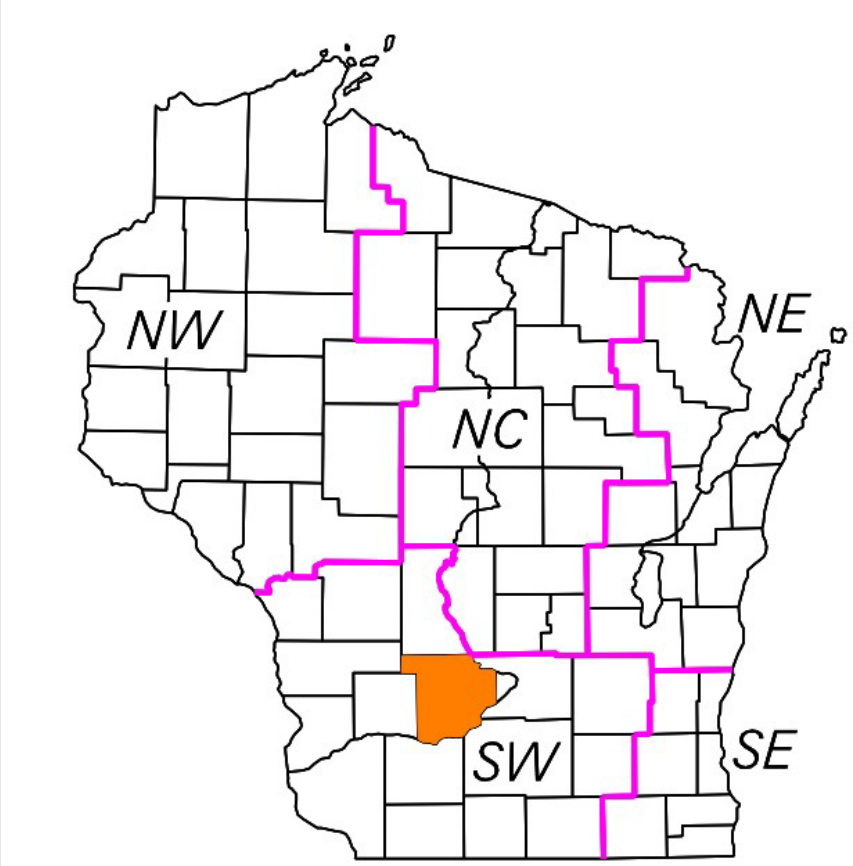
Emergency Project:
Slope Failure - STH 136 along Baraboo River
Rock Springs, WI

Geotechnical Unit - Bureau of Technical Services

2025 Midwest Geotechnical Conference, Indianapolis, IN

September 24, 2025

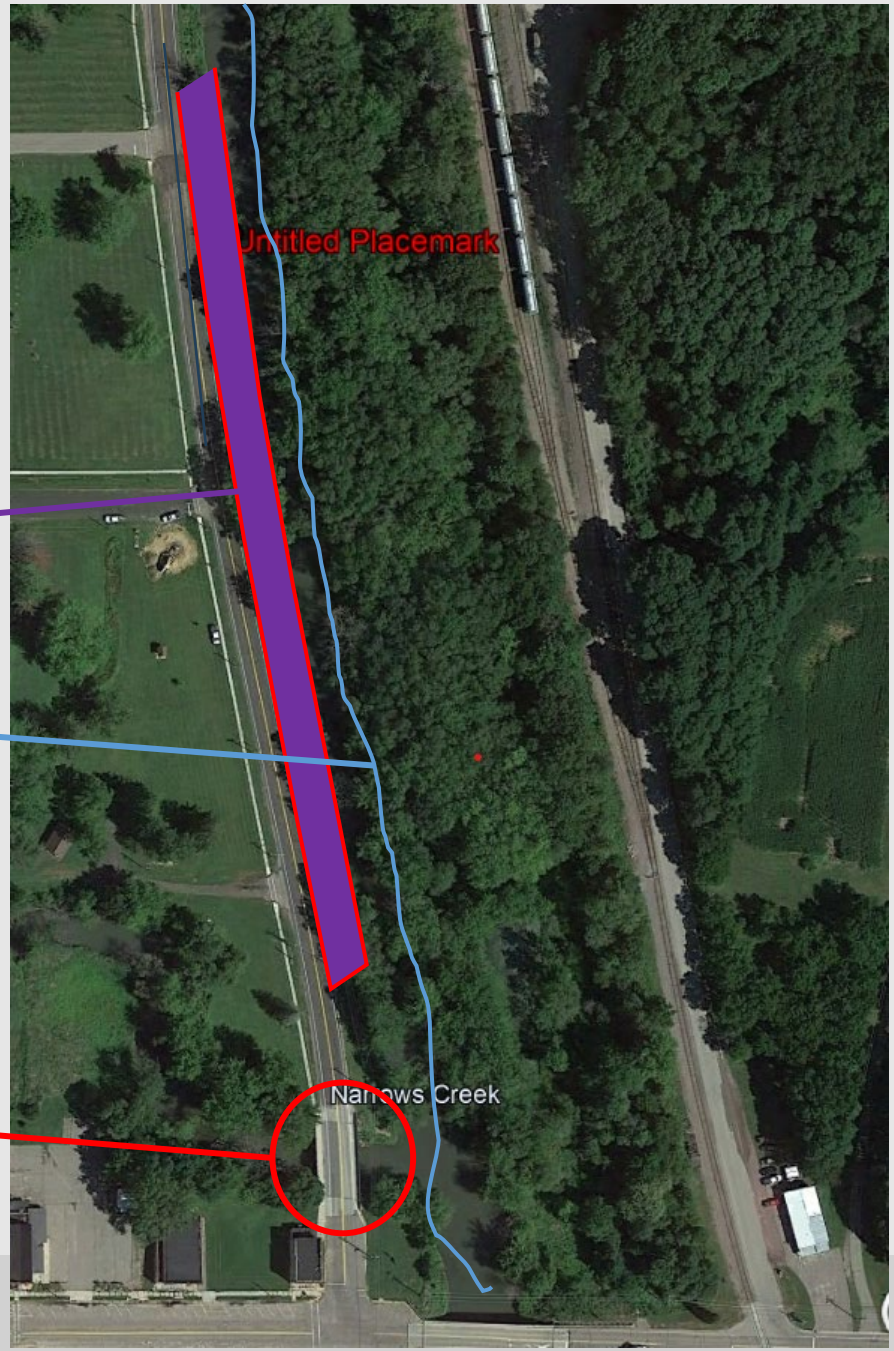


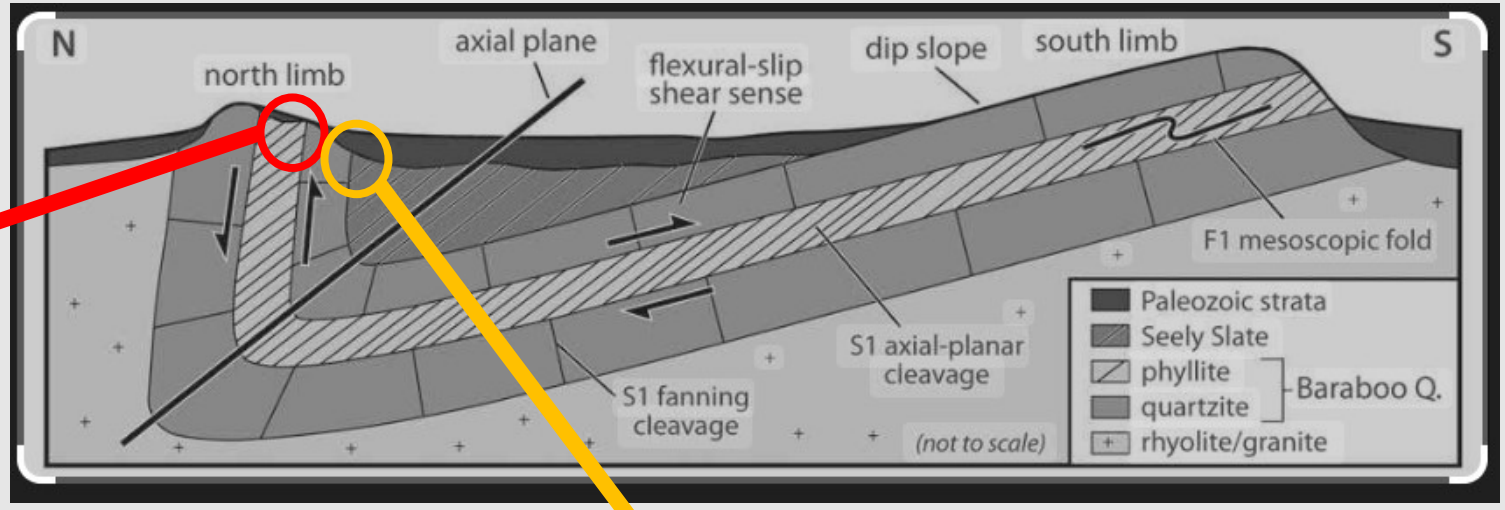
Van Hise Rock

Slope movement

Baraboo River

B-56-183




N
S
north limb
axial plane
flexural-slip
shear sense
dip slope
south limb
F1 mesoscopic fold
S1 axial-planar
cleavage
S1 fanning
cleavage
(not to scale)
Paleozoic strata
Seely Slate
phyllite
quartzite
Baraboo Q.
rhyolite/granite

Spring - 2023

Spring - 2023

Spring / Summer - 2024

May

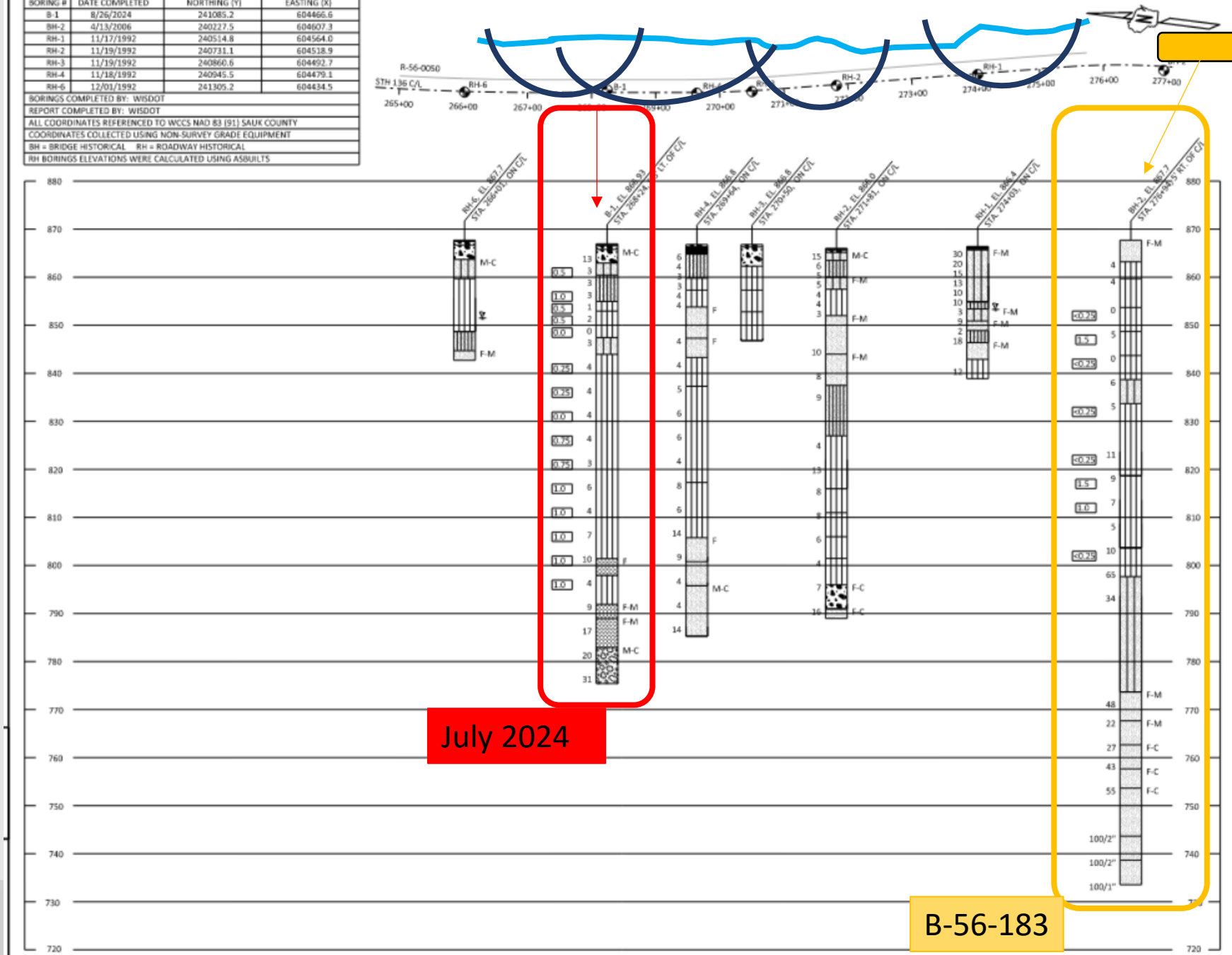
June

July

Spring / Summer - 2024

BORING #	DATE COMPLETED	NORTHING (Y)	EASTING (X)
B-1	8/26/2024	241085.2	604466.6
BH-2	4/13/2006	240227.5	604607.3
RH-1	11/17/1992	240514.8	604564.0
RH-2	11/19/1992	240731.1	604518.9
RH-3	11/19/1992	240860.6	604492.7
RH-4	11/18/1992	240945.5	604479.1
RH-6	12/01/1992	241305.2	604434.5

BORINGS COMPLETED BY: WISDOT
REPORT COMPLETED BY: WISDOT
ALL COORDINATES REFERENCED TO WCCS NAD 83 (91) SAUK COUNTY
COORDINATES COLLECTED USING NON-SURVEY GRADE EQUIPMENT
BH = BRIDGE HISTORICAL RH = ROADWAY HISTORICAL
RH BORINGS ELEVATIONS WERE CALCULATED USING ASBUILTS



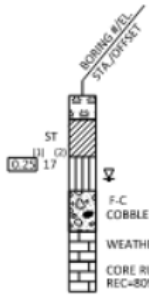
STATE PROJECT NUMBER

5573-05-02

MATERIAL SYMBOLS

ASPHALT, TOPSOIL, PEAT, CONCRETE, FILL, GRAVEL, SAND, CLAY, SILT, BOULDERS OR COBBLES, LIMESTONE, BEDROCK (UNKNOWN), SHALE, SANDSTONE, IGNEOUS/META

LEGEND OF BORING



(1) UNCONFINED STRENGTH, AS DETERMINED BY A POCKET PENETROMETER (TSF)

(2) UNLESS OTHERWISE, SPECIFIED THE SPT 'N' VALUE IS BASED ON AASHTO T-206, STANDARD PENETRATION TEST. THE SPT 'N' VALUE PRESENTED HAS NOT BEEN CORRECTED FOR OVERBURDEN PRESSURE OR HAMMER EFFICIENCY.

GROUND WATER ELEVATION

AT TIME OF DRILLING
END OF DRILLING
AFTER DRILLING

ABBREVIATIONS

F-FINE M-MEDIUM C-COARSE ST-SHELBY TUBE

SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION

BORINGS WERE COMPLETED AT POINTS APPROXIMATELY AS INDICATED ON THIS DRAWING TO OBTAIN INFORMATION CONCERNING THE CHARACTER OF SUBSURFACE MATERIALS FOUND AT THE SITE. BECAUSE THE INVESTIGATED DEPTHS ARE LIMITED AND THE AREA OF THE BORINGS IS VERY SMALL IN RELATION TO THE ENTIRE SITE, THE WISCONSIN DEPARTMENT OF TRANSPORTATION DOES NOT WARRANT SIMILAR SUBSURFACE CONDITIONS BELOW, BETWEEN, OR BEYOND THESE BORINGS. VARIATIONS IN SOIL CONDITIONS SHOULD BE EXPECTED AND FLUCTUATION IN GROUNDWATER LEVELS MAY OCCUR.

NO.	DATE	REVISION	BY

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN SECTION

STRUCTURE R-56-0050

DRAWN BY TLP/JJ | PLANS CK'D.

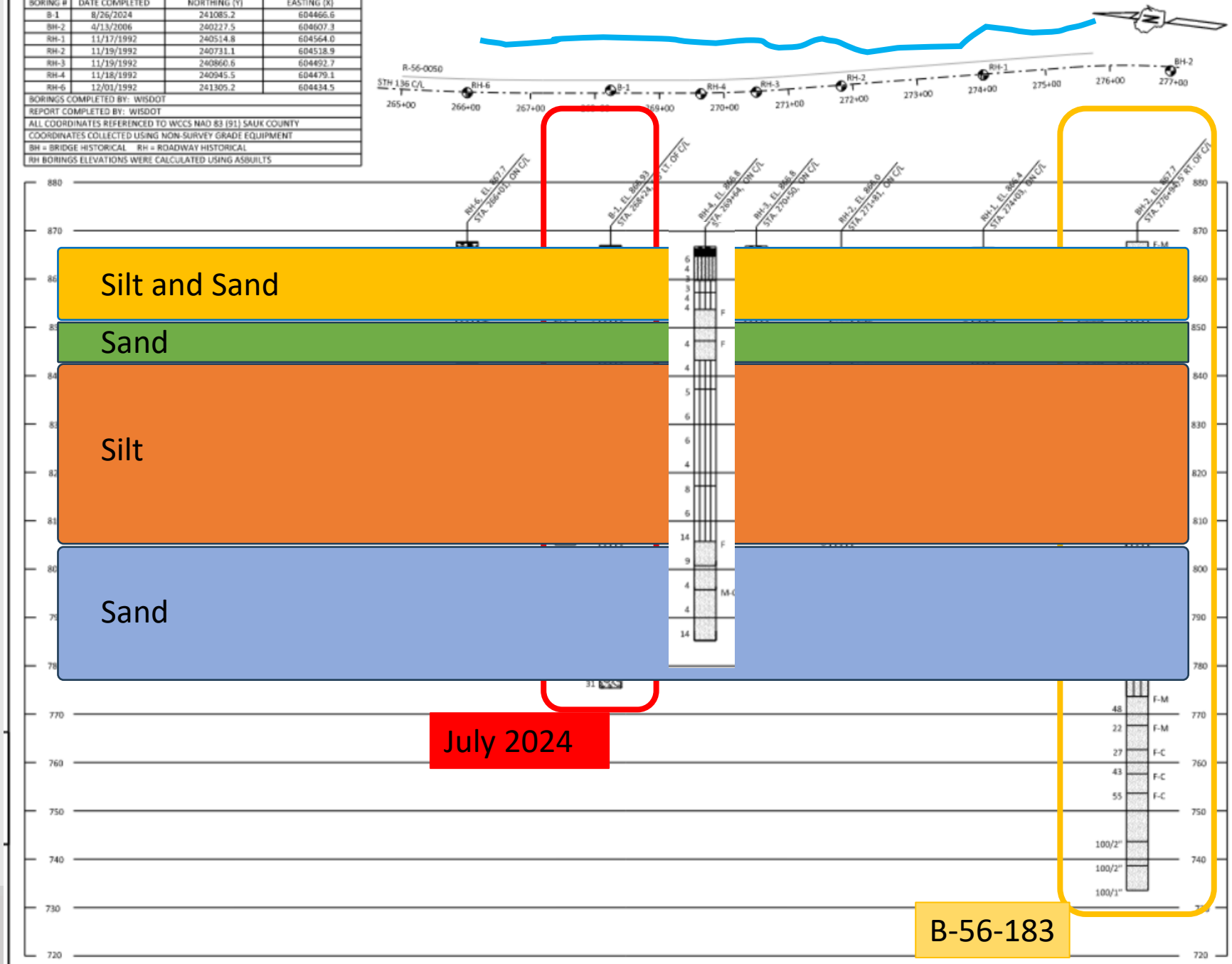
SUBSURFACE EXPLORATION

SHEET

WISCONSIN DEPARTMENT OF TRANSPORTATION

BORING #	DATE COMPLETED	NORTHING (Y)	EASTING (X)
B-1	8/26/2024	241085.2	604466.6
BH-2	4/13/2006	240227.5	604607.3
RH-1	11/17/1992	240514.8	604564.0
RH-2	11/19/1992	240731.1	604518.9
RH-3	11/19/1992	240860.6	604492.7
RH-4	11/18/1992	240945.5	604479.1
RH-6	12/01/1992	241305.2	604434.5

BORINGS COMPLETED BY: WISDOT
REPORT COMPLETED BY: WISDOT
ALL COORDINATES REFERENCED TO WCCS NAD 83 (91) SAUK COUNTY
COORDINATES COLLECTED USING NON-SURVEY GRADE EQUIPMENT
BH = BRIDGE HISTORICAL RH = ROADWAY HISTORICAL
RH BORINGS ELEVATIONS WERE CALCULATED USING ASBUILTS



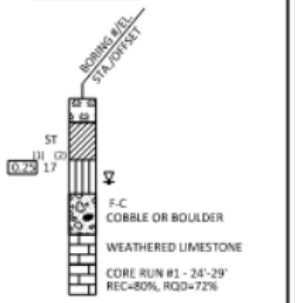
STATE PROJECT NUMBER

5573-05-02

MATERIAL SYMBOLS

ASPHALT, TOPSOIL, PEAT, CONCRETE, FILL, GRAVEL, SAND, CLAY, SILT, BOULDERS OR COBBLES, LIMESTONE, BEDROCK (UNKNOWN), SHALE, SANDSTONE, IGNEOUS/META

LEGEND OF BORING



(1) UNCONFINED STRENGTH, AS DETERMINED BY A POCKET PENETROMETER (TSF)

(2) UNLESS OTHERWISE, SPECIFIED THE SPT 'N' VALUE IS BASED ON AASHTO T-206, STANDARD PENETRATION TEST. THE SPT 'N' VALUE PRESENTED HAS NOT BEEN CORRECTED FOR OVERBURDEN PRESSURE OR HAMMER EFFICIENCY.

GROUND WATER ELEVATION

AT TIME OF DRILLING
END OF DRILLING
AFTER DRILLING

ABBREVIATIONS

F-FINE M-MEDIUM C-COARSE ST-SHELBY TUBE

SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION

BORINGS WERE COMPLETED AT POINTS APPROXIMATELY AS INDICATED ON THIS DRAWING TO OBTAIN INFORMATION CONCERNING THE CHARACTER OF SUBSURFACE MATERIALS FOUND AT THE SITE. BECAUSE THE INVESTIGATED DEPTHS ARE LIMITED AND THE AREA OF THE BORINGS IS VERY SMALL IN RELATION TO THE ENTIRE SITE, THE WISCONSIN DEPARTMENT OF TRANSPORTATION DOES NOT WARRANT SIMILAR SUBSURFACE CONDITIONS BELOW, BETWEEN, OR BEYOND THESE BORINGS. VARIATIONS IN SOIL CONDITIONS SHOULD BE EXPECTED AND FLUCTUATION IN GROUNDWATER LEVELS MAY OCCUR.

NO.	DATE	REVISION	BY

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN SECTION

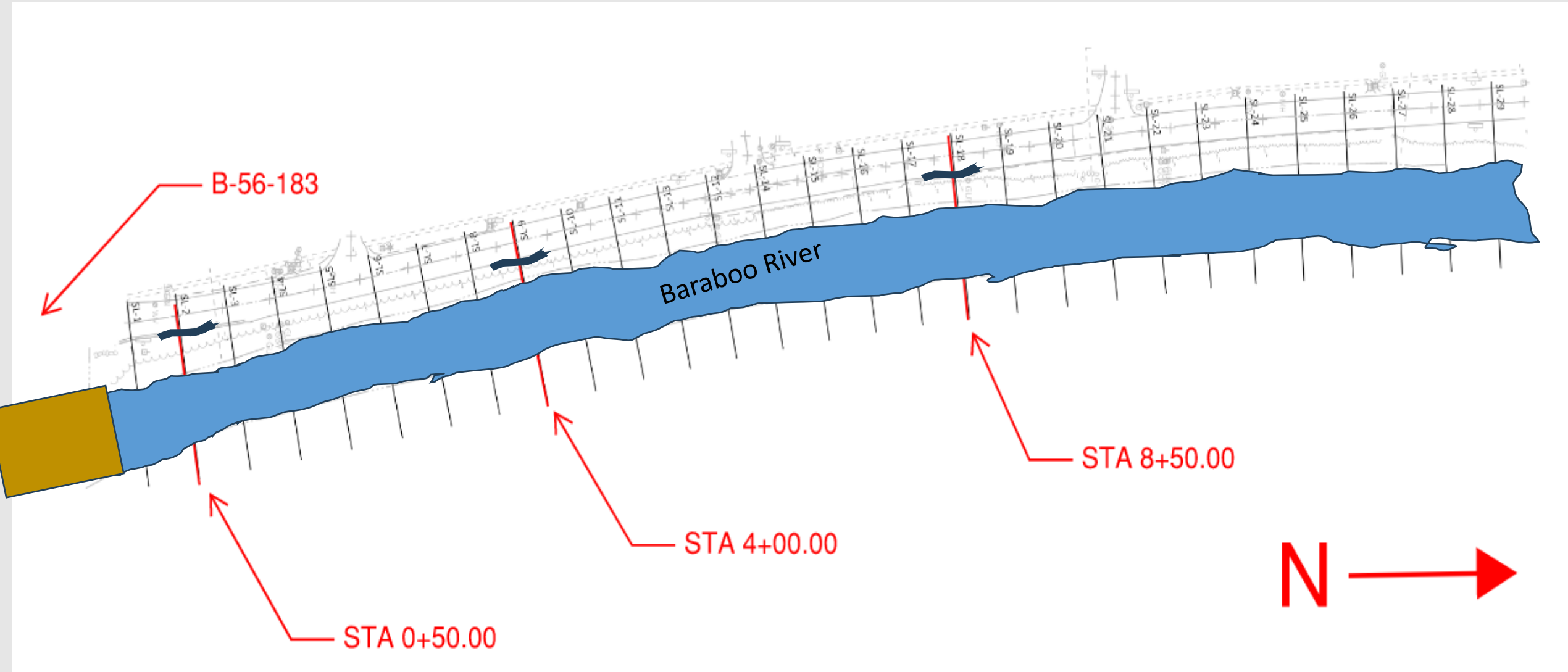
STRUCTURE R-56-0050

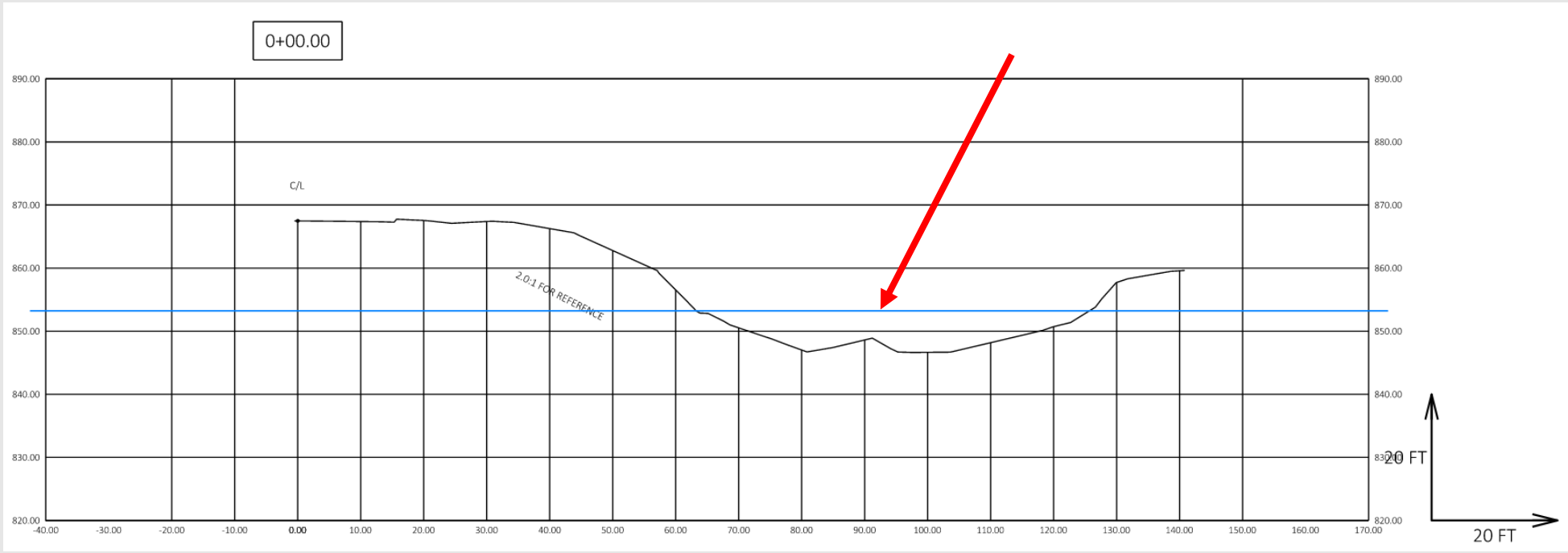
DRAWN BY TLP/JJ | PLANS CK'D.

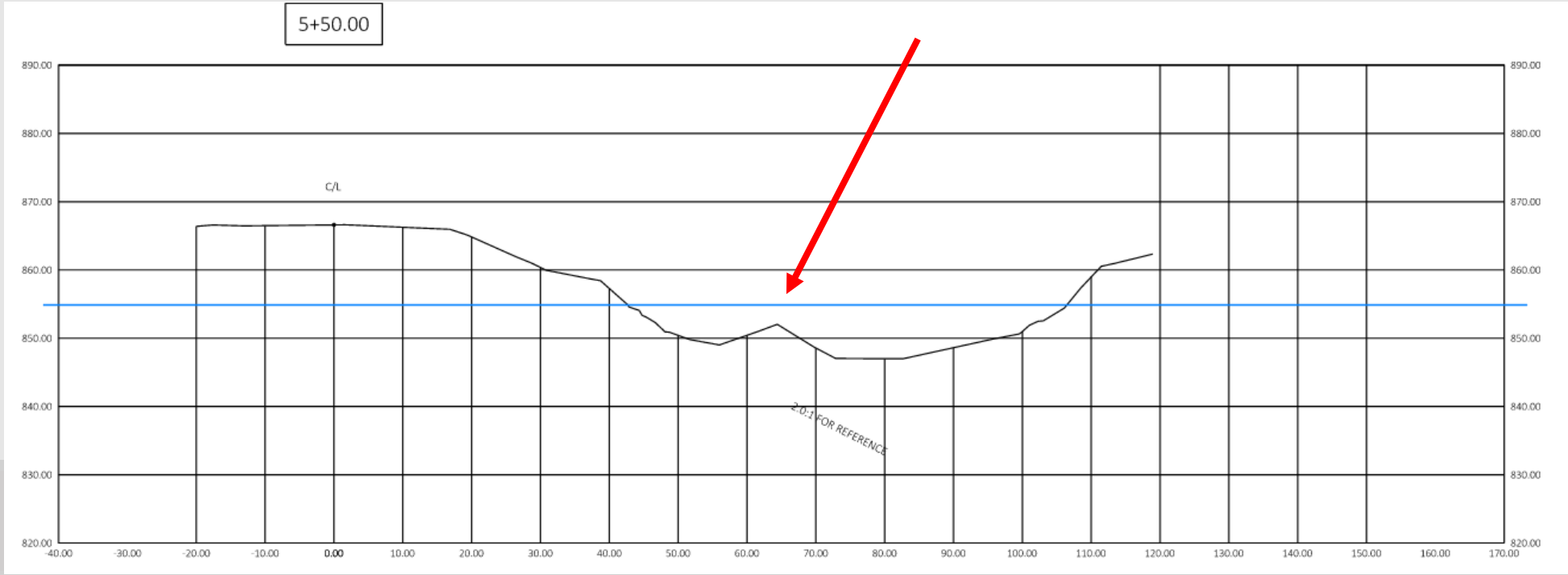
SUBSURFACE EXPLORATION

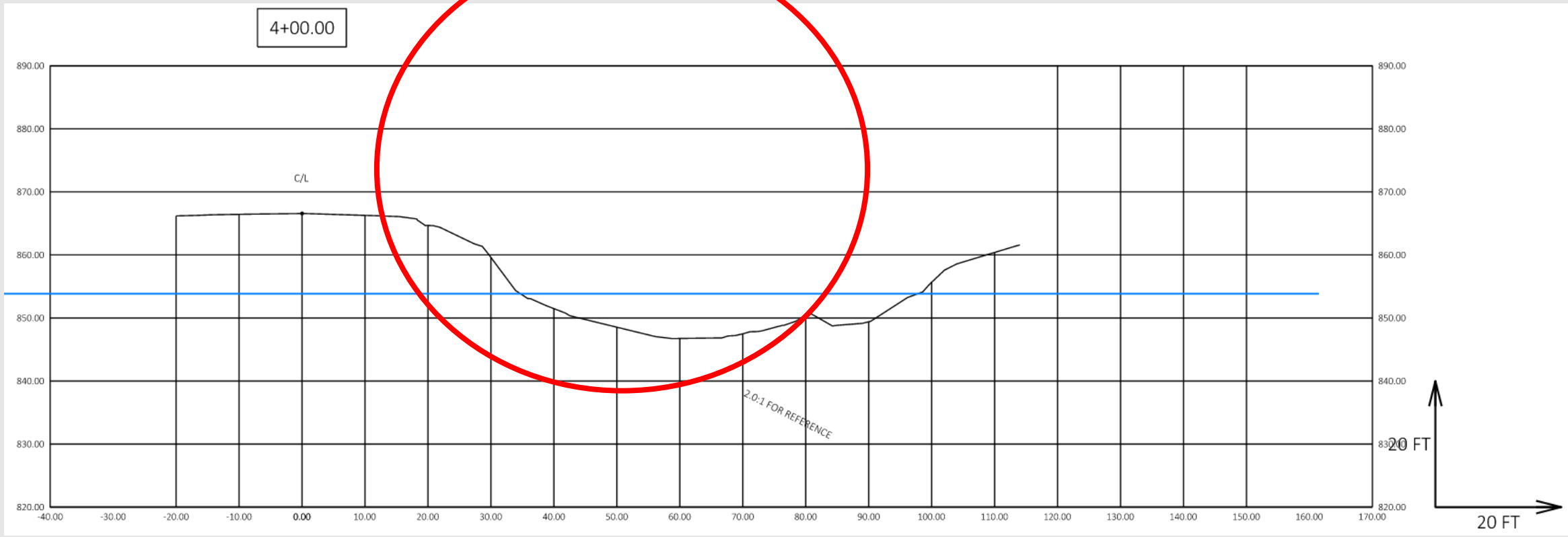
SHEET

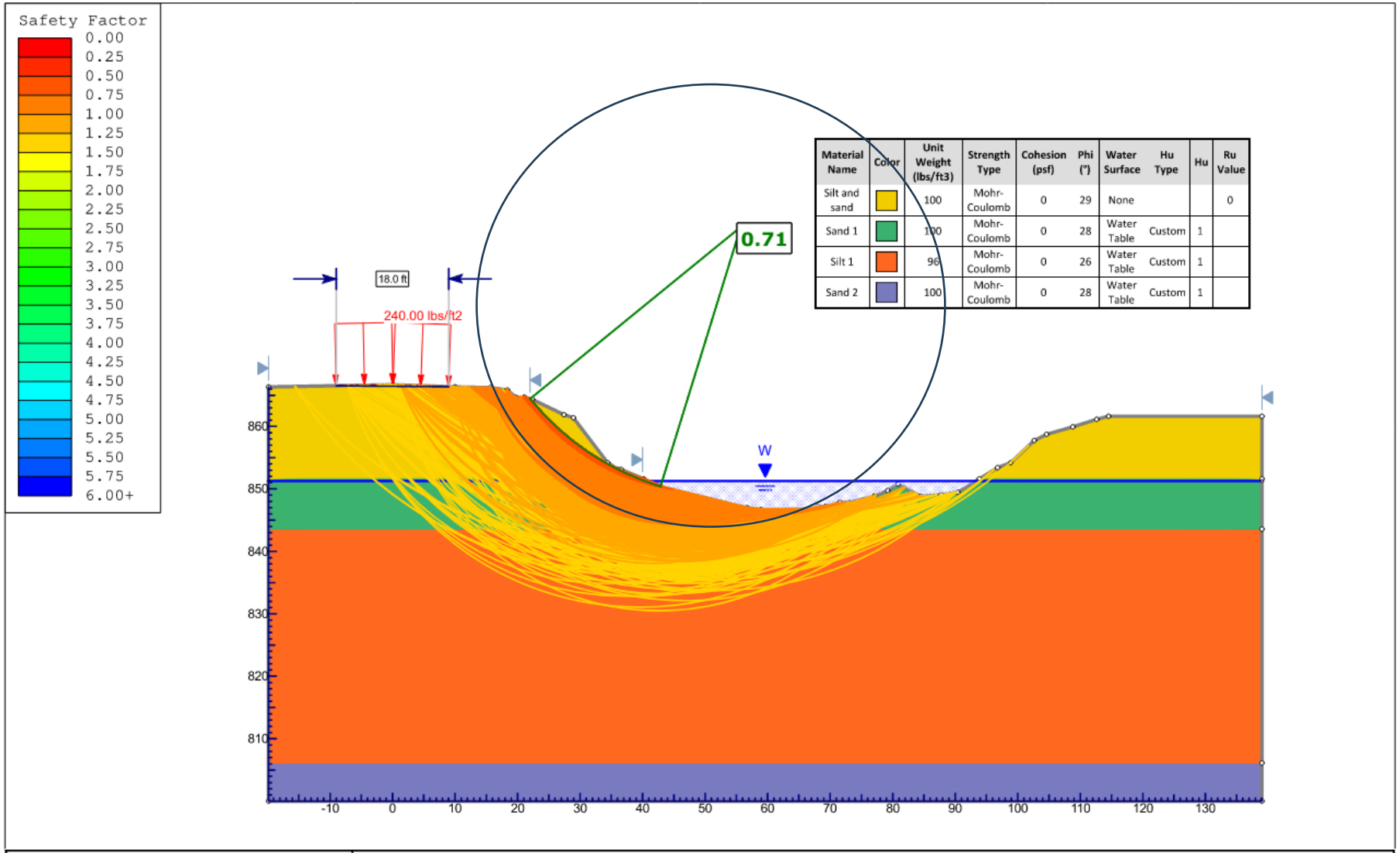
WISCONSIN DEPARTMENT OF TRANSPORTATION


B-56-183
Baraboo River
STA 8+50.00
STA 4+00.00
STA 0+50.00
N


0+00.00
C/L
2.0:1 FOR REFERENCE
20 FT
20 FT


5+50.00
C/L
2.0:1 FOR REFERENCE


4+00.00
C/L
2.0:1 FOR REFERENCE
20 FT
20 FT
890.00
880.00
870.00
860.00
850.00
840.00
830.00
820.00
-40.00
-30.00
-20.00
-10.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
150.00
160.00
170.00

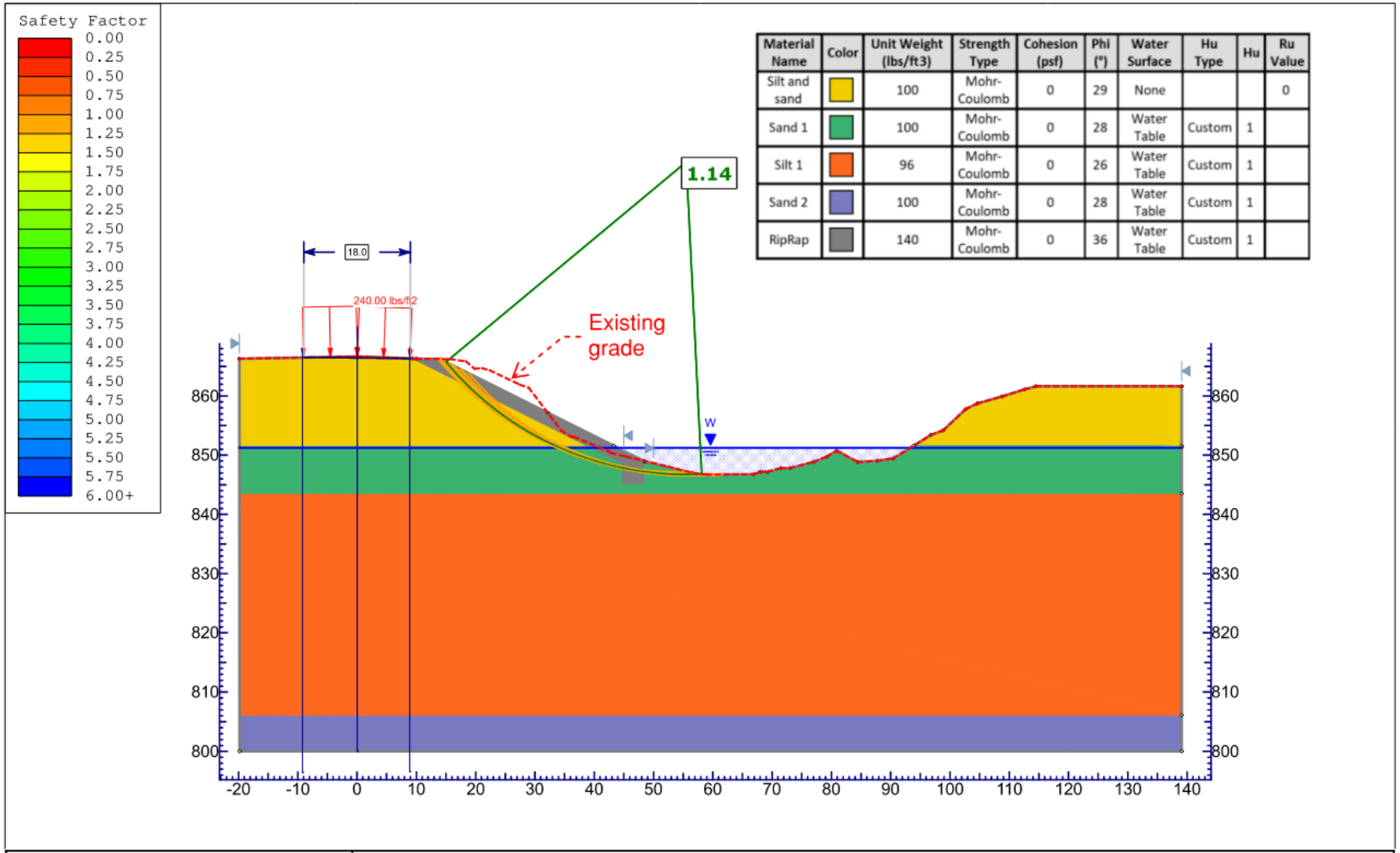


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Silt and sand		100	Mohr-Coulomb	0	29	None			0
Sand 1		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
Silt 1		96	Mohr-Coulomb	0	26	Water Table	Custom	1	
Sand 2		100	Mohr-Coulomb	0	28	Water Table	Custom	1	

rocscience

SLIDEINTERPRET 9.031

Project	STH 136, Rock Springs		
Station/Cross Section	4+00.00	Scenario	Existing Conditions
Drawn By	Paulo Florio	Company	WisDOT
Date	7/25/2024, 11:19:42 AM	File Name	STH 136, (STA 4+00.00) Rock Spring (historical borings) Full Analysis.slmd

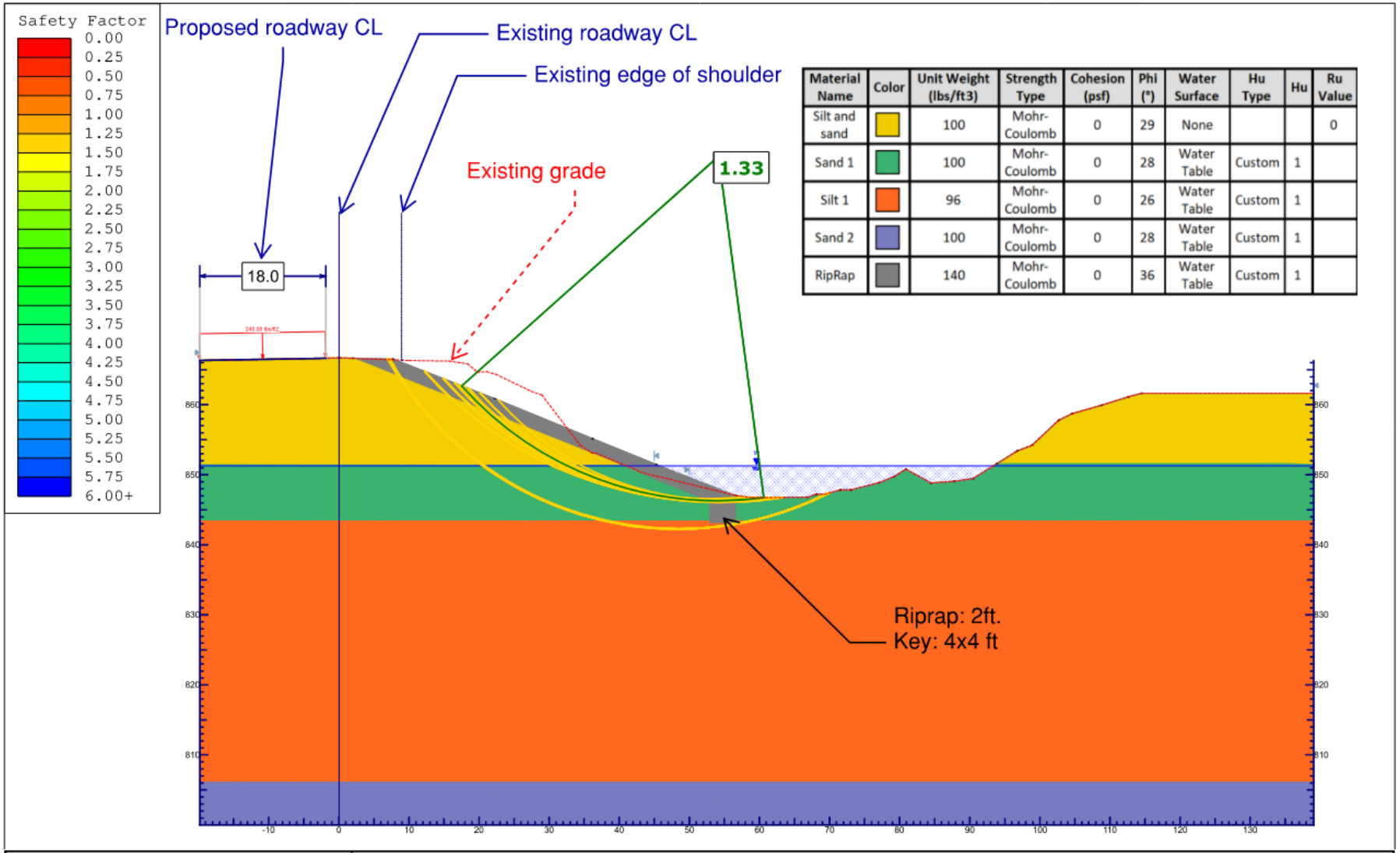


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Silt and sand		100	Mohr-Coulomb	0	29	None			0
Sand 1		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
Silt 1		96	Mohr-Coulomb	0	26	Water Table	Custom	1	
Sand 2		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
RipRap		140	Mohr-Coulomb	0	36	Water Table	Custom	1	

rocscience

SLIDEINTERPRET 9.031

Project	STH 136, Rock Springs		
Station/Cross Section	4+00.00	Scenario	2H:1V Slope + RR
Drawn By	Paulo Florio	Company	WisDOT
Date	7/25/2024, 11:19:42 AM	File Name	STH 136, (STA 4+00.00) Rock Spring (historical borings) Full Analysis.slmd

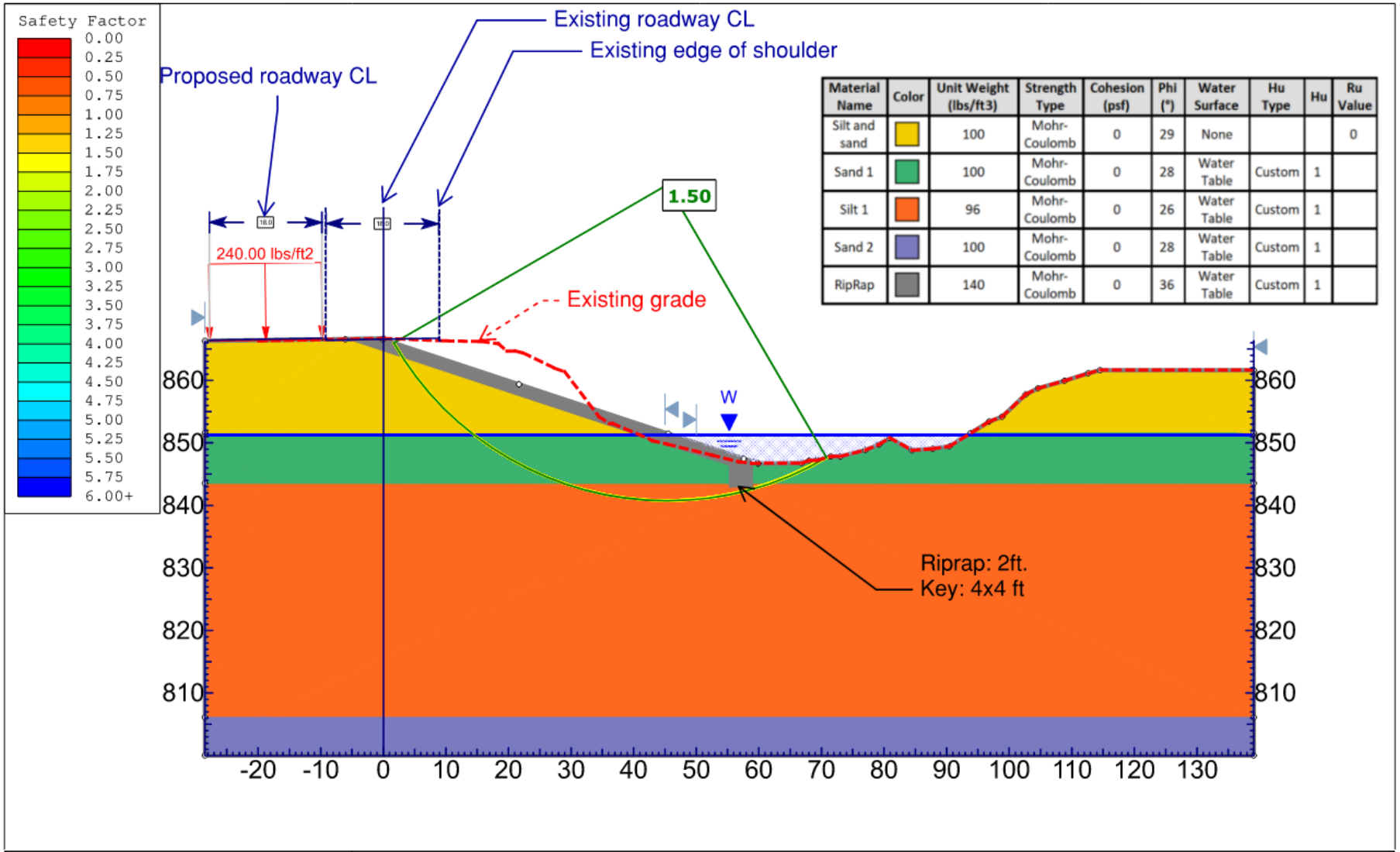


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Silt and sand		100	Mohr-Coulomb	0	29	None			0
Sand 1		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
Silt 1		96	Mohr-Coulomb	0	26	Water Table	Custom	1	
Sand 2		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
RipRap		140	Mohr-Coulomb	0	36	Water Table	Custom	1	

rocscience

SLIDEINTERPRET 9.031

Project	STH 136, Rock Springs		
Station/Cross Section	4+00.00	Scenario	2.5H:1V Slope + RR
Drawn By	Paulo Florio	Company	WisDOT
Date	7/25/2024, 11:19:42 AM	File Name	STH 136, (STA 4+00.00) Rock Spring (historical borings) Full Analysis.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Silt and sand		100	Mohr-Coulomb	0	29	None			0
Sand 1		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
Silt 1		96	Mohr-Coulomb	0	26	Water Table	Custom	1	
Sand 2		100	Mohr-Coulomb	0	28	Water Table	Custom	1	
RipRap		140	Mohr-Coulomb	0	36	Water Table	Custom	1	

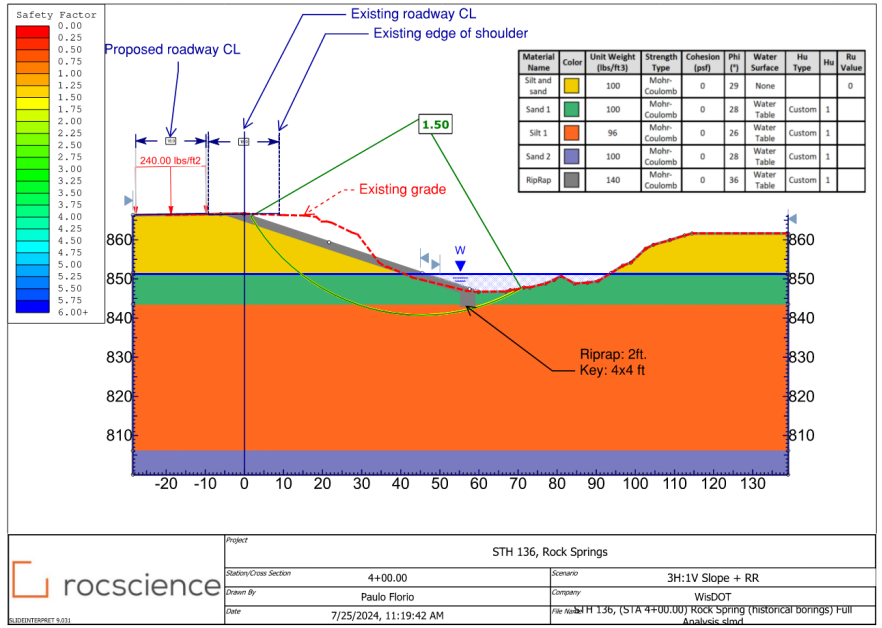
rocscience

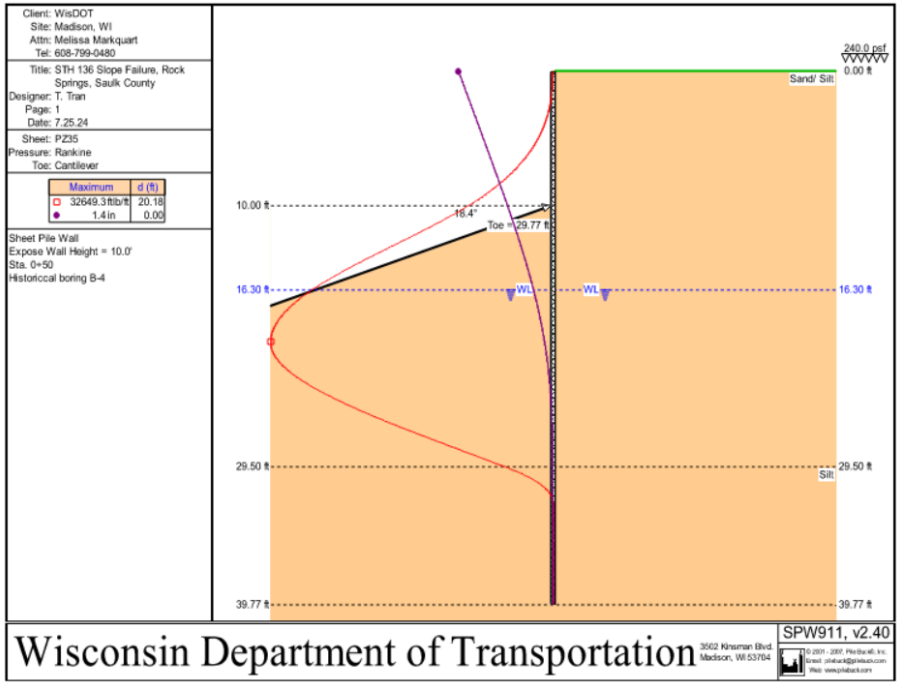
SLIDEINTERPRET 9.031

Project	STH 136, Rock Springs		
Station/Cross Section	4+00.00	Scenario	3H:1V Slope + RR
Drawn By	Paulo Florio	Company	WisDOT
Date	7/25/2024, 11:19:42 AM	File Name	STH 136, (STA 4+00.00) Rock Spring (historical borings) Full Analysis.slmd

Discussion with WisDOT SW Region:

- **Slope Grading**
  - Work must be done from the roadway
  - Real Estate Acquisition (TIME).
  - Environmental permitting (TIME)
  - Realignment of roadway (TIME).
- **Sheet Pile Wall**
  - Fast
  - Easy to construct
  - Expensive

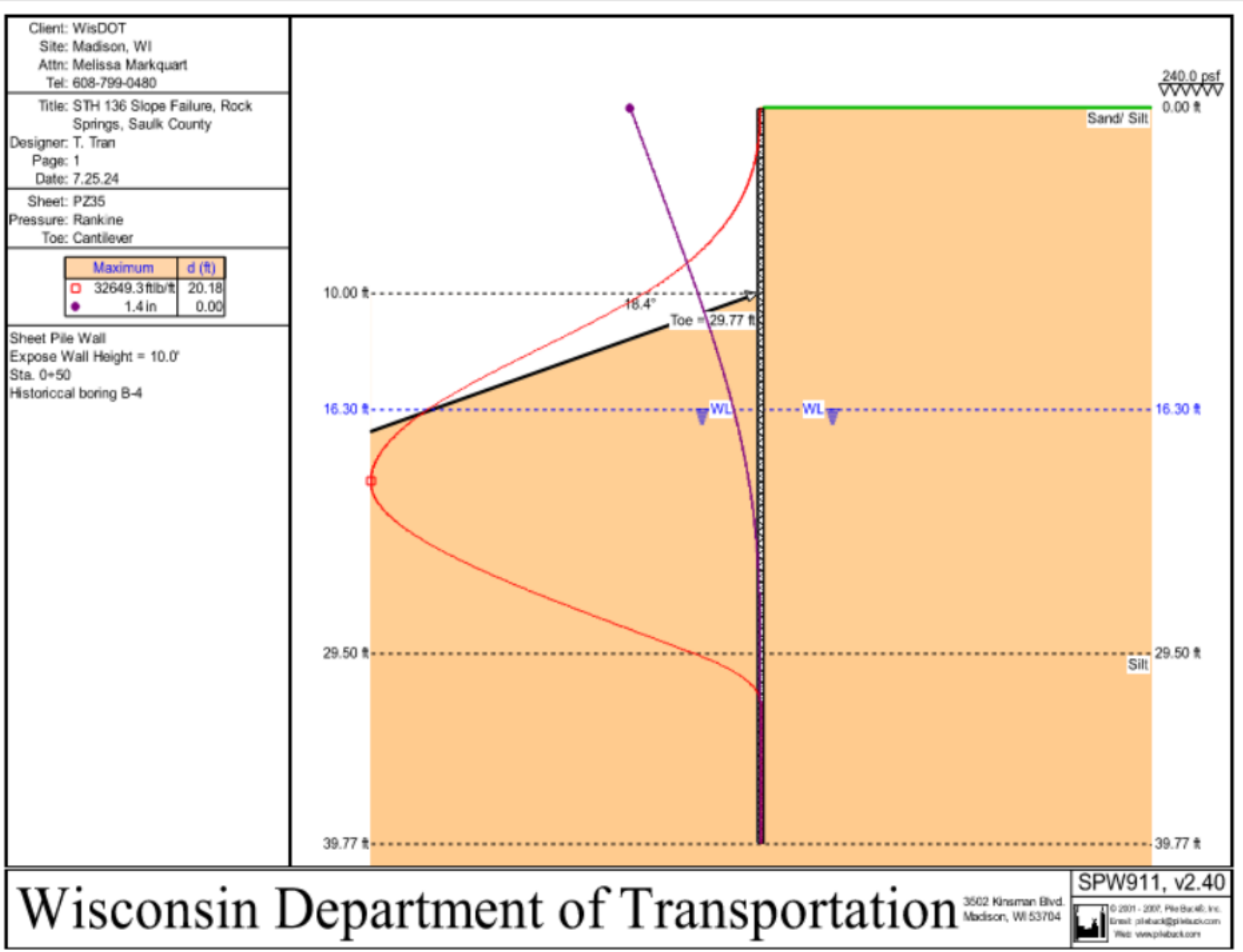




Sheet Pile Wall

- Cantilever type
- PZ35 sheet pile
- Max. Deflection 1.4 in

- 40 feet deep
- 10 feet exposed height
- 1,075 feet long




CAT
CAT
325F


CAT


ICE 28 VIBRO


CAT

Wall Completed:

- Wall Completion: September-November 2024
- Opened for Traffic: December 2024
- Total Cost: ~ $2.2 Million
- Wall Cost: ~ $1.5 Million


R-56-50

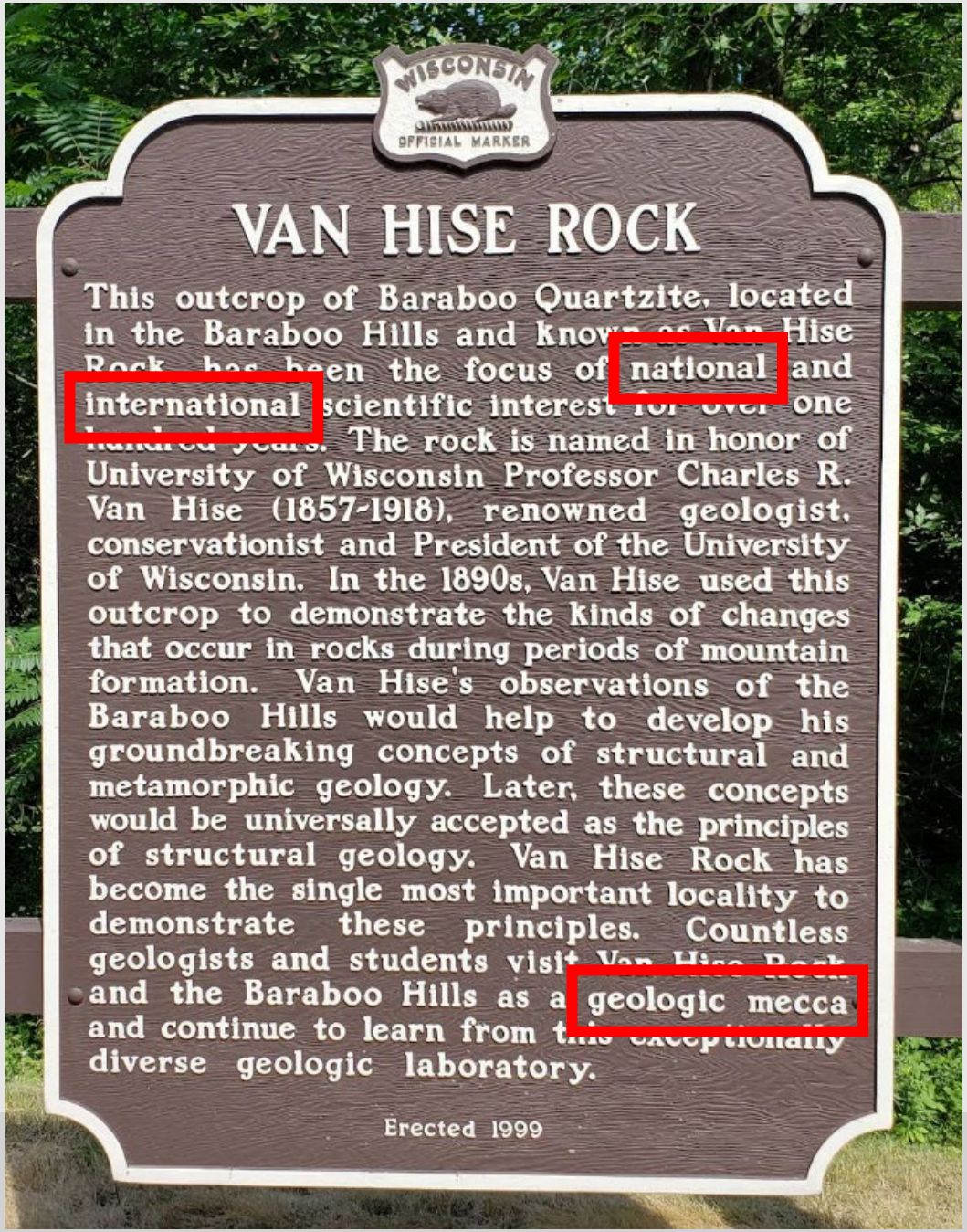
Closing Remarks:

After selection, The Region had it ready to let and start construction in 18 days…

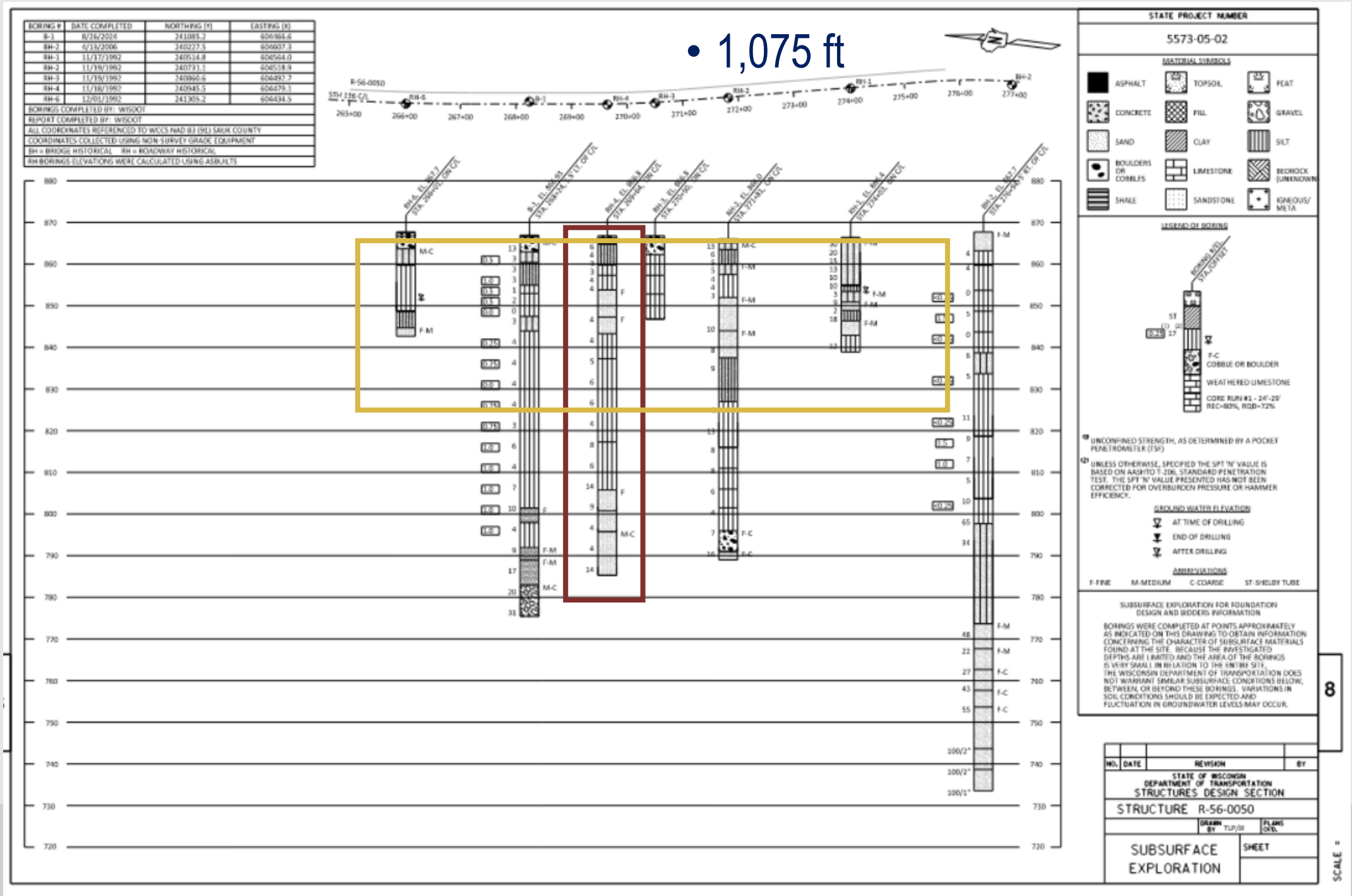
- **July 2024** BTS Geotech got involved
- **November 2024** the wall was completed

- Great team effort : BTS, BOS, SWR
- The need for bathymetry survey, Lidar, digging of historical boring, coordinating new boring, analyzing all data, visiting the site….
- Several meetings between all involved staff
- Fast turn around of slope stability models and sheet pile design
- Swift coordination with BOS so designers were quickly available for a plan set

Thank You !


WISCONSIN
OFFICIAL MARKER
VAN HISE ROCK
This outcrop of Baraboo Quartzite, located in the Baraboo Hills and known as Van Hise Rock, has been the focus of national and international scientific interest for over one hundred years. The rock is named in honor of University of Wisconsin Professor Charles R. Van Hise (1857-1918), renowned geologist, conservationist and President of the University of Wisconsin. In the 1890s, Van Hise used this outcrop to demonstrate the kinds of changes that occur in rocks during periods of mountain formation. Van Hise's observations of the Baraboo Hills would help to develop his groundbreaking concepts of structural and metamorphic geology. Later, these concepts would be universally accepted as the principles of structural geology. Van Hise Rock has become the single most important locality to demonstrate these principles. Countless geologists and students visit Van Hise Rock and the Baraboo Hills as a geologic mecca and continue to learn from this exceptionally diverse geologic laboratory.
Erected 1999

- 1,075 ft


BORING # | DATE COMPLETED | NORTHING (Y) | EASTING (X)
B-1 | 8/26/2024 | 241085.2 | 606966.6
RH-2 | 4/13/2006 | 240227.5 | 606607.3
RH-1 | 11/17/1992 | 240514.8 | 606564.0
RH-2 | 11/19/1992 | 240731.1 | 606518.9
RH-3 | 11/19/1992 | 240860.6 | 606492.7
RH-4 | 11/18/1992 | 240945.5 | 606479.1
RH-6 | 12/01/1992 | 241305.2 | 606434.5
BORINGS COMPLETED BY: WISDOT
REPORT COMPLETED BY: WISDOT
ALL COORDINATES REFERENCED TO WCCS NAD 83 (91) SAUK COUNTY
COORDINATES COLLECTED USING NON-SURVEY GRADE EQUIPMENT
BH = BRIDGE HISTORICAL RH = ROADWAY HISTORICAL
RH BORINGS ELEVATIONS WERE CALCULATED USING ASBUILTS
R-56-0050
STH 136 C/L
RH-6
B-1
RH-4
RH-3
RH-2
RH-1
RH-2
265+00
266+00
267+00
268+00
269+00
270+00
271+00
272+00
273+00
274+00
275+00
276+00
277+00
STATE PROJECT NUMBER
5573-05-02
MATERIAL SYMBOLS
ASPHALT
TOPSOIL
PEAT
CONCRETE
FILL
GRAVEL
SAND
CLAY
SILT
BOULDERS OR COBBLES
LIMESTONE
BEDROCK (UNKNOWN)
SHALE
SANDSTONE
IGNEOUS/ META
LEGEND OF BORING
F-C
COBBLE OR BOULDER
WEATHERED LIMESTONE
CORE RUN #1 - 24'-29'
REC=80%, RQD=72%
UNCONFINED STRENGTH, AS DETERMINED BY A POCKET PENETROMETER (TSF)
UNLESS OTHERWISE, SPECIFIED THE SPT 'N' VALUE IS BASED ON AASHTO T-206, STANDARD PENETRATION TEST. THE SPT 'N' VALUE PRESENTED HAS NOT BEEN CORRECTED FOR OVERBURDEN PRESSURE OR HAMMER EFFICIENCY.
GROUND WATER ELEVATION
AT TIME OF DRILLING
END OF DRILLING
AFTER DRILLING
ABBREVIATIONS
F-FINE
M-MEDIUM
C-COARSE
ST-SHELBY TUBE
SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION
BORINGS WERE COMPLETED AT POINTS APPROXIMATELY AS INDICATED ON THIS DRAWING TO OBTAIN INFORMATION CONCERNING THE CHARACTER OF SUBSURFACE MATERIALS FOUND AT THE SITE. BECAUSE THE INVESTIGATED DEPTHS ARE LIMITED AND THE AREA OF THE BORINGS IS VERY SMALL IN RELATION TO THE ENTIRE SITE, THE WISCONSIN DEPARTMENT OF TRANSPORTATION DOES NOT WARRANT SIMILAR SUBSURFACE CONDITIONS BELOW, BETWEEN, OR BEYOND THESE BORINGS. VARIATIONS IN SOIL CONDITIONS SHOULD BE EXPECTED AND FLUCTUATION IN GROUNDWATER LEVELS MAY OCCUR.
8
NO. DATE REVISION BY
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DESIGN SECTION
STRUCTURE R-56-0050
DRAWN BY TLP/JB
PLANS CKD.
SUBSURFACE EXPLORATION
SHEET
SCALE =