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MEMORANDUM

TO: Callie Ewald, P.E.
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Email: callie.ewald@Vermont.gov

FROM: GEODesign, Inc.
(Jack Cassara, EIT / Jacob Wimett, P.E.)

DATE: March 6, 2026

RE: Supplemental Memorandum –
Emergency Sheeting
Plainfield ER E24-2(610)
US Route 2
Plainfield, VT

FILE NO.: 0750-015.03

SUMMARY

GEODesign provided a report for this project on May 21, 2024 (referred to as “our Report” herein) in which we provided the results of subsurface explorations, a stability analysis, ongoing monitoring results, and recommendations to stabilize the slope.

On July 11, 2024 (following issuance of our Report) a significant flooding event led to the loss of an additional 30’ of embankment at the toe of the slope. This resulted in a less stable configuration which caused further loss of crest geometry and put US Route 2 at risk. In September of 2024, an emergency project to install sheet piles to support US Route 2 in the event of further slope instability was undertaken.

The purpose of this memorandum is to summarize our emergency sheet pile design and installation that occurred in September of 2024.

SHEET PILE DESIGN

The sheet pile wall was modeled using soil parameters and strata outlined in our Report as well as Light Detection and Ranging (LiDAR) data provided by VTrans.

The sheet pile wall design was constrained by proximity to Route 2, the equipment used to install the wall, and the existing slope failure. To model the wall, Rankine earth pressure coefficients were determined and used in the evaluation of soil pressures on either side of the sheeting. Civiltech's Shoring Suite (CT Shore) was used to determine minimum tieback length and embedment depth to provide stability of the supported roadway using an NZ-14 steel sheet.

Three main conditions were modeled:

1. Construction Wall Height with Crane Loading (5 ft wall height during installation)
2. Expected Wall Height with Traffic Loading (10 ft wall height after installation)
3. Future Wall Height with Traffic Loading (15 ft wall height after installation)

During our initial modeling, we determined that NZ-14 sheeting shall be installed to a depth of 40-feet or a minimum of 25-feet and refusal. Tiebacks were required and designed for 25-kip loading at a spacing of 5-feet.

AS-BUILT EVALUATION

Following installation of the sheet pile wall by Engineers Construction, Inc. (ECI), we evaluated the as-built plans for existing and future conditions, assuming the slope would see additional failure prior to a permanent repair solution. From the as-built conditions, we determined that the installed tied back sheetpile wall would be able to withstand a maximum exposed wall height of 16-feet.

Refer to Attachment 1 for details of the As-Built sheet pile wall by ECI, and Attachment 2 for a typical output from the CT Shore results.

LIMITATIONS

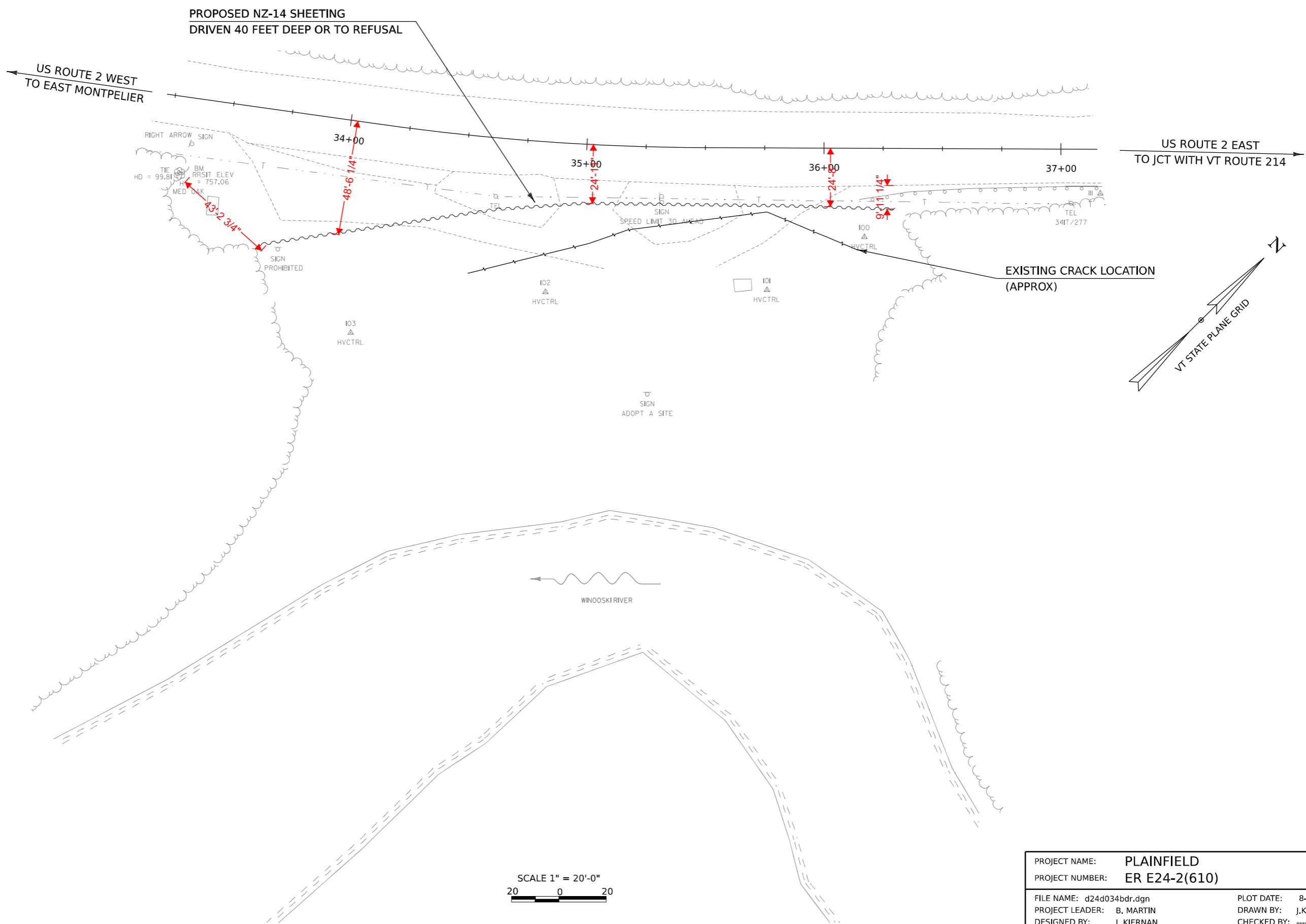
This memorandum is subject to the limitations included in our Report.

ATTACHMENTS:

- As-Built Layout (Attachment 1)
- Typical CT Shore Results (Attachment 2)



ATTACHMENT 1 – ECI AS-BUILTS

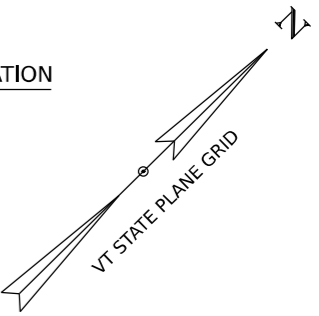


PROPOSED NZ-14 SHEETING
DRIVEN 40 FEET DEEP OR TO REFUSAL

US ROUTE 2 WEST
TO EAST MONTPELIER

US ROUTE 2 EAST
TO JCT WITH VT ROUTE 214

EXISTING CRACK LOCATION
(APPROX)

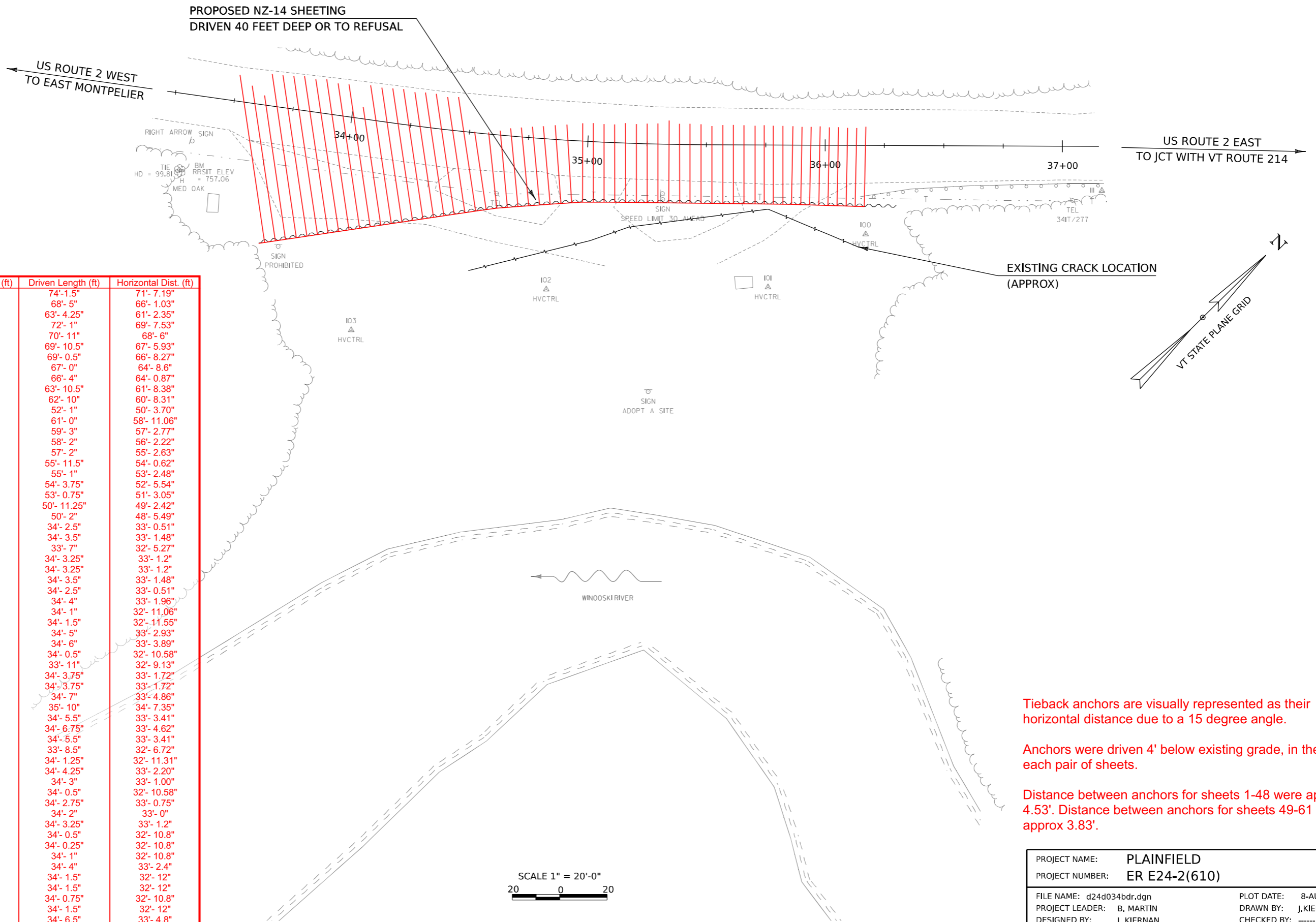


WINOOSKI RIVER

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	PLAINFIELD	PLOT DATE:	8-AUG-2024
PROJECT NUMBER:	ER E24-2(610)	DRAWN BY:	J.KIERNAN
FILE NAME:	d24d034bdr.dgn	CHECKED BY:	-----
PROJECT LEADER:	B. MARTIN	SHEET	1 OF 28
DESIGNED BY:	J. KIERNAN		
PLAN SHEET			

Tieback Anchor Horizontal Distance



Anchor #	Planned Length (ft)	Driven Length (ft)	Horizontal Dist. (ft)
1	75	74'-1.5"	71'- 7.19"
2	76	68'- 5"	66'- 1.03"
3	75	63'- 4.25"	61'- 2.35"
4	73	72'- 1"	69'- 7.53"
5	72	70'- 11"	68'- 6"
6	71	69'- 10.5"	67'- 5.93"
7	70	69'- 0.5"	66'- 8.27"
8	68	67'- 0"	64'- 8.6"
9	67	66'- 4"	64'- 0.87"
10	65	63'- 10.5"	61'- 8.38"
11	64	62'- 10"	60'- 8.31"
12	63	52'- 1"	50'- 3.70"
13	62	61'- 0"	58'- 11.06"
14	60	59'- 3"	57'- 2.77"
15	59	58'- 2"	56'- 2.22"
16	58	57'- 2"	55'- 2.63"
17	57	55'- 11.5"	54'- 0.62"
18	56	55'- 1"	53'- 2.48"
19	55	54'- 3.75"	52'- 5.54"
20	54	53'- 0.75"	51'- 3.05"
21	52	50'- 11.25"	49'- 2.42"
22	51	50'- 2"	48'- 5.49"
23	35	34'- 2.5"	33'- 0.51"
24	35	34'- 3.5"	33'- 1.48"
25	35	33'- 7"	32'- 5.27"
26	35	34'- 3.25"	33'- 1.2"
27	35	34'- 3.25"	33'- 1.2"
28	35	34'- 3.5"	33'- 1.48"
29	35	34'- 2.5"	33'- 0.51"
30	35	34'- 4"	33'- 1.96"
31	35	34'- 1"	32'- 11.06"
32	35	34'- 1.5"	32'- 11.55"
33	35	34'- 5"	33'- 2.93"
34	35	34'- 6"	33'- 3.89"
35	35	34'- 0.5"	32'- 10.58"
36	35	33'- 11"	32'- 9.13"
37	35	34'- 3.75"	33'- 1.72"
38	35	34'- 3.75"	33'- 1.72"
39	35	34'- 7"	33'- 4.86"
40	35	35'- 10"	34'- 7.35"
41	35	34'- 5.5"	33'- 3.41"
42	35	34'- 6.75"	33'- 4.62"
43	35	34'- 5.5"	33'- 3.41"
44	35	33'- 8.5"	32'- 6.72"
45	35	34'- 1.25"	32'- 11.31"
46	35	34'- 4.25"	33'- 2.20"
47	35	34'- 3"	33'- 1.00"
48	35	34'- 0.5"	32'- 10.58"
49	35	34'- 2.75"	33'- 0.75"
50	35	34'- 2"	33'- 0"
51	35	34'- 3.25"	33'- 1.2"
52	35	34'- 0.5"	32'- 10.8"
53	35	34'- 0.25"	32'- 10.8"
54	35	34'- 1"	32'- 10.8"
55	35	34'- 4"	33'- 2.4"
56	35	34'- 1.5"	32'- 12"
57	35	34'- 1.5"	32'- 12"
58	35	34'- 0.75"	32'- 10.8"
59	35	34'- 1.5"	32'- 12"
60	35	34'- 6.5"	33'- 4.8"

Tieback anchors are visually represented as their horizontal distance due to a 15 degree angle.

Anchors were driven 4' below existing grade, in the belly of each pair of sheets.

Distance between anchors for sheets 1-48 were approx. 4.53'. Distance between anchors for sheets 49-61 were approx 3.83'.

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PLAN SHEET			

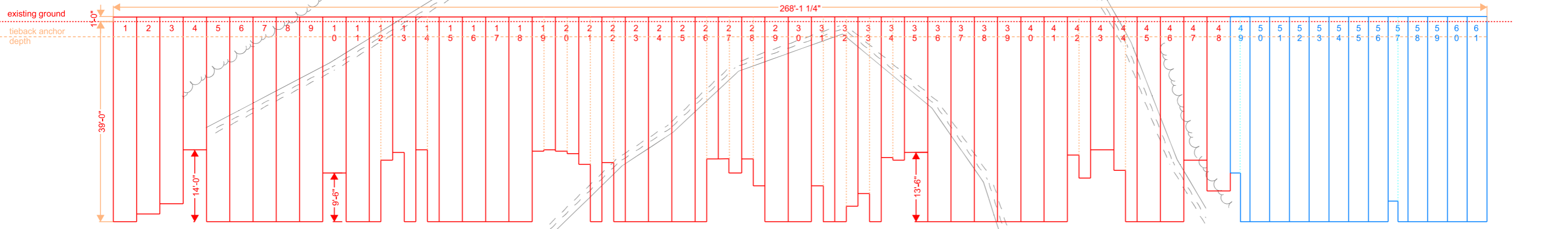
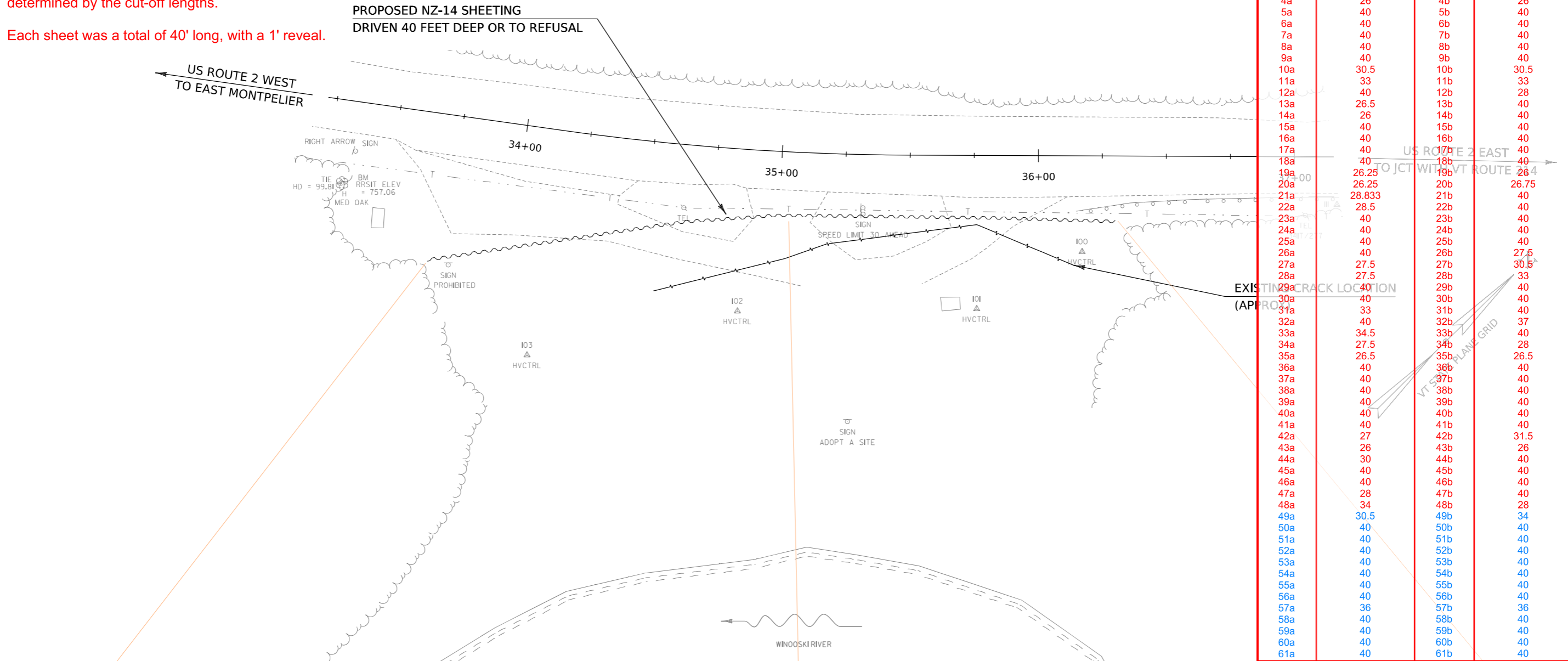
Sheet Pile Total Depths

Diagram shows the total length of sheet piles in existing ground, as determined by the cut-off lengths.

Each sheet was a total of 40' long, with a 1' reveal.

**PROPOSED NZ-14 SHEETING
DRIVEN 40 FEET DEEP OR TO REFUSAL**

Sheet #	Total Sheet L (ft)	Sheet #	Total Sheet L (ft)
1a	40	1b	40
2a	38.5	2b	38.5
3a	36.5	3b	36.5
4a	26	4b	26
5a	40	5b	40
6a	40	6b	40
7a	40	7b	40
8a	40	8b	40
9a	40	9b	40
10a	30.5	10b	30.5
11a	33	11b	33
12a	40	12b	28
13a	26.5	13b	40
14a	26	14b	40
15a	40	15b	40
16a	40	16b	40
17a	40	17b	40
18a	40	18b	40
19a	26.25	19b	26.4
20a	26.25	20b	26.75
21a	28.833	21b	40
22a	28.5	22b	40
23a	40	23b	40
24a	40	24b	40
25a	40	25b	40
26a	40	26b	27.5
27a	27.5	27b	30.5
28a	27.5	28b	33
29a	40	29b	40
30a	40	30b	40
31a	33	31b	40
32a	40	32b	37
33a	34.5	33b	40
34a	27.5	34b	28
35a	26.5	35b	26.5
36a	40	36b	40
37a	40	37b	40
38a	40	38b	40
39a	40	39b	40
40a	40	40b	40
41a	40	41b	40
42a	27	42b	31.5
43a	26	43b	26
44a	30	44b	40
45a	40	45b	40
46a	40	46b	40
47a	28	47b	40
48a	34	48b	28
49a	30.5	49b	34
50a	40	50b	40
51a	40	51b	40
52a	40	52b	40
53a	40	53b	40
54a	40	54b	40
55a	40	55b	40
56a	40	56b	40
57a	36	57b	36
58a	40	58b	40
59a	40	59b	40
60a	40	60b	40
61a	40	61b	40



PZC-14 assumed to have an avg. width of 4.53' for a pair of sheets.

PZC-17 assumed to have an avg. width of 3.83' for a pair of sheets.

SCALE 1" = 20'-0"
20 0 20
Scale 1" = 10'-0"

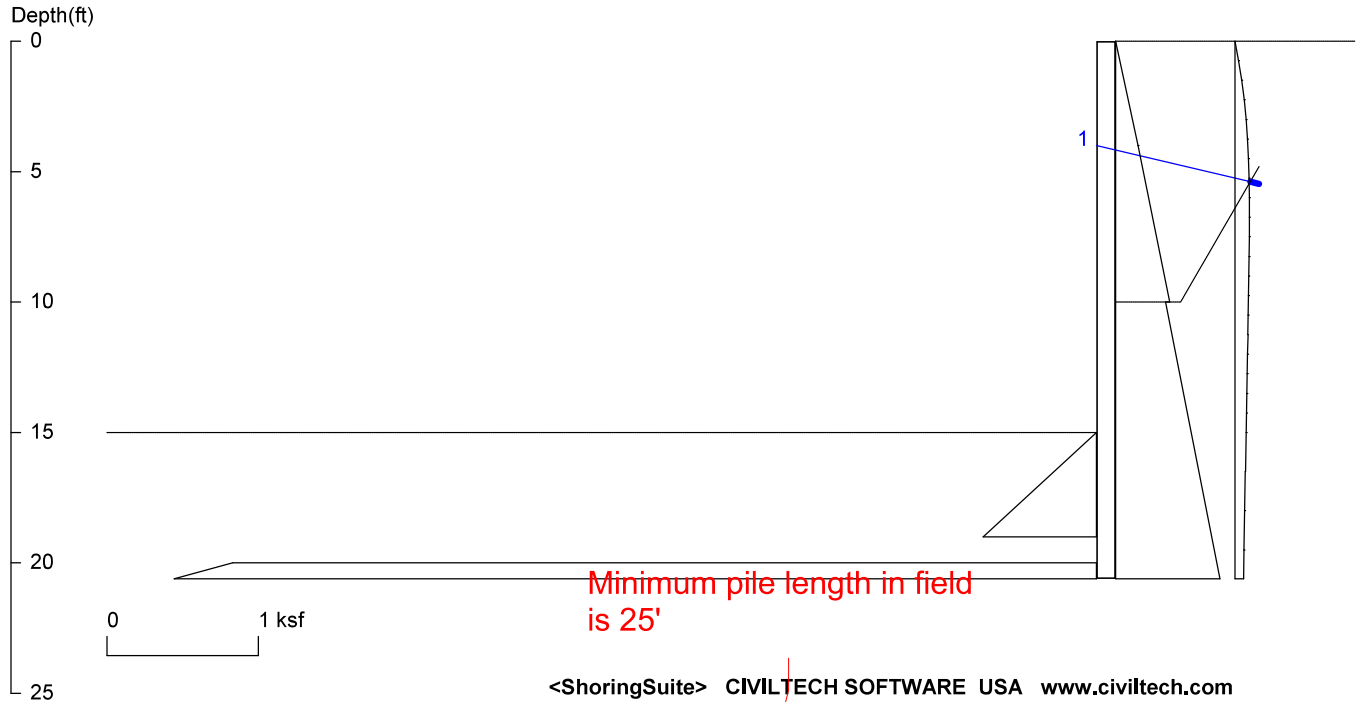
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PLAN SHEET			



ATTACHMENT 2 – EMERGENCY SHEETING
ALLOWABLE EXPOSED FACE

Plainfield - Emergency Situation

Traffic Loading With Tieback



Licensed to 4324324234 3424343

Date: 7/25/2025

File: M:\CL\0750 VAOT\750-12.29 Rte. 2 Plainfield Slide\Engineering\CT Shore\As Built Analysis\July 2025 As Built Analysis

Wall Height=15.0

Pile Diameter=1.0

Pile Spacing=1.0

Wall Type: 1. Sheet Pile

PILE LENGTH: Min. Embedment=5.61 Min. Pile Length=20.61

MOMENT IN PILE: Max. Moment=14.01 per Pile Spacing=1.0 at Depth=12.38

Tiebacks installed and tested to 25 kips allowable capacity.

PILE SELECTION:

Request Min. Section Modulus = 5.1 in³/ft=273.90 cm³/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

User Input I (Moment of Inertia):

Top Deflection = -0.10(in) based on E (ksi)=29000.00 and I (in⁴)/foot=164.3

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	4.0	15.0	4.5	17.0	16.4	4.4	5.3	25.1

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
0	0	4	0.148	0.037
4	0.148	10	0.358	0.035
10	0.33	50	1.690	0.034
*	Sur-	charge		
0.000	0.000	0.750	0.023	0.030310
0.750	0.023	1.500	0.043	0.027408
1.500	0.043	2.250	0.060	0.022586
2.250	0.060	3.000	0.073	0.017159
3.000	0.073	3.750	0.082	0.012125
3.750	0.082	4.500	0.088	0.007962
4.500	0.088	5.250	0.092	0.004750
5.250	0.092	6.000	0.094	0.002370
6.000	0.094	6.750	0.094	0.000648

Tiebacks installed are at least 33-feet long, condition is met.

6.750	0.094	7.500	0.094	-0.000583
7.500	0.094	8.250	0.092	-0.001456
8.250	0.092	9.000	0.091	-0.002071
9.000	0.091	9.750	0.089	-0.002500
9.750	0.089	10.500	0.087	-0.002795
10.500	0.087	11.250	0.085	-0.002993
11.250	0.085	12.000	0.082	-0.003120
12.000	0.082	12.750	0.080	-0.003193
12.750	0.080	13.500	0.078	-0.003227
13.500	0.078	14.250	0.075	-0.003231
14.250	0.075	15.000	0.073	-0.003212
15.000	0.073	16.500	0.068	-0.003152
16.500	0.068	18.000	0.063	-0.003036
18.000	0.063	19.500	0.059	-0.002892
19.500	0.059	21.000	0.055	-0.002735

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
15	0	19	0.748	0.187
20	5.71	50	24.79	0.636

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	1.00
2	10.00	1.00

PASSIVE SPACING:

No.	Z depth	Spacing
1	10.00	1.00

UNITS: Width, Spacing, Diameter, Length, and Depth - ft; Force - kip; Moment - kip-ft
Friction, Bearing, and Pressure - ksf; Pres. Slope - kip/ft³; Deflection - in