

TO: Dr. A. Emily Parkany, P.E., Research Manager
Ashlie Mercado, Research Engineer

CC: Patrick Ross, Hydraulics Engineer

FROM: Madeline Glow, Hydraulics Project Engineer

DATE: October 27, 2023

SUBJECT: Experimental Feature Work Plan 2018-R-3 Culvert Liners in Weathersfield and Woodford

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Introduction

The VTrans Hydraulics unit was tasked to annually inspect and report on the condition and functionality of two State-owned large culverts that were rehabilitated with spray-on liner systems. The structures are Bridge 18 in Woodford and Bridge 15 in Weathersfield and are both corrugated metal pipe culverts. In this report there are photos documenting the inspection findings and any damage or deterioration of the pipes' condition.

Existing Conditions

Bridge 18 is a State-owned bridge located on VT Route 9 in the Town of Woodford approximately 2.4 miles West of VT Route 8. Bridge 18 is a 7-ft diameter Corrugated Galvanized Multi Plate Pipe (CGMPP) originally built in 1919 but was reconstructed in 1965. In 2016 the structure had a rating of 3 or "serious" condition. The VTrans Bridge Inspection unit noted in their yearly inspection report that the existing structure invert had perforations throughout the pipe and ongoing corrosion along the water line and recommended that this structure be replaced soon. A culvert rehabilitation scope was proposed and approved by the VTrans Structures unit that called for rehabilitation of the existing culvert with a Spray-on culvert liner system.



Figure 1. Woodford BR18 Inlet Invert (2016 Inspection Photo)



Figure 2. Woodford BR18 Invert Corrosion Damage (2016 Inspection Photo)



Figure 3. Woodford BR18 Invert Condition Pre-Spray on Liner Construction (Construction Photo)

Bridge 15 is a State-owned bridge located on VT Route 131 in the Town of Weathersfield approximately one third of a mile West of the intersection with Weathersfield Center Road. Bridge 15 is an 11-ft diameter Corrugated Galvanized Multi Plate Pipe (CGMPP) originally built in 1959. In 2016 the structure had a rating of 5 or “fair” condition. The VTrans Bridge Inspection unit noted in their yearly inspection report that the existing structure had bolt line cracking and signs that the culvert was deforming or squashing. A culvert rehabilitation scope was proposed and approved by the VTrans Structures unit that called for rehabilitation of the existing culvert with a Spray-on culvert liner system.



Figure 4. Weathersfield BR15 Inlet (2018 Inspection Photo)



Figure 5. Weathersfield BR15 Barrel Rusting (2018 Inspection Photo)



Figure 6. Weathersfield BR15 cracking in plate pipe showing beginning of deformation (2018 Inspection Photo)

Installation and Construction Cost

The installation and construction of the Woodford BF 010-1(52)) liner and new concrete headwall was preformed in the summer of 2019. In order to prepare Bridge 18 for the liner installation, the pipe was pressure washed and any debris or sediment cleaned out. The poor condition of the pipe invert was a construction challenge that required a change order in the project contract to add geotextile concrete matting along the invert of the pipe over the numerous hole in the invert. Due to the number of severe perforations along the culvert invert, the construction project required a change order to repair the invert before the spray-on liner could be applied. The invert repair product, GeoMat, was a geotextile concrete matting product that hardens after hydration to form a durable concrete layer. This GeoMat liner system was needed on the invert in order for the spray-on concrete liner material to stick and bond to even surfaces of the pipe. There was a second change order on the Woodford project to permanently remove an existing VAST snow mobile trail bridge in order to install a cofferdam to pour and form the new beveled concrete headwall for the structure. These two change orders, in addition to the high cost of installing the new headwall, contributed to increased project cost.

The installation and construction of the Weathersfield STP 0146 (16) liner was performed in autumn of 2019 and was an easier installation compared to Woodford. The existing pipe was cleaned using a pressure washer to

remove debris and prep the structure for the spray-on liner. Bridge 15 was in fair condition and had no major holes or perforations throughout the invert, unlike Bridge 18. There was no need for the GeoMat used in Woodford and no additional change orders associated with this project. There was minimal headwall work needed on this structure but some of the existing stones at the headwall were reset and fixed as part of the project scope. Overall, the Weathersfield spray-on liner was easier to install and more straightforward compared to the Woodford liner.

The prime contractor, Alpine Construction LLC, whose contract bid was chosen and awarded by the Vermont Agency of Transportation was originally \$858,210.84 for both Weathersfield STP 0146 (16) & Woodford BF 010-1 (52) projects. The first change order to remove the VAST trail bridge was \$2,518.06 bringing the revised contract price to \$860,728.90. The second change order to install the GeoMat liner on the invert of Bridge 18 was \$33,732.80 bringing the revised contract price to \$894,461.70.

Spray-On Liner Inspection Photos

Woodford

The Woodford BF 010-1(52)) project rehabilitated Bridge 18 with a concrete spray-on liner and constructing a beveled headwall at the inlet. After the spray on liner was installed, the culvert was inspected by VTrans Hydraulics staff about once a year to check that the culvert was still functioning as intended and to check the condition. Below are photos from the annual inspections (2019 to 2023) showing the condition of the structure and any damage seen over time.



Figure 7. Woodford BR18 Spray On Liner: Outlet, fish baffles (2019)



Figure 8. Woodford BR18 Spray On Liner: Barrel (2019)



Figure 9. Woodford BR18 Spray On Liner: Inlet with beveled headwall (2021)



Figure 10. Woodford BR18 Spray On Liner: Barrel (2021)

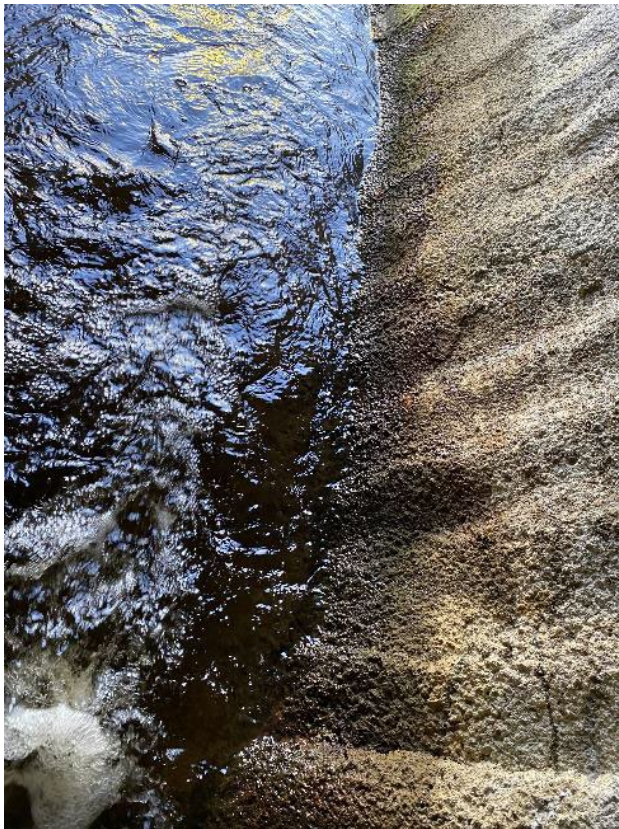


Figure 11. Woodford BR18 Spray On Liner: Staining along invert (left), Cracking along Outlet Mitered edge (right) (2021)



Figure 12. Woodford BR18 Spray On Liner: Barrel condition (2023)



Figure 13. Woodford BR18 Spray On Liner: Minor cracking in barrel (2023)



Figure 14. Woodford BR18 Spray On Liner: Invert rust or staining (2023)



Figure 15. Woodford BR18 Spray On Liner: Fish baffle condition (2023)

Weathersfield

The Weathersfield STP 0146 (16) project rehabilitated Bridge 15 with a concrete spray-on liner and minor headwall repairs. After the spray on liner was installed, the culvert was inspected by VTrans Hydraulics staff about once a year to check that the culvert was still functioning as intended and to check the condition. Below are photos from the annual inspections (2020 to 2023) showing the condition of the structure and any damage seen over time.



Figure 16. Weathersfield BR15 Spray On Liner: Inlet and headwall (2020)



Figure 17. Weathersfield BR15 Spray On Liner: Outlet Invert (2020)



Figure 18. Weathersfield BR15 Spray On Liner: Invert minor staining (2020)



Figure 19. Weathersfield BR15 Spray On Liner: Spray-On pipe material near inlet (2021)



Figure 20. Weathersfield BR15 Spray On Liner: Barrel condition (2021)



Figure 21. Weathersfield BR15 Spray On Liner: Outlet invert with some minor cracking at pipe edge (2021)



Figure 22. Weathersfield BR15 Spray On Liner: Inlet headwall (2023)



Figure(s) 23. Weathersfield BR15 Spray On Liner: side wall condition (left), minor cracking at culvert top (right) (2023)



Figure 24. Weathersfield BR15 Spray On Liner: Barrel (2023)



Figure 25. Weathersfield BR15 Spray On Liner: Outlet edge showing signs of algae growth and staining on liner (2023)

Inspection Findings and Conclusion

Both the Woodford and Weathersfield spray-on liner culverts are working well and functioning as intended. The Woodford liner was found to have some of the concrete flaking off at the outlet mitered edge over the past few years. Additionally, it was observed that groundwater was piping underneath the pipe and causing bacterial growth, likely caused by the CGMPP bottom invert rotting out. The Weathersfield pipe has been holding up very well with parts of the concrete liner flaking off around the outlet edge of the pipe and some algae or bacterial growth around the edge also.

In both structures there were minor cracks (less than 1/16th inch wide) observed at the edges of pipe outlets and minor cracks scattered throughout the barrel of the structures. Rust or algal black staining was also observed in both pipes along the invert but was not a concern to the structural condition of the liner. There was no delamination or major cracking seen in either liner structure, reducing the concern of water flowing in-between the host pipe and liner system or freeze thaw expansion issues.

Overall, these lined pipes are functioning in good condition and there are no major hydraulic concerns at this time. Based on the challenges seen during the installation of the liner and headwall on the Woodford structure, future pipes that are in fair condition or better and/or without major rusting or holes throughout the pipe invert would be better suited for this type of rehabilitation treatment. The Weathersfield project is likely a better example of this type of treatment to be replicated in the future as the host pipe was in fair condition with the invert mainly intact and only minor headwall work required, keeping the project at a more cost-effective level. With both of these pipe liner systems functioning very well after several years and through multiple high-water events, this type of spray-on liner system is worth considering for future projects.

Appendices

The following documents are attached as appendices to this report:

- Appendix A: Concrete Mix Design Submittal
- Appendix B: Milliken Infrastructure Solutions GeoSpray Geopolymer Mortar Submittal
- Appendix C: Milliken Infrastructure Solutions Concrete Cloth Geosynthetic Cementitious Composite Mat
- Appendix D: Michels Corp. Design Calculations for Liner Submittal
- Appendix E: Change Order 001: VAST Trail Bridge Removal
- Appendix F: Change Order 002: Culvert Liner
- Appendix G: Results of Bids
- Appendix H: Woodford BF 010-1 (52) / Weathersfield STP 0146 (16) Contract Plans

Appendix A: Concrete Mix Design Submittal

Alpine Construction LLC
10 Broad Street
Schuylerville, NY 12871

Date: 6/10/2019

Jay Strong
Resident Engineer
Montpelier, VT, 05633-5001

Subject: Woodford BF 010-1(52) Revised

Please be advised that we intend to use the following mix design(s) attached on the Woodford BF 010-1(52) project, at the specified locations:

Mix Design ID #	Date Approved	Location to be Used
HP19-B-190 HP Class B	4/24/2019	Headwall and Footings
SC19-C-190 Class C	4/29/2019	Filling Voids below OHW Line (Request this mix replace Class D Mix)
FF19-190 Flowable Fill	4/24/2019	Filling Voids above the OHW Line

William P Patenaude, Principal

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIAL AND RESEARCH SECTION - STRUCTURAL CONCRETE UNIT

STRUCTURAL CONCRETE MIX DESIGN SUBMISSION

Revision: 04/22/2017

Agency Use Only	
Mix ID	HP19-B-190
Mix Design #	190
Approved by	jwild
Approved Date	4/24/2019
Spec Book Year	2011

Concrete class: HPC B
Additional Description: With Fly Ash
Ready Mix Supplier: DAILEY, WE - SHAFTSBURY, VT
Designed By: George Woodworth
Design strength: 3500 PSI
Mix Design Style: Conventional
Agg weight - SSD or Dry: SSD

Mix designs are valid for a 12 month period from date of approval or unless there is a change in material, material property or design parameter.

Cement: 701.02	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
Cement Type III: 701.04	Source: _____ Brand Name: _____	Specific Gravity _____	0 lb/cy	0.00 cf
Blended Cement: 701.06	Source: <u>LAFARGE BLENDED - ST CONSTANT, QUEBEC</u> Brand Name: _____	Specific Gravity <u>3.019</u>	<u>452</u> lb/cy	<u>2.40</u> cf
Cement with Slag: 701.07	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
Pozzolan: 725.03(a)	Source: <u>HEADWATERS RESOURCES - SAMMIS</u> Brand Name: _____	Specific Gravity <u>2.740</u>	<u>112</u> lb/cy	<u>0.66</u> cf
Fly Ash: 725.03(a)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
Silica Fume: 725.03(b)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
Slag: 725.03(c)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
Water			<u>29.5</u> gals	<u>246.2</u> lb/cy
Air Content Target			<u>7.0</u> %	<u>3.94</u> cf
Coarse Aggregate 3/8" 704.02A	Source: _____ Absorption _____	Specific Gravity _____	0 lb/cy	0.00 cf
Coarse Aggregate 3/4" 704.02B	Source: <u>PECKHAM PIT - HOOSICK, NY</u> Absorption <u>0.39</u>	Specific Gravity <u>2.775</u>	_____ lb/cy	0.00 cf
Coarse Aggregate 1 1/2" 704.02C	Source: <u>PECKHAM PIT - HOOSICK, NY</u> Absorption <u>0.35</u>	Specific Gravity <u>2.770</u>	<u>1700</u> lb/cy	<u>9.84</u> cf
Fine Aggregate: 704.01	Source: <u>PECKHAM PIT - HOOSICK, NY</u> Absorption <u>0.76</u>	Specific Gravity <u>2.799</u> Fineness Modulus <u>2.85</u>	<u>1444</u> lb/cy	<u>8.27</u> cf
Air Entrainment Admixture 725.02(b)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>Darex II</u>	Specific Gravity <u>1.000</u>	<u>2</u> oz/cy	
Retarder Admixture: 725.02(c)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>Daratard 17</u>	Specific Gravity <u>1.200</u>	<u>4</u> oz/cwt	
High Range Water Reducer Admixture: 725.02(h)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>ADVA 140</u>	Specific Gravity <u>1.000</u>	<u>4</u> oz/cwt	
Other Admixtures:	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	0.00 cf
TOTAL			<u>46.803</u>	<u>3954</u> lb
				<u>27.00</u> cf

Approved by
Daoshan Kumarappa
VART Concrete Engineer
4/24/2019

Maximum Water/Cementitious Ratio 0.49
Maximum Water (gal/cy) 33.1
Slump Min/Max (inch) _____ min _____ max
Air Content Min/Max (%) 5.5 min 8.5 max
Design Unit Wt. (lb/cf) 146.45

Notes:

Pozzolan - BORAL RESOURCES

Original 1.5" SG= 2.768, abs=0.33. Blend 1.5" 65% (1105lbs), 3/4" 35% (595lbs).

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIAL AND RESEARCH SECTION - STRUCTURAL CONCRETE UNIT

STRUCTURAL CONCRETE MIX DESIGN SUBMISSION

Revision: 04/22/2017

Concrete class: 2013+ Class C
 Additional Description: With Fly Ash
 Ready Mix Supplier: DAILEY, WE - SHAFTSBURY, VT
 Designed By: George Woodworth
 Design strength: 3000 PSI
 Mix Design Style: Conventional
 Agg weight - SSD or Dry: SSD

Agency Use Only	
Mix ID	SC19-C-190
Mix Design #	190
Approved by	jwild
Approved Date	4/29/2019
Spec Book Year	2011

Mix designs are valid for a 12 month period from date of approval or unless there is a change in material, material property or design parameter.

Cement: 701.02	Source: <u>GLENS FALLS LEHIGH CEMEX - GLENS FALLS, NY</u> Brand Name: _____	Specific Gravity <u>3.150</u>	<u>451</u> lb/cy	<u>2.29</u> cf
Cement Type III: 701.04	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Blended Cement: 701.06	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Cement with Slag: 701.07	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Pozzolan: 725.03(a)	Source: <u>HEADWATERS RESOURCES - SAMMIS</u> Brand Name: _____	Specific Gravity <u>2.560</u>	<u>113</u> lb/cy	<u>0.71</u> cf
Fly Ash: 725.03(a)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Silica Fume: 725.03(b)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Slag: 725.03(c)	Source: _____ Brand Name: _____	Specific Gravity _____	_____ lb/cy	<u>0.00</u> cf
Water		<u>29.5</u> gals	<u>246.2</u> lb/cy	<u>3.94</u> cf
Air Content Target		<u>5.5</u> %		<u>1.485</u> cf
Coarse Aggregate 3/8" 704.02A	Source: _____	Absorption _____	Specific Gravity _____	<u>0</u> lb/cy <u>0.00</u> cf
Coarse Aggregate 3/4" 704.02B	Source: <u>PECKHAM PIT - HOOSICK, NY</u>	Absorption <u>0.39</u>	Specific Gravity <u>2.775</u>	<u>1790</u> lb/cy <u>10.34</u> cf
Coarse Aggregate 1 1/2" 704.02C	Source: _____	Absorption _____	Specific Gravity _____	_____ lb/cy <u>0.00</u> cf
Fine Aggregate: 704.01	Source: <u>PECKHAM PIT - HOOSICK, NY</u>	Absorption <u>0.76</u>	Specific Gravity <u>2.799</u> Fineness Modulus <u>2.85</u>	<u>1438</u> lb/cy <u>8.24</u> cf
Air Entrainment Admixture 725.02(b)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>Darex II</u>		Specific Gravity <u>1.000</u>	<u>2</u> oz/cy
Retarder Admixture: 725.02(c)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>Daratard 17</u>		Specific Gravity <u>1.200</u>	<u>4</u> oz/cwt
High Range Water Reducer Admixture: 725.02(h)	Source: <u>W.R. GRACE & CO. - CAMBRIDGE, MA</u> Brand Name: <u>ADVA 140</u>		Specific Gravity <u>1.000</u>	<u>4</u> oz/cwt
Other Admixtures:	Source: _____ Brand Name: _____		Specific Gravity _____	_____ _____ <u>0.00</u> cf
	Source: _____ Brand Name: _____		Specific Gravity _____	_____ _____ <u>0.00</u> cf
	Source: _____ Brand Name: _____		Specific Gravity _____	_____ _____ <u>0.00</u> cf
	Source: _____ Brand Name: _____		Specific Gravity _____	_____ _____ <u>0.00</u> cf
		TOTAL	<u>40.834</u>	<u>4038</u> lb <u>27.00</u> cf

Approved by
 Deepshah Kumarappa
 VDOT concrete Engineer
 4/29/2019

Maximum Water/Cementitious Ratio 0.49
 Maximum Water (gal/cy) 33.1
 Slump Min/Max (inch) _____ min _____ max
 Air Content Min/Max (%) 4.0 min 7.0 max
 Design Unit Wt. (lb/cf) 149.56

Notes:

Pozzolan- BORAL RESOURCES

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIAL AND RESEARCH SECTION - STRUCTURAL CONCRETE UNIT

STRUCTURAL CONCRETE MIX DESIGN SUBMISSION

Revision: 04/22/2017

Concrete class: Flowable Fill
 Additional Description _____
 Ready Mix Supplier: DAILEY, WE - SHAFTSBURY, VT
 Designed By: George Woodworth
 Design strength _____ 125 _____ PSI
 Mix Design Style: Flowable Fill
 Agg weight - SSD or Dry: SSD

Agency Use Only	
Mix ID	FF19-190
Mix Design #	190
Approved by	jwild
Approved Date	4/24/2019
Spec Book Year	2011

Mix designs are valid for a 12 month period from date of approval or unless there is a change in material, material property or design parameter.

Cement:		Specific Gravity	<u>3.150</u>	<u>75</u> lb/cy	<u>0.38</u> cf
701.02	Source: <u>LEHIGH NORTHEAST CEMENT CO - GLENSFALLS, NY</u>				
	Brand Name: _____				
Cement Type III:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
701.04	Source: _____				
	Brand Name: _____				
Blended Cement:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
701.06	Source: _____				
	Brand Name: _____				
Cement with Slag:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
701.07	Source: _____				
	Brand Name: _____				
Pozzolan:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
725.03(a)	Source: _____				
	Brand Name: _____				
Fly Ash:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
725.03(a)	Source: _____				
	Brand Name: _____				
Silica Fume:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
725.03(b)	Source: _____				
	Brand Name: _____				
Slag:		Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
725.03(c)	Source: _____				
	Brand Name: _____				
Water			<u>45</u> gals	<u>375.5</u> lb/cy	<u>6.02</u> cf
Air Content Target			<u>25.0</u> %		<u>6.75</u> cf
Coarse Aggregate 3/8"	Absorption _____	Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
704.02A	Source: _____				
	Brand Name: _____				
Coarse Aggregate 3/4"	Absorption _____	Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
704.02B	Source: _____				
	Brand Name: _____				
Coarse Aggregate 1 1/2"	Absorption _____	Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
704.02C	Source: _____				
	Brand Name: _____				
Fine Aggregate:	Absorption <u>0.76</u>	Specific Gravity	<u>2.799</u>	<u>2419</u> lb/cy	<u>13.85</u> cf
704.01	Source: <u>PECKHAM PIT - HOOSICK, NY</u>	Fineness Modulus	_____		
	Brand Name: _____				
Air Entrainment Admixture		Specific Gravity	_____	_____ oz/cy	
725.02(b)	Source: _____				
	Brand Name: _____				
Retarder Admixture:		Specific Gravity	_____	_____ oz/cwt	
725.02(c)	Source: _____				
	Brand Name: _____				
High Range Water Reducer Admixture:		Specific Gravity	_____	_____ oz/cwt	
725.02(h)	Source: _____				
	Brand Name: _____				
Other Admixtures:		Specific Gravity	<u>1.050</u>	<u>0.186</u> lb/cy	<u>0.00</u> cf
Specific performance admixture					
725.02(i)	Source: <u>MASTER BUILDERS INC - MESQUITE, TX</u>				
	Brand Name: <u>MasterCell 25</u>	Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
	Source: _____				
	Brand Name: _____	Specific Gravity	_____	_____ lb/cy	<u>0.00</u> cf
	Source: _____				
	Brand Name: _____				
		TOTAL	<u>73.849</u>	<u>2870</u> lb	<u>27.00</u> cf

Approved by
 Dasheen Kumarrappa
 VDOT Concrete Engineer
 4/24/2019

Maximum Water/Cementitious Ratio	<u>3.00</u>		
Maximum Water (gal/cy)	<u>27.0</u>		
Slump Min/Max (inch)	<u>8.0</u> min	<u>12.0</u> max	
Air Content Min/Max (%)	<u>10.0</u> min	<u>40.0</u> max	
Design Unit Wt. (lb/cf)	<u>106.29</u>		

Notes:

MasterCell 25 admixture from BASF maybe added at the job site or at the Ready Mix plant. 1-3" slump before adding. 1 bag/4 cy.

Appendix B: Milliken Infrastructure Solutions GeoSpray Geopolymer Mortar Submittal

Milliken Infrastructure Solutions

GeoSpray®

Geopolymer Mortar

Don't Replace, Rehabilitate!

GeoSpray® geopolymer mortar is used for rehabilitation of large diameter pipes and structures in Civil Infrastructure as well as Gas, Oil and Industrial locations. It is the first geopolymer mortar specifically designed as a structural and corrosion-resistant solution for large diameter storm and sanitary pipes, manholes, wet wells, and treatment plant structures.

GeoSpray geopolymer is a fiber reinforced mortar that looks and feels like Portland cement, but with higher performance properties. Unlike other cementitious liners, the unique GeoSpray mortar chemistry provides superior flexural and compressive strength, as well as ultra-low porosity and high self-bonding which eliminates cold joints. GeoSpray geopolymer is intended for use through multiple application techniques including pouring, troweling, spraying, or centrifugal/spin casting.

Engineered

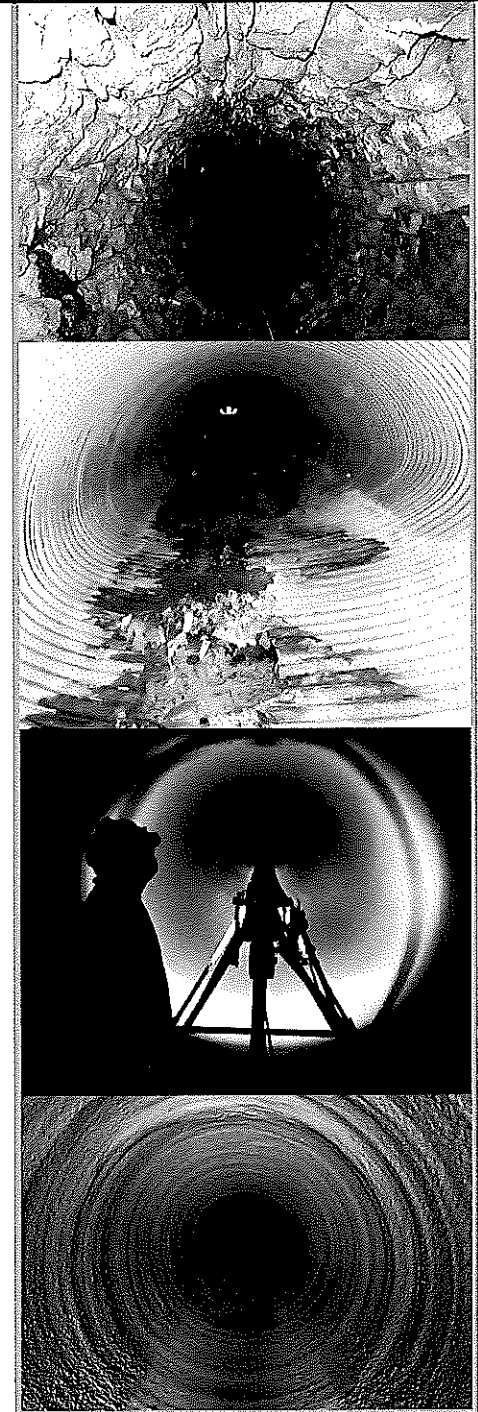
- Highest flexural strength repair mortar - 1500 psi at 28 days (ASTM C78)
- High early and ultimate strength
- Unique chemistry promotes self-bonding - Eliminating cold joints between applications
- Inherently resistant to H₂S corrosion mechanisms
- Adapts to any shape including: bends, curves and angles
- Most extensive third-party testing in the industry

Cost Efficient

- Typically lower installed lifecycle cost compared with alternative rehabilitation methods including: CIPP, slipline and spiral wound
- The larger the diameter the bigger the cost savings
- Minimal installation footprint
- Quick return to service with lower by-pass costs, flexible by-pass options tuned to your project needs
- Eliminate excavation with equipment that fits through 20 inch manholes

Safe & Sustainable

- Styrene free with no leachable toxins
- NSF 61 certification for potable water
- Third-party evaluation from EPA and other independent laboratories
- 50%+ of raw materials come from recycled industrial by-products
- Reduces greenhouse gas emissions over Portland cement based systems



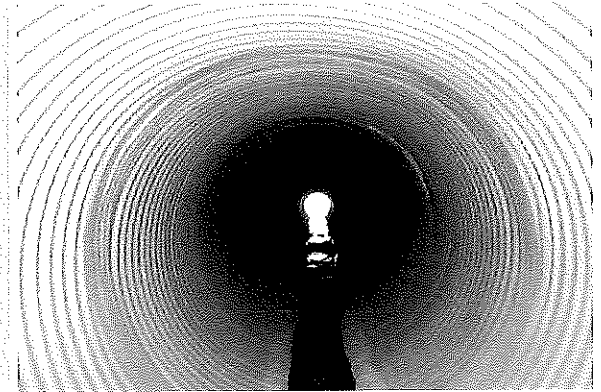
infrastructure.milliken.com
855-655-6750

MILLIKEN INFRASTRUCTURE. 
A Milliken COMPANY

Milliken Infrastructure Solutions

GeoSpray[®]

Geopolymer Mortar



GeoSpray geopolymer is a high performance fiber reinforced mortar specifically designed for structural rehabilitation. This high strength, ultra-low porosity material is made from natural mineral polymers and recycled industrial waste streams. The GeoSpray system is designed for use through multiple application techniques including pouring, placing, trowelling, spraying, or centrifugal casting.

Benefits

- Provides physical properties associated with cement mortars, but with the chemistry similar to that of an engineered stone
- Prevents cold joints between layers from its unique chemical nature
- Can be applied monolithically to any shape pipe, including right angles and curves
- Safe and sustainable

Typical Uses

GeoSpray geopolymer can be used for rehabilitation of pipes and structures in Civil Infrastructure, Gas & Oil and Chemical industries. Applications include:

- Pipelines
- Bridges
- Buildings
- Roads
- Tunnels
- Containment areas

Storage

GeoSpray geopolymer should be stored in a cool, dry location. Stored under proper conditions, shelf life is one year.

Test Method	Duration	GeoSpray	Conventional Repair Mortar
Compressive Strength ASTM C-39/C-109	1 Day 28 Days	Min. 2,500 psi / 17 MPa Min. 8,000 psi / 55 MPa	5000 psi / 34 MPa
Flexural Strength ASTM C-78	7 Day 28 Days	750 psi / 5.2 MPa 1500 psi / 10.3 MPa	500 psi / 3.4 MPa
Modulus of Elasticity ASTM C-469	1 Day 28 Days	3,000,000 psi / 20700 MPa 5,800,000 psi / 40000 MPa	3,000,000 psi / 20700 MPa
Bond Strength to Concrete ASTM C-882	1 Day 28 Days	Min 900 psi / 6.2 MPa Min. 2,500 psi / 17 MPa	N/A
Set Time ASTM C-807 Initial Cure Time	Initial Set Final Set	60 - 75 Minutes 90 - 110 Minutes	120 Minutes 300 minutes
Freeze Thaw Durability ASTM C-666	300 Cycles	100% Zero loss	80% to 90% 10% to 20% degradation
Shrinkage ASTM C-1090	28 Days	0.00% @ 65% R. H.	0.35% to 0.50% Shrinkage
Tensile Strength ASTM C-496	28 Days	Min. 800 psi / 5.5 MPa	400 psi / 2.7 MPa
Abrasion Resistance ASTM C-1138	5 Cycles @ 28 Day Maturity	2.7% Loss	4.7% Loss
Rapid Chloride Ion Permeability ASTM C-1202	28 Days	Very Low	N/A

infrastructure.milliken.com
855-655-6750

MILLIKEN INFRASTRUCTURE. 
A Milliken COMPANY

Composition

A proprietary micro-fiber reinforced ultra-dense geopolymer mortar designed for mechanical pumping and spraying. GeoSpray is an inorganic polymeric system that adheres strongly to prepared cement surfaces and itself.

Characteristics

A dark grey mortar with near-zero porosity. Wet density of ~127 lbs/ft³, or 2035 kg/m³. Largest particle size: 3.0 mm.

Yield and Coverage

Yields 0.43 ft³ (0.012 m³) per 50 lbs. For one 50lb bag, coverage is 10.3 ft² at 0.5" depth (0.96m² per 12mm depth)

Packaging

GeoSpray is available in 50lb (22.7kg) sealed bags or in 2,000lb (908kg) super sacks.

Cleaning and Preparation

The surface shall be thoroughly cleaned. Use high-pressure water blasting with a minimum of 3500 psi (or as required by local provisions) to clean and free all foreign material, including dirt, grit, roots, grease, sludge or other material that may be attached to the existing surface. All loose or defective brick, grout, or surface irregularities should be removed to provide an even surface prior to application of GeoSpray. When grease and oil are present, an approved detergent or muriatic acid shall be used integrally with the high pressure cleaning water. All materials resulting from the cleaning of the pipe shall be removed prior to application of GeoSpray.

Mixing

Do not exceed a 0.20 w/c ratio. Always add GeoSpray to the water. Follow normal industry standards for batching and mixing.

Work Time

Work time is 60 - 90 minutes at 80°F (27°C).

Application

Once mixed to proper consistency and homogeneity, GeoSpray can be hand troweled as a repair mortar for crack repair prior to spraying.

GeoSpray should be pumped from a horizontal mix auger cavity via an adjustable rotor stator pump through a hose for delivery to the appropriate application device (spray nozzle or spinner head), and shall be applied to a damp surface.

GeoSpray has an ultra-low abrasion rate on hoses and equipment; they will last much longer, with fewer interruptions and remobilizations.

Finishing

If necessary, troweling of materials can begin following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify the pipe wall. Take precautions not to over trowel.

GeoSpray can be finished using a steel trowel, wood float, sponge float, broom or brush, depending on the surface texture desired. Do not use a magnesium float.

Curing

Optimum curing occurs in a moist and moderate environment. General underground conditions are usually adequate to meet this requirement. If dry and/or hot conditions are present, the use of a wind barrier and fogging spray will be required.

During hot weather conditions, chilled water may be used to mix GeoSpray geopolymer. GeoSpray geopolymer cement should be maintained at a temperature lower than 90°F (32°C).

Standard industry practices may be used to maintain proper temperature.

Alternatively, GeoSpray should not be placed when the temperature in the curing environment is below 37°F (3°C). During cold weather

conditions, heaters, thermal breaks, and other methods may be used to maintain temperature above that threshold.

Quality Control & Material Testing

For each section length designated by the owner in the contract documents or purchase order, GeoSpray will be collected at the end of the hose near the discharge point. Use 4" by 8" cylinders in accordance with Test Method ASTM C 39/39M or sprayed panels in accordance with ASTM C1140.

Health & Safety

GeoSpray, is a cementitious powder, is alkaline and may cause significant skin and eye irritation. Adequate health and safety precautions should be observed during all storage, handling, use and drying periods. For safety and health precautions, reference the current version of the Safety Data Sheet for GeoSpray. When using GeoSpray in a confined space or closed area, consult the current OSHA or ANSI bulletins on safety requirements. Do not take internally. If swallowed, call a physician immediately.

Warranty

Milliken Infrastructure Solutions, LLC warrants this product to be free of defects in material and manufacturing. Should the product prove to be defective, the liability to Milliken Infrastructure Solutions shall be limited to replacement of the product, exfactory. Milliken Infrastructure Solutions makes no warranties as to merchantability or fitness for a particular purpose. This warranty is in lieu of all other warranties expressed or implied. Users should determine the suitability of the product for the intended use and assume all risk and liability in connection therewith.

Milliken Infrastructure Solutions, LLC is a subsidiary of Milliken & Company. The Milliken Infrastructure logo is a trademark of Milliken Infrastructure Solutions, LLC. The Milliken logo is used under license by Milliken Infrastructure Solutions, LLC, all rights reserved. GeoSpray is a registered trademark of Milliken Infrastructure Solutions, LLC.

Before using any Milliken Infrastructure Solutions, LLC product, the user must review the most recent version of the product's technical data sheet, material safety data sheet and other applicable documents, available at infrastructure.milliken.com or by calling 1-855-655-6750.

LIMITED WARRANTY: Milliken Infrastructure Solutions, LLC is very proud of our innovative GeoSpray® products (the "Products") and our superior customer service. We hereby warrant to the original purchaser that the Products meet Milliken's standard specifications at the time of delivery from us. If the Products are found to be defective because they do not meet this Warranty, then we will as the sole remedy either (at our option) refund the purchase price for those Products or provide replacement Products (in either case, not including shipping, installation or any other cost). Naturally, we are not responsible or liable for degradation, damage, liability or defect in, or related to, the Products caused by improper storage, use, installation or maintenance, any other party's representations, warranties, actions, or omissions, or acts of God. WE MAKE NO REPRESENTATION OR WARRANTY BEYOND THE EXPLICIT STATEMENTS CONTAINED IN THIS WARRANTY, AND ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, INFRINGEMENT, OR ANY WARRANTIES BASED UPON SAMPLES, MODELS, OR SPECIFICATIONS, ARE HEREBY EXPRESSLY DISCLAIMED, NOTWITHSTANDING ANYTHING TO THE CONTRARY, IN NO EVENT SHALL WE BE LIABLE TO THE ORIGINAL PURCHASER OR ANYONE ELSE FOR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, OR EXEMPLARY (OR ANY SIMILAR TYPE OF) DAMAGES RELATED TO THE PRODUCTS. As each customer's use of our Products and situation may be different, information we provide, including without limitation, use or installation suggestions, test results, samples, etc. is provided in good faith but without warranty and without accepting any responsibility or liability. Each customer must test and be responsible for its own specific use, installation, application, etc. All sales are exclusively subject to our standard terms of sale posted at www.milliken.com/terms (all additional/different terms are rejected) unless explicitly agreed otherwise in a signed writing. This Warranty is governed by the laws of the United States and the State of South Carolina, U.S.A. (without giving effect to its conflict of law principles), and any party desiring to take action under this Warranty hereby submits to the exclusive jurisdiction of the courts in such jurisdiction and waives any inconvenient forum claims related thereto. In the unlikely event that you have a warranty issue, please contact your distributor or sales representative to discuss and resolve the matter in accordance with this Warranty.

March 11, 2011
Lab no. 211126

Mr. Scott Gesicki
Geotree Technologies, Inc.
4851 W. 127th Avenue
Broomfield, Colorado 80020

Dear Mr. Gesicki:

Enclosed are the x-ray fluorescence (XRF) analytical results for your samples, "G-Spray" and "D-Earth". This report will be mailed and emailed to you as usual.

A representative portion of each sample was ground to approximately -400 mesh in a steel swing mill and then analyzed by our standard XRF procedure for 31 major, minor and trace elements. The relative precision/accuracy for this procedure is ~5-10% for major-minor elements and ~10-15% for trace elements (those elements listed in ppm) at levels greater than twice the detection limit in samples of average geologic composition. A replicate sample and a standard reference material ("GSP-2", a USGS standard rock) were analyzed with the samples to demonstrate analytical reproducibility for your samples and analytical accuracy for a geologic standard, respectively. The accepted ("known") values for the quality control standard are listed with the XRF results.

Thank you for the opportunity to be of continuing service to Geotree Technologies, Inc.

Sincerely,

Joy Maes

Geotree Technologies, Inc.
XRF Results for Samples

March 11, 2011
Lab no. 211126

IDENT	-----							-----						
	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₂ O ₅	S	Wt %	Cl	K ₂ O	CaO	TiO ₂	MnO ₂	Fe ₂ O ₃	BaO
G-SPRAY	0.61	3.20	6.01	63.6	0.11	1.25	<0.02		1.01	23.2	0.25	0.07	1.94	0.08
D-EARTH	0.43	0.48	4.93	79.6	0.10	0.12	0.02		0.91	0.73	0.22	<0.01	1.70	0.04
Quality Control - Replicate (R) sample and standard reference material (GSP-2) analyzed with samples														
G-SPRAY(R)	0.60	3.20	5.66	62.8	0.11	1.24	<0.02		0.99	22.7	0.24	0.06	1.91	0.08
GSP-2-XRF	3.02	1.17	13.8	68.7	0.29	<0.05	<0.02		5.70	2.08	0.66	0.04	4.94	0.15
GSP-2-known	2.78	0.96	14.9	66.6	0.29	----	----		5.38	2.10	0.66	0.04	4.90	0.15

IDENT	-----							-----						
	V	Cr	Co	Ni	W	Cu	PPM	Zn	As	Sn	Pb	Mo	Sr	U
G-SPRAY	58	93	<10	14	<10	47	52	<20	<50	31	<10	488	<20	
D-EARTH	24	12	<10	<10	<10	15	25	31	<50	19	<10	66	<20	
Quality Control														
G-SPRAY(R)	53	91	<10	15	<10	46	51	<20	<50	30	<10	483	<20	
GSP-2-XRF	58	23	<10	12	<10	45	123	<20	<50	42	<10	231	<20	
GSP-2-known	52	20	7	17	--	43	120	--	--	42	--	240	2	

Ident	-----					
	Th	Nb	PPM	Zr	Rb	Y
G-SPRAY	<20	<10	109	22	26	
D-EARTH	<20	<10	126	34	13	
Quality Control						
G-SPRAY(R)	<20	<10	106	18	22	
GSP-2-XRF	77	20	567	203	37	
GSP-2-known	105	27	550	245	28	

Initial_____

Date_____

Analysis Performed By The Mineral Lab, Inc

Appendix C: Milliken Infrastructure Solutions Concrete Cloth Geosynthetic Cementitious Composite


Milliken Infrastructure Solutions

Concrete Cloth™

Geosynthetic Cementitious Composite Mat

 STORM + SANITARY

 BRIDGES + ROADWAYS

 OIL, GAS + INDUSTRIAL



The Concrete Cloth™ material is a three-dimensional flexible cement impregnated fabric that hardens after hydration to form a durable concrete layer. Classified as a Geosynthetic Cementitious Composite Mat (GCCM), it is used in a variety of civil infrastructure markets including: transportation, oil & gas, stormwater, landfill, mining, and erosion control. Typical applications for use are ditch lining, slope stabilization, shoreline armor, secondary berm protection, culvert invert protection, and geosynthetic liner protection.

Product	MAN PORTABLE BATCH ROLLS				BULK ROLLS			
	Roll Width ft (m)	Roll Length ft (m)	Roll Area ft ² (m ²)	Average Unset Roll Weight lb (kg)	Roll Width ft (m)	Roll Length ft (m)	Roll Area ft ² (m ²)	Average Unset Roll Weight lb (kg)
CC5	3.63 (-1.1)	30.0 (-9.1)	108.9 (-10.1)	-140 (-64)	3.63 (-1.1)	600.0 (-182.9)	2175.0 (-202)	-2800 (-1270)
CC8	3.50 (-1.1)	20.0 (-6.1)	70.0 (-6.5)	-150 (-68)	3.50 (-1.1)	400.0 (-122)	1400.0 (-130)	-3000 (-1360)
CC13	Not Available				3.60 (-1.1)	239.0 (-72.8)	860.4 (-80)	-3355 (-1520)

Standard production size information is subject to change without notice. Please contact your Milliken representative or distributor on exact roll size quotes (sales based on ft²). All test data are typical minimum values unless otherwise noted.

Dimensional Parameters

Product	Thickness in (mm)	Dry Weight lb/ft ² (kg/m ²)	Cured Weight lb/ft ² (kg/m ²)
CC5	0.2 (5)	1.3 (6.3)	1.7 (8.5)
CC8	0.3 (8)	2.2 (10.6)	2.8 (14.2)
CC13	0.5 (13)	3.7 (18.0)	5.0 (24.3)

Listed weights are minimum values. Actual product weight may exceed these values.

Tensile Strength: ASTM D-5035

Product	Working Strength lb/ft ² (kg/m ²)		Ultimate Strength lb/ft ² (kg/m ²)	
	Length	Width	Length	Width
CC5	60 (10)	20 (3.5)	140 (24)	50 (8.5)
CC8	85 (15)	25 (4.4)	190 (33)	100 (17)
CC13	150 (26)	90 (16)	190 (33)	110 (19)

Puncture Resistance: ASTM D-6241

Product	Puncture Strength lb (kg)
CC5	350 (160)
CC8	500 (225)
CC13	720 (325)

CC13 has also passed ASTM G-13 (Impact Resistance of Pipeline Coatings).

Licensed from



Permeability

- Coefficient of Permeability 2x10⁻¹¹ m/s (CC8)
Permeability of joints will vary dependent on the jointing method, consult Milliken Infrastructure Solutions or your distributor for more information.

Set Time: ASTM C-807

- Initial Set: 120 min
- Final Set: 240 min
CC will achieve ~70% strength 24hr after hydration. Working Time 1-2 hrs after hydration.

Flex Strength: ASTM C-1185

- 7 Day Minimum: 475 psi (3.3 MPa)
- 7 Day Modulus Minimum: 26,000 psi (180 MPa)

Compressive Strength of Cement: ASTM C-109

- 3 Day Minimum: 4000 psi (27 MPa)

Taber Abrasion: ASTM C-1353

- Approximately 7.5x Greater than 2500 psi OPC

Freeze Thaw: ASTM C-1185

- 200 Cycles - Pass

Flame Resistance: MSHA ASTP-5011

- Vertical and Horizontal Certification

Manning's n Value: ASTM D-6460

- n=0.011

Permissible Shear & Velocity CC5: ASTM D-6460

- Shear <25 lb/ft² (1200 Pa)
- Velocity <35 ft/sec (10.7 m/s)

Product Exceeded Large Scale Testing Capabilities and was not tested to failure.

To actually achieve these permissible values, the CC material must be properly anchored with a system designed to meet or exceed these values.

MILLIKEN INFRASTRUCTURE 

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Concrete Cloth™

Geosynthetic Cementitious Composite Mat

 STORM + SANITARY

 BRIDGES + ROADWAYS

 OIL, GAS + INDUSTRIAL

Composition

Concrete Cloth GCCM is a three-dimensional flexible cement impregnated fabric that hardens after hydration. The material has a top surface fabric through which water will penetrate during hydration and a bottom surface consisting of a PVC membrane that acts as permeable barrier.

Characteristics

The dry density of the product before hydration is approximately 95 lbs/ft³ (1500 kg/m³). Upon complete hydration the density increases between 30-35% to approximately 125 lbs/ft³ (2000 kg/m³). The exact density will depend slightly on the thickness of material and the relative proportion of PVC membrane to cement.

Storage & Handling

Concrete Cloth matting is sold in three (3) thickness. Standard roll sizes referred to as Bulk or Batch rolls are noted in the product table on the proceeding page. Bulk rolls will be shipped a single roll to a pallet, Batch or Custom rolls maybe shipped multiple stacked rolls to a pallet.

It is important to check the wrapping when the Concrete Cloth rolls arrive on the jobsite. Unopened packages can be stored in a dry location, off the ground, and away from moisture for up to one year. Any damage to the packaging should be repaired prior to storage using plastic wrap and tape to protect the Concrete Cloth GCCM from premature hydration.

Batch rolls are designed to be able to lift by two (2) persons. Bulk rolls will require additional handling equipment rated for the weight of the rolls. Use of a load rated spreader bar is recommended.

Subgrade Preparation

Concrete Cloth matting will generally take the shape and structure of the surface to which it is applied and imperfections in the subgrade will be visible. It is necessary that a compact and smooth subgrade be prepared to engineering specifications prior to placement. Subgrade should be prepared to the lines and tolerances of the engineering drawings for the installation. It should be clear of surface vegetation and debris. To the extent possible Concrete Cloth materials should be in direct contact with the subgrade to which it is being applied.

Installation

Concrete Cloth matting is often overlapped to create joints so installation will typically begin at the lowest point of the project and proceed up the grade. A shingled installation overlapping the rolls is used to reduce any water seepage between the overlapped rolls.

The Concrete Cloth material is designed such that the PVC back of the material will be against the subgrade in most applications. This side is water resistant and will not allow subsequent hydration if the material is installed upside down. The PVC back side is identifiable as the side with a continuous film. It is packaged such that the PVC back will be on the outside of the roll. For this reason it is important when placing Concrete Cloth materials to let the fabric off from the bottom side of the roll.

Temporary anchoring may be used on the leading edge of roll to prevent unrolling. In applications where long lengths will be let off the roll, it is good practice to allow several feet of extra material on the down-slope side of the install to allow for migration of the material in the direction of equipment movement.

After installation of the first roll or cut piece, the leading edge of the second roll or cut piece will typically be shingled over the first. If shingling is not possible, other jointing can be used. Please consult the detailed Concrete Cloth Installation Guide for further details.

Cutting

Concrete Cloth matting is designed to be cut with commonly available cutting tools. A box cutter or razor knife is generally acceptable and rotary cutters are more efficient. Always cut the material from the fabric (top) side down to minimize tearing of the PVC membrane. When possible, use a straight edge. Always wear proper hand PPE when working with cutting tools.

Overlap and Jointing

Four (4) inch overlap is typically recommended for shingling. The most common joint is an overlapped screw joint. A stainless steel #12 screw (coarse threads) is recommended 4-18 inch (typical 6) on center at least 1 inch from the overlap edge. Consult the Installation Guide for additional jointing recommendations.

Anchoring

Along all exterior edges (top, bottom & sides) of the Concrete Cloth installation, it is recommended to install a toe-in trench (minimum of 6 inches in depth) to resist migration of surface water between the Concrete Cloth material and the subgrade. The trench may vary based on the recommendation of a certified design engineer.

Some slopes, soil types and applications may require anchors or nails to stabilize the underlying soil mass against internal instability. Concrete Cloth matting may be used as the non-structural facing treatment when internal anchorage conditions are required. Anchors may be installed first or the anchors can be inserted through the cloth.

Hydration

Complete hydration is critical to optimal performance. The Concrete Cloth product cannot be over hydrated and over watering is recommended. Any water source is acceptable in most circumstances.

Saturate the top surface. This will take multiple passes of a moderate spray of water from a garden hose or other source. More water will be needed as the slope of the install increases.

Insure that the material has been saturated by means of the "thumb test", by pressing a thumb to observe water pooling at the indentation.

Wait 30-60 minutes and then put a final dose of water on the material to ensure complete hydration.

The material can also be hydrated by submersion for 5-10 minutes but will only have a 1-2 hour working time after hydration.

Do not jet high pressure water directly onto the surface. Do not hydrate if temperature is likely to fall below 25F (-4C) within 24hrs of initial hydration. Do not install on frozen ground. Consult the Installation Guide for additional details and pictures.

Health & Safety

The material contains cement powder which is alkaline and may cause skin irritation. Always wear proper PPE and consult the SDS for additional information.

Appendix D: Michels Corp. Design Calculations for Liner Submittal



CONTRACTOR SUBMITTAL SUMMARY PROJECT

NAME: Woodford BF 010-1 (52) / Weathersfield STP 0146 (16)

MICHELS PROJECT NO.:

<p style="text-align: center;">Michels Corporation 99 Callender Rd Watertown, CT 06795</p> <p style="text-align: center; margin-top: 20px;">ATTN: Terril Bentley(920) 539-5685</p>	<p style="text-align: right;">SUBMITTAL NO.: <u> 1 </u></p> <p style="text-align: center;">1ST <input checked="" type="checkbox"/> 2ND <input type="checkbox"/> 3RD <input type="checkbox"/> 4TH <input type="checkbox"/></p> <p style="text-align: right;">DATE RECEIVED: <u>6.28.19</u></p> <p style="text-align: right;">DATE RETURNED: _____</p>
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CONTR. SUBMITTAL NO.: <u> 1,2,3,4 </u> ITEM.: Product Data / Technical Documentation SPEC. SEC. / PAGE NO.: _____ SUPPLIER/SUBCONTR.: <u> Milliken Environmental / Michels </u>	NO. COPIES RECEIVED	REVIEW ACTION				NO. COPIES RETURNED
		NO EXCEPTIONS OBSERVED	MAKE CORRECTIONS NOTED	REVISE AS NOTED AND RESUBMIT	REJECT - RESUBMIT	
DETAILED DESCRIPTION						
1. Product Data as required (Digital)	1					
2. QA/QC Process Control Data / Sample Forms (Digital)	1					
3. Michels Experience Documentation (Digital)	1					
4. Design Calculations	1					

REMARKS:

**** Please sign and return this form to Tbentley@michels.us when received.

Received by _____

Date _____



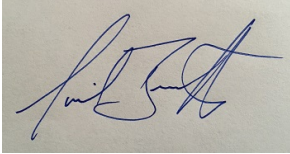
DRIVING INNOVATION.
TRANSFORMING CONSTRUCTION.

Michels Pipe Services A Div. of MICHELS Corp.
99 Callendar Rd
Watertown, CT 06795
Ph 860.417.0442
Fax 860 274 5619

Department: Vermont Agency of Transportation
Project Location: Woodford & Weathersfield, VT
Project Title: Woodford BF 010-1 (52) / Weathersfield STP 0146 (16)
City's Project Number: _____
Prepared By: Terril Bentley
Michels Project No: _____

Date Received: _____
Contractor: Michels Corp

Submittal number: 4
Submittal Date: 6.28.19
Revision Date: _____
Revision Number: _____
Specification Section: _____
Subsection: _____
Item: Design Calculations
Page: _____

Reviewed For Compliance
6.28.19

Terril Bentley

Deviation (Y or N): n
Submittal Description: Design Calculations
Intended Use: For Approval
Plan Sheet: _____
Manufacturer: _____
Supplier: Michels
Applicable Standard: Astm Various
Referenced Document: _____
Notes: _____



Vermont Agency of
Transportation

Woodford & Weathersfield, VT

Woodford BF 010-1 (52) /

Weathersfield STP 0146 (16)

Design Calculations



June 27, 2019

Terril Bentley
Estimator/Project Manager
Michels
99 Callender Road
Watertown, CT 06795

Subject: Stamped Calculations for Culvert Lining Woodford, and Weathersfield

Dear Terril:

DuBois & King (D&K) is pleased to provide our calculations for material thickness for these two culvert lining projects. The project numbers are Woodford BF010-1(52) and Weathersfield STP0146 (16). Both project are VTrans projects.

These calculations were prepared in accordance to the plans and specifications that are contained in construction contract for these VTrans projects, and in accordance with our scope of services provided to you on June 11, 2019.

The material properties used were those provided by Michels, Corp. The soil properties were those provided in the project specifications. No independent material testing or soil exploration was done by us.

If you have any questions, I can be reached at 802-728-7213 or at mevans-mongeon@dubois-king.com.

Sincerely,
DuBois & King, Inc.

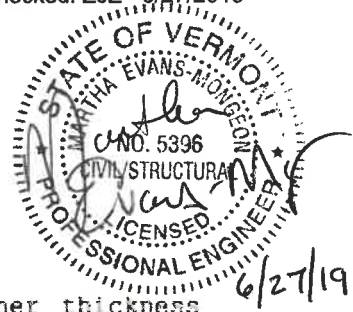
Martha Evans-Mongeon, PE
Bridge Project Manager

CC: Jim Hall, Bridge Department Manager, D&K



Load rating
Michel
Woodford culvert

by: MEM 6/26/2019
checked: ZJZ 6/27/2019



Woodford culvert BF 010-1 (52) Pin 13B270

From the construction proposal:

Design Methodology. The Contractor shall submit liner thickness calculations to the Engineer for review. The liner thickness shall be calculated using the distributed beam load over a partial ring model with the following equation:

$$t = \sqrt{\frac{0.0744 Q_t r^2 N}{S_f c}}$$

Where:

- t = Minimum Liner Thickness, inches
- Q_t = Total External Load as calculated from ASTM F 1216-09 for fully deteriorated cases for soil and hydraulic loads with the addition of appropriate live load standards as specified, psi
- r = Radius of the crown of the pipe, inches
- N = Safety Factor
- S_f = The 28-day Flexural Strength (or Modulus of Rupture) as determined by ASTM C78, with a value of 1250 psi minimum.
- c = Ovality Reduction Factor as defined in ASTM F 1216-09

Note: If the contractor desires to submit another design method for consideration, this may be done as long as the distributed beam load over a partial ring model is submitted as a minimum for comparison.

(d) Specific Minimum Design Details. Design shall include:

- Safety Factor (N) = 2.0
- Ovality (Δ), as defined in ASTM F1216-09 = 0.0
- Live Load = AASHTO LRFD HL93
- Soil Density - 130 pcf
- Water Table Depth, as measured from the surface = at crown of pipe.

Woodford BF 010-1(52) (Existing 84" Pipe)

Pipe diameter = 84 inches

Length of Pipe = 81.5 feet (liner required for entire length)

Material: Corrugated Multi-Plate Pipe

Depth of fill above crown of pipe = 5.5 feet

Note that a safety factor is being used. So the design method in Allowable stress, not Load factor or Load a resistance factor design

$\sigma_f := 1250\text{psi}$ given minimum value of 28 day Flexural Strength

See Data sheet geospray geomortar, actual minimum is 1500 psi use 1250 here

$C_{\text{constant}} := .0744$

$N_{\text{safety}} := 2$

$R_1 := 42\text{in}$

$\Delta := 0$

$$C_{\text{nov_oval}} := \frac{\left[\left(1 - \frac{\Delta}{100} \right) \right]^3}{\left[\left(1 + \frac{\Delta}{100} \right) \right]^2} = 1$$

See ASTM F 1216-09

$\text{depth}_{\text{soil}} := 6\text{ft}$ See proposal plans sheet 19 of 41 section 51+00 finished grade = 2221.0 top of existing pipe 2215.25 difference 5.75 ft use 6 ft to be conservative

$$\gamma_{\text{soil}} := 130 \frac{\text{lbf}}{\text{ft}^3}$$

Boring information from geotech report

groundwater 2206.5 in B103 medium dense gravelly sandy silt
groundwater 2210.5 in B 104 loose gravelly sand
groundwater 2217.2 in B105 Dense sandy gravel
groundwater 2217.7 in B106 Dense silty gravelly sand organics
at 2206 +/-

Live load per AASHTO

3.6.1.3—Application of Design Vehicular Live Loads

3.6.1.3.1—General

Unless otherwise specified, the extreme force effect shall be taken as the larger of the following:

- The effect of the design tandem combined with the effect of the design lane load, or
- The effect of one design truck with the variable axle spacing specified in [Article 3.6.1.2.2](#), combined with the effect of the design lane load, and
- For negative moment between points of

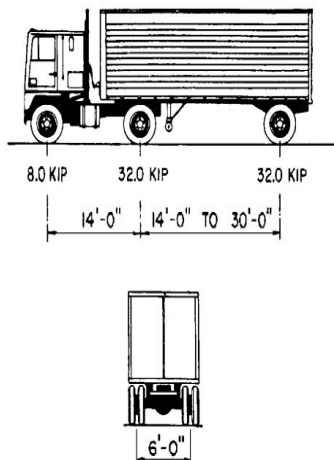
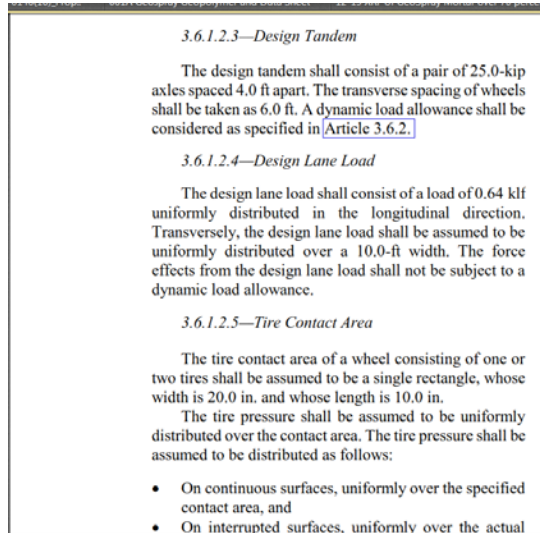


Figure 3.6.1.2.2-1—Characteristics of the Design Truck

$$P_{\text{wheel_HL93}} := 16000\text{ lbf}$$



Since the wheel load for the tandem would be 25 kips/2 or 12.5 kips that is less than the truck wheel load of 32 kips./2 or 16 kips. The truck and lane combination control s

$$\text{Lane} := 640 \frac{\text{lbf}}{\text{ft}}$$

$$\text{lane}_{\text{pressure}} := \frac{\text{Lane}}{10\text{ft}} = 0.444 \cdot \text{psi}$$

$l_t := 10\text{in}$ Length of tire contact area

$w_t := 20\text{in}$ Width of tire contact area

AASHTO 3.6.1.2.6a

Where the depth of fill over round, nonconcrete culverts is greater than 1.0 ft, or when the depth of fill over flat top three-sided, or long-span concrete arch culverts, or

concrete pipe is 2.0 ft or greater the live load shall be distributed to the structure as wheel loads, uniformly distributed over a rectangular area with sides equal to the dimension of the tire contact area specified in Article 3.6.1.2.5 increased by the live load distribution factors (LLDF) specified in Table 3.6.1.2.6a-1, and the provisions of Articles 3.6.1.2.6b and 3.6.1.2.6c. More precise methods of analysis may be used.

From Table 3.6.1.2.6a-1 for non-concrete pipe

LLDF := 1.15

traffic direction is parallel to culvert span

3.6.1.2.6b—Traffic Parallel to the Culvert Span

For live load distribution transverse to culvert spans, the wheel/axle load interaction depth H_{int-t} shall be determined as:

$$H_{int} = \frac{s_w \frac{w_l}{12} - \frac{0.06D_i}{12}}{LLDF} \quad (3.6.1.2.6b-1)$$

in which:

- where $H < H_{int-t}$:

$$w_w = \frac{w_l}{12} + LLDF(H) + 0.06 \frac{D_i}{12} \quad (3.6.1.2.6b-2)$$

- where $H \geq H_{int-t}$:

$$w_w = \frac{w_l}{12} + s_w + LLDF(H) + 0.06 \frac{D_i}{12} \quad (3.6.1.2.6b-3)$$

$s_w := 6\text{ft}$

$D_i := R_1 \cdot 2$

$$H_{\text{int}} := \frac{[s_w - (w_t) - (.06 \cdot D_i)]}{LLDF} \quad H_{\text{int}} = 3.403 \cdot \text{ft}$$

Since $H > H_{\text{int}}$

$$w_w := w_t + s_w + LLDF \cdot (\text{depth}_{\text{soil}}) + .06 \cdot D_i = 14.987 \cdot \text{ft}$$

For live load distribution parallel to culvert span, the wheel/axle load interaction depth $H_{\text{int-p}}$ shall be determined as:

$$H_{\text{int-p}} = \frac{s_a - \frac{l_t}{12}}{LLDF} \quad (3.6.1.2.6b-4)$$

in which:

- where $H < H_{\text{int-p}}$:

$$l_w = \frac{l_t}{12} + LLDF(H) \quad (3.6.1.2.6b-5)$$

- where $H \geq H_{\text{int}}$:

$$l_w = \frac{l_t}{12} + s_a + LLDF(H) \quad (3.6.1.2.6b-6)$$

where:

A_{LL}	=	rectangular area at depth H (ft ²)
l_w	=	live load patch length at depth H (ft)
w_w	=	live load patch width at depth H (ft)
$H_{\text{int-t}}$	=	wheel interaction depth transverse to culvert

$$s_a := 14 \text{ft} \quad \text{Axle Spacing}$$

$$H_{\text{int-p}} := \frac{(s_a - l_t)}{LLDF} = 11.449 \cdot \text{ft}$$

Since $H < H_{\text{int-p}}$

$$l_w := l_t + LLDF \cdot (\text{depth}_{\text{soil}}) = 7.733 \cdot \text{ft}$$

$$\text{lane}_w := 10 \text{ft}$$

depth_soil_min := 5.5ft Minimum cover where there is a wheel load

$$IM := 33 \cdot \left(1 - .125 \cdot \frac{\text{depth_soil_min}}{\text{ft}} \right) = 10.313 \quad \text{AASHTO equation 3.6.2.2-1}$$

if IM is negative use zero IM

$$IM := 10.3\%$$

$$\text{wheel_pressure} := \frac{[(1 + IM)P_{\text{wheel_HL93}}]}{l_w \cdot w_w} = 1.057 \cdot \text{psi}$$

$$\gamma_{II} := 1$$

Use a load factor of 1 since this is an allowable stress design, and there is a safety factor of 2.

$$\text{live_pressure} := (\text{wheel_pressure} + \text{lane_pressure}) \cdot \gamma_{II} = 1.502 \cdot \text{psi}$$

$$H_w := 0\text{ft}$$

specification assumes no water above top of pipe

$$\gamma_{ev} := 1.0$$

Use a load factor of 1 since this is an allowable stress design, and there is a safety factor of 2.

$$\text{dead_pressure} := (\gamma_{\text{soil}} \cdot \text{depth}_{\text{soil}}) \cdot \gamma_{ev} = 5.417 \cdot \text{psi}$$

use γ_{soil} since soil above pipe is not bouyant, according to the specification assumptions

$$\text{pressure}_{\text{tot}} := \text{live_pressure} + \text{dead_pressure} = 6.919 \cdot \text{psi}$$

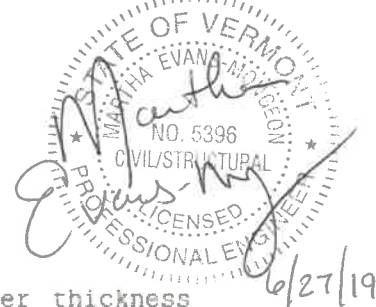
$$t_{\text{req}} := \sqrt{\frac{(C_{\text{constant}} \cdot \text{pressure}_{\text{tot}} \cdot R_1^2 \cdot N_{\text{safety}})}{(\sigma_f \cdot C_{\text{nov_oval}})}} = 1.205 \cdot \text{in}$$

Thickness of 1.25 inches is OK



Load rating
Michel
Weathersfield

by: MEM 6/26/2019
checked: ZJZ 6/27/2019



Weathersfield culvert STP 0146(16) Pin 00C266

From the construction proposal:

Design Methodology. The Contractor shall submit liner thickness calculations to the Engineer for review. The liner thickness shall be calculated using the distributed beam load over a partial ring model with the following equation:

$$t = \sqrt{\frac{0.0744 Q_T r^2 N}{S_F c}}$$

Where:

- t = Minimum Liner Thickness, inches
- Q_T = Total External Load as calculated from ASTM F 1216-09 for fully deteriorated cases for soil and hydraulic loads with the addition of appropriate live load standards as specified, psi
- r = Radius of the crown of the pipe, inches
- N = Safety Factor
- S_F = The 28-day Flexural Strength (or Modulus of Rupture) as determined by ASTM C78, with a value of 1250 psi minimum.
- c = Ovality Reduction Factor as defined in ASTM F 1216-09

Note: If the contractor desires to submit another design method for consideration, this may be done as long as the distributed beam load over a partial ring model is submitted as a minimum for comparison.

(d) Specific Minimum Design Details. Design shall include:

- Safety Factor (N) = 2.0
- Ovality (Δ), as defined in ASTM F1216-09 = 0.0
- Live Load = AASHTO LRFD HL93
- Soil Density = 130 pcf
- Water Table Depth, as measured from the surface = at crown of pipe.

Weathersfield STP 0146(16) (Existing 132" Pipe)

Pipe diameter = 132 inches

Length of Pipe = 114 feet (see plans for required length of liner)

Material: Corrugated Multi-Plate Pipe

Depth of fill above crown of pipe = 15 feet

Note that a safety factor is being used. So the design method in Allowable stress, not Load factor or Load a resistance factor design.

$\sigma_f := 1250\text{psi}$ given minimum value of 28 day Flexural Strength

See Data sheet geospray geomortar, actual minimum is 1500 psi use 1250 here

$C_{\text{constant}} := .0744$

$N_{\text{safety}} := 2$

$R_1 := 66\text{in}$

$\Delta := 0$

$$C_{\text{nov_oval}} := \frac{\left[\left(1 - \frac{\Delta}{100} \right) \right]^3}{\left[\left(1 + \frac{\Delta}{100} \right) \right]^2} = 1$$

See ASTM F 1216-09

$\text{depth}_{\text{soil}} := 15.\text{ft}$ See propsal plans sheet 35 of 41 section 51+00 finished grade = 806.0 top of existing pipe 791.5, difference 14.5 ft

$$\gamma_{\text{soil}} := 130 \frac{\text{lbf}}{\text{ft}^3}$$

Boring information from geotech report

No water surface information is available

Live load per AASHTO

3.6.1.3—Application of Design Vehicular Live Loads

3.6.1.3.1—General

Unless otherwise specified, the extreme force effect shall be taken as the larger of the following:

- The effect of the design tandem combined with the effect of the design lane load, or
- The effect of one design truck with the variable axle spacing specified in Article 3.6.1.2.2, combined with the effect of the design lane load, and
- For negative moment between points of

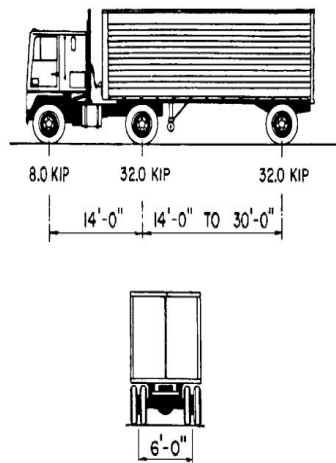
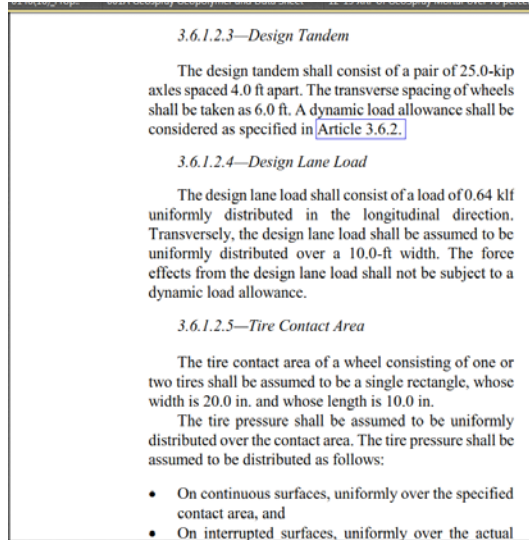


Figure 3.6.1.2.2-1—Characteristics of the Design Truck

$$P_{\text{wheel_HL93}} := 16000\text{ lbf}$$



Since the wheel load for the tandem would be 25 kips/2 or 12.5 kips that is less than the truck wheel load of 32 kips./2 or 16 kips. The truck and lane combination control s

$$\text{Lane} := 640 \frac{\text{lbf}}{\text{ft}}$$

$$\text{lane}_{\text{pressure}} := \frac{\text{Lane}}{10\text{ft}} = 0.444 \cdot \text{psi}$$

$l_t := 10\text{in}$ Length of tire contact area

$w_t := 20\text{in}$ Width of tire contact area

AASHTO 3.6.1.2.6a

Where the depth of fill over round, nonconcrete culverts is greater than 1.0 ft, or when the depth of fill over flat top three-sided, or long-span concrete arch culverts, or

3-24

AASHTO

concrete pipe is 2.0 ft or greater the live load shall be distributed to the structure as wheel loads, uniformly distributed over a rectangular area with sides equal to the dimension of the tire contact area specified in Article 3.6.1.2.5 increased by the live load distribution factors (LLDF) specified in Table 3.6.1.2.6a-1, and the provisions of Articles 3.6.1.2.6b and 3.6.1.2.6c. More precise methods of analysis may be used.

From Table 3.6.1.2.6a-1 for non-concrete pipe

LLDF := 1.15

traffic direction is parallel to culvert span

3.6.1.2.6b—Traffic Parallel to the Culvert Span

For live load distribution transverse to culvert spans, the wheel/axle load interaction depth H_{int-t} shall be determined as:

$$H_{int} = \frac{s_w - \frac{w_l}{12} - \frac{0.06D_i}{12}}{LLDF} \quad (3.6.1.2.6b-1)$$

in which:

- where $H < H_{int-t}$:

$$w_w = \frac{w_l}{12} + LLDF(H) + 0.06 \frac{D_i}{12} \quad (3.6.1.2.6b-2)$$

- where $H \geq H_{int-t}$:

$$w_w = \frac{w_l}{12} + s_w + LLDF(H) + 0.06 \frac{D_i}{12} \quad (3.6.1.2.6b-3)$$

$s_w := 6\text{ft}$

$D_i := R_1 \cdot 2$

$$H_{\text{int}} := \frac{[s_w - (w_t) - (.06 \cdot D_i)]}{LLDF} \quad H_{\text{int}} = 3.194 \cdot \text{ft}$$

Since $H > H_{\text{int}}$

$$w_w := w_t + s_w + LLDF \cdot (\text{depth}_{\text{soil}}) + .06 \cdot D_i = 25.577 \cdot \text{ft}$$

For live load distribution parallel to culvert span, the wheel/axle load interaction depth $H_{\text{int-p}}$ shall be determined as:

$$H_{\text{int-p}} = \frac{s_a - \frac{l_t}{12}}{LLDF} \quad (3.6.1.2.6b-4)$$

in which:

- where $H < H_{\text{int-p}}$:

$$l_w = \frac{l_t}{12} + LLDF(H) \quad (3.6.1.2.6b-5)$$

- where $H \geq H_{\text{int}}$:

$$l_w = \frac{l_t}{12} + s_a + LLDF(H) \quad (3.6.1.2.6b-6)$$

where:

A_{LL}	=	rectangular area at depth H (ft ²)
l_w	=	live load patch length at depth H (ft)
w_w	=	live load patch width at depth H (ft)
$H_{\text{int-t}}$	=	wheel interaction depth transverse to culvert

$$s_a := 14 \text{ft} \quad \text{Axle Spacing}$$

$$H_{\text{int-p}} := \frac{(s_a - l_t)}{LLDF} = 11.449 \cdot \text{ft}$$

Since $H > H_{\text{int-p}}$

$$l_w := l_t + s_a + LLDF \cdot (\text{depth}_{\text{soil}}) = 32.083 \cdot \text{ft}$$

$$\text{lane}_w := 10 \text{ft}$$

depth_soil_min := 14ft Minimum cover where there is a wheel load

$$IM := 33 \cdot \left(1 - .125 \cdot \frac{\text{depth_soil_min}}{\text{ft}} \right) = -24.75 \quad \text{AASHTO equation 3.6.2.2-1}$$

if IM is negative use zero IM

$$IM := 0$$

$$\text{wheel_pressure} := \frac{[(1 + IM)P_{\text{wheel_HL93}}]}{l_w \cdot w_w} = 0.135 \cdot \text{psi}$$

$\gamma_{II} := 1.0$ **Use a load factor of 1 since this is an allowable stress design, and there is a safety factor of 2.**

$$\text{live_pressure} := (\text{wheel_pressure} + \text{lane_pressure}) \cdot \gamma_{II} = 0.58 \cdot \text{psi}$$

$H_w := 0\text{ft}$ specification assumes no water above top of pipe

$\gamma_{ev} := 1.0$ **Use a load factor of 1 since this is an allowable stress design, and there is a safety factor of 2.**

$$\text{dead_pressure} := (\gamma_{\text{soil}} \cdot \text{depth}_{\text{soil}}) \cdot \gamma_{ev} = 13.542 \cdot \text{psi}$$

use γ_{soil} since soil above pipe is not bouyant,
according to the specification assumptions

$$\text{pressure}_{\text{tot}} := \text{live_pressure} + \text{dead_pressure} = 14.122 \cdot \text{psi}$$

$$t_{\text{req}} := \sqrt{\frac{(C_{\text{constant}} \cdot \text{pressure}_{\text{tot}} \cdot R_1^2 \cdot N_{\text{safety}})}{(\sigma_f \cdot C_{\text{nov_oval}})}} = 2.706 \cdot \text{in}$$

Thickness of 2.71 inches is OK

Appendix E: Change Order 001: VAST Trail Bridge Removal

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802
 Project Name: WEATHERSFIELD STP 0146(16)
 Project Name: WOODFORD BF 010-1(52)
 Change Order: 001 SUPPLEMENTAL AGREEMENT

Date: 06/11/2019

Extra Work Order: Y

TO: ALPINE CONSTRUCTION, LLC- You are hereby notified to perform the following work in accordance with the Provisions of your Contract with the Agency of Transportation dated **02/14/2019** and as modified by this document and in accordance with the 2011 Standard Specifications for Highway and Bridge Construction and Supplements thereto.

REVISION: To add Item 900.545 Supplemental Agreement (VAST Trail Bridge Removal)

NECESSITY FOR REVISION: Within the project limits along Route 9 in Woodford, there is an existing VAST Trail with a timber bridge spanning the unnamed stream that runs through the culvert located at Bridge 18. This bridge was identified during project design as conflicting with the project scope of work at Bridge 18 making it necessary for removal prior to work starting. The note on plan sheet 10 of 41 states, "If the Contractor is required to remove the VAST Bridge, it shall be paid as Extra Work." The bridge could not be removed prior to construction, and Alpine Construction removed it on May 20th, 2019 and set it in the right of way. On May 22, 2019, Alpine used their men and equipment again to load the bridge onto a trailer for removal by Barkus Excavating on behalf of VAST. Work Order One was provided by Alpine Construction on June 4, 2019 detailing the men, equipment and hours on the respective dates. This was reviewed by project staff and the cost associated were agreed upon.

This change order received verbal approval from, Project Manager, **Nick Wark** on **06/05/2019**.
 This change order received verbal approval from, Federal Highway Administrator, on **N/A** .

NEW ITEMS NOT IN CONTRACT: Item 900.545 Supplemental Agreement (VAST Trail Bridge Removal) at Two Thousand, Five Hundred Eighteen Dollars and Six Cents (\$2,518.06/LS) per Lump Sum. Payment will be full compensation for complete removal of the VAST timber structure and loading the structure onto a trailer for removal from the project. Price includes any incidentals necessary including the furnishing of all labor, tools, equipment, materials to complete the work for the items listed above. Any agreement for delivery, storage, repair, or replacement is solely the responsibility of VAST and will not be covered by this Change Order. This is full and final compensation for the work performed as described by this Change of Design/Supplementary Agreement.

QUANTITY AND COSTS AS PER PLANS AND/OR REVISIONS											
Project Name: WOODFORD BF 010-1(52)											
Sub Item	Line Nbr	Catg	Item Code	Unit	Unit Price	Current Qty	CO Qty	Revised Qty	Current Price	CO Price	Revised Price
	9000	1211	900.545	LS	\$2,518.06	0.000	1.000	1.000	\$0.00	\$2,518.06	\$2,518.06
Description: SUPPLEMENTAL AGREEMENT (VAST Trail Bridge Removal)											
Totals:									\$0.00	\$2,518.06	\$2,518.06

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802

Date: 06/11/2019

Project Name: WEATHERSFIELD STP 0146(16)

Project Name: WOODFORD BF 010-1(52)

Change Order: 001 SUPPLEMENTAL AGREEMENT

Extra Work Order: Y

Additional Cost: \$2,518.06 Contract Extension Granted: N

New Completion Date:

Original Contract Amount: \$858,210.84

Revised Contract Amount: \$860,728.90

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802
 Project Name: WEATHERSFIELD STP 0146(16)
 Project Name: WOODFORD BF 010-1(52)
 Change Order: 001 SUPPLEMENTAL AGREEMENT

Date: 06/11/2019

Extra Work Order: Y

Change Order Approved:			
ALPINE CONSTRUCTION, LLC		<i>William P. PATENGAUDE</i>	<i>William P. Patenaude 6/21/2019</i>
Contractor		Authorized Individual (Printed)	Signature of Authorized Individual / Date
Recommended for Approval:			
Jay Strong	Mark Mackintosh	N/A	N/A
Resident Engineer	Regional Construction Engineer	Construction Engineer	Director of Program Development
Date: 06/18/2019	Date: 06/20/2019	Date:	Date:

Approved for Federal Participation	
N/A	
Division Administrator, FHWA	
Date:	

Appendix F: Change Order 002: Culvert Liner

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802
 Project Name: WEATHERSFIELD STP 0146(16)
 Project Name: WOODFORD BF 010-1(52)
 Change Order: 002 SUPPLEMENTAL AGREEMENT

Date: 07/24/2019

Extra Work Order: Y

TO: ALPINE CONSTRUCTION, LLC- You are hereby notified to perform the following work in accordance with the Provisions of your Contract with the Agency of Transportation dated **02/14/2019** and as modified by this document and in accordance with the 2011 Standard Specifications for Highway and Bridge Construction and Supplements thereto.

REVISION: To add Item 900.545 Supplemental Agreement (Culvert Lining) to the Woodford BF 010-1(52) project.

To revise the Contract Completion Date to September 28, 2019.

NECESSITY FOR REVISION: The existing culvert was found to be in poor condition with significant corrosion and holes along the bottom surface, which a spray-on concrete liner would not be able to repair. An onsite meeting was held June 11, 2019 between Bill Patenaude of Alpine Construction, Terril Bentley representing Subcontractor Michels Corporation, and Resident Engineer Jay Strong. Mr. Bentley suggested a GeoMat lining ten feet wide along the length of the culvert to bridge the holes and cover the corrosion prior to the spray-on concrete liner.

The installation of the GeoMat liner shall require two weeks to complete, which impacts the Critical Path. Therefore, the Completion Date shall be extended 14 calendar days.

This change order received verbal approval from, Project Manager, **Nick Wark** on **06/26/2019**.

This change order received verbal approval from, Federal Highway Administrator, on **N/A**.

NEW ITEMS NOT IN CONTRACT: Item 900.545 Supplemental Agreement (Culvert Lining) at Thirty-Three Thousand, Seven Hundred Thirty-Two Dollars and Eighty Cents (\$33,732.80/LS) per Lump Sum. The GeoMat shall be a Concrete Cloth CC5 supplied by Milliken Infrastructure Solutions and installed by Michels Corporation with assistance from Alpine Construction. Manufacture installation procedures and material specifications shall be submitted and accepted prior to installation. Payment will be full compensation for submittals, fabricating, transporting, handling, and including the furnishing of all labor, tools, equipment, materials and incidentals necessary to complete the work for the items listed above.

QUANTITY AND COSTS AS PER PLANS AND/OR REVISIONS											
Project Name: WOODFORD BF 010-1(52)											
Sub Item	Line Nbr	Catg	Item Code	Unit	Unit Price	Current Qty	CO Qty	Revised Qty	Current Price	CO Price	Revised Price
	9005	1211	900.545	LS	\$33,732.80	0.000	1.000	1.000	\$0.00	\$33,732.80	\$33,732.80
Description: SUPPLEMENTAL AGREEMENT (Culvert Liner)											

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802
Project Name: WEATHERSFIELD STP 0146(16)
Project Name: WOODFORD BF 010-1(52)
Change Order: 002 SUPPLEMENTAL AGREEMENT

Date: 07/24/2019

Extra Work Order: Y

Totals:	\$0.00	\$33,732.80	\$33,732.80
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Additional Cost: \$33,732.80 Contract Extension Granted: Y New Completion Date: 09/28/2019
Original Contract Amount: \$858,210.84
Revised Contract Amount: \$894,461.70

Vermont
Agency of Transportation
CHANGE OF DESIGN or CONSTRUCTION

Contract ID: 19011802
 Project Name: WEATHERSFIELD STP 0146(16)
 Project Name: WOODFORD BF 010-1(52)
 Change Order: 002 SUPPLEMENTAL AGREEMENT

Date: 07/24/2019

Extra Work Order: Y

Change Order Approved:			
ALPINE CONSTRUCTION, LLC		William P. PATENAUDE	<i>William P. Patenaude</i> 8/6/2019
Contractor		Authorized Individual (Printed)	Signature of Authorized Individual / Date
Recommended for Approval:			
Jay Strong	Seth Hisman	N/A	N/A
Resident Engineer	Regional Construction Engineer	Construction Engineer	Director of Program Development
Date: 07/29/2019	Date: 08/05/2019	Date:	Date:

Approved for Federal Participation	
N/A	
Division Administrator, FHWA	
Date:	

Appendix G: Results of Bids

VERMONT AGENCY OF TRANSPORTATION
 LETTING DATE : 01/18/19 11:00 A.M.
 RESULTS OF BIDS

RUN DATE : 01/18/19
 CALL : 002 PAGE : 1

PROJECT(S) : WEATHERSFIELD STP 0146(16)
 WOODFORD BF 010-1(52)

CONTRACT ID : 13B270
 CALL ORDER : 002
 CONTRACT TIME : 09/14/19 COMPLETION DATE

CONTRACT DESCRIPTION :
 WOODFORD BF 010-1 (52) - VERMONT ROUTE 9, BRIDGE NO 18.
 PROJECT IS APPROXIMATELY 2.4 MILES WEST OF INTERSECTION WITH
 VT 8.THIS PROJECT SHALL CONSIST OF LINING THE EXISTING
 CULVERT WITH A CONCRETE SPRAY-ON LINER AND CONSTRUCTING A
 BEVELLED HEADWALL AT THE INLET.

TOWN(S) : WOODFORD WEATHERSFIELD
 COUNTY : BENNINGTON
 DISTRICT : D01

WEATHERSFIELD STP 0146 (16) - VT ROUTE 131, BRIDGE NO 15.
 PROJECT IS APPROXIMATELY 0.33 MILES WEST OF THE INTERSECTION
 OF VT 131 AND TH-1 (WEATHERSFIELD CENTER ROAD).THIS PROJECT
 SHALL CONSIST OF LINING THE EXISTING CULVERT WITH A CONCRETE
 SPRAY-ON LINER AND MINOR HEADWALL REPAIRS.

RANK	VENDOR NO./NAME	TOTAL BID	% OVER LOW BID
1	120029650910 ALPINE CONSTRUCTION, LLC	\$ 858,210.84	100.0000%
2	980284489601 COLD RIVER BRIDGES, LLC	\$ 1,353,815.00	157.7485%

LINE NO / ITEM CODE / ALT ITEM DESCRIPTION	QUANTITY	(1) 120029650910 ALPINE CONSTRUCTION, LLC		(2) 980284489601 COLD RIVER BRIDGES, LLC		UNIT PRICE	AMOUNT
		UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
SECTION 0001 ROADWAY							
0005 201.30 THINNING AND TRIMMING	0.090 ACRE	49155.00000	4423.95	50000.00000	4500.00		
0010 203.27 UNCLASSIFIED CHANNEL EXCAVATION	130.000 CY	20.00000	2600.00	35.00000	4550.00		
0015 203.32 GRANULAR BORROW	330.000 CY	42.00000	13860.00	35.00000	11550.00		
0020 204.22 TRENCH EXCAVATION OF EARTH, EXPLORATORY (N.A.B.I.)	2.000 CY	75.00000	150.00	75.00000	150.00		
0025 204.25 STRUCTURE EXCAVATION	270.000 CY	15.00000	4050.00	75.00000	20250.00		
0030 204.30 GRANULAR BACKFILL FOR STRUCTURES	280.000 CY	40.00000	11200.00	75.00000	21000.00		
0035 208.40 COFFERDAM	LUMP	72000.00000	72000.00	145000.00000	145000.00		
0040 501.34 CONCRETE, HIGH PERFORMANCE CLASS B	47.000 CY	860.00000	40420.00	1200.00000	56400.00		
0045 507.11 REINFORCING STEEL, LEVEL I	5320.000 LB	1.72000	9150.40	2.00000	10640.00		

VERMONT AGENCY OF TRANSPORTATION
 LETTING DATE : 01/18/19 11:00 A.M.
 RESULTS OF BIDS

RUN DATE : 01/18/19
 CALL : 002 PAGE : 2

PROJECT(S) : WEATHERSFIELD STP 0146(16)
 WOODFORD BF 010-1(52)

CONTRACT ID : 13B270

LINE NO / ITEM CODE / ALT ITEM DESCRIPTION	QUANTITY		(1) 120029650910 ALPINE CONSTRUCTION, LLC		(2) 980284489601 COLD RIVER BRIDGES, LLC		()	
			UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0050 514.10 WATER REPELLENT, SILANE	5.000	GAL	76.00000	380.00	200.00000	1000.00		
0055 529.15 REMOVAL OF STRUCTURE (84" CGMPP X 7')	1.000	EACH	2500.00000	2500.00	110000.00000	110000.00		
0060 541.31 CONCRETE, CLASS D	3.000	CY	2431.00000	7293.00	3000.00000	9000.00		
0065 541.45 CONTROLLED DENSITY (FLOWABLE) FILL	4.000	CY	1936.00000	7744.00	1500.00000	6000.00		
0070 602.30 REPOINTING MASONRY	20.000	SY	619.00000	12380.00	200.00000	4000.00		
0075 602.35 REBUILT STONE MASONRY	1.000	CY	6289.00000	6289.00	10500.00000	10500.00		
0080 602.40 REPAIRING STONE MASONRY	2.000	SY	5775.00000	11550.00	5000.00000	10000.00		
0085 613.12 STONE FILL, TYPE III	100.000	CY	53.00000	5300.00	100.00000	10000.00		
0090 630.15 FLAGGERS	400.000	HR	36.00000	14400.00	30.00000	12000.00		
0095 631.10 FIELD OFFICE, ENGINEERS (BF 010-1(52))		LUMP	5000.00000	5000.00	10000.00000	10000.00		
0100 631.10 FIELD OFFICE, ENGINEERS (STP 0146(16))		LUMP	5000.00000	5000.00	10000.00000	10000.00		
0105 631.16 TESTING EQUIPMENT, CONCRETE (BF 010-1(52))		LUMP	700.00000	700.00	500.00000	500.00		
0110 631.16 TESTING EQUIPMENT, CONCRETE (STP 0146(16))		LUMP	700.00000	700.00	500.00000	500.00		
0115 631.26 FIELD OFFICE TELEPHONE (N.A.B.I.) (BF 010-1(52))	3000.000	DL	1.00000	3000.00	1.00000	3000.00		
0120 631.26 FIELD OFFICE TELEPHONE (N.A.B.I.) (STP 0146(16))	3000.000	DL	1.00000	3000.00	1.00000	3000.00		
0125 635.11 MOBILIZATION/DEMOBILIZATION (BF 010-1(52))		LUMP	40000.00000	40000.00	65000.00000	65000.00		
0130 635.11 MOBILIZATION/DEMOBILIZATION (STP 0146(16))		LUMP	36857.00000	36857.00	65000.00000	65000.00		
0135 649.31 GEOTEXTILE UNDER STONE FILL	220.000	SY	5.00000	1100.00	3.00000	660.00		

VERMONT AGENCY OF TRANSPORTATION
 LETTING DATE : 01/18/19 11:00 A.M.
 RESULTS OF BIDS

RUN DATE : 01/18/19
 CALL : 002 PAGE : 3

PROJECT(S) : WEATHERSFIELD STP 0146(16)
 WOODFORD BF 010-1(52)

CONTRACT ID : 13B270

LINE NO / ITEM CODE / ALT ITEM DESCRIPTION	QUANTITY		(1) 120029650910 ALPINE CONSTRUCTION, LLC		(2) 980284489601 COLD RIVER BRIDGES, LLC		()	
			UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0140 649.51 GEOTEXTILE FOR SILT FENCE	128.000	SY	12.95000	1657.60	10.00000	1280.00		
0145 649.61 GEOTEXTILE FOR FILTER CURTAIN	77.000	SY	18.49000	1423.73	10.00000	770.00		
0150 651.15 SEED	14.000	LB	10.00000	140.00	50.00000	700.00		
0155 651.18 FERTILIZER	120.000	LB	4.00000	480.00	10.00000	1200.00		
0160 651.20 AGRICULTURAL LIMESTONE	0.500	TON	750.00000	375.00	1500.00000	750.00		
0165 651.25 HAY MULCH	0.700	TON	608.00000	425.60	2000.00000	1400.00		
0170 651.35 TOPSOIL	130.000	CY	65.00000	8450.00	25.00000	3250.00		
0175 652.10 EPSC PLAN (BF 010-1(52))		LUMP	1400.00000	1400.00	3000.00000	3000.00		
0180 652.10 EPSC PLAN (STP 0146(16))		LUMP	1400.00000	1400.00	3000.00000	3000.00		
0185 652.20 MONITORING EPSC PLAN	40.000	HR	55.00000	2200.00	50.00000	2000.00		
0190 652.30 MAINTENANCE OF EPSC PLAN (N.A.B.I.) (BF 010-1(52))	1.000	LU	2000.00000	2000.00	2000.00000	2000.00		
0195 652.30 MAINTENANCE OF EPSC PLAN (N.A.B.I.) (STP 0146(16))	1.000	LU	2000.00000	2000.00	2000.00000	2000.00		
0200 653.20 TEMPORARY EROSION MATTING	340.000	SY	3.94000	1339.60	10.00000	3400.00		
0205 653.21 PERMANENT EROSION MATTING	110.000	SY	5.96000	655.60	15.00000	1650.00		
0210 653.35 VEHICLE TRACKING PAD	45.000	CY	85.00000	3825.00	75.00000	3375.00		
0215 653.45 FILTER BAG	1.000	EACH	542.00000	542.00	1000.00000	1000.00		
0220 653.50 BARRIER FENCE	40.000	LF	5.25000	210.00	30.00000	1200.00		
0225 653.55 PROJECT DEMARCATION FENCE	880.000	LF	4.13000	3634.40	3.00000	2640.00		
0230 900.608 SPECIAL PROVISION (E-STONE TYPE E2)	20.000	CY	53.00000	1060.00	150.00000	3000.00		
0235 900.640 SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 132" PIPE)	114.000	LF	1912.00000	217968.00	2100.00000	239400.00		

VERMONT AGENCY OF TRANSPORTATION
 LETTING DATE : 01/18/19 11:00 A.M.
 RESULTS OF BIDS

RUN DATE : 01/18/19
 CALL : 002 PAGE : 4

PROJECT(S) : WEATHERSFIELD STP 0146(16)
 WOODFORD BF 010-1(52)

CONTRACT ID : 13B270

LINE NO / ITEM CODE / ALT ITEM DESCRIPTION	QUANTITY	(1) 120029650910 ALPINE CONSTRUCTION, LLC		(2) 980284489601 COLD RIVER BRIDGES, LLC		()	
		UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT
0240 900.640 SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 84" PIPE)	82.000 LF	1797.00000	147354.00	1800.00000	147600.00		
0245 900.645 SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM) (BF 010-1(52))	LUMP	54311.48000	54311.48	175000.00000	175000.00		
0250 900.645 SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM) (STP 0146(16))	LUMP	54311.48000	54311.48	140000.00000	140000.00		
0255 900.645 SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE) (BF 010-1(52))	LUMP	15000.00000	15000.00	5000.00000	5000.00		
0260 900.645 SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE) (STP 0146(16))	LUMP	15000.00000	15000.00	5000.00000	5000.00		
SECTION TOTALS		\$	858,210.84	\$	1,353,815.00	\$	
COMMON ITEMS TOTAL		\$	858,210.84	\$	1,353,815.00	\$	
CONTRACT TOTALS (LOW COST)		\$	858,210.84	\$	1,353,815.00	\$	

Appendix H: Woodford BF 010-1 (52) / Weathersfield STP 0146 (16) Plans

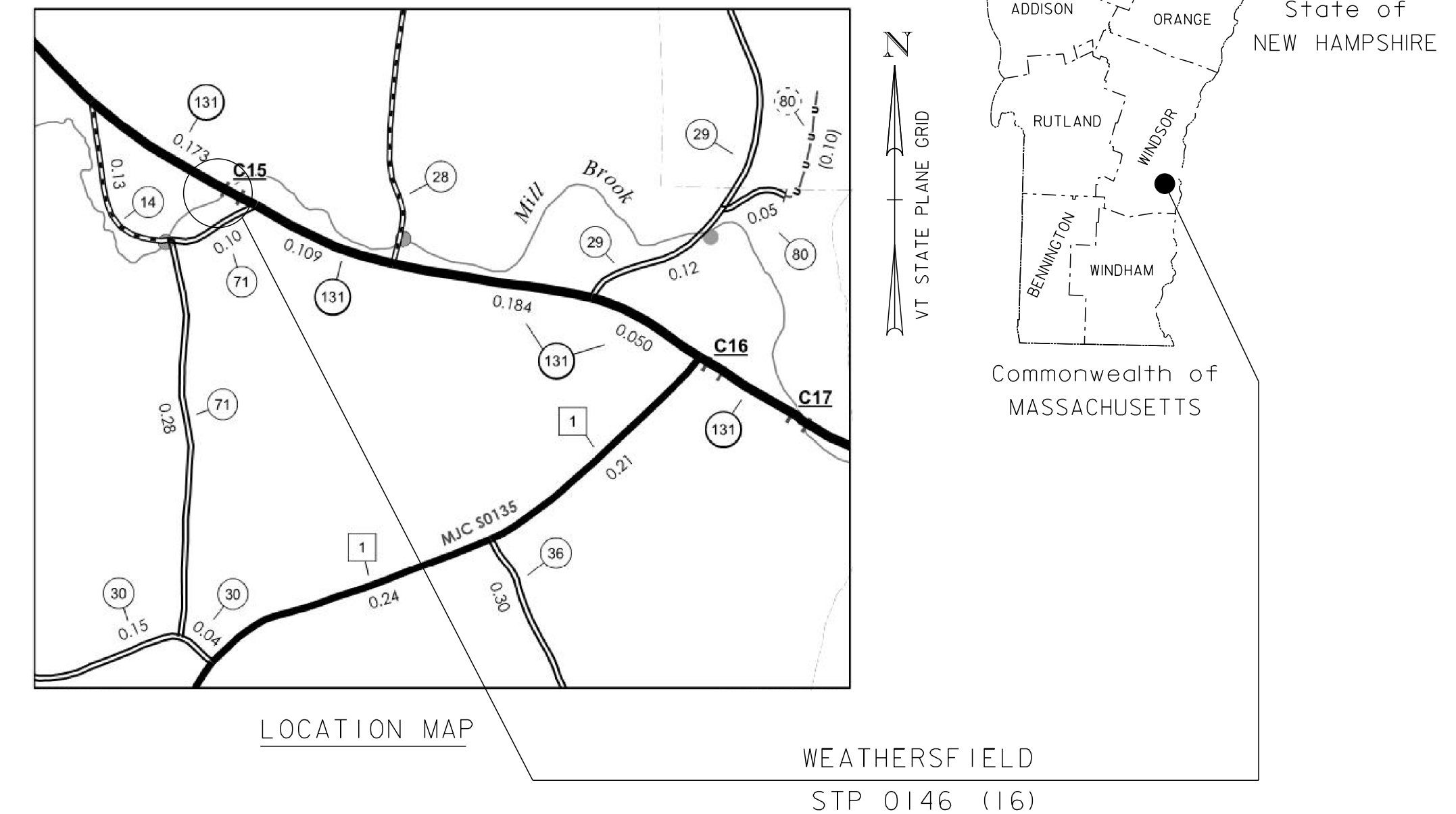
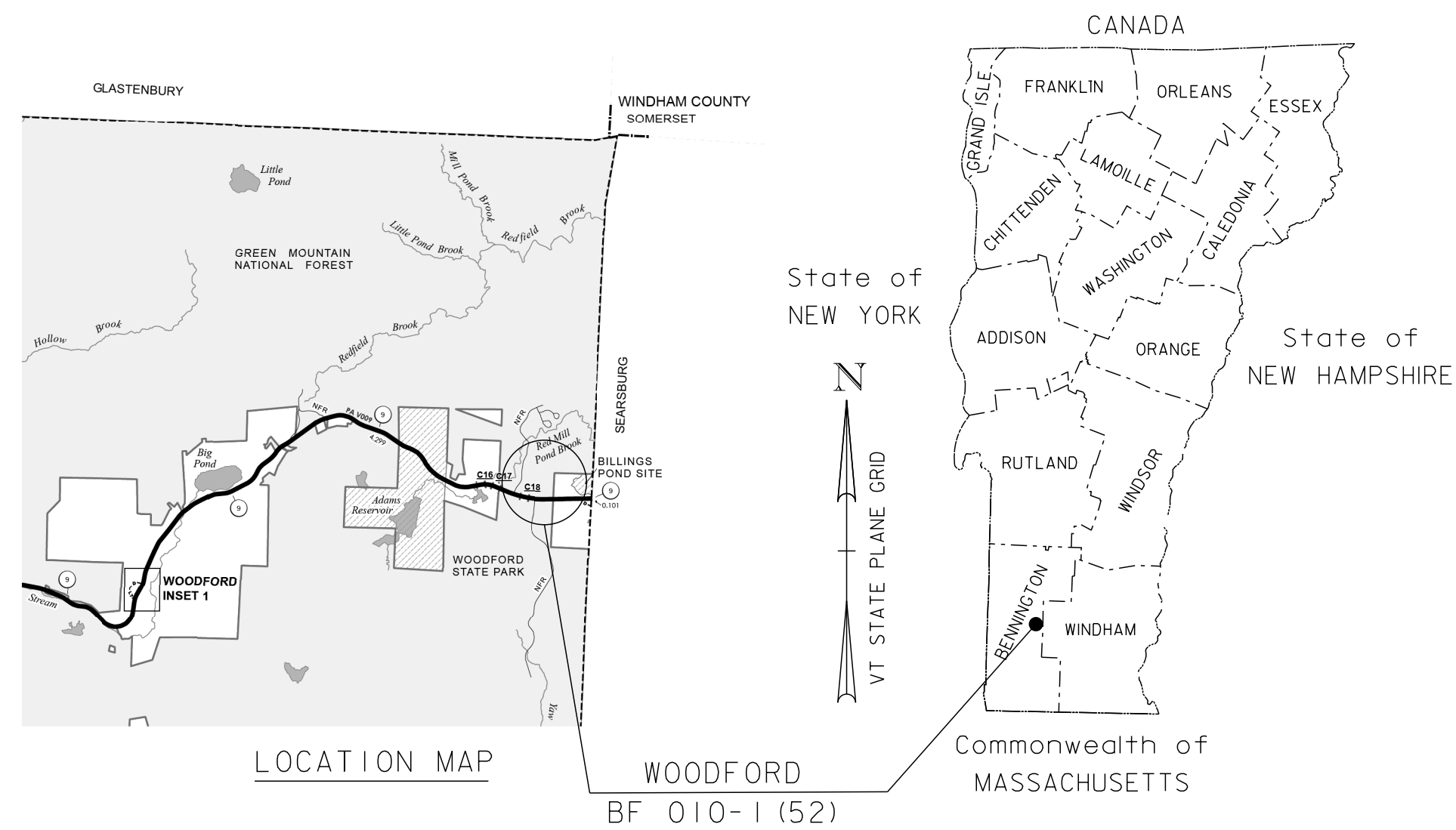
SUMMARY OF SHEETS
 PROJECT COMPOSITE SHEETS: 1-2
 BF 010-1 (52) SHEETS: 3-24
 STP 0146 (16) SHEETS: 25-41

STATE OF VERMONT AGENCY OF TRANSPORTATION



PROPOSED IMPROVEMENT BRIDGE PROJECT

TOWNS OF WOODFORD/WEATHERSFIELD
 COUNTIES OF BENNINGTON/WINDSOR



WOODFORD BF 010-1 (52)

ROUTE NO : VT ROUTE 9 , BRIDGE NO : 18

PROJECT LOCATION: APPROXIMATELY 2.4 MILES WEST OF INTERSECTION WITH VT 8.

PROJECT DESCRIPTION: THE PROJECT SHALL CONSIST OF LINING THE EXISTING CULVERT WITH A CONCRETE SPRAY-ON LINER AND CONSTRUCTING A BEVELLED HEADWALL AT THE INLET.

LENGTH OF STRUCTURE: 7.02 FEET
 LENGTH OF PROJECT: 225.00 FEET

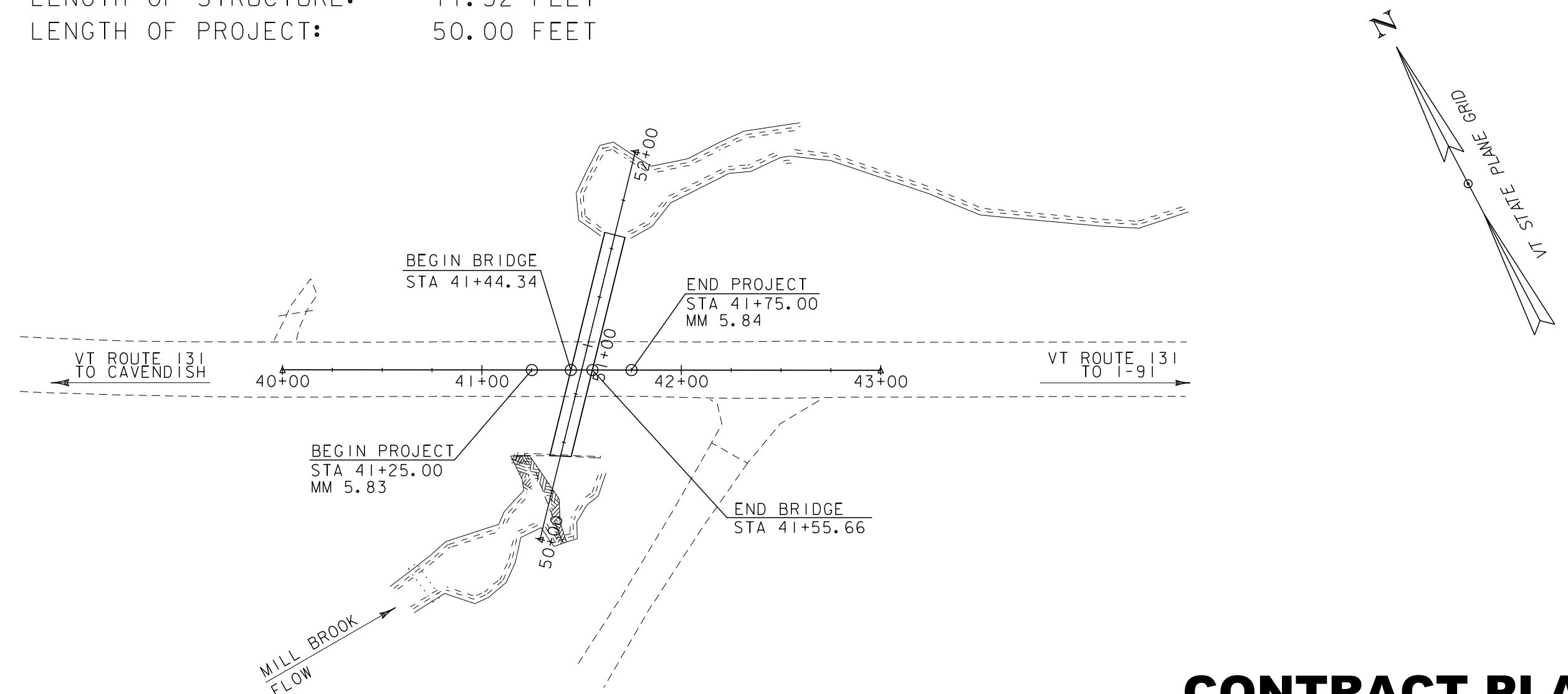
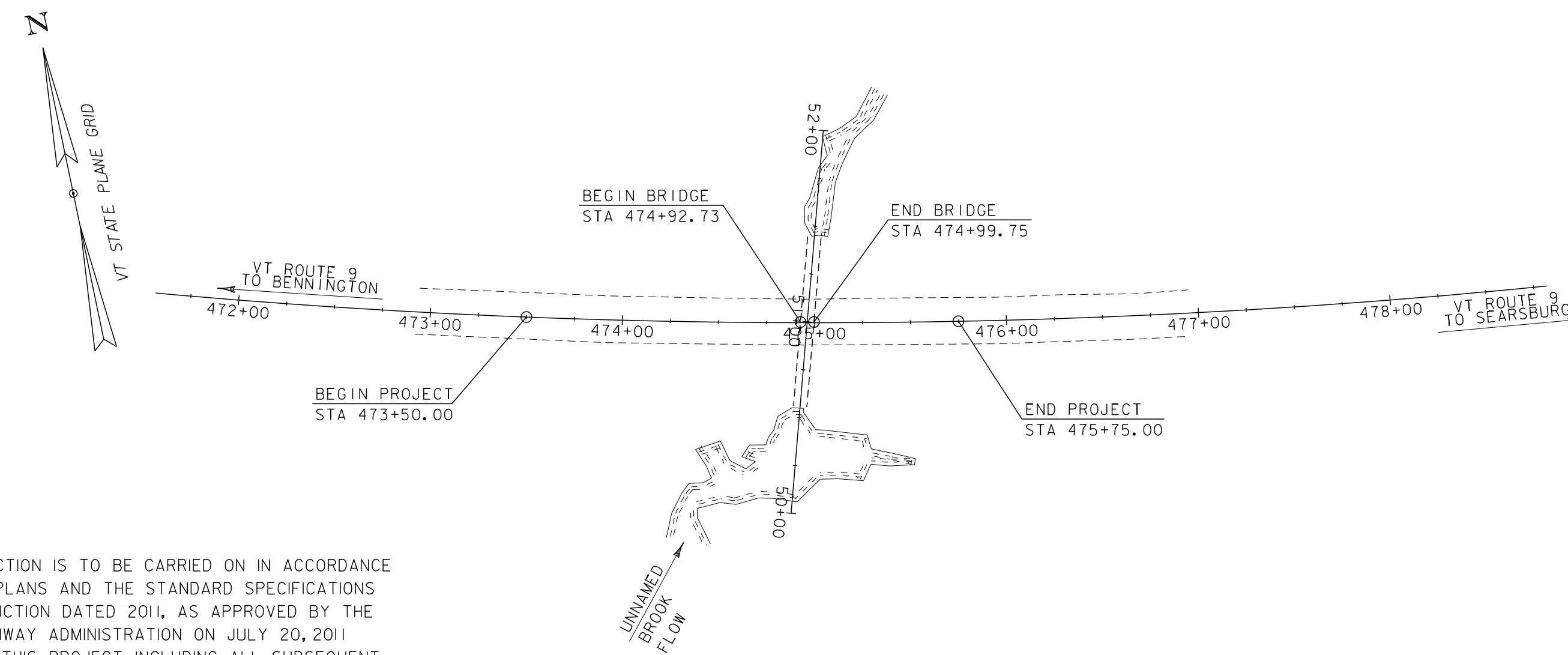
WEATHERSFIELD STP 0146 (16)

ROUTE NO : VT ROUTE 131, BRIDGE NO : 15

PROJECT LOCATION: APPROXIMATELY 0.33 MILES WEST OF THE INTERSECTION OF VT 131 AND TH-1 (WEATHERSFIELD CENTER ROAD).

PROJECT DESCRIPTION: THE PROJECT SHALL CONSIST OF LINING THE EXISTING CULVERT WITH A CONCRETE SPRAY-ON LINER AND MINOR HEADWALL REPAIRS.

LENGTH OF STRUCTURE: 11.32 FEET
 LENGTH OF PROJECT: 50.00 FEET



CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL 2	
SURVEYED BY :	VTRANS
SURVEYED DATE :	07/03/2014 & 02/21/2014
DATUM	
VERTICAL	NAVD88
HORIZONTAL	NAD83 (2011)

SCALE 1" = 60'-0"
 60 0 60

**CONTRACT PLANS
 14-NOV-2018**



GM2 Associates, Inc.
 197 Loudon Road, Suite 310
 Concord, NH 03301
 Tel: 603-856-7854
 Fax: 603-856-7855

DIRECTOR OF PROJECT DELIVERY	
APPROVED _____	DATE _____
PROJECT MANAGER : N. WARK	
PROJECT NAME : WOODFORD & WEATHERSFIELD	
PROJECT NUMBER : BF 010-1 (52) & STP 0146 (16)	
SHEET 1 OF 41 SHEETS	

GENERAL INFORMATION

SYMBOLOLOGY LEGEND NOTE

THE SYMBOLOLOGY ON THIS SHEET IS INTENDED TO COVER STANDARD CONVENTIONAL SYMBOLOLOGY. THE SYMBOLOLOGY IS USED FOR EXISTING & PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROJECT ANNOTATION, AS NOTED ON PROJECT PLAN SHEETS. THIS LEGEND SHEET COVERS THE BASICS. SYMBOLOLOGY ON PLANS MAY VARY, PLAN ANNOTATIONS AND NOTES SHOULD BE USED TO CLARIFY AS NEEDED.

R. O. W. ABBREVIATIONS (CODES) & SYMBOLS

POINT CODE	DESCRIPTION
CH	CHANNEL EASEMENT
CONST	CONSTRUCTION EASEMENT
CUL	CULVERT EASEMENT
D&C	DISCONNECT & CONNECT
DIT	DITCH EASEMENT
DR	DRAINAGE EASEMENT
DRIVE	DRIVEWAY EASEMENT
EC	EROSION CONTROL
HWY	HIGHWAY EASEMENT
I&M	INSTALL & MAINTAIN EASEMENT
LAND	LANDSCAPE EASEMENT
R&RES	REMOVE & RESET
R&REP	REMOVE & REPLACE
R.T.&I.	RIGHTS, TITLE, AND INTEREST
SR	SLOPE RIGHT
UE	UTILITY EASEMENT
(P)	PERMANENT EASEMENT
(T)	TEMPORARY EASEMENT
■	BNDNS BOUND SET
□	BNDNS BOUND TO BE SET
●	IPNS IRON PIN SET
⊙	IPNS IRON PIN TO BE SET
⊠	CALC EXISTING ROW POINT
○	PROW PROPOSED ROW POINT
[LENGTH]	LENGTH CARRIED ON NEXT SHEET

COMMON TOPOGRAPHIC POINT SYMBOLS

POINT CODE	DESCRIPTION
⊗	APL BOUND APPARENT LOCATION
○	BM BENCHMARK
□	BND BOUND
□	CB CATCH BASIN
⊕	COMB COMBINATION POLE
□	DITHR DROP INLET THROATED DNC
⊕	EL ELECTRIC POWER POLE
○	FPOLE FLAGPOLE
⊙	GASFIL GAS FILLER
○	GP GUIDE POST
⊗	GSO GAS SHUT OFF
○	GUY GUY POLE
○	GUYW GUY WIRE
⊗	GV GATE VALUE
⊗	H TREE HARDWOOD
△	HCTRL CONTROL HORIZONTAL
△	HVCTRL CONTROL HORIZ. & VERTICAL
◇	HYD HYDRANT
⊙	IP IRON PIN
⊙	IPIPE IRON PIPE
⊕	LI LIGHT - STREET OR YARD
⊕	MB MAILBOX
○	MH MANHOLE (MH)
□	MM MILE MARKER
⊙	PM PARKING METER
□	PMK PROJECT MARKER
⊙	POST POST STONE/WOOD
⊕	RRSIG RAILROAD SIGNAL
⊕	RRSL RAILROAD SWITCH LEVER
⊕	S TREE SOFTWOOD
⊕	SAT SATELLITE DISH
⊕	SHRUB SHRUB
⊕	SIGN SIGN
⊕	STUMP STUMP
⊕	TEL TELEPHONE POLE
○	TIE TIE
⊕	TSIGN SIGN W/DOUBLE POST
⊕	VCTRL CONTROL VERTICAL
○	WELL WELL
⊗	WSO WATER SHUT OFF

THESE ARE COMMON VAOT SURVEY POINT SYMBOLS FOR EXISTING FEATURES, ALSO USED FOR PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROPOSED ANNOTATION.

PROPOSED GEOMETRY CODES

CODE	DESCRIPTION
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
CC	CENTER OF CURVE
PT	POINT OF TANGENCY
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
POB	POINT OF BEGINNING
POE	POINT OF ENDING
STA	STATION PREFIX
AH	AHEAD STATION SUFFIX
BK	BACK STATION SUFFIX
D	CURVE DEGREE OF (100FT)
R	CURVE RADIUS OF
T	CURVE TANGENT LENGTH
L	CURVE LENGTH OF
E	CURVE EXTERNAL DISTANCE

UTILITY SYMBOLOLOGY

UNDERGROUND UTILITIES

— UGU —	UTILITY (GENERIC-UNKNOWN)
— UT —	TELEPHONE
— UE —	ELECTRIC
— UC —	CABLE (TV)
— UEC —	ELECTRIC+CABLE
— UET —	ELECTRIC+TELEPHONE
— UCT —	CABLE+TELEPHONE
— UECT —	ELECTRIC+CABLE+TELEP.
— G —	GAS LINE
— W —	WATER LINE
— S —	SANITARY SEWER (SEPTIC)

ABOVE GROUND UTILITIES (AERIAL)

— AGU —	UTILITY (GENERIC-UNKNOWN)
— T —	TELEPHONE
— E —	ELECTRIC
— C —	CABLE (TV)
— EC —	ELECTRIC+CABLE
— ET —	ELECTRIC+TELEPHONE
— AER E&T —	ELECTRIC+TELEPHONE
— CT —	CABLE+TELEPHONE
— ECT —	ELECTRIC+CABLE+TELEP.
—	UTILITY POLE GUY WIRE

PROJECT CONSTRUCTION SYMBOLOLOGY

PROJECT DESIGN & LAYOUT SYMBOLOLOGY

— — — — — CZ — — — — —	CLEAR ZONE
—————	PLAN LAYOUT MATCHLINE

PROJECT CONSTRUCTION FEATURES

△ — △ — △ — △	TOP OF CUT SLOPE
○ — ○ — ○ — ○	TOE OF FILL SLOPE
⊗ ⊗ ⊗ ⊗ ⊗ ⊗	STONE FILL
-----	BOTTOM OF DITCH
-----	CULVERT PROPOSED
-----	STRUCTURE SUBSURFACE
PDF — PDF —	PROJECT DEMARCATION FENCE
BF x x x x BF x x x x	BARRIER FENCE
XXXXXXXXXXXXXXXXXXXX	TREE PROTECTION ZONE (TPZ)
//////	STRIPING LINE REMOVAL
~~~~~	SHEET PILES

**CONVENTIONAL BOUNDARY SYMBOLOLOGY**

**BOUNDARY LINES**

—————	TOWN BOUNDARY LINE
—————	COUNTY BOUNDARY LINE
—————	STATE BOUNDARY LINE
///	PROPOSED STATE R.O.W. (LIMITED ACCESS)
---	PROPOSED STATE R.O.W.
---	STATE ROW (LIMITED ACCESS)
---	STATE ROW
---	TOWN ROW
---	PERMANENT EASEMENT LINE (P)
---	TEMPORARY EASEMENT LINE (T)
---	SURVEY LINE
+	PROPERTY LINE (P/L)
SR — SR — SR —	SLOPE RIGHTS
6f — 6f —	6F PROPERTY BOUNDARY
4f — 4f —	4F PROPERTY BOUNDARY
HAZ — HAZ —	HAZARDOUS WASTE

**EPSC LAYOUT PLAN SYMBOLOLOGY**

**EPSC MEASURES**

ONNOONNOONNO	FILTER CURTAIN
□ — □ — □ — □	SILT FENCE
□ — x — x — x — x — □	SILT FENCE WOVEN WIRE
▶ — ▶ — ▶ — ▶	CHECK DAM
■	DISTURBED AREAS REQUIRING RE-VEGETATION
⊗	EROSION MATTING

SEE EPSC DETAIL SHEETS FOR ADDITIONAL SYMBOLOLOGY

**ENVIRONMENTAL RESOURCES**

—	WETLAND BOUNDARY
-----	RIPARIAN BUFFER ZONE
-----	WETLAND BUFFER ZONE
-----	SOIL TYPE BOUNDARY
— T&E —	THREATENED & ENDANGERED SPECIES
HAZ — HAZ —	HAZARDOUS WASTE AREA
— AG —	AGRICULTURAL LAND
— HABITAT —	FISH & WILDLIFE HABITAT
— FLOOD PLAIN —	FLOOD PLAIN
— OHW —	ORDINARY HIGH WATER (OHW)
—	STORM WATER
-----	USDA FOREST SERVICE LANDS
-----	WILDLIFE HABITAT SUIT/CONN

**ARCHEOLOGICAL & HISTORIC**

— ARCH —	ARCHEOLOGICAL BOUNDARY
— HISTORIC DIST —	HISTORIC DISTRICT BOUNDARY
— HISTORIC —	HISTORIC AREA
Ⓜ	HISTORIC STRUCTURE

**CONVENTIONAL TOPOGRAPHIC SYMBOLOLOGY**

**EXISTING FEATURES**

-----	ROAD EDGE PAVEMENT
-----	ROAD EDGE GRAVEL
-----	DRIVEWAY EDGE
-----	DITCH
-----	FOUNDATION
x — x — x — x —	FENCE (EXISTING)
□ — □ — □ — □ —	FENCE WOOD POST
○ — ○ — ○ — ○ —	FENCE STEEL POST
~~~~~	GARDEN
○ — ○ — ○ — ○ —	ROAD GUARDRAIL
	RAILROAD TRACKS
-----	CULVERT (EXISTING)
○○○○○○○○○○○○○○○○	STONE WALL
-----	WALL
~~~~~	WOOD LINE
~~~~~	BRUSH LINE
~~~~~	HEDGE
-----	BODY OF WATER EDGE
-----	LEDGE EXPOSED

PROJECT NAME:	WOODFORD & WEATHERSFIELD		
PROJECT NUMBER:	BF 010-1(52) & STP 0146(16)		
FILE NAME:	z13b270_00c266leg.dgn	PLOT DATE:	11/14/2018
PROJECT LEADER:	T. LEVINS	DRAWN BY:	VTRANS
DESIGNED BY:	VTRANS	CHECKED BY:	T. LEVINS
LEGEND SHEET		SHEET	2 OF 41



# STATE OF VERMONT AGENCY OF TRANSPORTATION



## PROPOSED IMPROVEMENT BRIDGE PROJECT

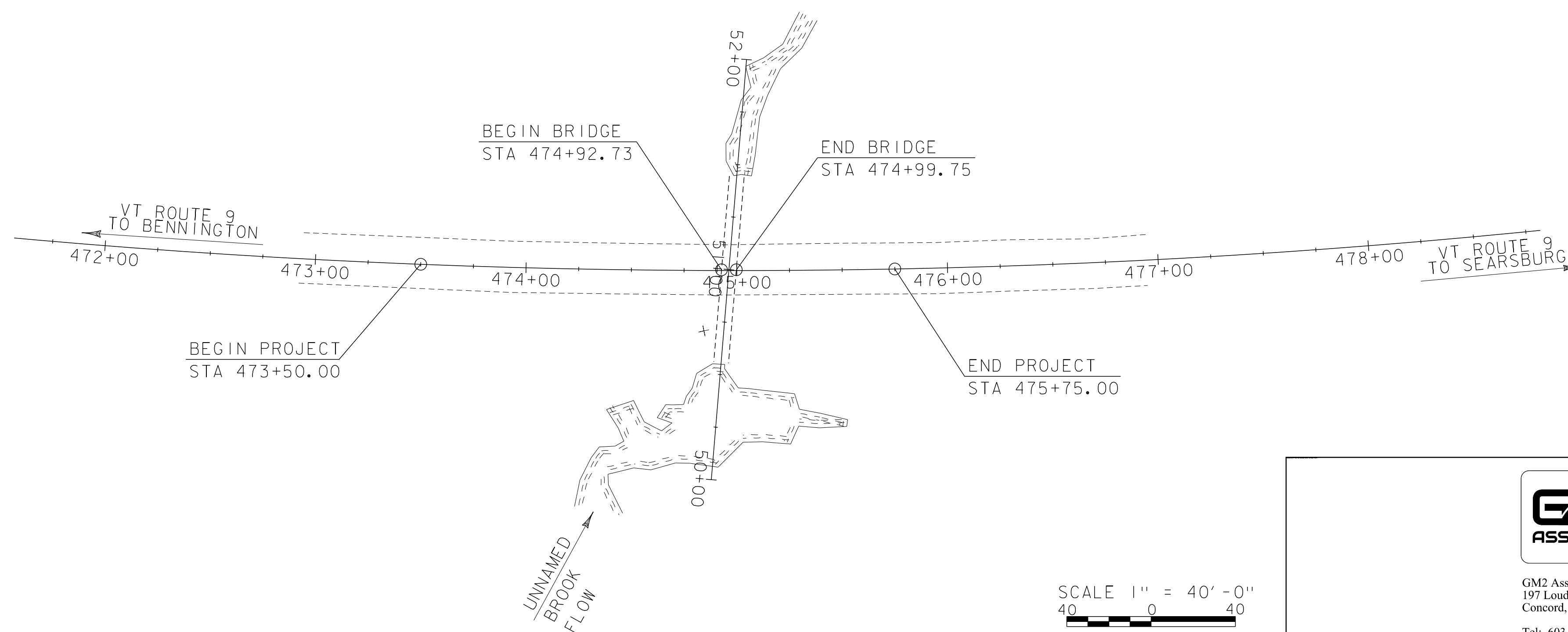
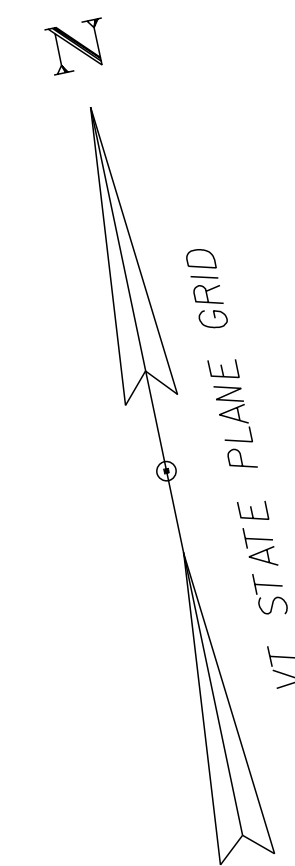
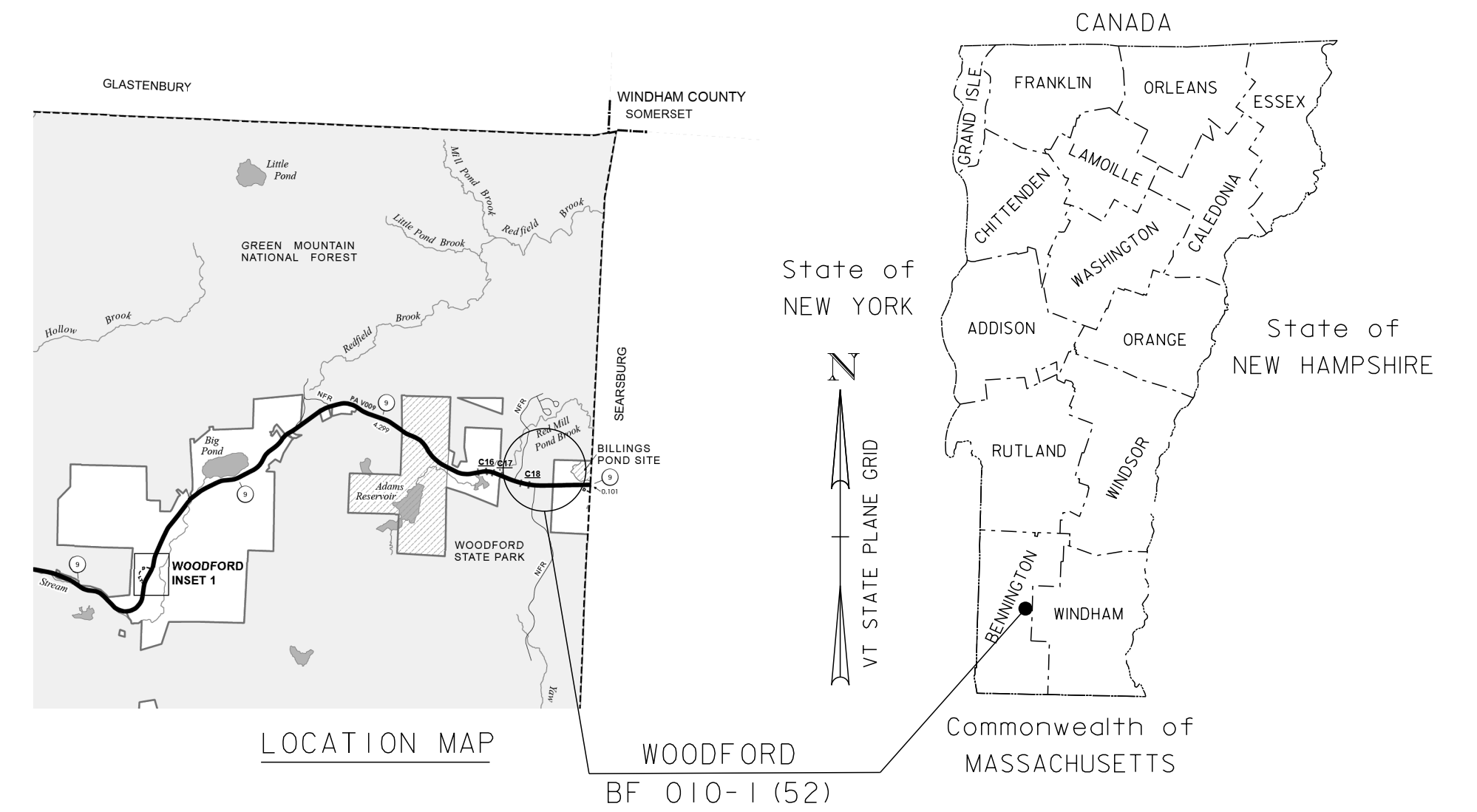
TOWN OF WOODFORD  
COUNTY OF BENNINGTON

ROUTE NO : VT ROUTE 9 , BRIDGE NO : 18

PROJECT LOCATION: APPROXIMATELY 2.4 MILES WEST OF INTERSECTION WITH VT 8.

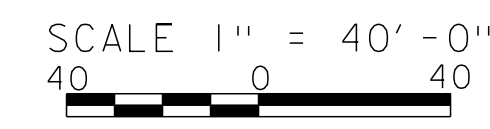
PROJECT DESCRIPTION: THE PROJECT SHALL CONSIST OF LINING THE EXISTING CULVERT WITH A CONCRETE SPRAY-ON LINER AND CONSTRUCTING A BEVELLED HEADWALL AT THE INLET.

LENGTH OF STRUCTURE: 7.02 FEET  
LENGTH OF PROJECT: 225.00 FEET



CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL 2	
SURVEYED BY :	VTRANS
SURVEYED DATE :	07/03/2014
DATUM	
VERTICAL	NAVD88
HORIZONTAL	NAVD83 (2011)



**CONTRACT PLANS  
14-NOV-2018**

 GM2 Associates, Inc. 197 Loudon Road, Suite 310 Concord, NH 03301 Tel: 603-856-7854 Fax: 603-856-7855	DIRECTOR OF PROJECT DELIVERY	
	APPROVED _____ DATE _____	
PROJECT MANAGER : N. WARK		
PROJECT NAME : WOODFORD		
PROJECT NUMBER : BF 010-1 (52)		
SHEET 3 OF 41 SHEETS		

# PRELIMINARY INFORMATION SHEET (CULVERT)

**INDEX OF SHEETS**

**FINAL HYDRAULIC REPORT**

**PLAN SHEETS**

3	TITLE SHEET
4	PRELIMINARY INFORMATION SHEET
5	QUANTITY SHEET
6	TYPICAL SECTION
7	PROJECT NOTES
8	TE SHEET
9	EXISTING CONDITIONS
10	LAYOUT SHEET
11	HEADWALL DETAIL SHEET
12	REBAR LAYOUT SHEET
13	REINFORCING SCHEDULE SHEET
14	PROFILE
15	BORING INFORMATION SHEET
16	BORING LOGS 1
17	BORING LOGS 2
18	CHANNEL CROSS SECTIONS 1
19	CHANNEL CROSS SECTIONS 2
20	CHANNEL CROSS SECTIONS 3
21	EPSC NARRATIVE
22	EPSC CONSTRUCTION SITE PLAN
23	EPSC DETAILS 1
24	EPSC DETAILS 2

**STANDARDS LIST**

T-1	TRAFFIC CONTROL GENERAL NOTES	4/25/2016
T-17	TRAFFIC CONTROL MISCELLANEOUS DETAILS	8/6/2012

**STRUCTURES DETAIL SHEETS**

SD-501.00	CONCRETE DETAILS AND NOTES	2/9/2012
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**HYDROLOGIC DATA**

Date: June 16, 2017

DRAINAGE AREA : 0.6 sq. mi.  
 CHARACTER OF TERRAIN : Hilly and forested with some fields and wetlands  
 STREAM CHARACTERISTICS : Sinuous perennial stream  
 NATURE OF STREAMBED : Fine material including sand and silt

**PEAK FLOW DATA - ANNUAL EXCEEDANCE PROBABILITY (AEP)**

43% =	45 cfs	2% =	145 cfs
10% =	95 cfs	1% =	170 cfs
4% =	125 cfs	0.2% =	240 cfs

DATE OF FLOOD OF RECORD : Unknown  
 ESTIMATED DISCHARGE : Unknown  
 WATER SURFACE ELEV. : Unknown  
 NATURAL STREAM VELOCITY : @ 2% AEP = 4.4 fps  
 ICE CONDITIONS : Low  
 DEBRIS : Moderate  
 DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? No  
 IS ORDINARY RISE RAPID? No  
 IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? No  
 IF YES, DESCRIBE : N/A

WATERSHED STORAGE : 2% HEADWATERS :  
 UNIFORM :  
 IMMEDIATELY ABOVE SITE : X

**EXISTING STRUCTURE INFORMATION**

STRUCTURE TYPE : CGMPP with Mitered Ends  
 YEAR BUILT : 1965  
 CLEAR SPAN(NORMAL TO STREAM): 7.0'  
 VERTICAL CLEARANCE ABOVE STREAMBED: 7.0'  
 WATERWAY OF FULL OPENING: 38.5 sq. ft.  
 DISPOSITION OF STRUCTURE: Rehabilitation  
 TYPE OF MATERIAL UNDER SUBSTRUCTURE: Unknown

**WATER SURFACE ELEVATIONS AT:**

43% AEP =	2211.4'	VELOCITY =	6.2 fps
10% AEP =	2212.8'	"	7.7 fps
4% AEP =	2213.4'	"	8.4 fps
2% AEP =	2213.8'	"	8.8 fps
1% AEP =	2214.3'	"	9.2 fps

**LONG TERM STREAMBED CHANGES:**

IS THE ROADWAY OVERTOPPED BELOW 1% AEP: No  
 FREQUENCY: N/A  
 RELIEF ELEVATION: 2221.1'  
 DISCHARGE OVER ROAD @ 1% AEP: N/A

**UPSTREAM STRUCTURE**

TOWN: N/A - Confluence DISTANCE:  
 HIGHWAY #: STRUCTURE #:  
 CLEAR SPAN: CLEAR HEIGHT:  
 YEAR BUILT: FULL WATERWAY:  
 STRUCTURE TYPE:

**DOWNSTREAM STRUCTURE**

TOWN: N/A - Tributary to Billings Pond DISTANCE:  
 HIGHWAY #: STRUCTURE #:  
 CLEAR SPAN: CLEAR HEIGHT:  
 YEAR BUILT: FULL WATERWAY:  
 STRUCTURE TYPE:

**LRFR LOAD RATING FACTORS**

LOADING LEVELS	TRUCK						
	H-20	HL-93	3S2	6 AXLE	3A STR.	4A STR.	5A SEM
TONNAGE	20	36	36	66	30	34.5	38
INVENTORY							
POSTING							
OPERATING							
COMMENTS:	TABLE TO BE COMPLETED BY CONTRACTOR'S DESIGNER						

**CULVERT DESIGN CRITERIA**

1. PROPOSED CULVERT IS A LINING.
2. CULVERT ENDS ARE NOT SKEWED.
3. CULVERT WILL BE SET AT A SLOPE OF 0.79 IN. ON 10 FT.
4. CULVERT WILL REQUIRE FISH PASSAGE ACCOMMODATIONS.
5. CULVERT CONSTRUCTION WILL REQUIRE TEMPORARY RELOC. OF STREAM FLOW.

**PROPOSED STRUCTURE**

STRUCTURE TYPE: CGMPP with 2" Spray-on Liner and Beveled Inlet Headwall

CLEAR SPAN(NORMAL TO STREAM): 6' - 8"  
 VERTICAL CLEARANCE ABOVE STREAMBED: 6' - 8"  
 WATERWAY OF FULL OPENING: 34.9 sq. ft.

**WATER SURFACE ELEVATIONS AT:**

43% AEP =	2211.3'	VELOCITY=	6.9 fps
10% AEP =	2212.4'	"	8.2 fps
4% AEP =	2213.1'	"	8.8 fps
2% AEP =	2213.5'	"	9.2 fps
1% AEP =	2213.9'	"	9.6 fps

IS THE ROADWAY OVERTOPPED BELOW 1% AEP: No  
 FREQUENCY: N/A  
 RELIEF ELEVATION: 2221.1'  
 DISCHARGE OVER ROAD @ 1% AEP: N/A

BRIDGE LOW CHORD ELEVATION: N/A  
 FREEBOARD: N/A

SCOUR: N/A

REQUIRED CHANNEL PROTECTION: Stone Fill Type II

**PERMIT INFORMATION**

AVERAGE DAILY FLOW: - DEPTH OR ELEVATION:  
 ORDINARY LOW WATER: -  
 ORDINARY HIGH WATER: -

**TEMPORARY BRIDGE REQUIREMENTS**

STRUCTURE TYPE: N/A  
 CLEAR SPAN (NORMAL TO STREAM):  
 VERTICAL CLEARANCE ABOVE STREAMBED:  
 WATERWAY AREA OF FULL OPENING:

**ADDITIONAL INFORMATION**

**TRAFFIC MAINTENANCE NOTES**

1. MAINTAIN TWO-WAY TRAFFIC ON THE EXISTING STRUCTURE.
2. TRAFFIC SIGNALS ARE NOT NECESSARY.
3. SIDEWALKS ARE NOT NECESSARY

**DESIGN VALUES**

1. DESIGN LIVE LOAD	HL-93
2. FUTURE PAVEMENT	d _p : ---
3. CULVERT OPENING	D: 7.00 FT
4. MIN. MID-SPAN POS. CAMBER @ RELEASE (PRESTRESSED UNITS)	Δ: ---
5. PRESTRESSING STRAND	f _y : ---
6. PRESTRESSED CONCRETE STRENGTH	f' _c : ---
7. PRESTRESSED CONCRETE RELEASE STRENGTH	f' _{cr} : ---
8. CONCRETE, HIGH PERFORMANCE CLASS AA	f' _c : --- KSI
9. CONCRETE, HIGH PERFORMANCE CLASS A	f' _c : --- KSI
10. CONCRETE, HIGH PERFORMANCE CLASS B	f' _c : 3.5 KSI
11. CONCRETE, CLASS C	f' _c : --- KSI
12. REINFORCING STEEL	f _y : 60 KSI
13. STRUCTURAL STEEL AASHTO M270	f _y : ---
14. NOMINAL BEARING RESISTANCE OF SOIL	q _n : 9.0 KSF
15. SOIL BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: 0.45
16. NOMINAL BEARING RESISTANCE OF ROCK	q _n : --- KSF
17. ROCK BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: ---
18. PILE RESISTANCE FACTOR	φ: ---
19. LATERAL PILE DEFLECTION	Δ: --- INCH
20. BASIC WIND SPEED	V _{3s} : ---
21. MINIMUM GROUND SNOW LOAD	p _g : ---
22. SEISMIC DATA	PGA: --- S _s : --- S ₁ : ---
23.	---
24.	---
25.	---
26.	---

PROJECT NAME: **WOODFORD**  
 PROJECT NUMBER: **BF 010-1(52)**  
 FILE NAME: z13b270pi.dgn PLOT DATE: 11/14/2018  
 PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
 DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
**PRELIMINARY INFORMATION SHEET** SHEET 4 OF 41

**TRAFFIC DATA**

YEAR	ADT	DHV	% D	% T	ADTT	
2017	3200	490	54	15.2	540	20 year ESAL for flexible pavement from 2017 to 2037 : N/A
2037	3400	520	54	19.9	750	40 year ESAL for flexible pavement from 2017 to 2057 : N/A
						Design Speed : 50 mph

AS BUILT "REBAR" DETAIL		
LEVEL I	LEVEL II	LEVEL III
TYPE:	TYPE:	TYPE:
GRADE:	GRADE:	GRADE:

# QUANTITY SHEET 1

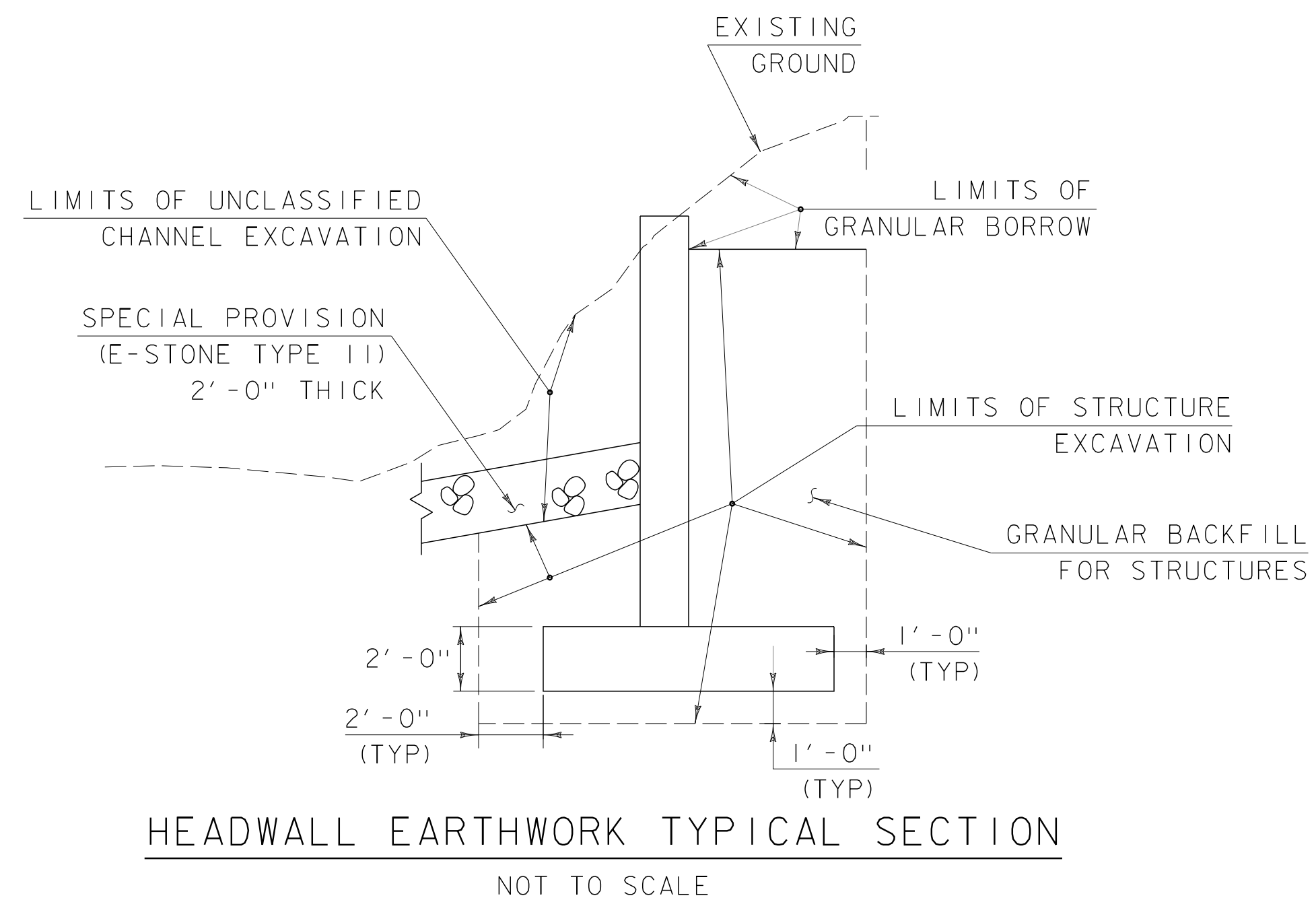
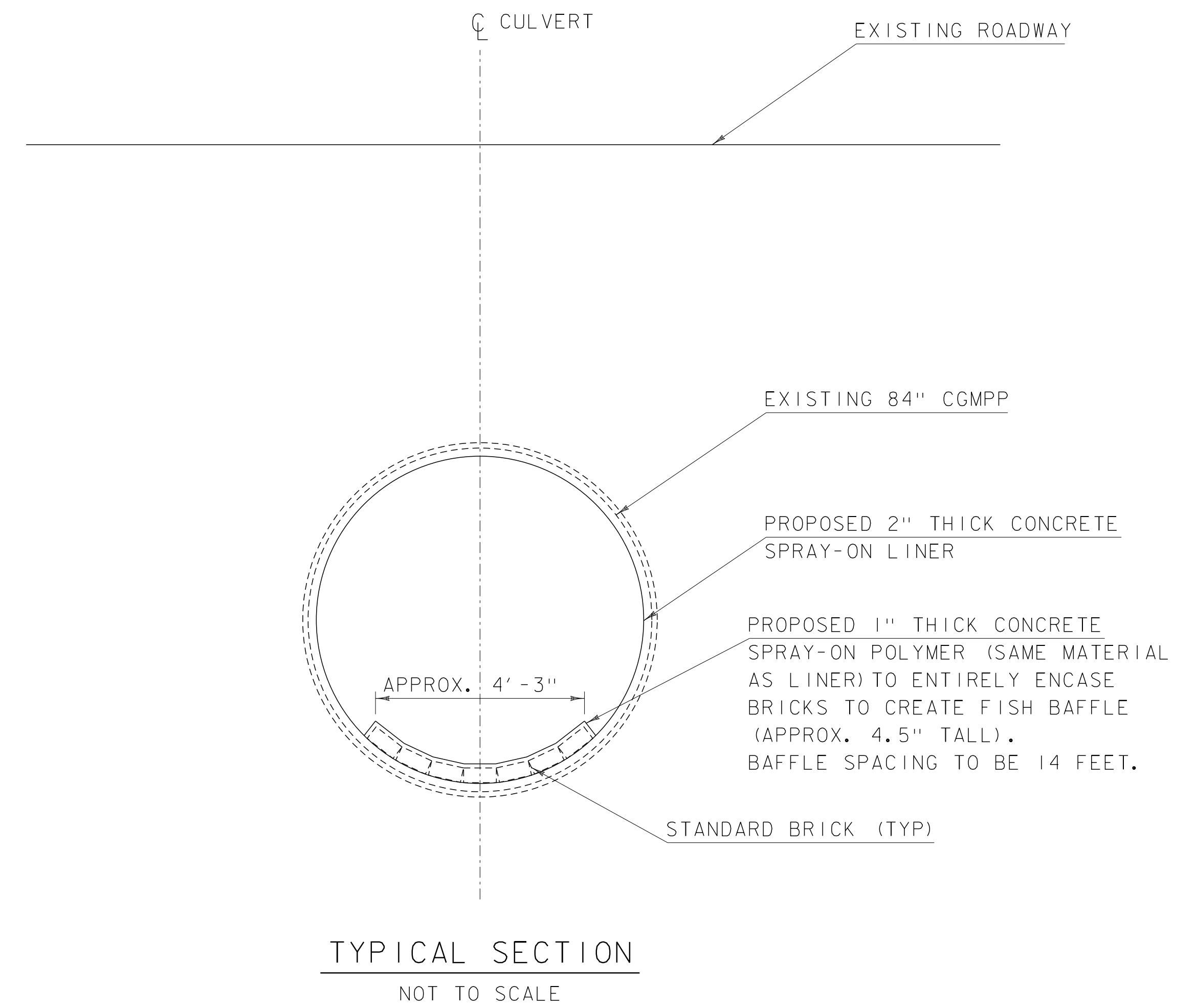
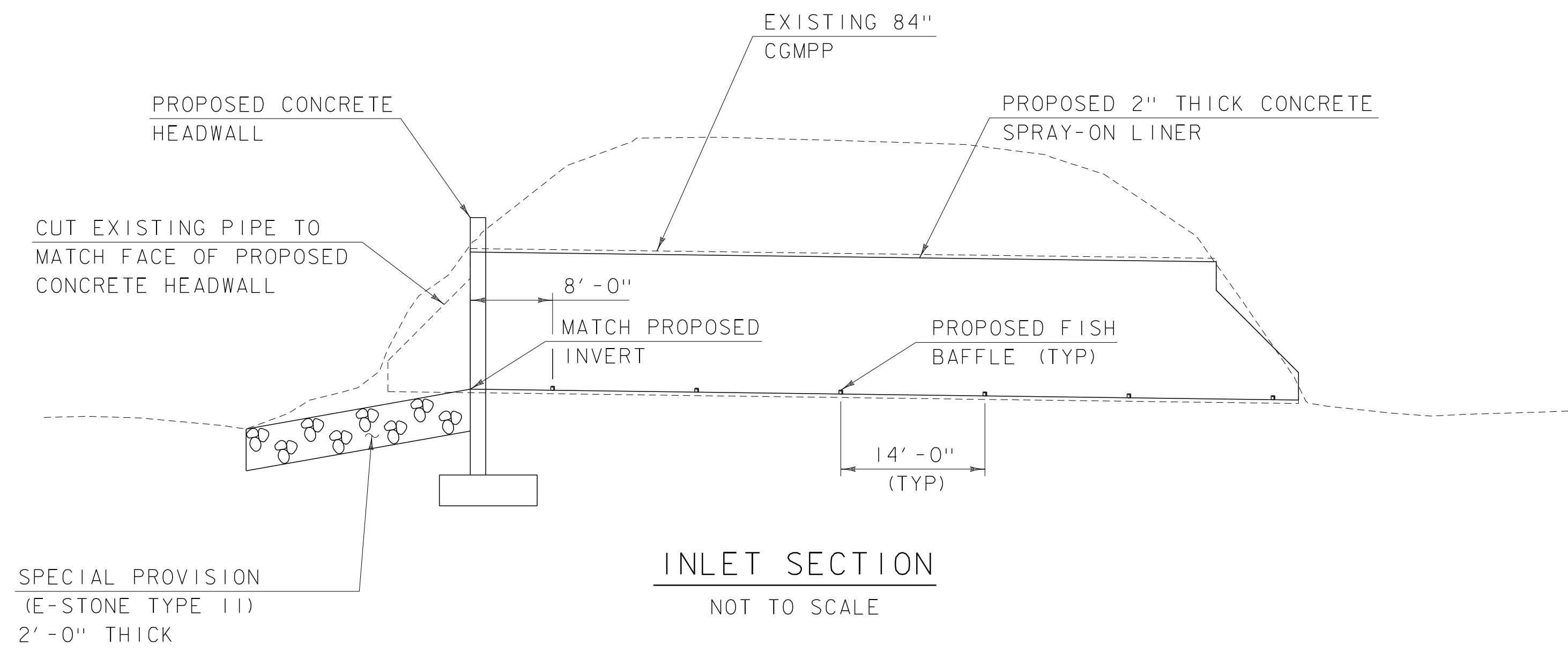
SUMMARY OF ESTIMATED QUANTITIES										TOTALS		DESCRIPTIONS				DETAILED SUMMARY OF QUANTITIES			
							ROADWAY	EROSION CONTROL	BRIDGE	FULL C.E. ITEMS	GRAND TOTAL	FINAL	UNIT	ITEMS	ITEM NUMBER	ROUND	QUANTITIES	UNIT	ITEMS
									130		130		CY	UNCLASSIFIED CHANNEL EXCAVATION	203.27				
							330				330		CY	GRANULAR BORROW	203.32				
									1		1		CY	TRENCH EXCAVATION OF EARTH, EXPLORATORY (N.A.B.I.)	204.22				
									270		270		CY	STRUCTURE EXCAVATION	204.25				
									280		280		CY	GRANULAR BACKFILL FOR STRUCTURES	204.30				
									1		1		LS	COFFERDAM	208.40				
									47		47		CY	CONCRETE, HIGH PERFORMANCE CLASS B	501.34				
									5140		5140		LB	REINFORCING STEEL, LEVEL I	507.11				
									4		4		GAL	WATER REPELLENT, SILANE	514.10				
									1		1		EACH	REMOVAL OF STRUCTURE (84" CGMPP x 7')	529.15				
									2		2		CY	CONCRETE, CLASS D	541.31				
									2		2		CY	CONTROLLED DENSITY (FLOWABLE) FILL	541.45				
									100		100		CY	STONE FILL, TYPE III	613.12				
							200				200		HR	FLAGGERS	630.15				
										1	1		LS	FIELD OFFICE, ENGINEERS (BF 010-1(52))	631.10				
										1	1		LS	TESTING EQUIPMENT, CONCRETE (BF 010-1(52))	631.16				
										3000	3000		DL	FIELD OFFICE COMMUNICATIONS (N.A.B.I.) (BF 010-1(52))	631.26				
							1				1		LS	MOBILIZATION/DEMobilIZATION (BF 010-1(52))	635.11				
									220		220		SY	GEOTEXTILE UNDER STONE FILL	649.31				
								90			90		SY	GEOTEXTILE FOR SILT FENCE	649.51				
								20			20		SY	GEOTEXTILE FOR FILTER CURTAIN	649.61				
								12			12		LB	SEED	651.15				
								100			100		LB	FERTILIZER	651.18				
								0.4			0.4		TON	AGRICULTURAL LIMESTONE	651.20				
								0.6			0.6		TON	HAY MULCH	651.25				
								110			110		CY	TOPSOIL	651.35				
								1			1		LS	EPSC PLAN (BF 010-1(52))	652.10				
								20			20		HR	MONITORING EPSC PLAN	652.20				
								1			1		LU	MAINTENANCE OF EPSC PLAN (N.A.B.I.) (BF 010-1(52))	652.30				
								340			340		SY	TEMPORARY EROSION MATTING	653.20				
								30			30		CY	STABILIZED CONSTRUCTION ENTRANCE	653.35				
								410			410		LF	PROJECT DEMARCATIOn FENCE	653.55				
								20			20		CY	SPECIAL PROVISION (E-STONE TYPE II)	900.608				
								82			82		LF	SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 84" PIPE)	900.640				
								1			1		LS	SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM) (BF 010-1(52))	900.645				
							1				1		LS	SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE) (BF 010-1(52))	900.645				

PROJECT NAME: WOODFORD  
PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270qs.dgn  
PROJECT LEADER: T. LEVINS  
DESIGNED BY: B. WILLIAMS  
QUANTITY SHEET

PLOT DATE: 11/14/2018  
DRAWN BY: B. WILLIAMS  
CHECKED BY: T. LEVINS  
SHEET 5 OF 41





PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-1(52)	
FILE NAME: z13b270+typ.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
TYPICAL SECTION	SHEET 6 OF 41

**GENERAL NOTES:**

1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO STATE OF VERMONT AGENCY OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR CONSTRUCTION, DATED 2011, AND THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION, DATED 2014, AND ITS LATEST REVISIONS.
2. ALL WORK AND ANY ASSOCIATED ACTIVITY ON THIS PROJECT SHALL BE PERFORMED WITHIN THE PROPOSED PROJECT LIMITS AS SHOWN ON THE PLANS.
3. DIMENSIONS, ANGLES, AND ELEVATIONS SHOWN ON THESE PLANS HAVE BEEN OBTAINED FROM SURVEY INFORMATION AND LIMITED FIELD INVESTIGATION, AND MAY NOT ACCURATELY REFLECT ACTUAL FIELD CONDITIONS. ACCORDINGLY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING FIELD MEASUREMENTS FOR ALL STRUCTURE COMPONENTS IMPACTED BY THE WORK (EXISTING OR PROPOSED) TO ASSURE CONSISTENCY WITH THE PROPOSED MODIFICATIONS. ANY DISCREPANCIES IN DIMENSIONS, CHARACTER, OR EXTENT OF THE EXISTING FEATURES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ADVANCING THE WORK. FABRICATION DRAWINGS REQUIRED FOR VARIOUS ITEMS OF THE WORK SHALL INDICATE THE ACTUAL FIELD MEASUREMENTS AND SHALL BE SO NOTED.
4. ALL DIMENSIONS ARE HORIZONTAL OR VERTICAL, AND ARE GIVEN AT 68 DEGREES FAHRENHEIT, UNLESS OTHERWISE NOTED.
5. IT IS EXPECTED THAT CULVERT LINING AND CONCRETE HEADWALL CONSTRUCTION WILL BE THE EXTENT OF THE WORK, AS NOTED ON THE PLANS. DURING THE COURSE OF CONSTRUCTION, IF THE CONTRACTOR SEES AN AREA OF CONCERN, SUCH AS VOIDS AROUND THE EXISTING CULVERT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE ENGINEER SHALL MAKE A DETERMINATION AS TO THE NEED FOR FURTHER EXPLORATION.
6. THE CONTRACTOR SHALL TAKE MEASUREMENTS TO ENSURE OVERHEAD UTILITY LINES ARE NOT IMPACTED BY CONSTRUCTION. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL UTILITY INFORMATION AND REQUIREMENTS.

**CONCRETE NOTES:**

1. CONCRETE PAYMENT AND CLASSIFICATION WILL BE AS FOLLOWS:
  - A. FILLING VOIDS BELOW PIPE OHW FLOW LINE: ITEM 541.31, CONCRETE, CLASS D.
  - B. FILLING VOIDS ABOVE PIPE OHW FLOW LINE: ITEM 541.45, CONTROLLED DENSITY (FLOWABLE) FILL.
  - C. CONCRETE FOR HEADWALL AND FOOTINGS: ITEM 501.34, CONCRETE, HIGH PERFORMANCE CLASS B.
2. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1 INCH BY 1 INCH, UNLESS OTHERWISE NOTED.
3. WATER REPELLENT, SILANE SHALL BE APPLIED TO ALL EXPOSED CONCRETE SURFACES. PAYMENT WILL BE MADE UNDER ITEM 514.10, "WATER REPELLENT, SILANE". APPLICATION RATE OF "WATER REPELLENT, SILANE" SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

**PIPE REHABILITATION NOTES:**

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR ANY DAMAGE THAT OCCURS TO THE SIDE SLOPES AS A RESULT OF CONSTRUCTION ACTIVITIES.
2. THE PORTION OF EXISTING CULVERT TO REMAIN IN PLACE SHALL REMAIN UNDISTURBED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATION OF THE EXISTING PIPE TO THE SATISFACTION OF THE ENGINEER. THE CONTRACTOR SHALL REMOVE SEDIMENT, LARGE STONES, AND/OR LARGE DEBRIS FROM THE INSIDE OF THE EXISTING CULVERT PRIOR TO INSTALLATION OF THE NEW LINER. PAYMENT FOR THIS WORK WILL BE MADE UNDER CONTRACT ITEM 900.640, "SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 84" PIPE)".
3. ONCE THE CONCRETE SPRAY-ON LINER HAS CURED SUFFICIENTLY, THE CONTRACTOR SHALL CONSTRUCT FISH BAFFLES AT 14-FOOT SPACING AS SHOWN ON THE PLANS. PAYMENT FOR THIS WORK WILL BE MADE UNDER CONTRACT ITEM 900.640, "SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 84" PIPE)".
4. IF VOIDS AROUND THE CULVERT ARE FOUND DURING CONSTRUCTION, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE ENGINEER WILL DETERMINE IF THE VOIDS ARE REQUIRED TO BE FILLED. THIS WORK SHALL BE PAID UNDER ITEM 541.45, "CONTROLLED DENSITY (FLOWABLE) FILL" OR ITEM 541.31, "CONCRETE, CLASS D", DEPENDING UPON THE LOCATION RELATIVE TO THE ORDINARY HIGH WATER MARK.
5. THE CONTRACTOR SHALL FILL ANY VOIDS BELOW THE ORDINARY HIGH WATER MARK IN THE CULVERT FROM WITHIN THE CULVERT BEFORE INSTALLING THE LINER. PAYMENT FOR THIS WORK SHALL BE MADE UNDER ITEM 541.31, "CONCRETE, CLASS D".
6. THE CONTRACTOR SHALL FILL ANY VOIDS ABOVE THE ORDINARY HIGH WATER MARK IN THE CULVERT FROM WITHIN THE CULVERT BEFORE INSTALLING THE LINER. PAYMENT FOR THIS WORK SHALL BE MADE UNDER ITEM 541.45, "CONTROLLED DENSITY (FLOWABLE) FILL".

**TEMPORARY RELOCATION OF STREAM NOTES:**

1. ITEM 900.645, "SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM)," SHALL BE USED TO DIVERT THE BROOK FLOW AROUND THE CONSTRUCTION AREA. THE CONTRACTOR SHALL SUBMIT A PLAN SHOWING THE PROPOSED METHOD OF DIVERTING THE BROOK AND ALLOWING THE CONSTRUCTION OF THE NEW HEADWALL. THE INSTALLATION OF THE CONCRETE LINER SHALL BE PERFORMED IN THE DRY. ANY METHOD USED SHALL BE PAID UNDER ITEM 900.645, "SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM)" AND SHALL INCLUDE, BUT NOT BE LIMITED TO:
  - A. THE TEMPORARY PIPE HARDWARE, PUMP RENTALS, AND MONITORING OF THE PUMP DIVERSION.
  - B. ANY EXCAVATION, IMPACTS, OR EROSION CONTROL MEASURES NEEDED TO INSTALL THE TEMPORARY DIVERSION AND REMOVE THE TEMPORARY DIVERSION OUTSIDE THE IMPACTS SHOWN ON THE PLANS.
  - C. INCIDENTALS USED WHILE DIVERTING THE WATER TO THE TEMPORARY DIVERSION (SANDBAGS, PUMPS, ETC.).
2. THE BROOK SHALL BE DIVERTED DURING LOW FLOW CONDITIONS ONLY. SEE PERMIT FOR REQUIREMENTS.

**TRAFFIC CONTROL NOTES:**

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF A SITE SPECIFIC TRAFFIC CONTROL PLAN FOR ALL STAGES OF CONSTRUCTION. THE PLAN SHALL CLEARLY DETAIL HOW TRAFFIC WILL BE MAINTAINED. THE PLAN SHALL SPECIFY ALL CONSTRUCTION ACTIVITIES REQUIRING ALTERNATING ONE-WAY TRAFFIC, RELATE THOSE ACTIVITIES TO THE CONSTRUCTION SCHEDULE, AND SHOW APPROPRIATE TEMPORARY TRAFFIC CONTROL. ALL COSTS WILL BE INCLUDED IN ITEM 900.645 "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".
2. REDMILL CAMPGROUND ROAD AND WILDE ROAD ARE IN THE PROXIMITY OF THE PROJECT AND SHALL REMAIN OPEN DURING CONSTRUCTION.

PROJECT NAME: WOODFORD  
 PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270notes.dgn PLOT DATE: 11/14/2018  
 PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
 DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
 PROJECT NOTES SHEET 7 OF 41



GPS CONTROL POINTS

HVCTRL #1  
 B95032  
 NORTH = 142309.5030  
 EAST = 1502198.7350  
 ELEV. = 2226.510

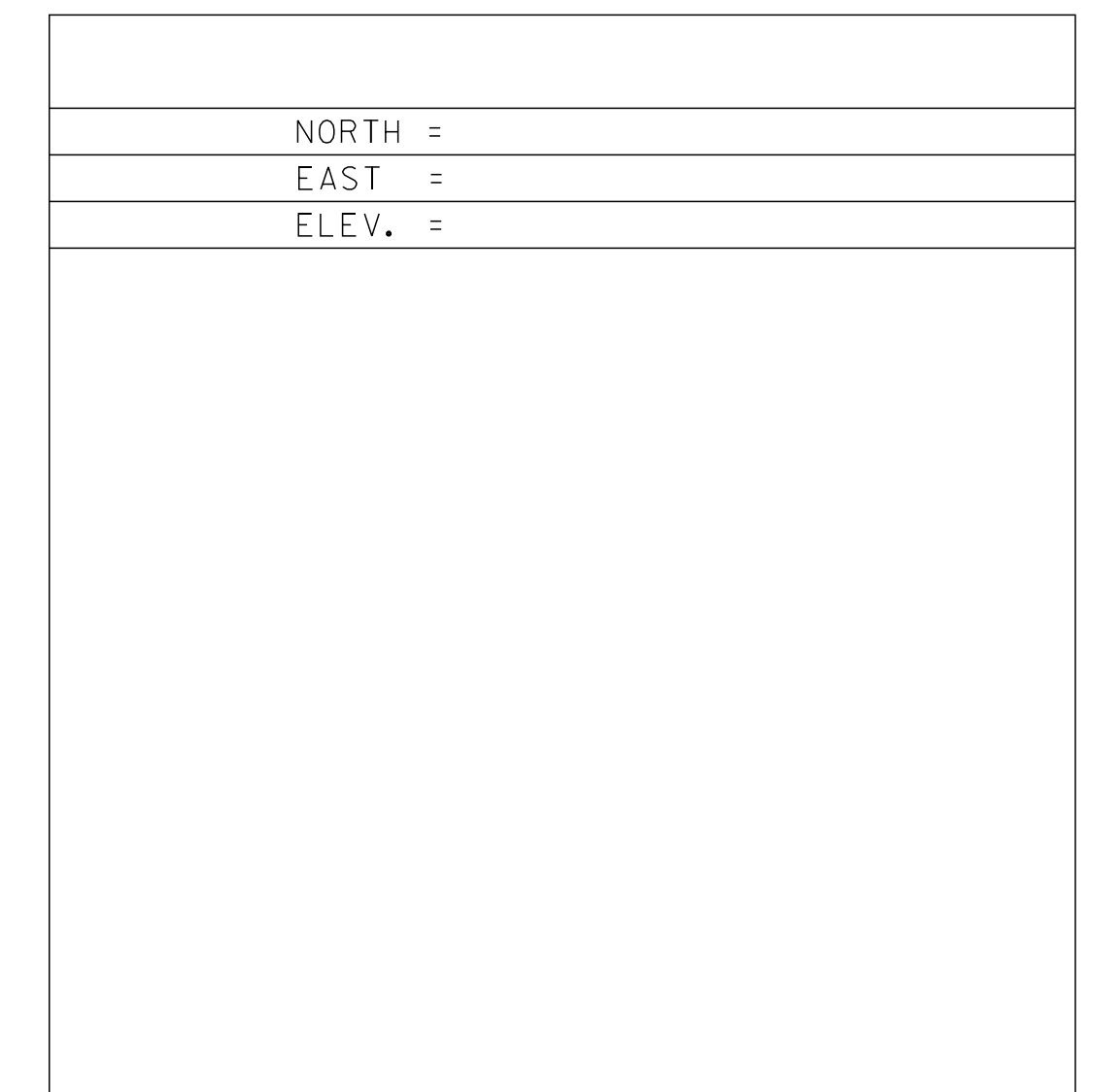
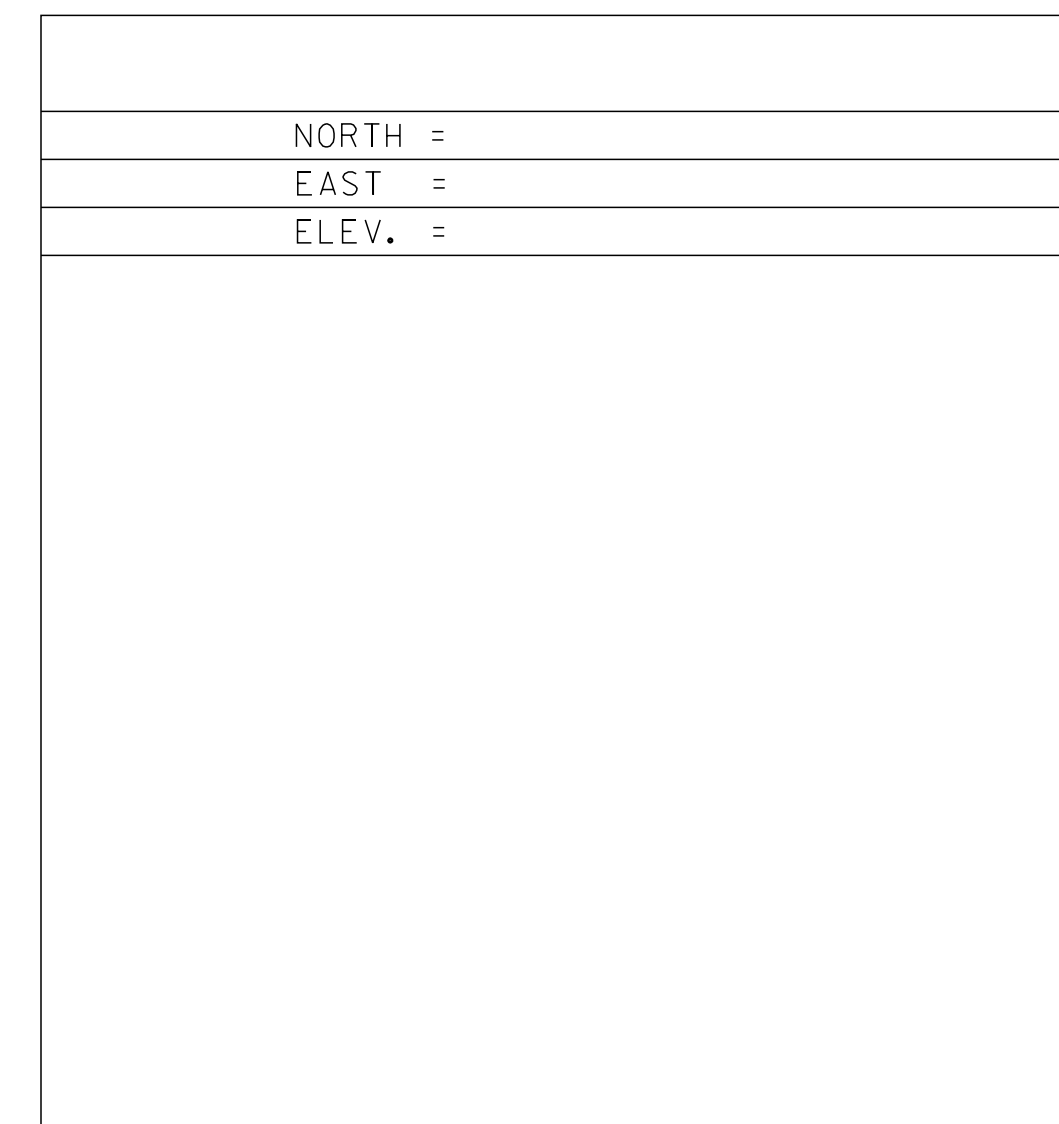
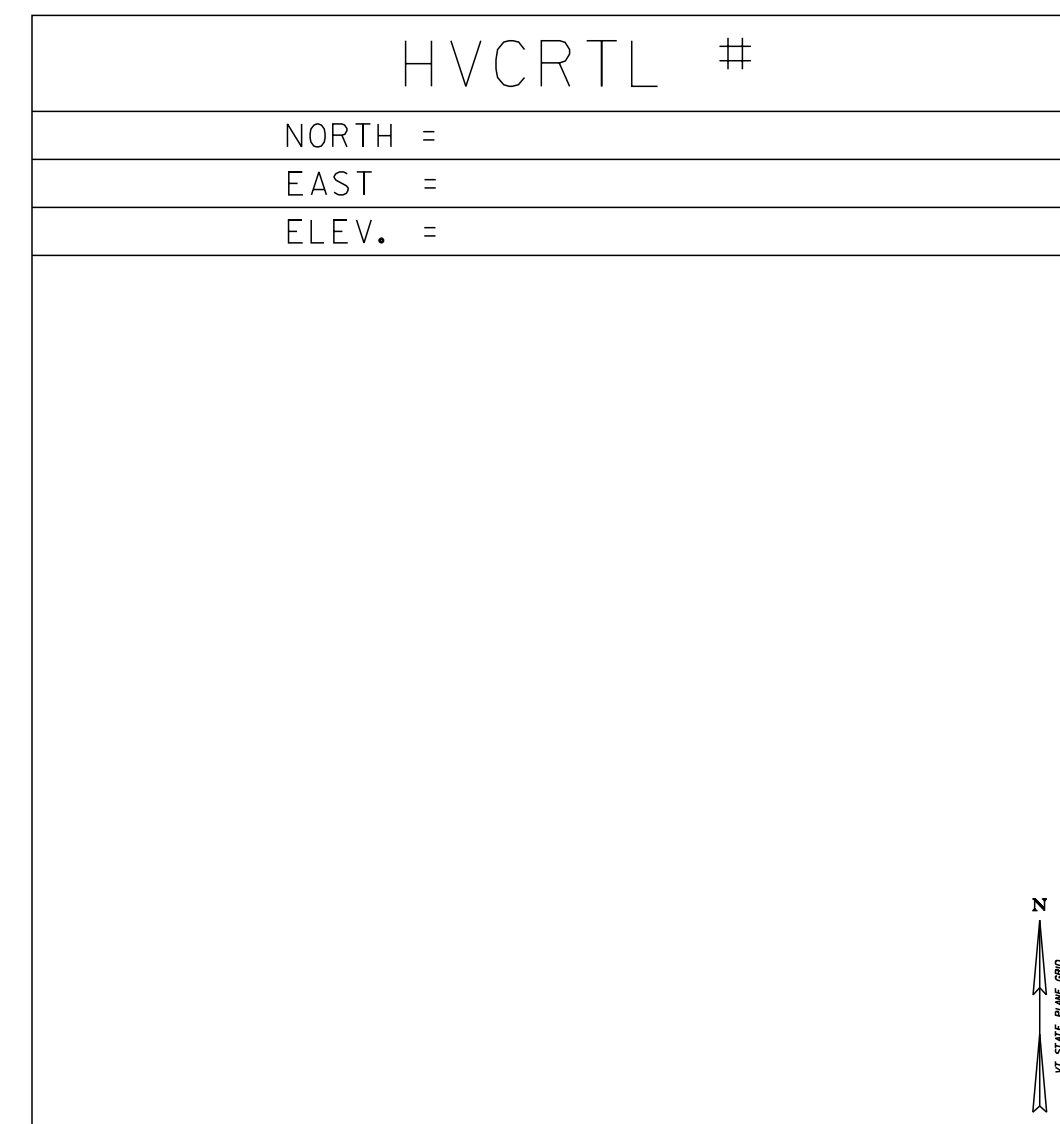
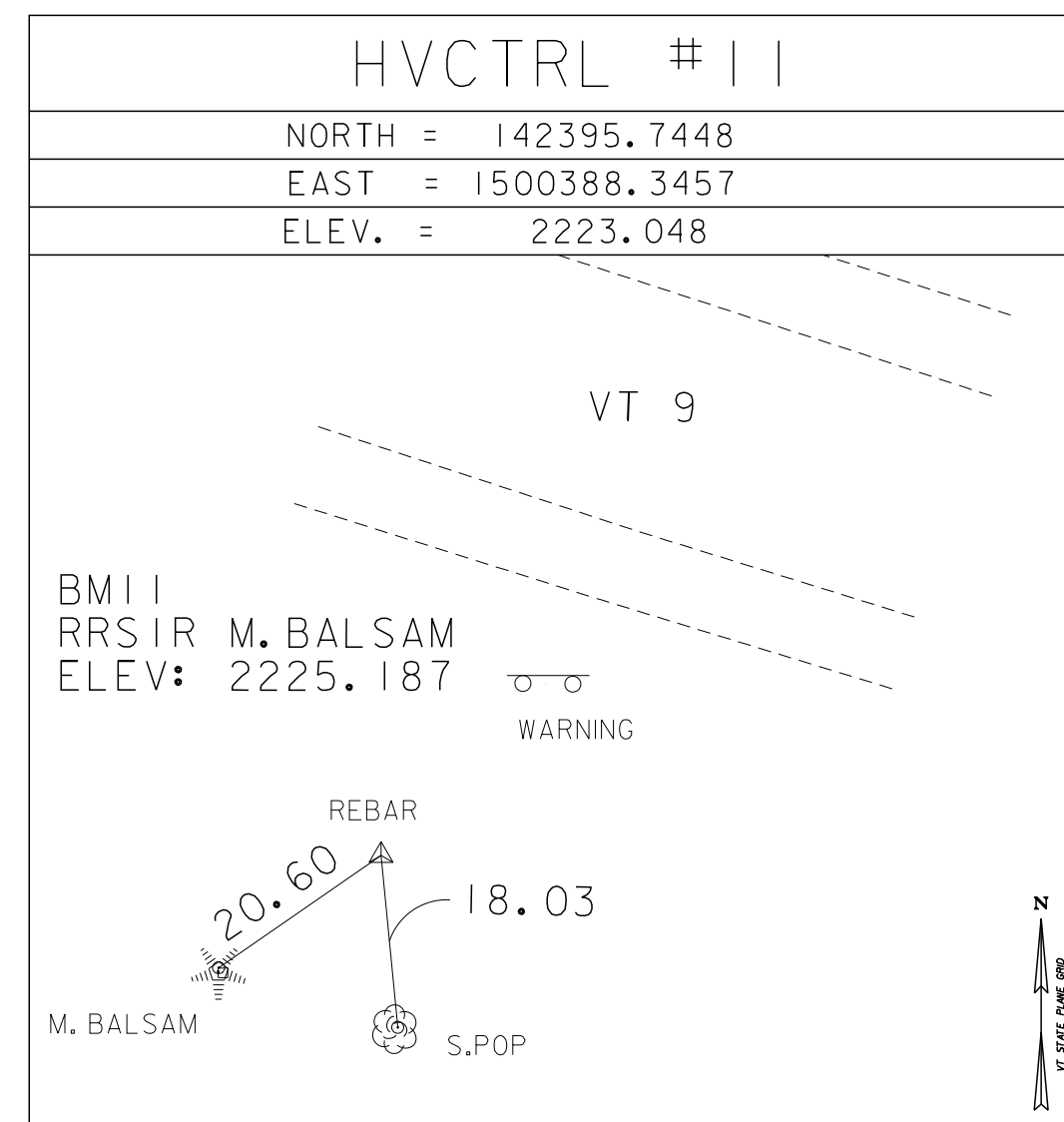
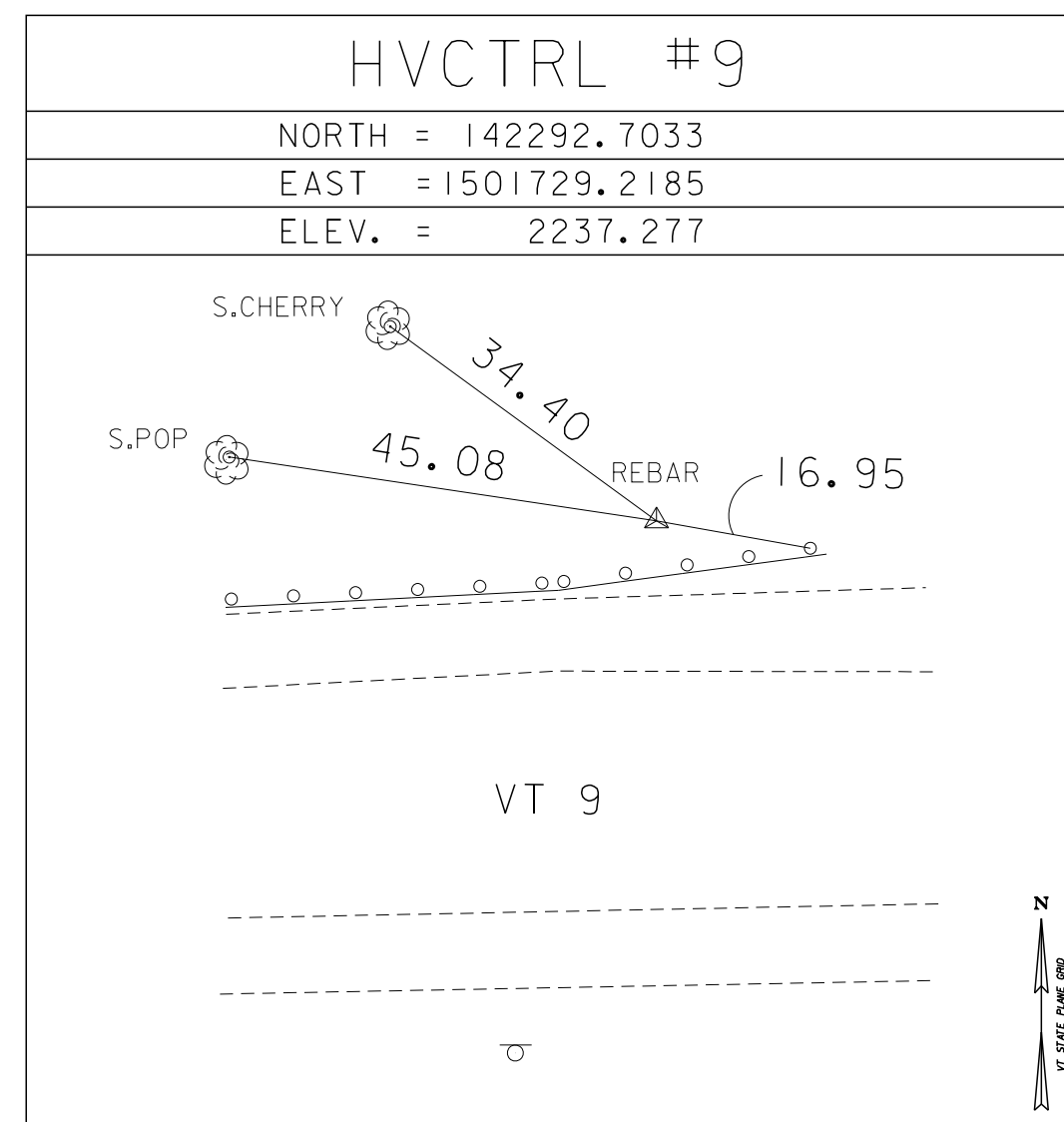
WOODFORD, VT., ABOUT 9.5 MI (15.3 KM) EAST OF BENNINGTON, VT., ABOUT 7.5 MI (12.1 KM) WEST OF WILMINGTON, AND ABOUT 10.5 MI (16.9 KM) NORTH OF THE MASSACHUSETTS/VERMONT STATE LINE. TO REACH FROM THE INTERSECTION OF VT ROUTE 9 AND VT ROUTE 8 IN SEARSBURG GO 1.9 MI (3.1 KM) TO THE SITE OF THE MARK ON THE RIGHT. THE MARK IS SET 4 CM (2 INCHES) BELOW GROUND SURFACE IN THE TOP OF A 30 CM (12 INCH) DIAMETER CONCRETE MONUMENT. IT IS 10.7 M (35.1 FT) NORTH OF AND ABOUT 0.5 M (1.6 FT) LOWER THAN THE CENTERLINE OF VT ROUTE 9, 24.7 M (81.0 FT) SOUTHEAST OF POLE NO 354/664, 36.1 M (118.4 FT) WEST OF POLE NO 242/663, 30.9 M (101.4 FT) SOUTH OF THE SOUTHEAST CORNER OF HOUSE NO 9271 AND 7.2 M (23.6 FT) WEST OF THE CENTERLINE OF THE MOST EASTERLY ENTRANCE TO A CIRCULAR GRAVEL DRIVE.

HVCTRL #10  
 B95031  
 NORTH = 142236.8370  
 EAST = 1501259.7180  
 ELEV. = 2225.880

WOODFORD, VT., ABOUT 9.5 MI (15.3 KM) EAST OF BENNINGTON, VT., ABOUT 7.5 MI (12.1 KM) WEST OF WILMINGTON, AND ABOUT 10.5 MI (16.9 KM) NORTH OF THE MASSACHUSETTS/VERMONT STATE LINE. TO REACH FROM THE INTERSECTION OF VT ROUTES 9 AND 8 IN SEARSBURG GO WEST ALONG VT ROUTE 9 FOR 2.3 MI (3.7 KM) TO THE INTERSECTION OF A GRAVEL ROAD LEFT TO THE GEORGE D. AIKEN WILDERNESS AREA AND THE MARK ON THE LEFT IN THE SOUTHEAST QUADRANT OF THE INTERSECTION. THE MARK IS SET 5 CM BELOW GROUND SURFACE IN THE TOP OF A 30 CM DIAMETER CONCRETE MONUMENT POURED 1.5 M (4.9 FT) DEEP. IT IS 11.8 M (38.7 FT) SOUTH OF AND ABOUT 0.7 M (2.3 FT) LOWER THAN THE CENTERLINE OF VT ROUTE 9, 11.6 M (38.1 FT) EAST OF THE CENTERLINE OF THE GRAVEL ROAD, 5.5 M (18.0 FT) NORTHEAST OF THE GEORGE D. AIKEN WILDERNESS SIGN, 12.4 M (40.7 FT) NORTH OF POLE NO. 238/667, AND 0.6 M (2.0 FT) NORTH OF A FIBERGLASS WITNESS POST. THIS MARK IS INTERVISIBLE WITH MARK B95032.

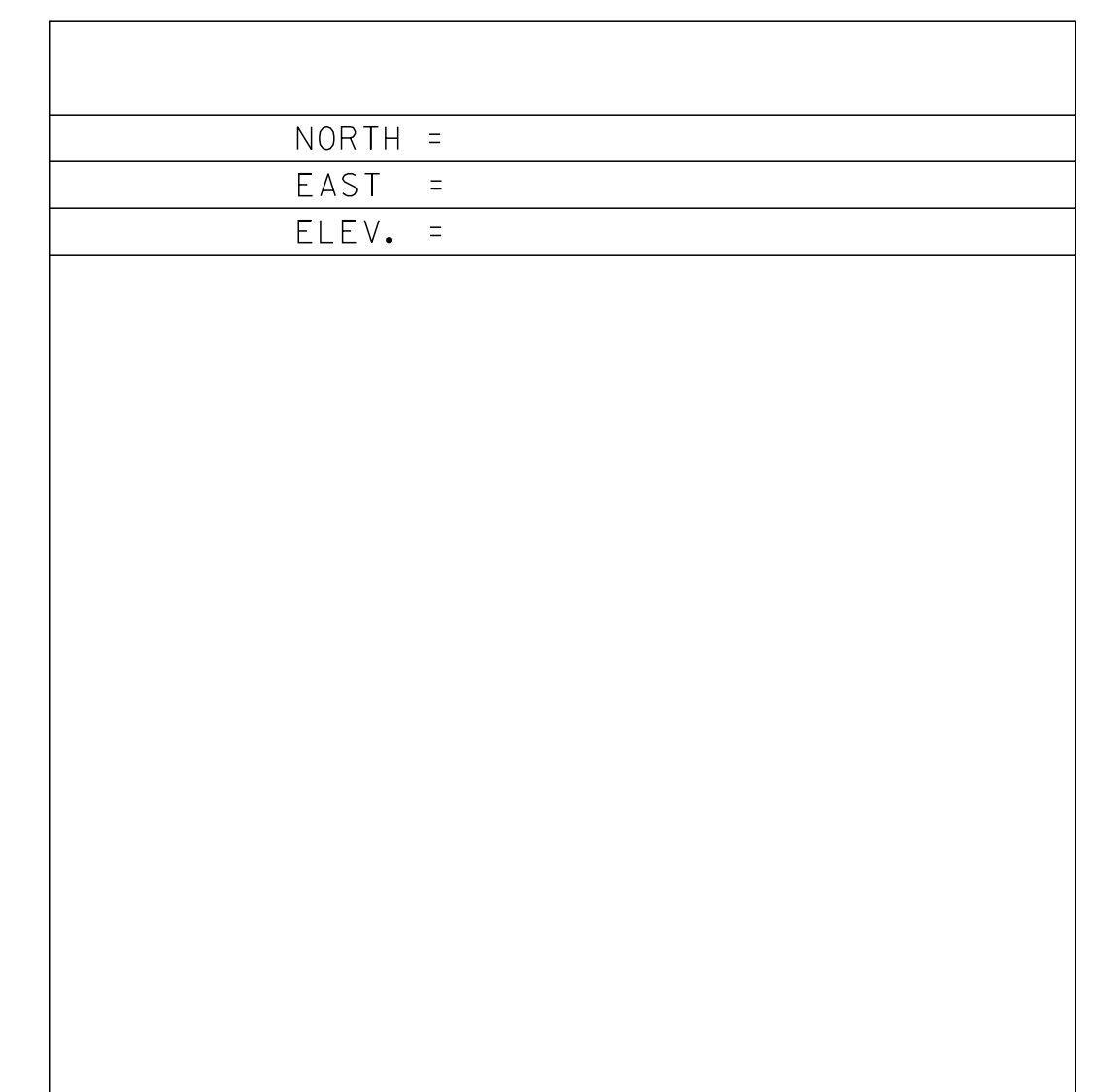
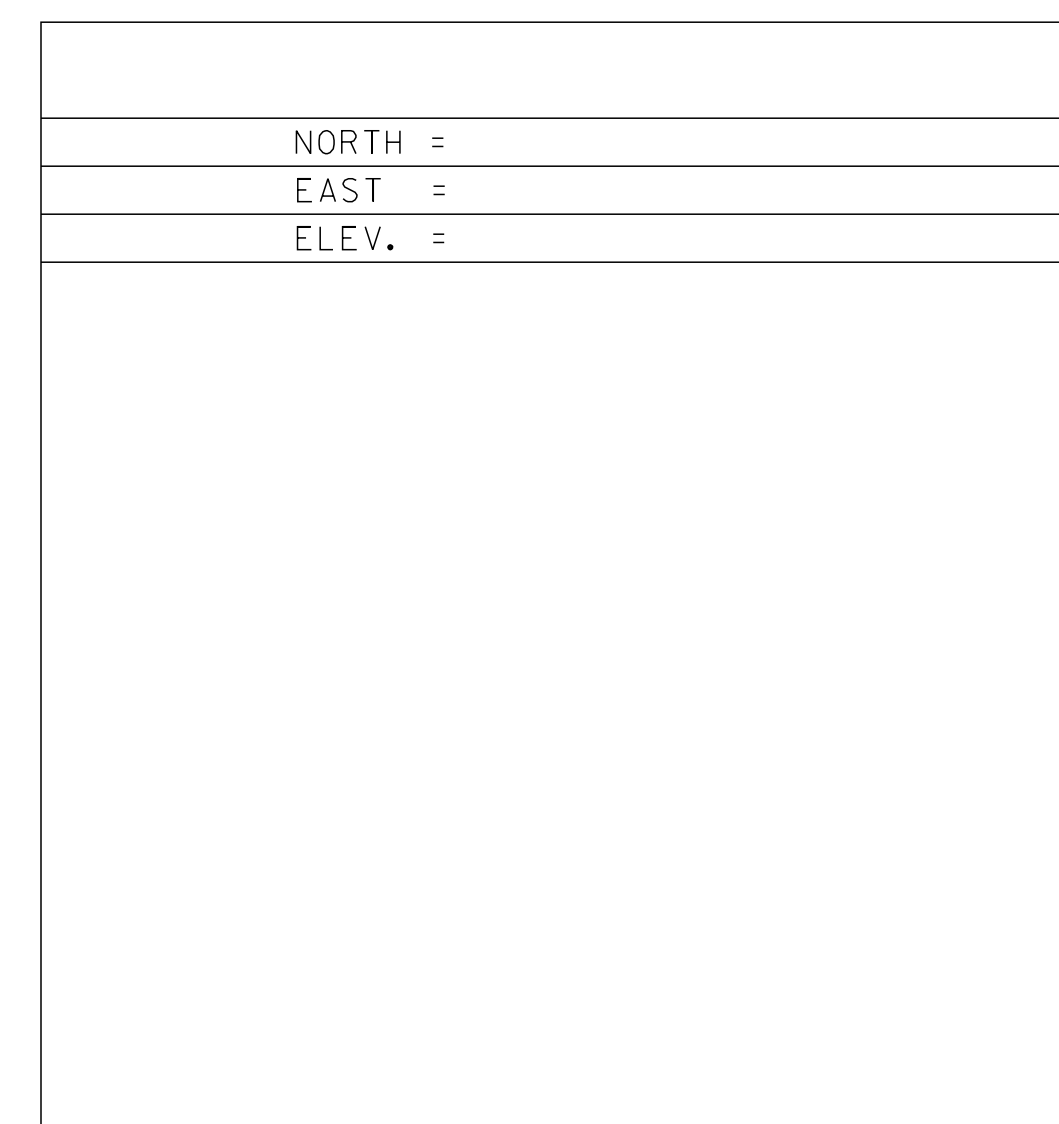
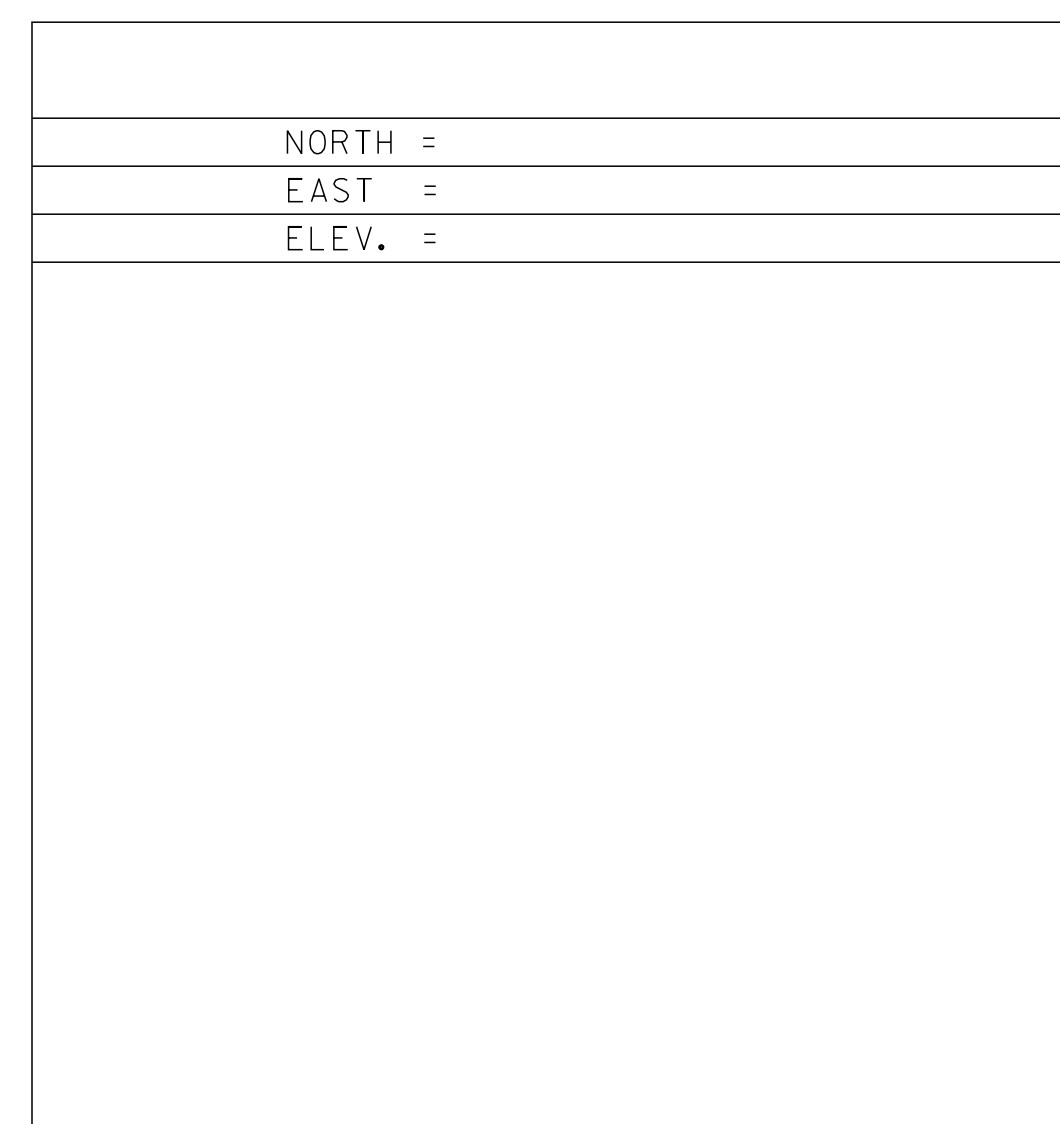
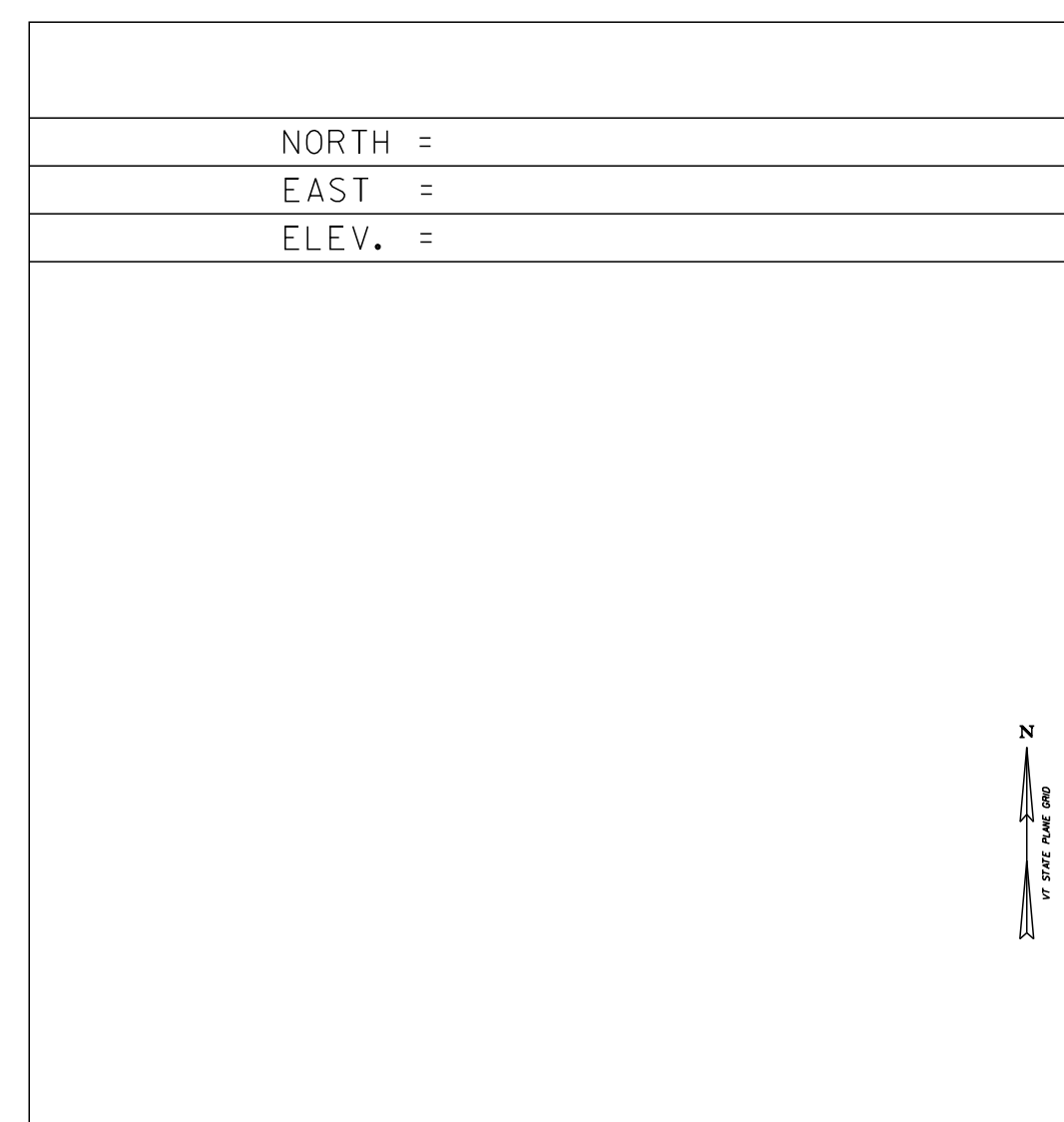
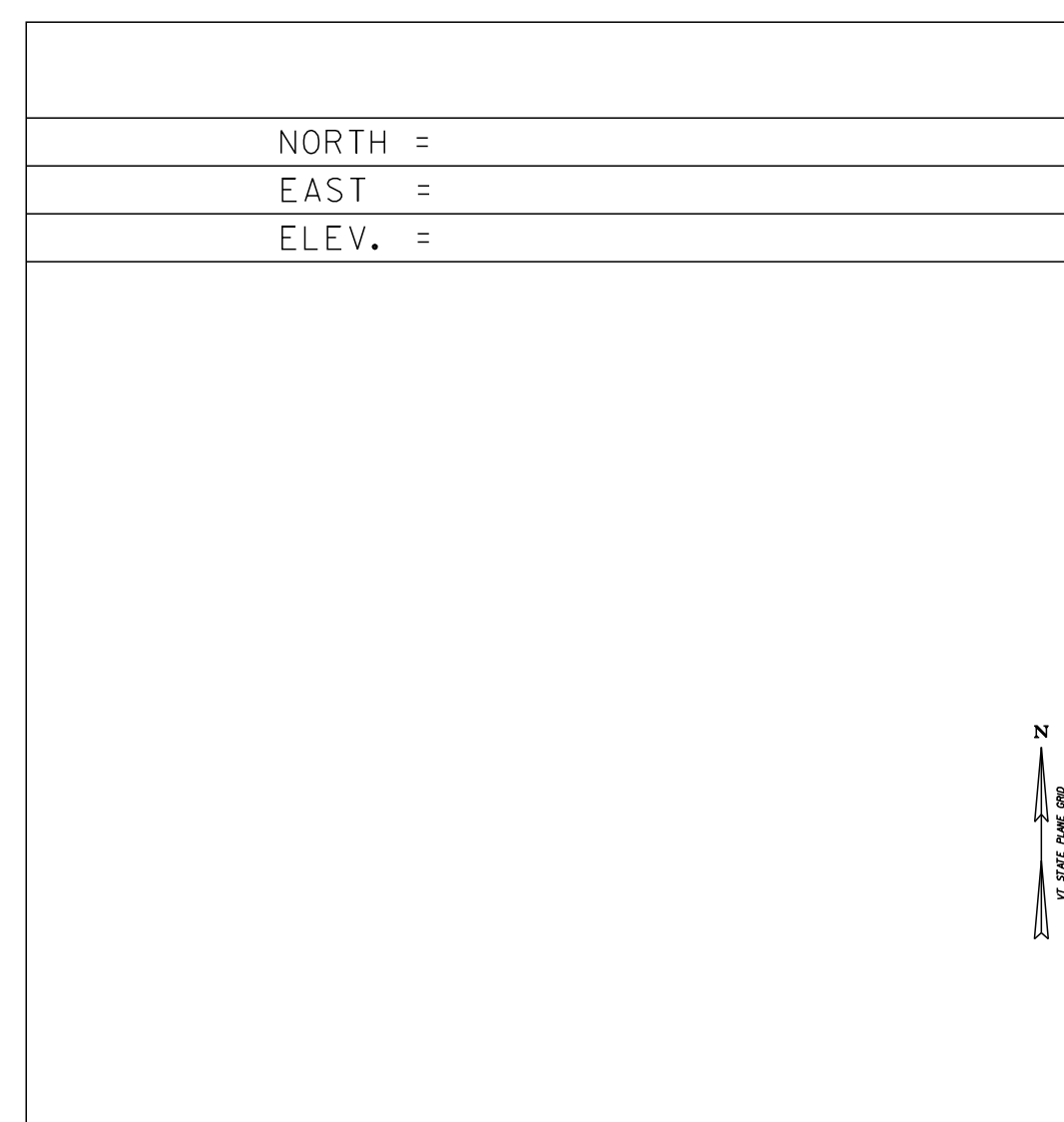
*GPS CONTROL PROVIDED BY VT GSU

TRAVERSE TIES



*TRAVERSE COMPLETED 06/09/2014 BY L. ORVIS P.C. & H. MCGOWAN

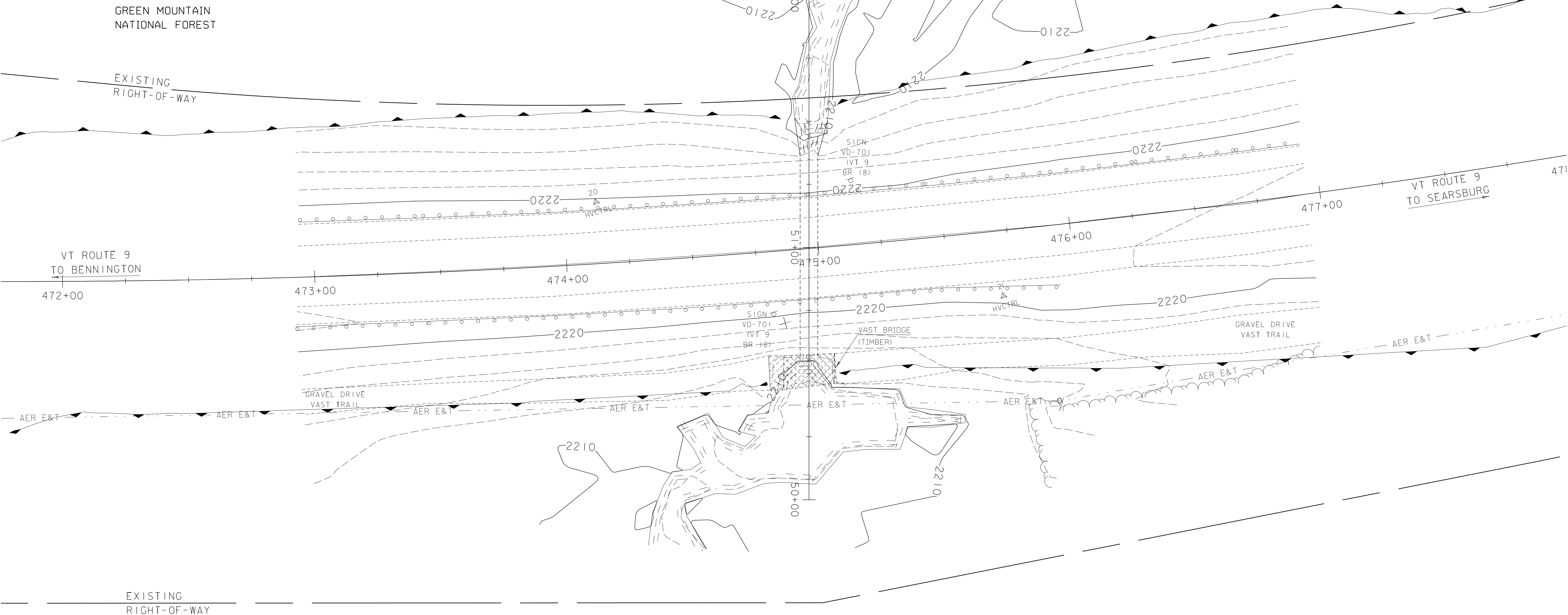
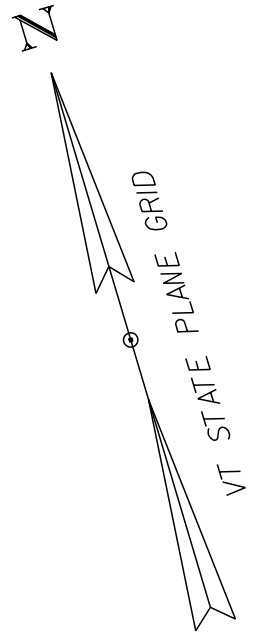
ALIGNMENT TIES



DATUM  
 VERTICAL NAVD 88  
 HORIZONTAL NAD 83 (2011)  
 ADJUSTMENT COMPASS

PROJECT NAME: WOODFORD  
 PROJECT NUMBER: BF 010-1(52)  
 FILE NAME: x13b270t1.dgn  
 PROJECT LEADER: N. WARK  
 DESIGNED BY: VTRANS  
 TIE SHEET  
 PLOT DATE: 11/14/2018  
 DRAWN BY: G. HITCHCOCK  
 CHECKED BY: P. BEYOR  
 SHEET 8 OF 41

WILMINGTON-MUNDAL ASSOCIATION  
 UNDULATING, VERY STONY SOIL  
 0% - 3% SLOPES  
 NO "K" VALUE REPORTED



GREEN MOUNTAIN NATIONAL FOREST

EXISTING RIGHT-OF-WAY

VT ROUTE 9 TO BENNINGTON

VT ROUTE 9 TO SEARSBURG

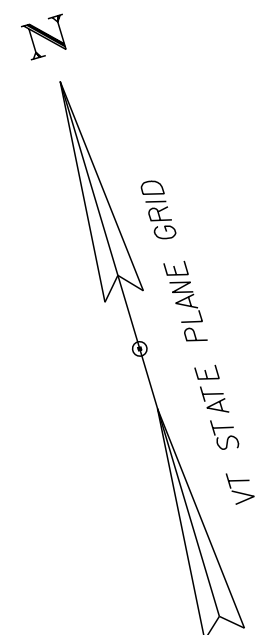
EXISTING RIGHT-OF-WAY

GREEN MOUNTAIN NATIONAL FOREST

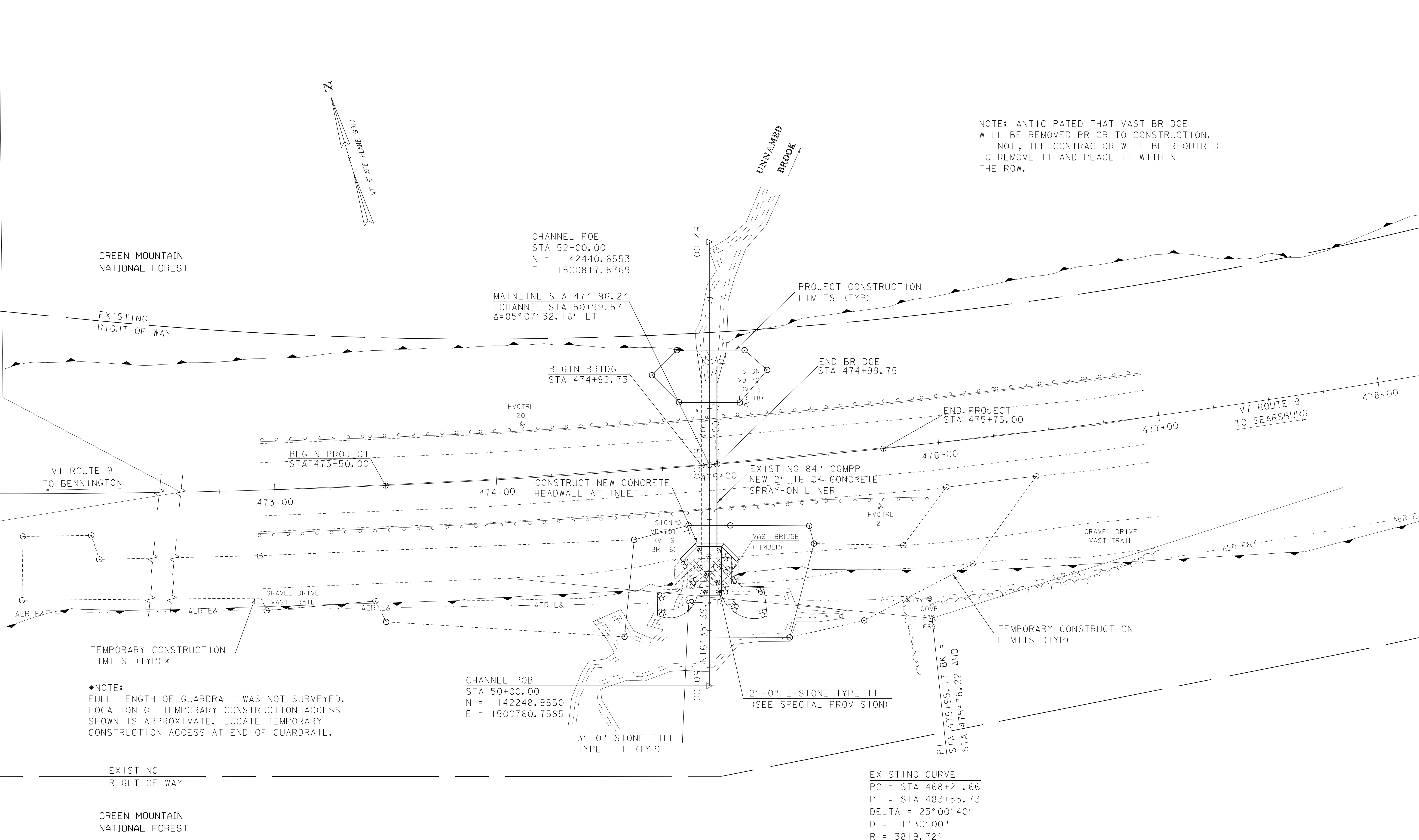
EXISTING CULVERT DATA  
 EXISTING 7' CGMPP  
 92' LONG, BUILT 1919  
 RECONSTRUCTED 1965  
 6' AVERAGE COVER  
 38 SQFT WATERWAY AREA

PROJECT NAME: WOODFORD	PLOT DATE: 11/14/2018
PROJECT NUMBER: BF 010-1(52)	DRAWN BY: B. WILLIAMS
FILE NAME: z13B270bdr_ero.dgn	CHECKED BY: T. LEVINS
PROJECT LEADER: T. LEVINS	EXISTING CONDITIONS
DESIGNED BY: B. WILLIAMS	SHEET 9 OF 41





NOTE: ANTICIPATED THAT VAST BRIDGE WILL BE REMOVED PRIOR TO CONSTRUCTION. IF NOT, THE CONTRACTOR WILL BE REQUIRED TO REMOVE IT AND PLACE IT WITHIN THE ROW.



GREEN MOUNTAIN NATIONAL FOREST

EXISTING RIGHT-OF-WAY

CHANNEL POE  
STA 52+00.00  
N = 142440.6553  
E = 1500817.8769

MAINLINE STA 474+96.24  
= CHANNEL STA 50+99.57  
 $\Delta = 85^\circ 07' 32.16''$  LT

PROJECT CONSTRUCTION LIMITS (TYP)

BEGIN BRIDGE  
STA 474+92.73

END BRIDGE  
STA 474+99.75

BEGIN PROJECT  
STA 473+50.00

END PROJECT  
STA 475+75.00

VT ROUTE 9 TO BENNINGTON

VT ROUTE 9 TO SEARSBURG

CONSTRUCT NEW CONCRETE HEADWALL AT INLET

EXISTING 84" CGMPP  
NEW 2" THICK CONCRETE SPRAY-ON LINER

473+00

474+00

476+00

477+00

478+00

AER E&T

AER E&T

AER E&T

AER E&T

AER E&T

AER E&T

AER E&T

AER E&T

AER E&T

TEMPORARY CONSTRUCTION LIMITS (TYP) *

TEMPORARY CONSTRUCTION LIMITS (TYP)

*NOTE:  
FULL LENGTH OF GUARDRAIL WAS NOT SURVEYED. LOCATION OF TEMPORARY CONSTRUCTION ACCESS SHOWN IS APPROXIMATE. LOCATE TEMPORARY CONSTRUCTION ACCESS AT END OF GUARDRAIL.

CHANNEL POB  
STA 50+00.00  
N = 142248.9850  
E = 1500760.7585

2'-0" E-STONE TYPE II (SEE SPECIAL PROVISION)

3'-0" STONE FILL TYPE III (TYP)

PI  
STA 475+99.17 BK =  
STA 475+78.22 AHD

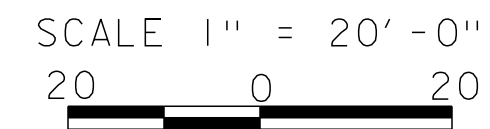
EXISTING RIGHT-OF-WAY

GREEN MOUNTAIN NATIONAL FOREST

EXISTING CURVE  
PC = STA 468+21.66  
PT = STA 483+55.73  
DELTA = 23° 00' 40"  
D = 1° 30' 00"  
R = 3819.72'  
T = 777.51'  
L = 1534.07'  
E = 78.33'

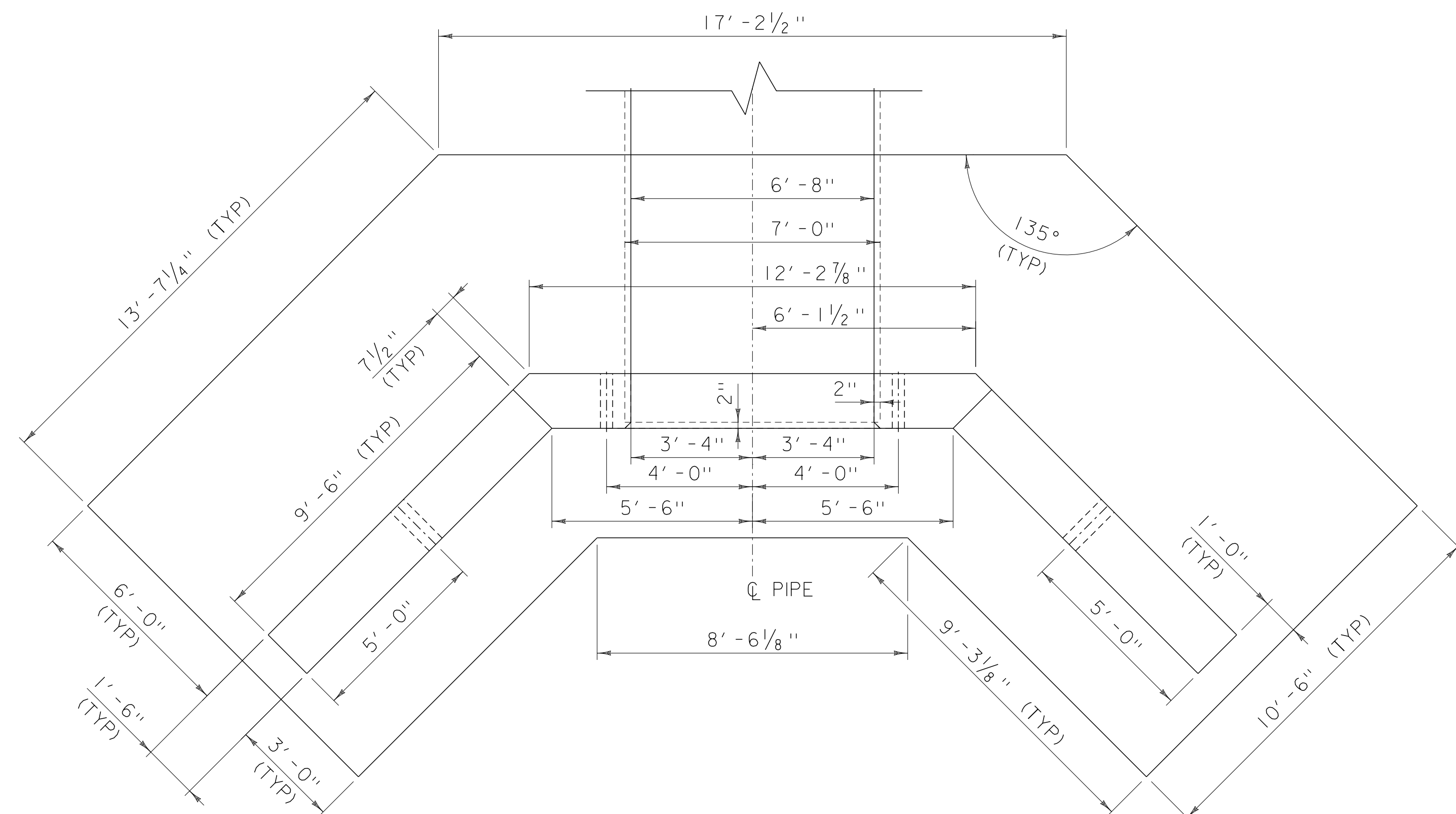
EXISTING CULVERT DATA  
EXISTING 7' CGMPP  
92' LONG, BUILT 1919  
RECONSTRUCTED 1965  
6' AVERAGE COVER  
38 SQFT WATERWAY AREA

LAYOUT

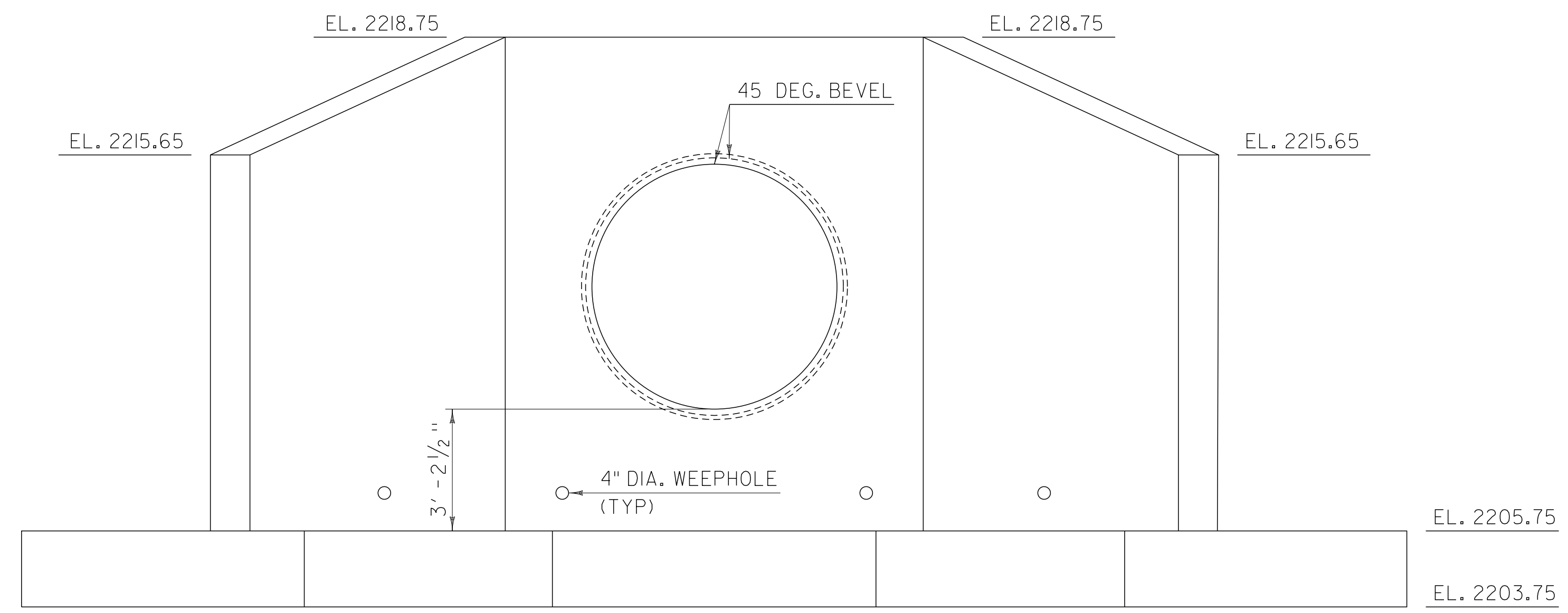


PROJECT NAME: WOODFORD	
PROJECT NUMBER: BF 010-I(52)	
FILE NAME: z13b270bdr.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
LAYOUT SHEET	SHEET 10 OF 41

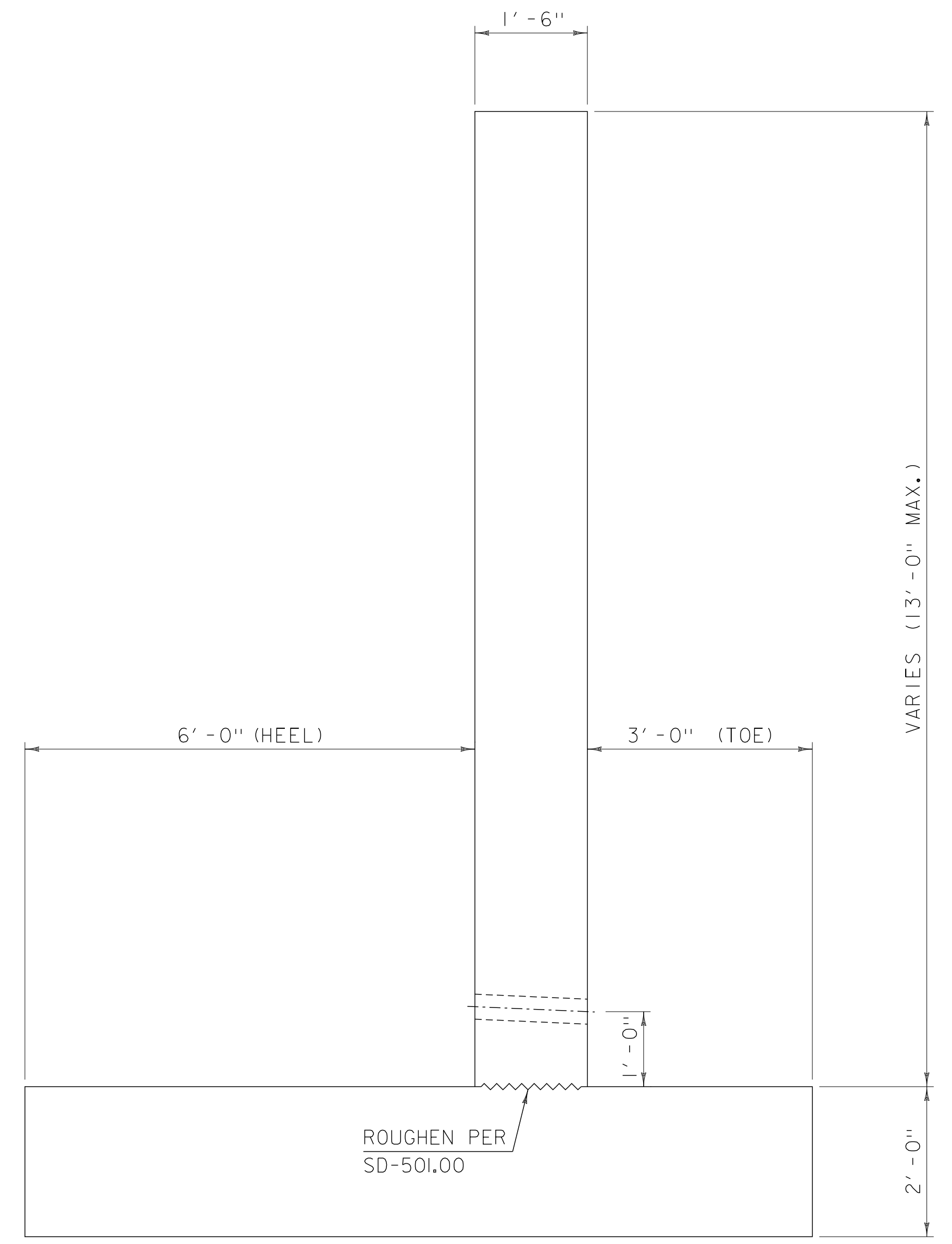




**HEADWALL PLAN**  
SCALE: 3/8" = 1'-0"



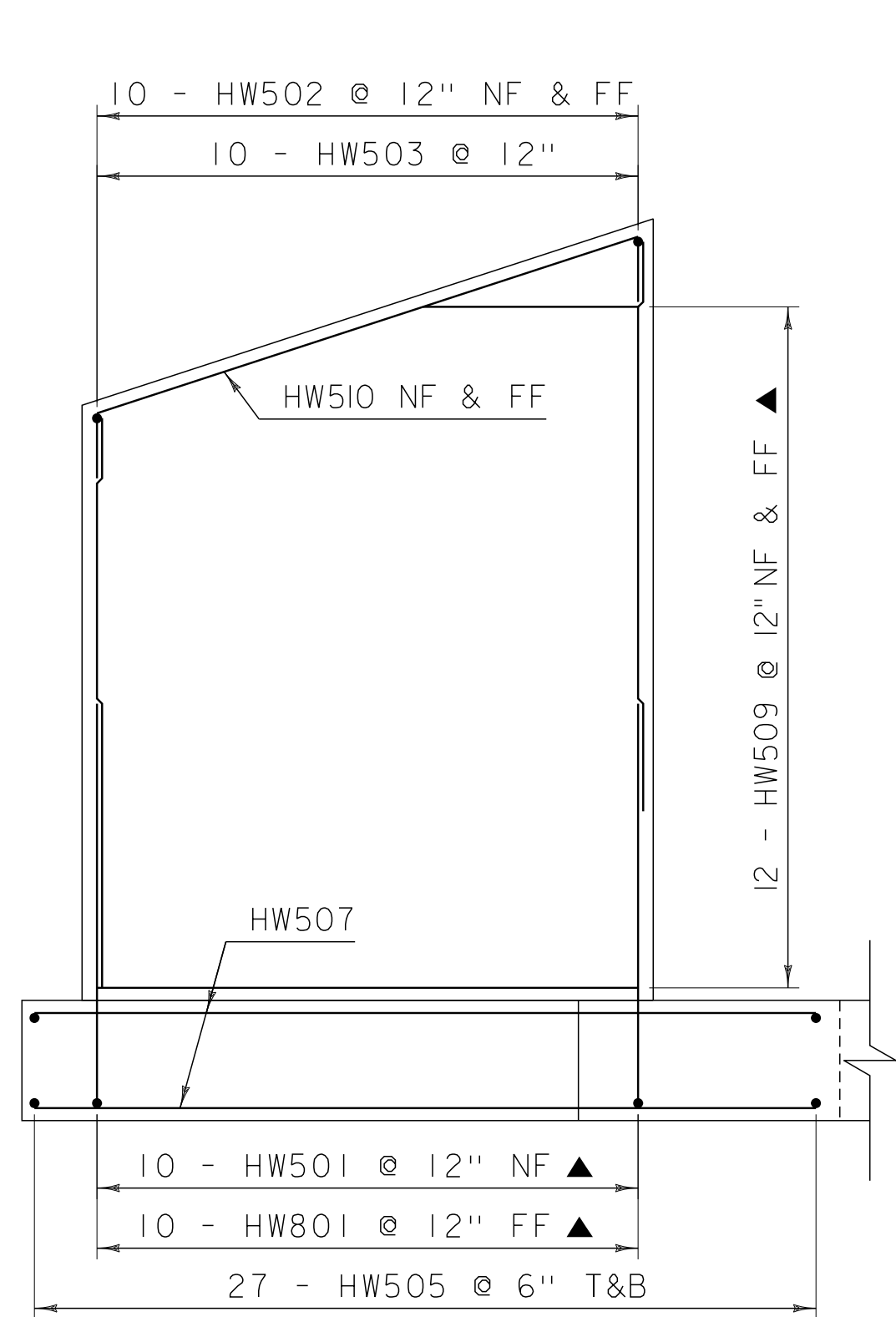
**HEADWALL ELEVATION**  
SCALE: 3/8" = 1'-0"



**HEADWALL SECTION**  
SCALE: 3/4" = 1'-0"

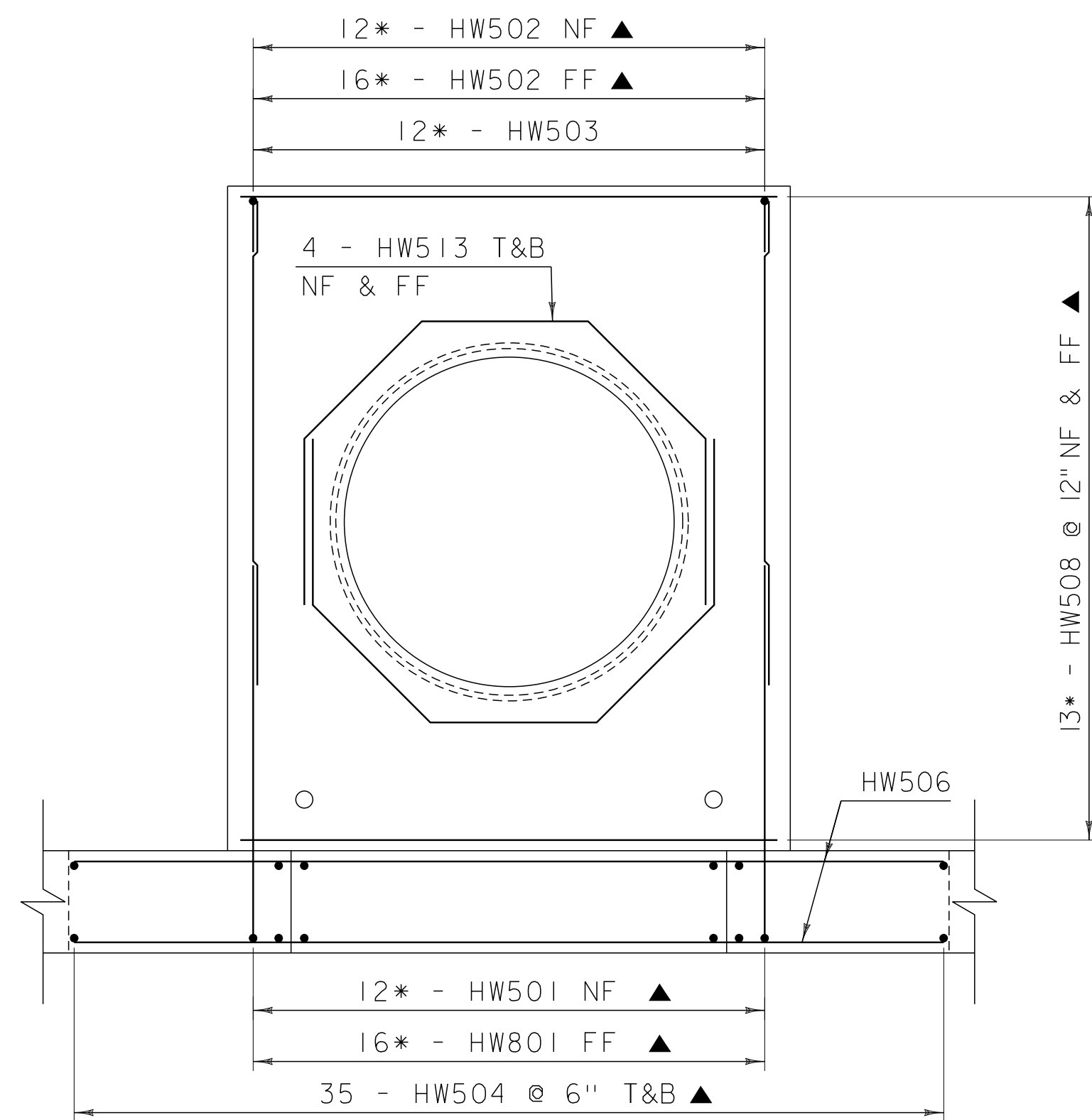
PROJECT NAME:	WOODFORD	PLOT DATE:	11/14/2018
PROJECT NUMBER:	BF 010-I(52)	DRAWN BY:	B. WILLIAMS
FILE NAME:	z13b270sub.dgn	DESIGNED BY:	B. WILLIAMS
PROJECT LEADER:	T. LEVINS	CHECKED BY:	T. LEVINS
HEADWALL DETAIL SHEET		SHEET	11 OF 41





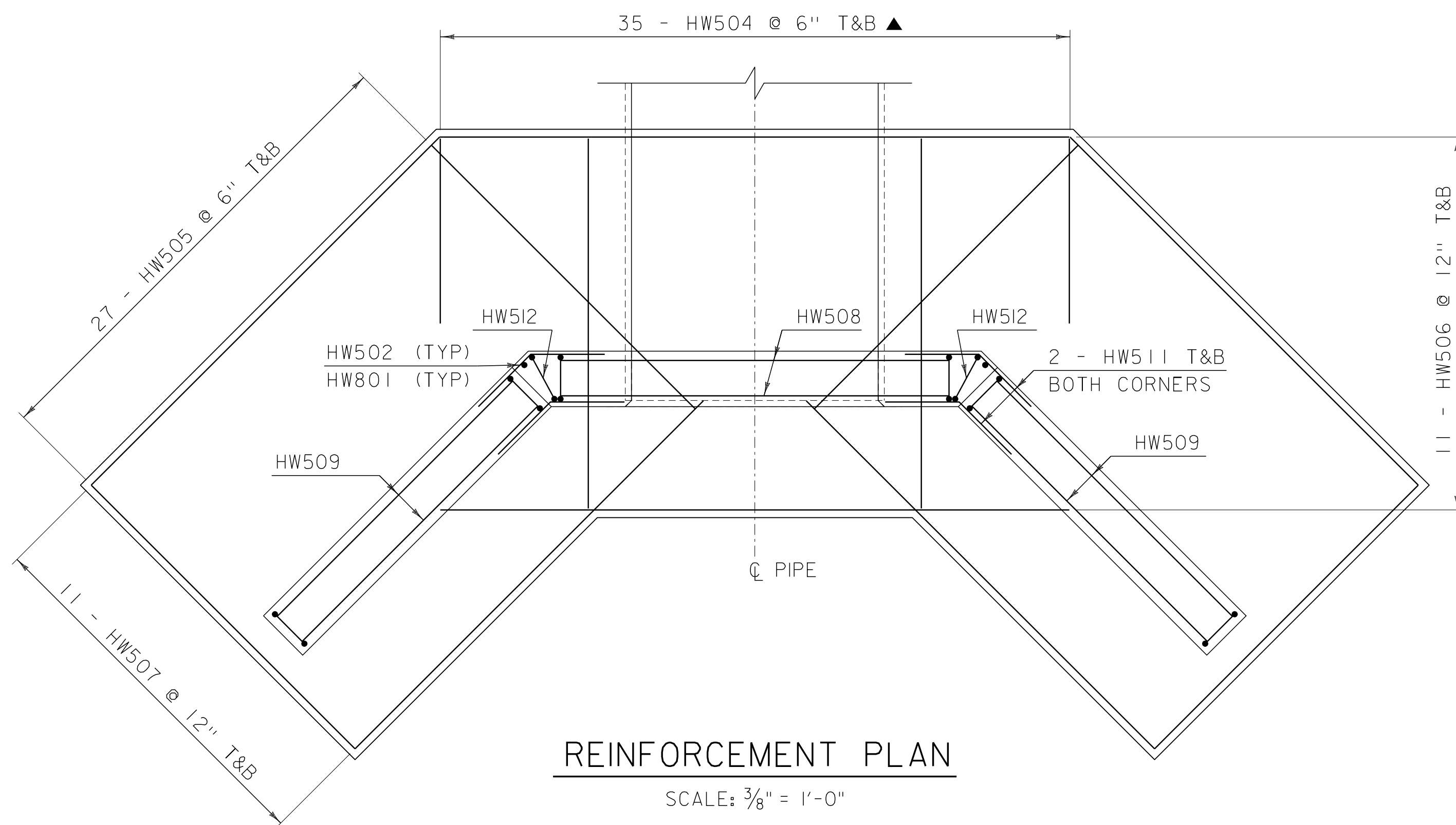
WINGWALL REINFORCEMENT ELEVATION

SCALE: 3/8" = 1'-0"



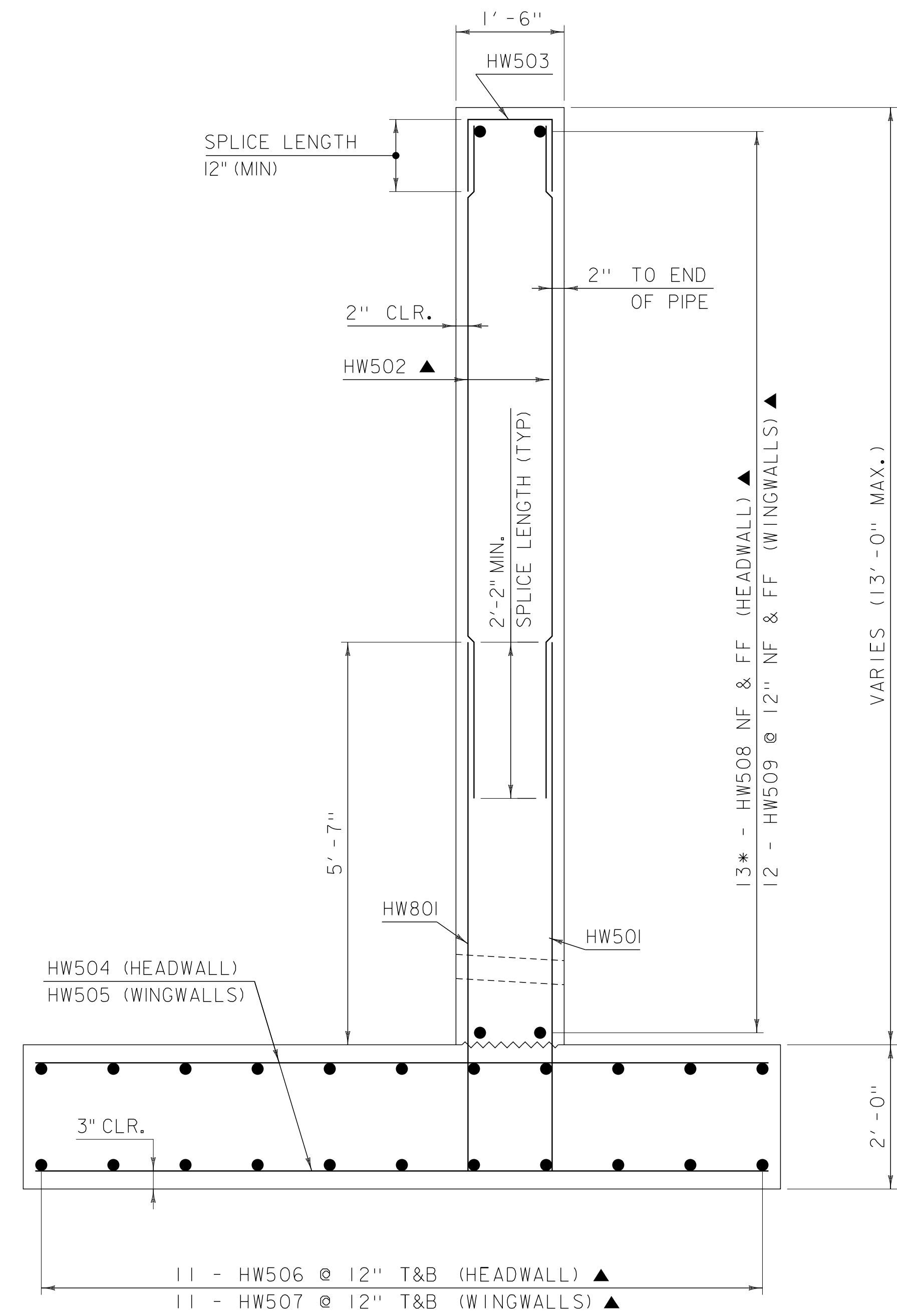
HEADWALL REINFORCEMENT ELEVATION

SCALE: 3/8" = 1'-0"



REINFORCEMENT PLAN

SCALE: 3/8" = 1'-0"



HEADWALL REINFORCEMENT SECTION

SCALE: 3/4" = 1'-0"

NOTE

- * = SPACED EVENLY
- NF = NEAR FACE
- FF = FAR FACE
- ▲ = CUT TO FIT IN FIELD
- T&B = TOP AND BOTTOM

PROJECT NAME: WOODFORD  
 PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270rebar.dgn  
 PROJECT LEADER: T. LEVINS  
 DESIGNED BY: B. WILLIAMS  
 REBAR LAYOUT SHEET

PLOT DATE: 11/14/2018  
 DRAWN BY: B. WILLIAMS  
 CHECKED BY: T. LEVINS  
 SHEET 12 OF 41

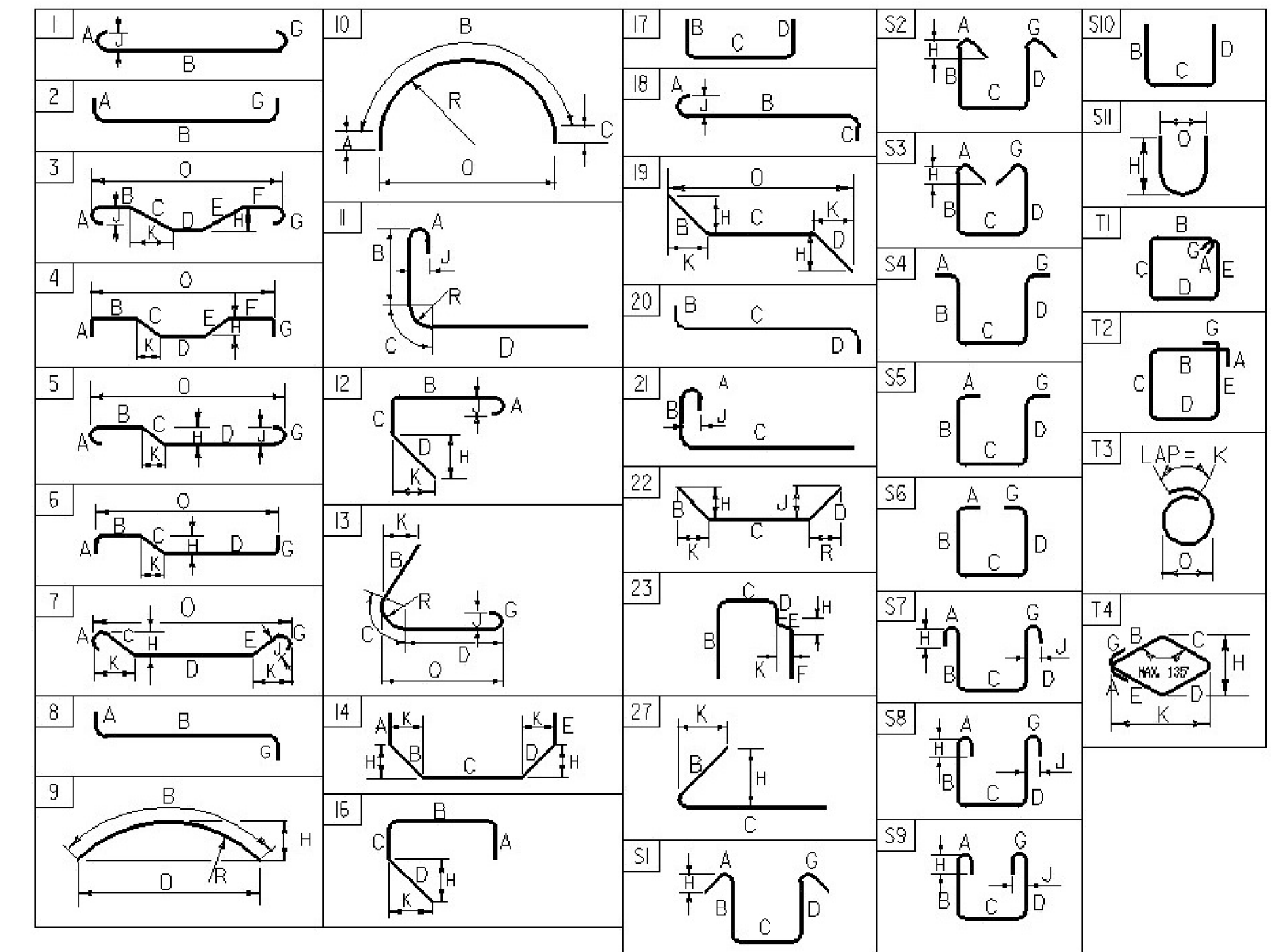


# REINFORCING STEEL SCHEDULE

ITEM	EACH	SIZE	LENGTH	MARK	TYPE	A	B	C	D	E	F	G	H	J	K	R	O	ITEM	EACH	SIZE	LENGTH	MARK	TYPE	A	B	C	D	E	F	G	H	J	K	R	O
▲ 32	5	7'- 4"	HW501	STR																															
▲ 36	5	9'- 4"	HW502	STR																															
32	5	3'- 1"	HW503	17			1'- 0"	1'- 1"	1'- 0"																										
▲ 70	5	10'- 0"	HW504	STR																															
108	5	10'- 0"	HW505	STR																															
22	5	16'- 9"	HW506	STR																															
44	5	13'- 2"	HW507	STR																															
▲ 26	5	10'- 6"	HW508	STR																															
▲ 48	5	9'- 0"	HW509	STR																															
4	5	9'- 5"	HW510	STR																															
8	5	4'- 0"	HW511	19			2'- 0"	2'- 0"	0'- 0"					1'- 5"		1'- 5"	3'- 5"																		
2	5	3'- 2"	HW512	17			1'- 0"	1'- 2"	1'- 0"																										
4	5	16'- 3"	HW513	14	3'- 3"	3'- 3"	3'- 3"	3'- 3"	3'- 3"	3'- 3"																									
▲ 36	8	7'- 4"	HW801	STR																															

~ NOTES ~

- UNLESS OTHERWISE DESIGNATED, ALL BAR REINFORCEMENT FOR CONCRETE IN SIZES UP TO AND INCLUDING NO. 18 SHALL CONFORM TO THE REQUIREMENTS OF THE "SPECIFICATIONS FOR DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT", AASHTO M 31 (ASTM A 615-SI). ALL BARS SHALL BE GRADE 60, UNLESS OTHERWISE DESIGNATED.
- FOR TYPICAL BENDING DETAILS, RECOMMENDED PIN DIAMETER "D" OF BENDS AND HOOKS, AND OTHER STANDARD PRACTICE, SEE CURRENT CONCRETE REINFORCING STEEL INSTITUTE "MANUAL OF STANDARD PRACTICE".
- BARS WHICH REQUIRE MORE ACCURATE BENDING THAN STANDARD PRACTICES SHOULD HAVE LIMITS INDICATED.
- ALL DIMENSIONS ARE OUT TO OUT OF BAR EXCEPT "A" AND "G" ON STANDARD 180 DEGREE AND 135 DEGREE HOOKS.
- "J" DIMENSION ON 180 DEGREE HOOKS TO BE SHOWN ONLY WHERE NECESSARY TO RESTRICT HOOK SIZE. OTHERWISE, STANDARD HOOKS ARE TO BE USED.
- "H" DIMENSION ON STIRRUPS TO BE SHOWN ONLY WHEN NECESSARY TO MAINTAIN CLEARANCES.
- WHERE SLOPE DIFFERS FROM 45 DEGREES, DIMENSIONS "H" AND "K" MUST BE SHOWN.
- ▲ DENOTES BARS TO BE CUT IN FIELD.
- * DENOTES ONE EXTRA BAR ADDED FOR TESTING PURPOSES.
- △ DENOTES TWO EXTRA BARS ADDED FOR TESTING PURPOSES.
- E IN BAR MARK PREFIX DENOTES EPOXY COATED REINFORCING STEEL.



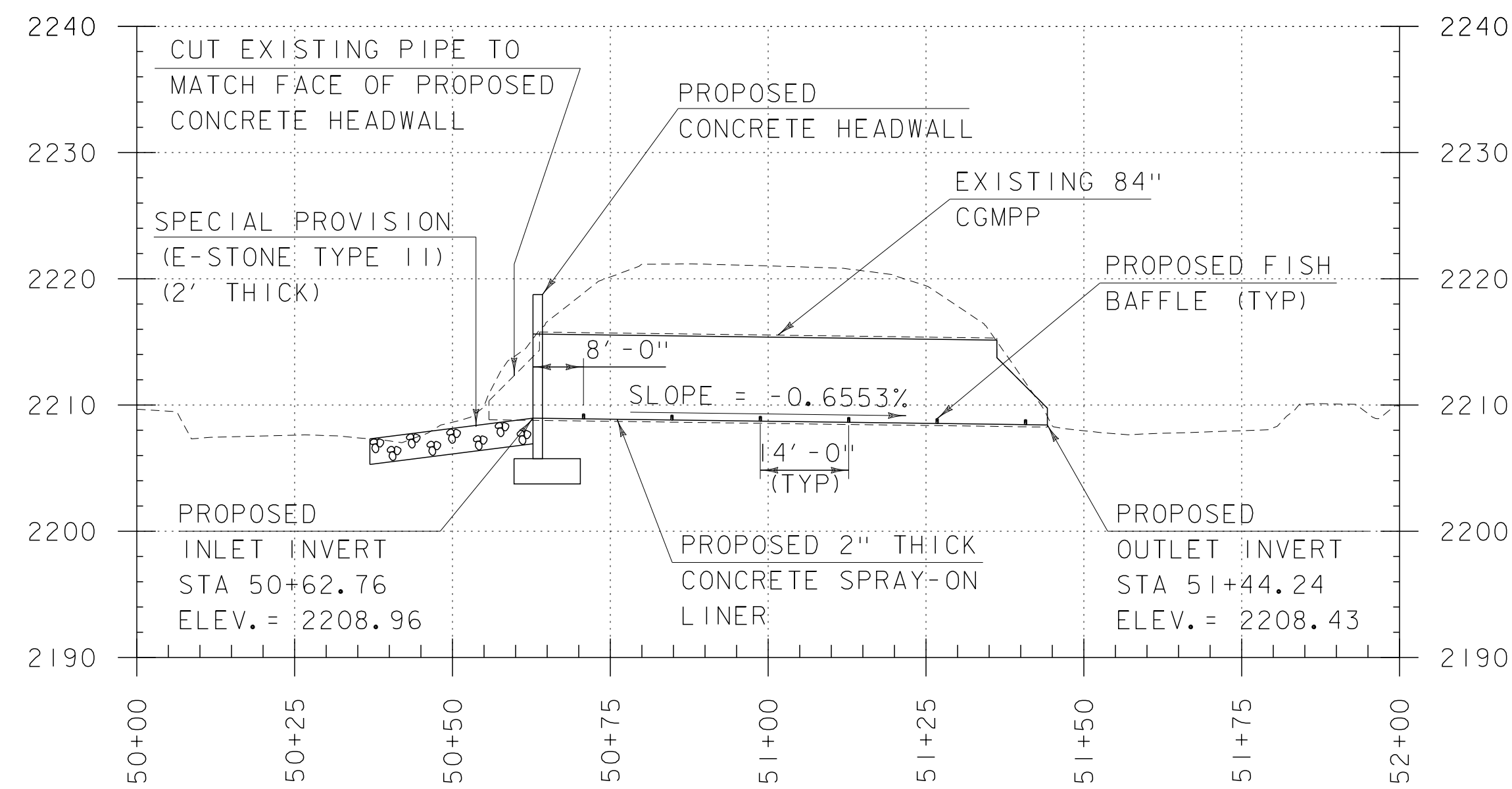
**ASTM STANDARD REINFORCING BARS**

BAR SIZE	WEIGHT PER FOOT	DIMENSION (INCHES)	YIELD STRENGTH (KSI)	TENSILE STRENGTH (KSI)
#3	0.376	0.375	0.11	1.178
#4	0.668	0.500	0.20	1.571
#5	1.043	0.625	0.31	1.963
#6	1.502	0.750	0.44	2.356
#7	2.04	0.875	0.60	2.749
#8	2.670	1.000	0.79	3.14
#9	3.400	1.13	1.00	3.54
#10	4.3	1.270	1.27	3.990
#11	5.31	1.410	1.56	4.430
#14	7.65	1.69	2.25	5.32
#18	13.60	2.26	4.00	7.09

~ REINFORCING STEEL CORROSION RESISTANCE LEVEL ~

THE REINFORCING STEEL MARKS IN THIS SCHEDULE INDICATE THE REQUIRED BAR CORROSION RESISTANCE LEVEL. CORROSION RESISTANCE LEVEL IS DENOTED WITH A .2 FOR LEVEL TWO SUFFIX OR .3 FOR LEVEL THREE SUFFIX. .1 FOR LEVEL ONE IS TO BE OMITTED. THE BAR MATERIAL TYPE AND BAR STEEL GRADE PROVIDED FOR EACH CORROSION LEVEL WILL BE RECORDED ON THE PLAN SET PI SHEET FOR AS-BUILT RECORD PLAN ARCHIVES.

PROJECT NAME:	<b>WOODFORD</b>	PLOT DATE:	11/14/2018
PROJECT NUMBER:	<b>BF 010-1(52)</b>	DRAWN BY:	<b>B. WILLIAMS</b>
FILE NAME:	<b>z13b270sched</b>	CHECKED BY:	<b>T. LEVINS</b>
PROJECT MANAGER:	<b>T. LEVINS</b>	SHEET	13 OF 41
DESIGNED BY:	<b>B. WILLIAMS</b>	REINFORCING STEEL SCHEDULE SHEET #1	

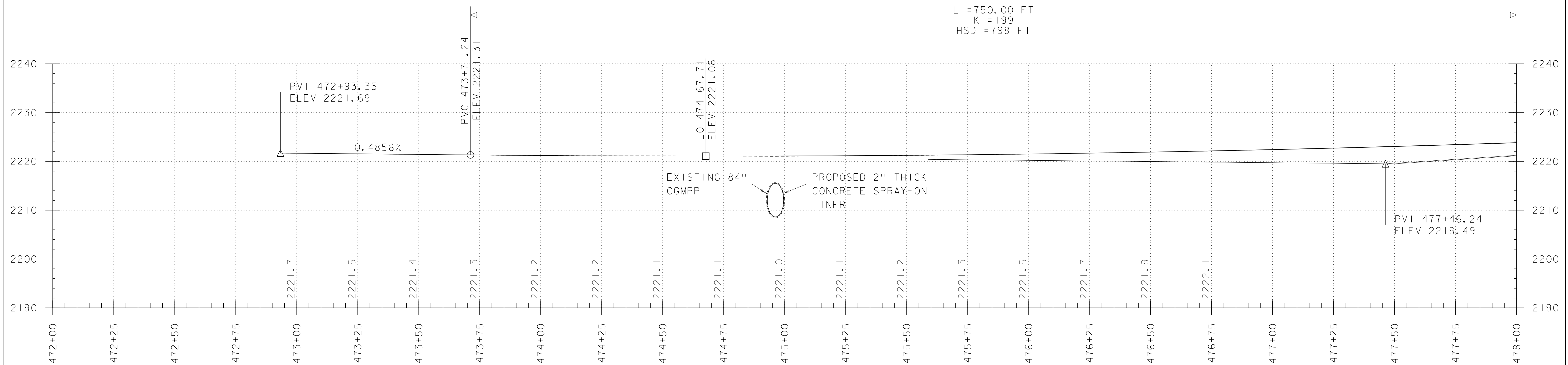


**CULVERT PROFILE**

HORIZONTAL SCALE 1" = 20' - 0"  
 VERTICAL SCALE 1" = 10' - 0"

**NOTES:**

1. ELEVATIONS SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG  $\mathcal{C}$
2. ELEVATIONS SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG  $\mathcal{C}$



**VT ROUTE 9 PROFILE**

HORIZONTAL SCALE 1" = 20' - 0"  
 VERTICAL SCALE 1" = 10' - 0"

PROJECT NAME:	WOODFORD
PROJECT NUMBER:	BF 010-I(52)
FILE NAME:	z13b270profile.dgn
PROJECT LEADER:	T. LEVINS
DESIGNED BY:	B. WILLIAMS
PROFILE	
PLOT DATE:	11/14/2018
DRAWN BY:	B. WILLIAMS
CHECKED BY:	T. LEVINS
SHEET	14 OF 41



**SOIL CLASSIFICATION**

**AASHTO**

A1	Gravel and Sand
A3	Fine Sand
A2	Silty or Clayey Gravel and Sand
A4	Silty Soil - Low Compressibility
A5	Silty Soil - Highly Compressible
A6	Clayey Soil - Low Compressibility
A7	Clayey Soil - Highly Compressible

**ROCK QUALITY DESIGNATION**

R.Q.D. (%)	ROCK DESCRIPTION
<25	Very Poor
25 to 50	Poor
51 to 75	Fair
76 to 90	Good
>90	Excellent

**SHEAR STRENGTH**

UNDRAINED SHEAR STRENGTH IN P.S.F.	CONSISTENCY
<250	Very Soft
250-500	Soft
500-1000	Med. Stiff
1000-2000	Stiff
2000-4000	Very Stiff
>4000	Hard

**CORRELATION GUIDE OF "N" TO DENSITY/CONSISTENCY**

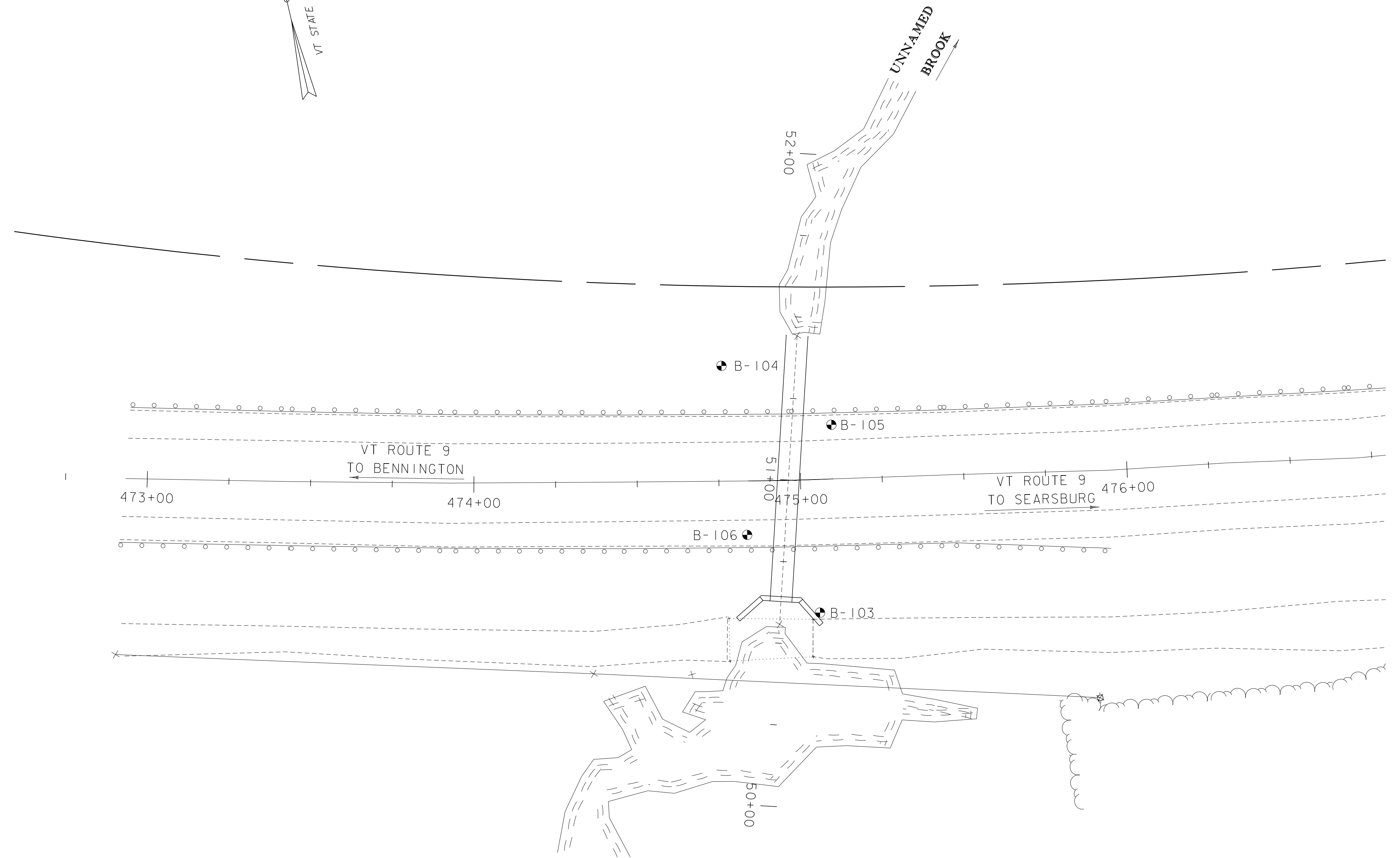
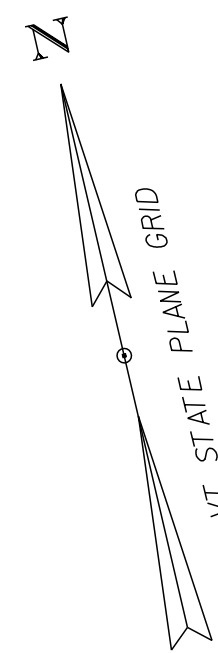
DENSITY (GRANULAR SOILS)		CONSISTENCY (COHESIVE SOILS)	
N	DESCRIPTIVE TERM	N	DESCRIPTIVE TERM
<5	Very Loose	<2	Very Soft
5-10	Loose	2-4	Soft
11-24	Med. Dense	5-8	Med. Stiff
25-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard

**COMMONLY USED SYMBOLS**

▼	Water Elevation
⊕	Standard Penetration Boring
⊗	Auger Boring
⊙	Rod Sounding
S	Sample
N	Standard Penetration Test Blow Count Per Foot For: 2" O.D. Sampler 1 3/8" I.D. Sampler Hammer Weight Of 140 Lbs. Hammer Fall Of 30"
VS	Field Vane Shear Test
US	Undisturbed Soil Sample
B	Blast
DC	Diamond Core
MD	Mud Drill
WA	Wash Ahead
HSA	Hollow Stem Auger
AX	Core Size 1 1/8"
BX	Core Size 1 3/8"
NX	Core Size 2 1/8"
M	Double Tube Core Barrel Used
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
NP	Non Plastic
w	Moisture Content (Dry Wgt. Basis)
D	Dry
M	Moist
MTW	Moist To Wet
W	Wet
Sat	Saturated
Bo	Boulder
Gr	Gravel
Sa	Sand
Si	Silt
Cl	Clay
HP	Hardpan
Le	Ledge
NLTD	No Ledge To Depth
CNPF	Can Not Penetrate Further
TLOB	Top of Ledge Or Boulder
NR	No Recovery
Rec.	Recovery
%Rec.	Percent Recovery
ROD	Rock Quality Designation
CBR	California Bearing Ratio
<	Less Than
>	Greater Than
R	Refusal (N > 100)
VTSPG	NAD83 - See Note 7

**COLOR**

blk	Black	pnk	Pink
bl	Blue	pu	Purple
brn	Brown	rd	Red
dk	Dark	tn	Tan
gr'y	Gray	wh	White
gn	Green	yel	Yellow
lt	Light	mltc	Multicolored
or	Orange		



**BORING CHART**

HOLE NO.	SURV. STATION	OFFSET	GROUND ELEV.	ELEV. TLOB
B-103	475+06	40.80	2210.0	2193.10
B-104	474+90	-35.30	2216.0	2198.00
B-105	475+10	-16.60	2220.7	NA
B-106	474+84	16.50	2221.2	NA

**DEFINITIONS (AASHTO)**

<b>BEDROCK (LEDGE)</b> - Rock in its native location of indefinite thickness.	<b>VARVED</b> - Alternate layers of silt and clay.
<b>BOULDER</b> - A rock fragment with an average dimension > 12 inches.	<b>HARDPAN</b> - Extremely dense soil, cemented layer, not softened when wet.
<b>COBBLE</b> - Rock fragments with an average dimension between 3 and 12 inches.	<b>MUCK</b> - Soft organic soil (containing > 10% organic material).
<b>GRAVEL</b> - Rounded particles of rock < 3" and > 0.0787" (#10 sieve).	<b>MOISTURE CONTENT</b> - Weight of water divided by dry weight of soil.
<b>SAND</b> - Particles of rock < 0.0787" (#10 sieve) and > 0.0029" (#200 sieve).	<b>FLOWING SAND</b> - Granular soil so saturated (loose) that it flows into drill casing during extraction of wash rod.
<b>SILT</b> - Soil < 0.0029" (#200 sieve), non or slightly plastic and exhibits no strength when air-dried.	<b>STRIKE</b> - Angle from magnetic north to line of intersection of bed with a horizontal plane.
<b>CLAY</b> - Fine grained soil, exhibits plasticity when moist and considerable strength when air-dried.	<b>DIP</b> - Inclination of bed with a horizontal plane.

**GENERAL NOTES**

- The subsurface explorations shown herein were made between 4-1-14 and 4-4-14 by the Agency.
- Soil and rock classifications, properties and descriptions are based on engineering interpretation from available subsurface information by the Agency and may not necessarily reflect actual variations in subsurface conditions that may be encountered between individual boring or sample locations.
- Observed water levels and/or conditions indicated are as recorded at the time of exploration and may vary according to the prevailing rainfall, methods of exploration and other factors.
- Engineering judgment was exercised in preparing the subsurface information presented herein. Analysis and interpretation of subsurface data was performed and interpreted for Agency design and estimating purposes. Presentation of the information in the Contract is intended to provide the Contractor access to the same data available to the Agency. The subsurface information is presented in good faith and is not intended as a substitute for personal investigation, independent interpretation, independent analysis or judgment by the Contractor.
- Pictorial structure details shown on the boring plan layout or soils profile are for illustrative purposes only and may not accurately portray final contract details.
- Terminology used on boring logs to describe the hardness, degree of weathering, and spacing of fractures, joints and other discontinuities in the bedrock is defined in the AASHTO Manual on Subsurface Investigations, 1988.
- Northing and Easting coordinates are shown in Vermont State Plane Grid North American Datum 1983 in meters and survey feet.

PROJECT NAME: WOODFORD

PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13B270borinfo.dgn

PROJECT LEADER: T. LEVINS

DESIGNED BY: M. DUTTON


BORING INFORMATION SHEET

PLOT DATE: 11/14/2018

DRAWN BY: M. DUTTON

CHECKED BY: T. LEVINS

SHEET 15 OF 41


 <b>STATE OF VERMONT</b> AGENCY OF TRANSPORTATION CONSTRUCTION AND MATERIALS BUREAU CENTRAL LABORATORY	<b>BORING LOG</b>		Boring No.: <b>B-103</b>						
	<b>Woodford</b> <b>BF010-1(52)</b> <b>VT-9 BR#18</b>		Page No.: 1 of 1 Pin No.: 13b270 Checked By: MRG						
Boring Crew: GARROW, NIETO Date Started: 9/23/15 Date Finished: 9/23/15 VTSPG NAD83: N 142298.69 ft E 1500789.76 ft Station: 475+06 Offset: 40.80 Ground Elevation: 2210.0 ft		Casing: WB Sampler: SS I.D.: 4 in 1.5 in Hammer Wt: N.A. 140 lb. Hammer Fall: N.A. 30 in. Hammer/Rod Type: Auto/AWJ Rig: CME 55 TRACK C _r = 1.46	<b>Groundwater Observations</b> <table border="1"> <thead> <tr> <th>Date</th> <th>Depth (ft)</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>09/23/15</td> <td>3.5</td> <td>W.T. after drilling.</td> </tr> </tbody> </table>	Date	Depth (ft)	Notes	09/23/15	3.5	W.T. after drilling.
Date	Depth (ft)	Notes							
09/23/15	3.5	W.T. after drilling.							

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
BOC EL. 2208.46		A-1-b, Sa, Dk/brn, Moist, Rec. = 0.4 ft, Lab Note: Roots were within sample.	WH-4-6-4 (10)	19.4	17.9	68.7	13.4
		Field Note: No Recovery	4-4-1-3 (8)				
5		A-2-4, SiSa, Dk/brn-gry, Wet, Rec. = 0.3 ft, Lab Note: Roots were within sample.	3-2-WH-2 (W.H.)	26.0	19.4	51.3	29.3
		A-2-4, SaGr, Dk/brn-gry, Moist, Rec. = 1.0 ft	3-8-6-4 (14)	12.1	48.4	34.7	16.9
10		A-4, GrSaSi, gry-Dk/brn-blk, Moist, Rec. = 1.0 ft, Lab Note: Sample tested non-plastic. A trace (<5%) organics were within sample.	3-4-6-9 (10)	28.0	24.5	34.1	41.4
		Field Note: No Recovery	4-6-5-6 (11)				
15		A-4, GrSi, gry, Moist, Rec. = 0.4 ft	6-7-6-8 (13)	18.9	29.9	18.1	52.0
		A-4, Si, gry, Moist, Rec. = 1.4 ft, Lab Note: Sample tested non-plastic.	4-4-5-4 (9)	29.7	0.1	9.3	90.6
		A-4, SaSi, gry, Moist, Rec. = 0.4 ft, Lab Note: Sample tested non-plastic.	6-R@5" (R)	20.6	17.1	31.1	51.8
		Field Note: NXDC, cleaned out casing. Field Note: Boulder, NXMDC, 16.9-22.9 feet.					
20		A-1-B, SaGr, gry-Lt/brn, Moist, Rec. = 1.1 ft, Lab Note: Broken Rock was within sample.	6-38-R@2.5" (R)	9.1	53.3	30.6	16.1
		Hole stopped @ 24.2 ft					
25		Remarks: Hole Collapsed at 3.5 feet.					

Notes:  
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.  
 2. N Values have not been corrected for hammer energy. C is the hammer energy correction factor.  
 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

BOC = APPROX. BOTTOM OF CULVERT

BORING LOG 2 WOODFORD BF 010-1(52).GPJ VERMONT AOT.GDT 10/27/15

 <b>STATE OF VERMONT</b> AGENCY OF TRANSPORTATION CONSTRUCTION AND MATERIALS BUREAU CENTRAL LABORATORY	<b>BORING LOG</b>		Boring No.: <b>B-104</b>									
	<b>Woodford</b> <b>BF010-1(52)</b> <b>VT-9 BR#18</b>		Page No.: 1 of 1 Pin No.: 13b270 Checked By: MRG									
Boring Crew: GARROW, NIETO Date Started: 9/23/15 Date Finished: 9/24/15 VTSPG NAD83: N 142381.54 ft E 1500790.22 ft Station: 474+90 Offset: -35.30 Ground Elevation: 2216.0 ft		Casing: WB Sampler: SS I.D.: 4 in 1.5 in Hammer Wt: N.A. 140 lb. Hammer Fall: N.A. 30 in. Hammer/Rod Type: Auto/AWJ Rig: CME 55 TRACK C _r = 1.46	<b>Groundwater Observations</b> <table border="1"> <thead> <tr> <th>Date</th> <th>Depth (ft)</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>09/24/15</td> <td>3.7</td> <td>W.T. after drilling.</td> </tr> <tr> <td>09/24/15</td> <td>5.5</td> <td>W.T. before drilling.</td> </tr> </tbody> </table>	Date	Depth (ft)	Notes	09/24/15	3.7	W.T. after drilling.	09/24/15	5.5	W.T. before drilling.
Date	Depth (ft)	Notes										
09/24/15	3.7	W.T. after drilling.										
09/24/15	5.5	W.T. before drilling.										

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
BOC EL. 2208.46		A-1-B, GrSa, brn, Moist, Rec. = 0.4 ft	WH-1-3-4 (4)	12.2	33.8	53.5	12.7
		Field Note: NXDC, Cleaned out casing.					
5		A-1-b, SaGr, Lt/brn, Moist, Rec. = 0.4 ft	4-3-4-4 (7)	10.5	53.4	28.4	18.2
		Field Note: NXDC, Cleaned out casing.					
10		A-4, SaSi, gry, Moist, Rec. = 1.2 ft, Lab Note: Sample tested non-plastic.	3-3-7-5 (10)	25.8	2.6	27.9	69.5
		Field Note: No Recovery	9-11-11-12 (22)				
15		A-4, GrSi, gry, Moist, Rec. = 1.3 ft, Lab note: Broken rock was within sample.	5-18-15-18 (33)	15.4	37.1	19.3	43.6
		Field Note: No Recovery					
20		A-1-b, SaGr, gry, Moist, Rec. = 1.1 ft, Lab note: Broken rock was within sample.	19-14-19-17 (33)	8.1	51.1	32.5	16.4
		Field Note: NXDC, Cleaned out casing. Field Note: NXDC, Cobbles and Boulders Field Note: No Recovery	R@1.5" (R)				
25		A-2-4, Sa, gry, Moist, Rec. = 1.1 ft	2-1-1-1 (2)	22.5	8.7	79.4	11.9
		Hole stopped @ 24.0 ft					
25		Remarks: Hole Collapsed at 6.9 feet.					

Notes:  
 1. Stratification lines represent approximate boundary between material types. Transition may be gradual.  
 2. N Values have not been corrected for hammer energy. C is the hammer energy correction factor.  
 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.

PROJECT NAME:	WOODFORD
PROJECT NUMBER:	BF 010-1(52)
FILE NAME:	z13b270B103.dgn
PROJECT LEADER:	T. LEVINS
DESIGNED BY:	M. DUTTON
BORING LOGS 1	
PLOT DATE:	11/14/2018
DRAWN BY:	M. DUTTON
CHECKED BY:	T. LEVINS
SHEET	16 OF 41



STATE OF VERMONT AGENCY OF TRANSPORTATION CONSTRUCTION AND MATERIALS BUREAU CENTRAL LABORATORY		BORING LOG		Boring No.: <b>B-105</b>			
		Woodford BF010-1(52) VT-9 BR#18		Page No.: 1 of 1			
				Pin No.: 13b270			
				Checked By: MRG			
Boring Crew: GARROW, JUDKINS, NIETO		Casing		Groundwater Observations			
Date Started: 9/24/15 Date Finished: 9/24/15		Type: WB	Sampler: SS	Date	Depth (ft)		
VTSPG NAD83: N 142357.87 ft E 1500806.26 ft		I.D.: 4 in	1.5 in	09/24/15	3.5		
Station: 475+10 Offset: -16.60		Hammer Wt: N.A.	140 lb.	Notes: W.T. after drilling.			
Ground Elevation: 2220.7 ft		Hammer Fall: N.A.	30 in.				
		Hammer/Rod Type: Auto/AWJ					
		Rig: CME 45C SKID	C. = Unknown				
Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.67 ft					
		A-1-B, GrSa, Lt/brn, Moist, Rec. = 0.8 ft	7-8-11-1 (19)	8.6	43.3	45.9	10.8
5		Field Note: NXDC, Cleaned out casing.					
		Field Note: No Recovery	7-9-6-8 (15)				
10		Field Note: NXDC, Cleaned out casing.					
		A-1-B, SaGr, Lt/brn-Lt/gry, Moist, Rec. = 0.8 ft	6-33-8-4 (41)	12.3	44.0	37.7	18.3
15		Field Note: NXDC, Cleaned out casing.					
		A-1-a, Gr, gry-brn, Moist, Rec. = 0.6 ft, Lab Note: A lot of broken rock was within sample.	6-18-12-6 (30)	14.6	75.7	18.9	5.4
		Field Note: NXDC, Cleaned out casing.					
		Field Note: No Recovery	4-6-6-7 (12)				
20		A-4, Si, gry, Moist, Rec. = 0.8 ft	6-5-6-4 (11)	27.8	4.9	7.6	87.5
		A-4, Si, gry, Moist, Rec. = 1.4 ft, Lab Note: Sample tested non-plastic.	4-4-4-4 (8)	29.5	2.9	6.7	90.4
		A-4, Si, gry, Moist, Rec. = 0.3 ft, Lab Note: Sample tested non-plastic.	3-4-4-7 (8)	28.9	6.6	9.3	84.1
25		A-4, GrSi, gry, MTW, Rec. = 0.8 ft, Lab Note: Broken rock was within sample.	4-8-R@5" (R)	22.8	34.8	17.5	47.7
		A-4, GrSaSi, gry, MTW, Rec. = 0.5 ft	R@6" (R)	19.7	20.9	37.8	41.3
30		Field Note: No Recovery	R@6" (R)				
		Hole stopped @ 29.5 ft					
		Remarks: Hole Collapsed at 9.2 feet.					
Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. 2. N Values have not been corrected for hammer energy. C is the hammer energy correction factor. 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.							

BOC = APPROX. BOTTOM OF CULVERT

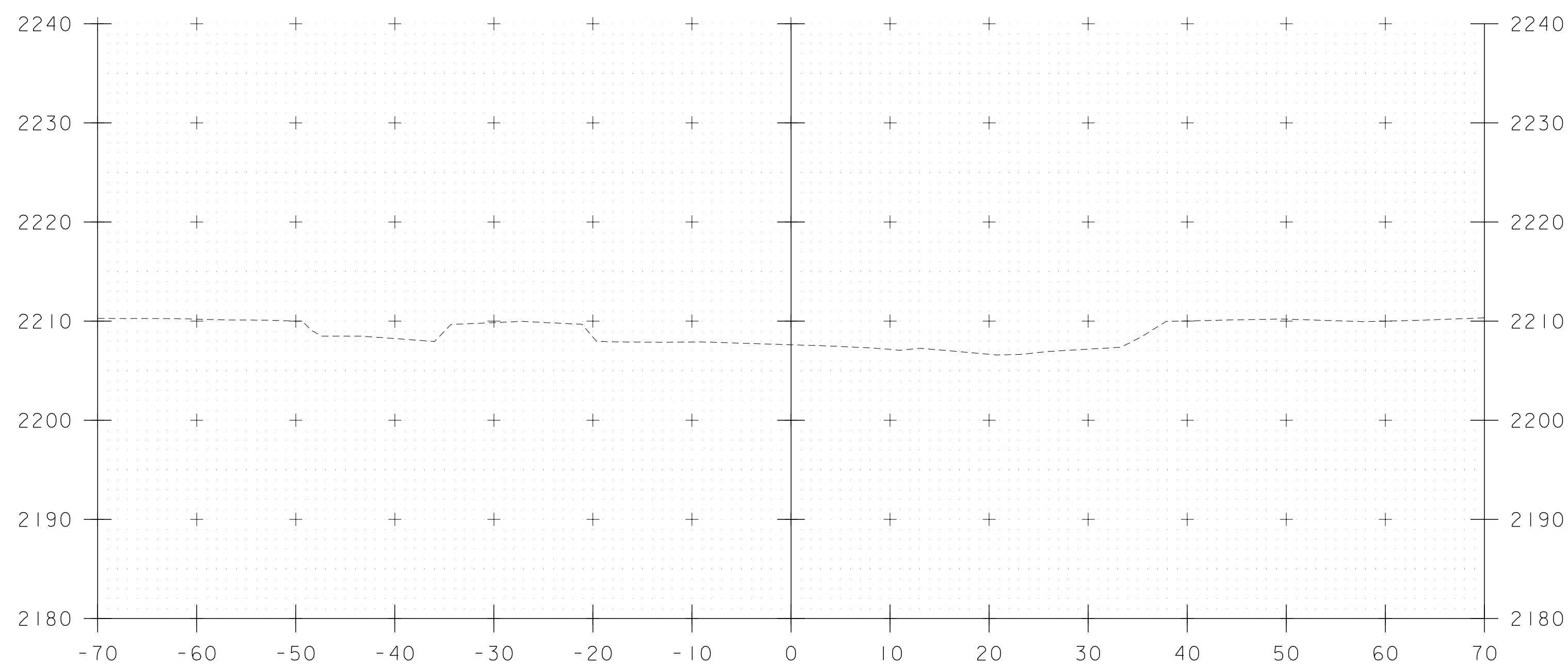
STATE OF VERMONT AGENCY OF TRANSPORTATION CONSTRUCTION AND MATERIALS BUREAU CENTRAL LABORATORY		BORING LOG		Boring No.: <b>B-106</b>			
		Woodford BF010-1(52) VT-9 BR#18		Page No.: 1 of 1			
				Pin No.: 13b270			
				Checked By: MRG			
Boring Crew: GARROW, NIETO		Casing		Groundwater Observations			
Date Started: 9/24/15 Date Finished: 9/25/15		Type: WB	Sampler: SS	Date	Depth (ft)		
VTSPG NAD83: N 142332.72 ft E 1500773.74 ft		I.D.: 4 in	1.5 in	09/25/15	3.5		
Station: 474+84 Offset: 16.50		Hammer Wt: N.A.	140 lb.	Notes: W.T. before drilling.			
Ground Elevation: 2221.2 ft		Hammer Fall: N.A.	30 in.				
		Hammer/Rod Type: Auto/AWJ					
		Rig: CME 45C SKID	C. = Unknown				
Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.62 ft					
		A-1-B, GrSa, Lt/brn, Moist, Rec. = 1.3 ft	9-10-11-12 (21)	6.7	29.6	56.2	14.2
5		Field Note: NXDC, Cleaned out casing.					
		A-1-B, SiSaGr, brn, Moist, Rec. = 0.8 ft	16-12-12-15 (24)	10.9	40.7	35.2	24.1
10		Field Note: NXDC, Cleaned out casing.					
		A-1-B, SiGrSa, Lt/brn, Moist, Rec. = 0.2 ft	6-6-4-3 (10)	14.9	34.9	45.1	20.0
15		Field Note: NXDC, Cleaned out casing.					
		A-1-A, SaGr, blk-Dk/brn, Moist, Rec. = 0.4 ft, Lab Note: Sample contained 27.8% organics (AASHTO T-267). Broken rock was within sample.	2-1-4-5 (5)	107.0	66.4	28.2	5.4
		A-4, SiSa, brn, Moist, Rec. = 0.6 ft, Lab Note: Sample contained a trace (<5%) organics. (AASHTO T-267)	4-3-2-5 (5)	80.8	1.4	60.9	37.7
		A-4, SaSi, gry, Moist, Rec. = 1.4 ft	4-3-2-5 (5)	24.2	1.0	45.5	53.5
20		A-4, Si, gry, Moist, Rec. = 1.1 ft, Lab Note: Broken rock was within sample.	9-6-6-16 (12)	22.6	14.3	19.1	66.6
		A-4, SiSa, gry, Moist, Rec. = 0.3 ft	13-9-10-8 (19)	27.0	2.2	51.9	45.9
		Field Note: Cleaned out casing.					
		A-4, Si, gry, Moist, Rec. = 1.0 ft	3-3-4-3 (7)	29.2	6.2	11.0	82.8
25		A-4, Si, gry, Moist, Rec. = 1.0 ft, Lab Note: Sample tested non-plastic. A very small amount of clay was present in the sample.	2-3-3-4 (6)	24.7	5.2	5.9	88.9
		Field Note: Cleaned out casing.					
		A-4, GrSi, gry, Moist, Rec. = 0.5 ft, Lab Note: Broken rock was within sample.	9-16-R@0" (R)	18.5	33.1	18.0	48.9
		Field Note: NXDC, Cleaned out casing.					
30		A-1-B, GrSa, gry, Moist, Rec. = 0.5 ft, Lab Note: Broken rock was within sample.	13-42-R@1.5" (R)	15.0	41.4	50.4	8.2
		Hole stopped @ 30.1 ft					
		Remarks: Hole collapsed at 11.2 feet.					
Notes: 1. Stratification lines represent approximate boundary between material types. Transition may be gradual. 2. N Values have not been corrected for hammer energy. C is the hammer energy correction factor. 3. Water level readings have been made at times and under conditions stated. Fluctuations may occur due to other factors than those present at the time measurements were made.							

BORING LOG 2 WOODFORD BF 010-1(52).GPJ VERMONT AOT.GDT 10/27/15

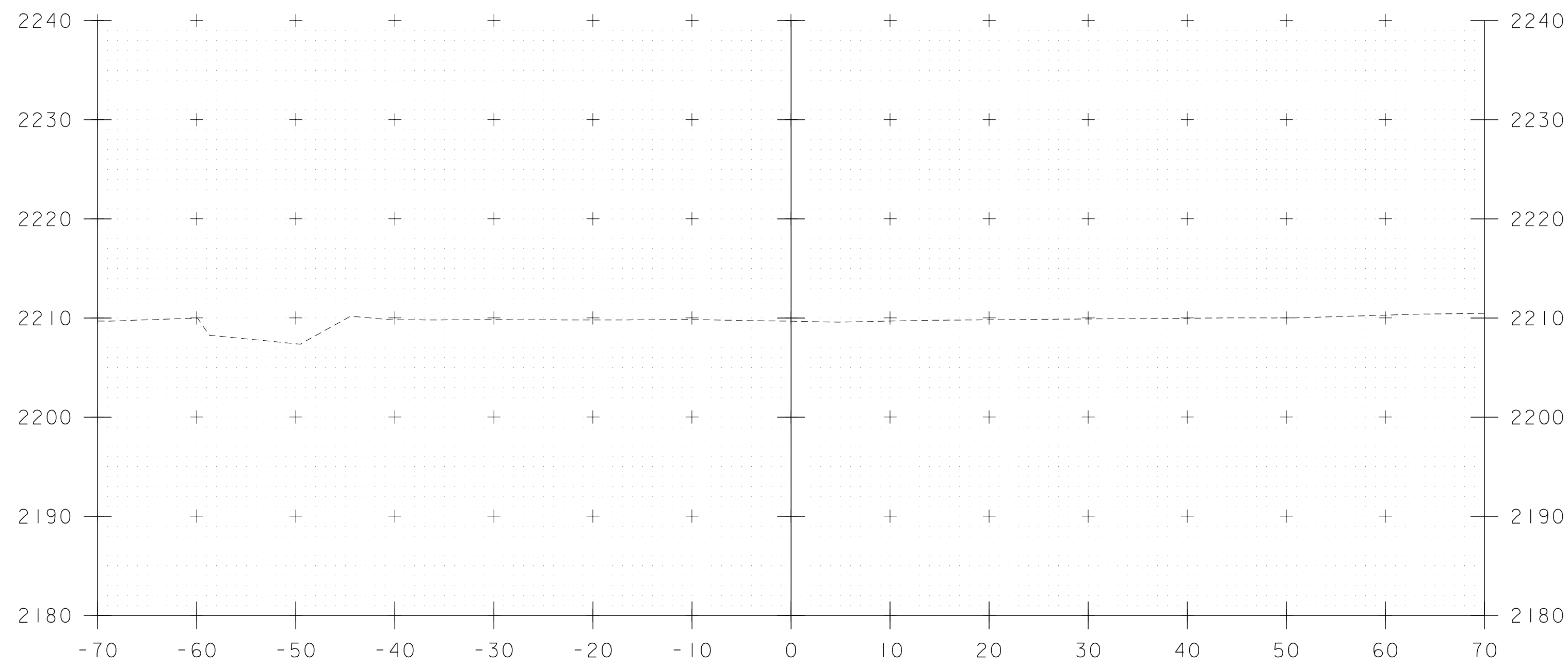
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PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270B105.dgn PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: M. DUTTON  
DESIGNED BY: M. DUTTON CHECKED BY: T. LEVINS  
BORING LOGS 2 SHEET 17 OF 41

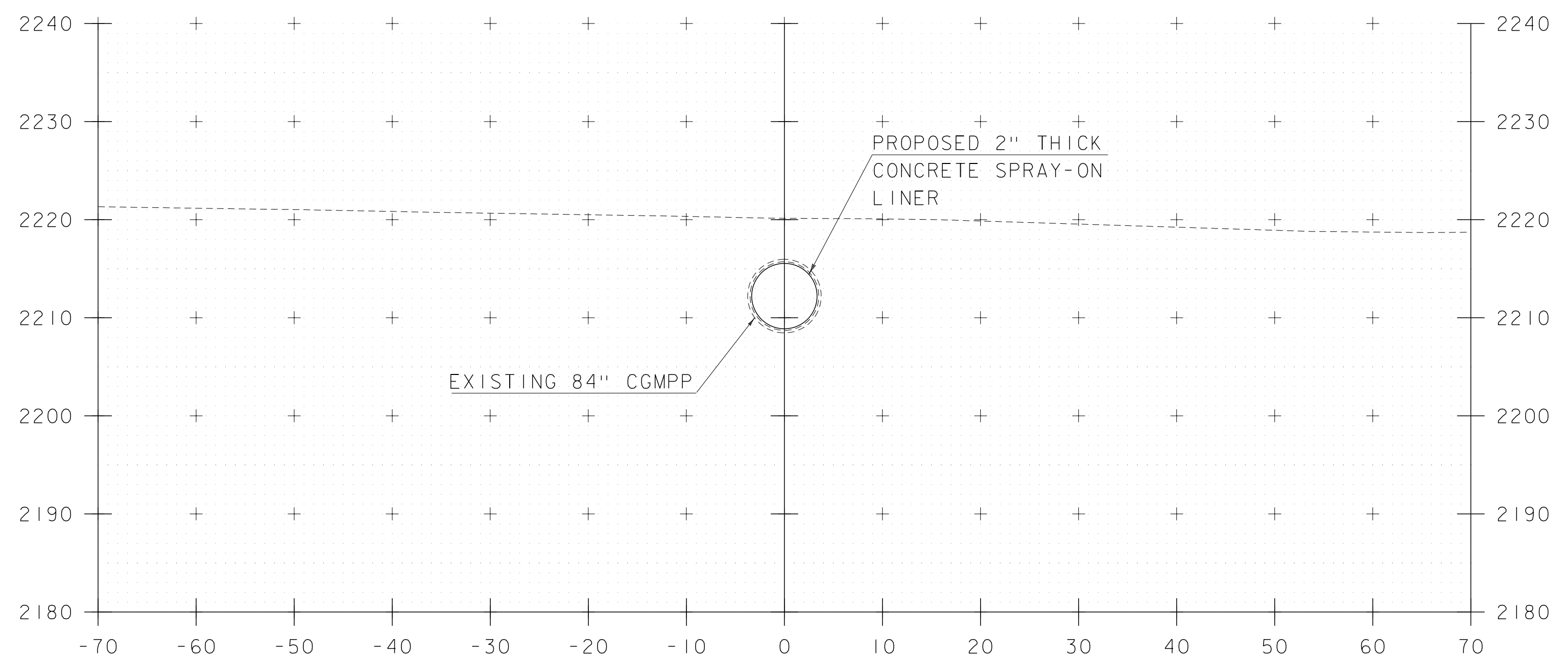




50+25

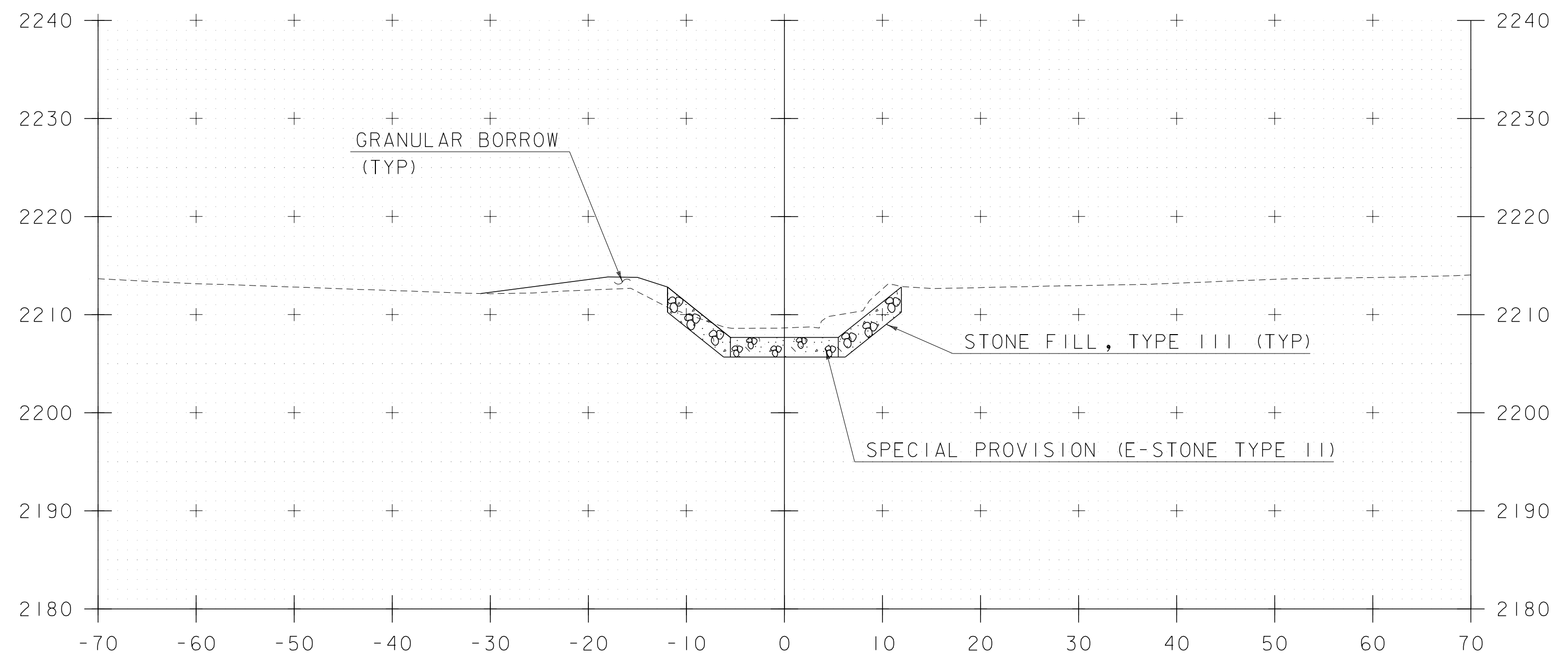


50+00



50+75

STA. 50+62.76  
 END UNCLASSIFIED CHANNEL EXCAVATION  
 END GEOTEXTILE UNDER STONE FILL  
 END STONE FILL, TYPE III  
 END SPECIAL PROVISION (E-STONE TYPE II)



50+50

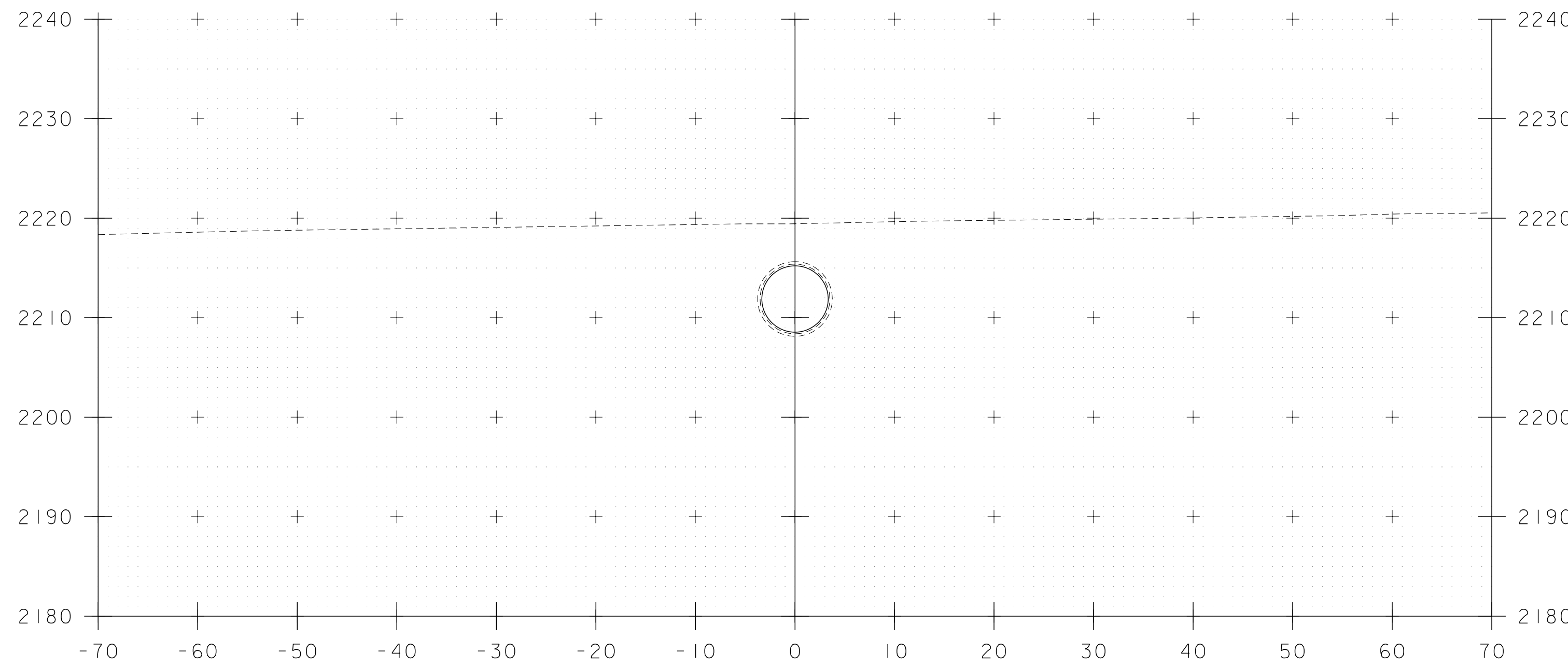
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 STA. 50+30.45  
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 BEGIN GEOTEXTILE UNDER FILL  
 BEGIN STONE FILL TYPE III

STA. 50+00 TO STA. 50+75

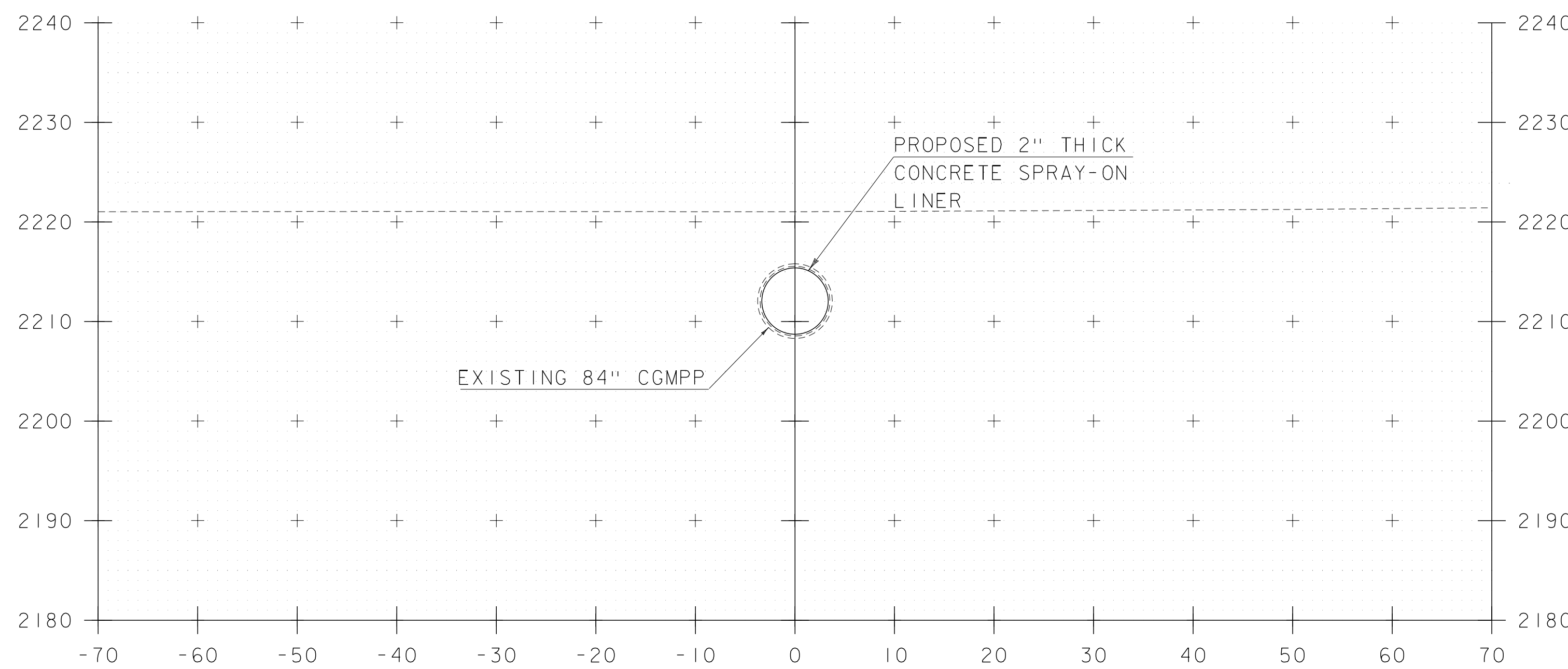


PROJECT NAME:	WOODFORD	FILE NAME:	z13b270xs.dgn	PLOT DATE:	11/14/2018
PROJECT NUMBER:	BF 010-I(52)	PROJECT LEADER:	T. LEVINS	DRAWN BY:	B. WILLIAMS
		DESIGNED BY:	B. WILLIAMS	CHECKED BY:	T. LEVINS
		CHANNEL CROSS SECTIONS I		SHEET	18 OF 41

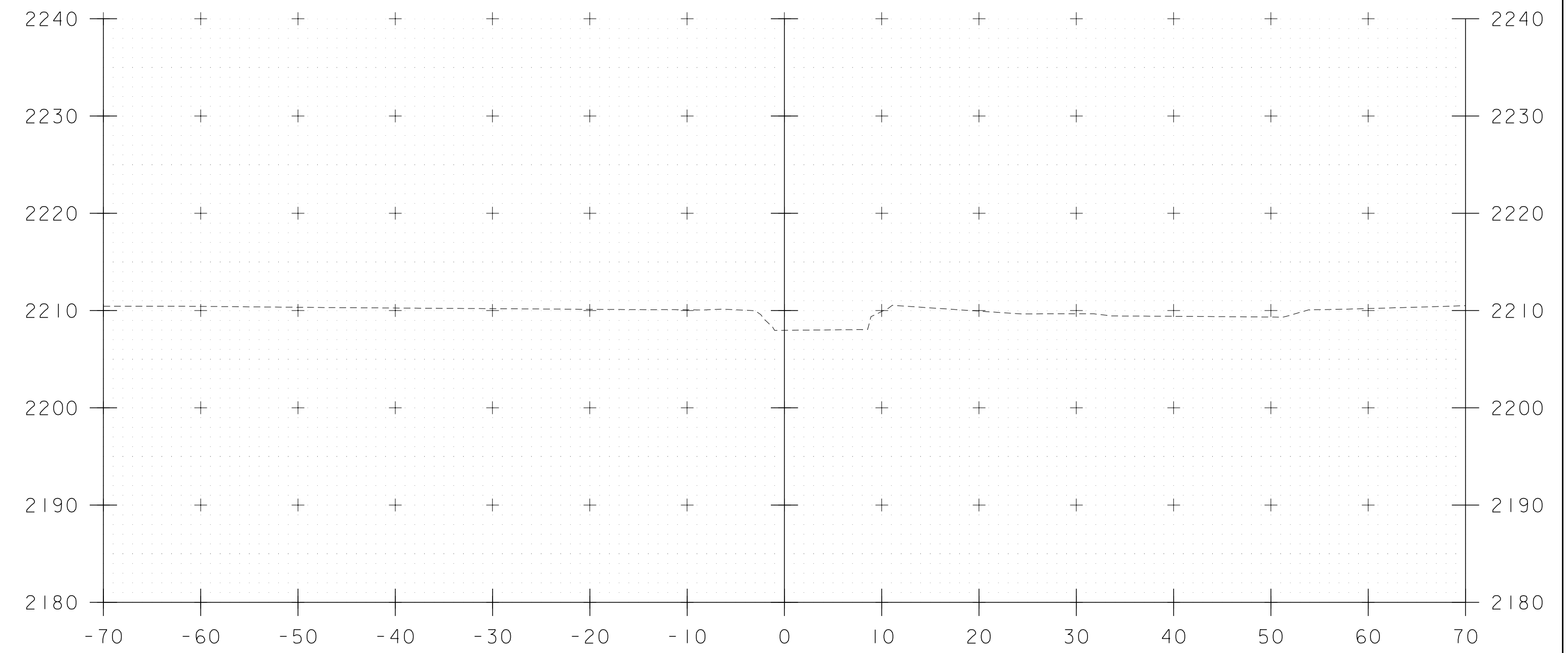




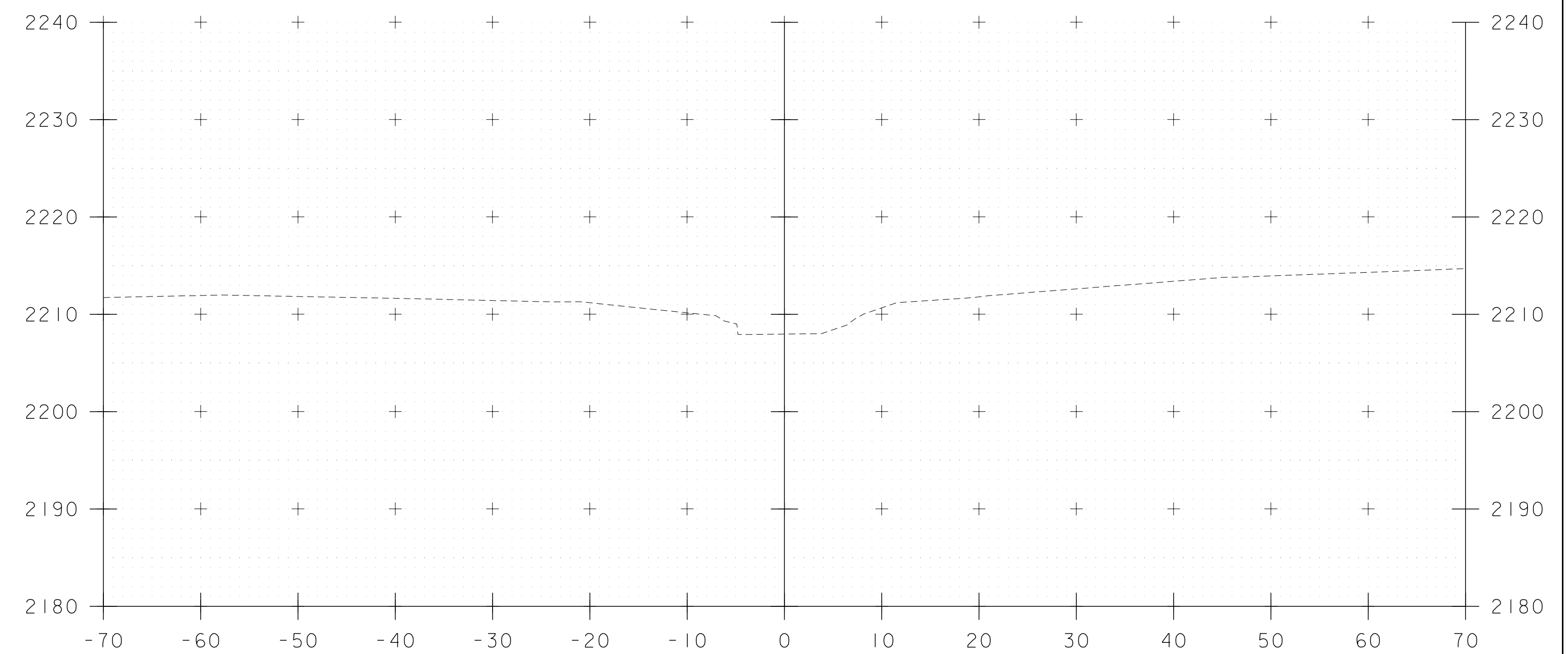
51+25



51+00



51+75



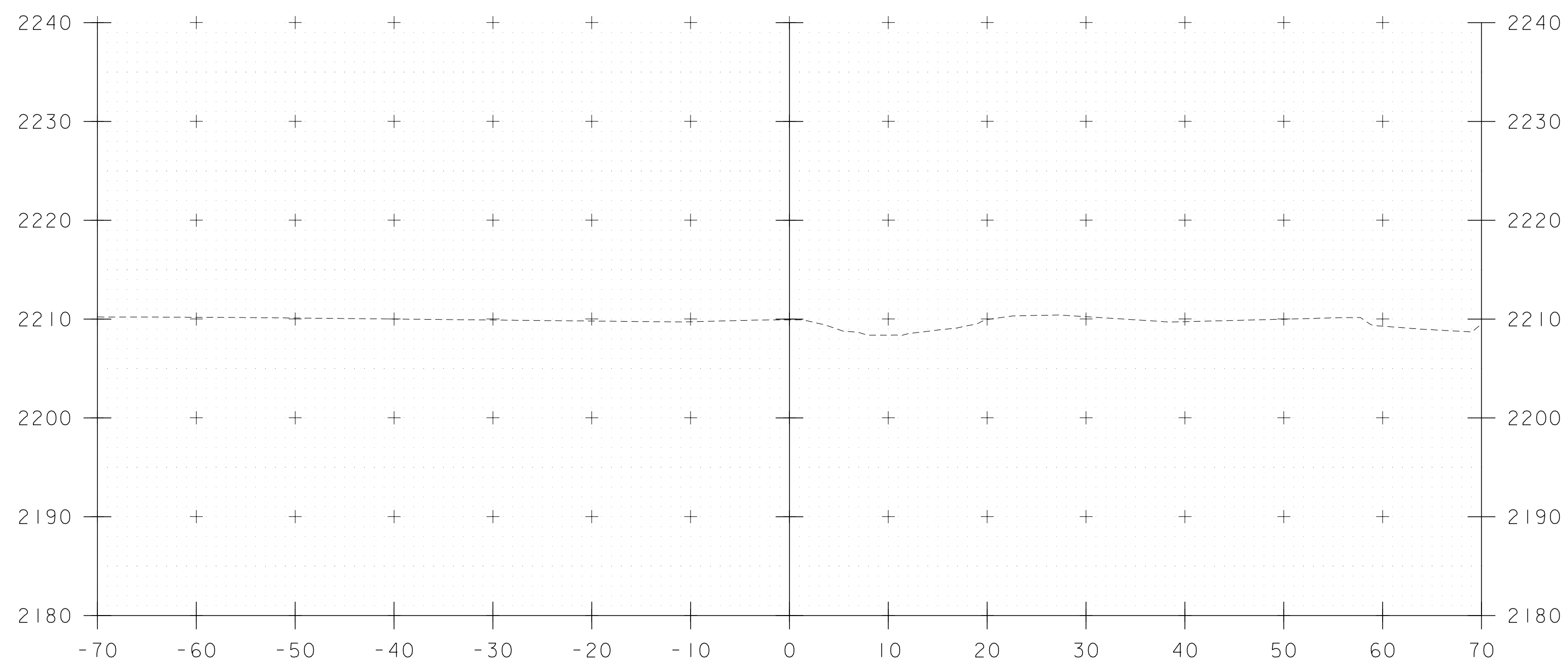
51+50

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

STA. 51+00 TO STA. 51+75



PROJECT NAME:	WOODFORD	PLOT DATE:	11/14/2018
PROJECT NUMBER:	BF 010-1(52)	DRAWN BY:	B. WILLIAMS
FILE NAME:	z13b270xs.dgn	CHECKED BY:	T. LEVINS
PROJECT LEADER:	T. LEVINS	CHANNEL CROSS SECTIONS 2	SHEET 19 OF 41
DESIGNED BY:	B. WILLIAMS		



52+00

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

STA. 52+00 TO STA. 52+00



PROJECT NAME: WOODFORD  
 PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270xs.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
CHANNEL CROSS SECTIONS 3	SHEET 20 OF 41

## **EPSC PLAN NARRATIVE**

### **1.1 PROJECT DESCRIPTION**

THE WOODFORD BF 010-1(52) PROJECT PROPOSES THE REHABILITATION OF THE CURRENT BRIDGE ON VT ROUTE 9 SPANNING AN UNNAMED BROOK IN THE TOWN OF WOODFORD. THE EXISTING CULVERT WILL BE LINED WITH A 2" THICK SPRAY ON CONCRETE LINER. THE SHOULDER WIDTHS ARE SUBSTANDARD BUT DO NOT WARRANT IMPROVEMENT UNDER THE PROPOSED REHABILITATION.

NOTE: AREA OF DISTURBANCE INCLUDES LIMITS OF EARTH DISTURBANCE WITHIN THE PROJECT AREA, AS WELL AS WASTE, STAGING AREAS, AND OTHER EARTH DISTURBING ACTIVITIES WITHIN OR DIRECTLY ADJACENT TO THE PROJECT LIMITS AS SHOWN ON THE ATTACHED EPSC PLAN.

TOTAL AREA OF DISTURBANCE AS SHOWN ON THE ATTACHED EPSC PLAN IS APPROXIMATELY 0.40 ACRES.

IT IS ANTICIPATED THAT THIS PROJECT WILL LAST ONE TO TWO MONTHS.

### **1.2 SITE INVENTORY**

#### **1.2.1 TOPOGRAPHY**

THE AREA SURROUNDING THE PROJECT IS GRASS AND WOODS IN A RURAL SETTING.

#### **1.2.2 DRAINAGE, WATERWAYS, BODIES OF WATER, AND PROXIMITY TO NATURAL OR MAN-MADE WATER FEATURES**

THE BROOK IS THE ONLY WATER SOURCE ON THE PROJECT SITE. THE BROOK IS CLASSIFIED AS FLAT, SINUOUS, NARROW, WITH A CONFINED CHANNEL AT THE SITE. THE STREAM BED CONSISTS OF FINE, GRAVELY, SANDY SILT. THE TRIBUTARY AREA AT THE CULVERT CROSSING IS 0.6 SQ. MI.

#### **1.2.3 VEGETATION**

THE VEGETATION IN THE PROJECT AREA CONSISTS OF TALL GRASS AND BRUSH. THE IMPACT TO VEGETATION WILL BE LIMITED TO THAT WHICH IS DIRECTLY AFFECTED BY ACCESS TO THE INLET OF EXISTING CULVERT DURING CONSTRUCTION. DISTURBED VEGETATION WILL BE REESTABLISHED WITH STANDARD SEED AND MULCH PRACTICES.

#### **1.2.4 SOILS**

ALL SOIL DATA CAME FROM THE U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE FOR THE COUNTY OF BENNINGTON, VERMONT. SOILS ON THE PROJECT SITE ARE WILMINGTON-MUNDAL ASSOCIATION, UNDULATING, VERY STONY SOIL, 0% TO 3% SLOPES.

NO "K" VALUE REPORTED.

**NOTE:** "K" VALUES GENERALLY INDICATE THE FOLLOWING:

0.0-0.23 = LOW EROSION POTENTIAL

0.24-0.36 = MODERATE EROSION POTENTIAL

0.37 AND HIGHER = HIGH EROSION POTENTIAL

#### **1.2.5 SENSITIVE RESOURCE AREAS**

CRITICAL HABITATS: NO

HISTORICAL OR ARCHEOLOGICAL AREAS: NO

PRIME AGRICULTURAL LAND: NO

THREATENED AND ENDANGERED SPECIES: A PLANT SPECIES OF SPECIAL CONCERN IN NEARBY WETLANDS;

NORTHERN LONG-EARED BAT

WATER RESOURCE: UNNAMED BROOK

WETLANDS: THERE ARE CLASS II WETLANDS WITHIN THE PROJECT AREA.

### **1.3 RISK EVALUATION**

THIS PROJECT DOES NOT FALL UNDER THE JURISDICTION OF GENERAL PERMIT 3-9020 FOR STORMWATER RUNOFF FROM CONSTRUCTION SITES. SHOULD CHANGES PRIOR TO OR DURING CONSTRUCTION RESULT IN ONE OR MORE ACRES OF EARTH DISTURBANCE OR SHOULD THE PROJECT BECOME PART OF A LARGER PLAN OF DEVELOPMENT, THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY ADDITIONAL PERMITTING.

### **1.4 EROSION PREVENTION AND SEDIMENT CONTROL**

THE EROSION CONTROL PLANS ARE MEANT AS A GUIDELINE FOR PREVENTING EROSION AND CONTROLLING SEDIMENT TRANSPORT. THE PRINCIPLES OUTLINED IN THIS NARRATIVE CONSIST OF APPLYING MEASURES THROUGHOUT CONSTRUCTION OF THE PROJECT IN ORDER TO MINIMIZE SEDIMENT TRANSPORT TO THE RECEIVING WATERS. THE MEASURES INCLUDE STABILIZATION AND STRUCTURAL PRACTICES, STORM WATER CONTROLS AND OTHER POLLUTION PREVENTION PRACTICES. THEY HAVE BEEN PROPOSED BY THE DESIGNER AS A BASIS FOR PROTECTING RESOURCES AND WILL NEED TO BE BUILT UPON BASED ON THE SPECIFIC MEANS AND METHODS OF THE CONTRACTOR. REFER TO THE LOW RISK SITE HANDBOOK AND APPROPRIATE DETAIL SHEETS FOR SPECIFIC GUIDANCE AND CONSTRUCTION DETAILING. ALL MEASURES

SHALL BE REGULARLY MAINTAINED AND SHALL BE CHECKED FOR SEDIMENT BUILD-UP. SEDIMENT SHALL BE DISPOSED OF AT AN APPROVED SITE WHERE IT WILL NOT BE SUBJECT TO EROSION.

#### **1.4.1 MARK SITE BOUNDARIES**

SITE BOUNDARIES AND AREAS CONSTRUCTION EQUIPMENT CAN ACCESS SHALL BE DELINEATED.

PROJECT DEMARCATION FENCING (PDF) SHALL BE USED TO PHYSICALLY MARK SITE BOUNDARIES.

#### **1.4.2 LIMIT DISTURBANCE AREA**

PREVENTING INITIAL SOIL EROSION BY MINIMIZING THE EXPOSED AREA IS MUCH MORE EFFECTIVE THAN TREATING ERODED SEDIMENT. EARTH DISTURBANCE CAN BE MINIMIZED THROUGH CONSTRUCTION PHASING BY ONLY OPENING UP EARTH AS NECESSARY. THIS CAN LIMIT THE AREA THAT WILL BE DISTURBED AND EXPOSED TO EROSION. EMPLOY TEMPORARY CONSTRUCTION STABILIZATION PRACTICES IN INCREMENTAL STAGES AS PHASES CHANGE. FOR PROJECTS WHICH FALL UNDER THE CONSTRUCTION GENERAL PERMIT, ONLY THE ACREAGE LISTED ON THE PERMIT AUTHORIZATION MAY BE EXPOSED AT ANY GIVEN TIME.

MAINTAINING VEGETATED BUFFERS ALONG STREAM BANKS, WETLANDS OR OTHER SENSITIVE AREAS IS A CRUCIAL EROSION AND SEDIMENT CONTROL MEASURE THAT SHOULD BE ESTABLISHED WHEREVER POSSIBLE.

#### **1.4.3 SITE ENTRANCE/EXIT STABILIZATION**

TRACKING OF SEDIMENT ONTO PUBLIC HIGHWAYS SHALL BE MINIMIZED TO REDUCE THE POTENTIAL FOR RUNOFF ENTERING RECEIVING WATERS. INSTALLATION SHALL COINCIDE WITH THE CONTRACTORS PROGRESS SCHEDULE.

STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN AND ANYWHERE EQUIPMENT WILL BE GOING FROM AREAS OF EXPOSED SOILS TO PAVED SURFACES.

#### **1.4.4 INSTALL SEDIMENT BARRIERS**

SEDIMENT BARRIERS SHALL BE UTILIZED TO INTERCEPT RUNOFF AND ALLOW SUSPENDED SEDIMENT TO SETTLE OUT. THEY SHALL BE INSTALLED PRIOR TO ANY UP SLOPE WORK.

GEOTEXTILE FOR SILT FENCE SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN. A FILTER CURTAIN, TURBIDITY CURTAIN, OR FILTER BAG SHALL BE INSTALLED AT THE OUTLET END OF THE CULVERT AS PROPOSED ON THE EPSC PLAN.

#### **1.4.5 DIVERT UPLAND RUNOFF**

DIVERSIONARY MEASURES SHALL BE USED TO INTERCEPT RUNOFF FROM ABOVE THE CONSTRUCTION AND DIRECT IT AROUND THE DISTURBED AREA SO THAT CLEAN WATER DOES NOT BECOME MUDDIED WHILE TRAVELING OVER EXPOSED SOILS ON THE CONSTRUCTION SITE.

NONE ANTICIPATED.

#### **1.4.6 SLOW DOWN CHANNELIZED RUNOFF**

CHECK STRUCTURES SHALL BE UTILIZED TO REDUCE THE VELOCITY, AND THUS THE EROSION POTENTIAL, OF CONCENTRATED FLOW IN CHANNELS.

NONE ANTICIPATED.

#### **1.4.7 CONSTRUCT PERMANENT CONTROLS**

PERMANENT STORMWATER TREATMENT DEVICES SHALL BE INSTALLED AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH PERMIT CONDITIONS.

NONE ANTICIPATED.

#### **1.4.8 STABILIZE EXPOSED SOILS DURING CONSTRUCTION**

ALL AREAS OF DISTURBANCE MUST HAVE TEMPORARY STABILIZATION IN PLACE WITHIN 48 HOURS OF DISTURBANCE OR IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT 3-9020 AUTHORIZATION.

SURFACE ROUGHENING OF ALL EXPOSED SLOPES, COMBINED WITH TEMPORARY MULCHING, SHALL BE UTILIZED ON A REGULAR BASIS. BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED TO STABILIZE ALL SLOPES STEEPER THAN 1:3.

THE FORECAST OF RAINFALL EVENTS SHALL TRIGGER IMMEDIATE PROTECTION OF EXPOSED SOILS.

#### **1.4.9 WINTER STABILIZATION**

VARIOUS MEASURES SPECIFIC TO WINTER MAY BE NECESSARY SHOULD THE PROJECT EXTEND INTO WINTER (OCTOBER 15 THROUGH APRIL 15). REFER TO THE LOW RISK SITE HANDBOOK FOR GUIDANCE.

NONE ANTICIPATED.

#### **1.4.10 STABILIZE SOIL AT FINAL GRADE**

EXPOSED SOIL MUST BE STABILIZED WITHIN 48 HOURS OF REACHING FINAL GRADE.

SEED, MULCH, FERTILIZER AND LIME SHALL BE USED TO ESTABLISH PERMANENT VEGETATION. FOR SLOPES STEEPER THAN 1:3, BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED INSTEAD OF MULCH.

#### **1.4.11 DE-WATERING ACTIVITIES**

DISCHARGE FROM DEWATERING ACTIVITIES THAT FLOWS OFF OF THE CONSTRUCTION SITE MUST NOT CAUSE OR CONTRIBUTE TO A VIOLATION OF THE VERMONT WATER QUALITY STANDARDS. SPACE DEWATERING WILL BE REQUIRED DURING HEADWALL CONSTRUCTION.

#### **1.4.12 INSPECT YOUR SITE**

INSPECT THE PROJECT SITE BASED ON SPECIAL PROVISION REQUIREMENTS OR CONSTRUCTION GENERAL PERMIT AUTHORIZATION STIPULATIONS.

### **1.5 SEQUENCE AND STAGING**

THIS SECTION WILL BE DEVELOPED BY THE CONTRACTOR USING THE GUIDANCE OUTLINED IN THE VTRANS EPSC PLAN CONTRACTOR CHECKLIST.

#### **1.5.1 CONSTRUCTION SEQUENCE**

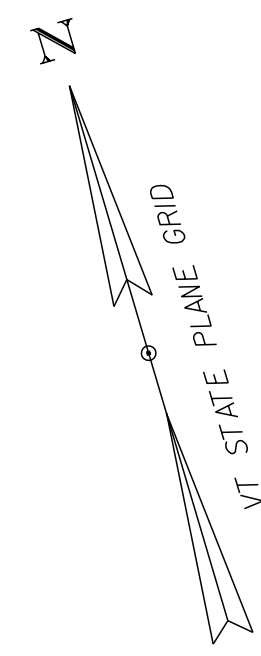
#### **1.5.2 OFF-SITE ACTIVITIES**

IN ADDITION TO THE CONTRACTOR CHECKLIST ANY ACTIVITIES OUTSIDE THE CONSTRUCTION LIMITS SHALL FOLLOW SPECIFICATION 105.25- 105.29 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

PROJECT NAME: WOODFORD  
PROJECT NUMBER: BF 010-1(52)

FILE NAME: z13b270epscnarrative.dgr PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
EPSC NARRATIVE SHEET 21 OF 41

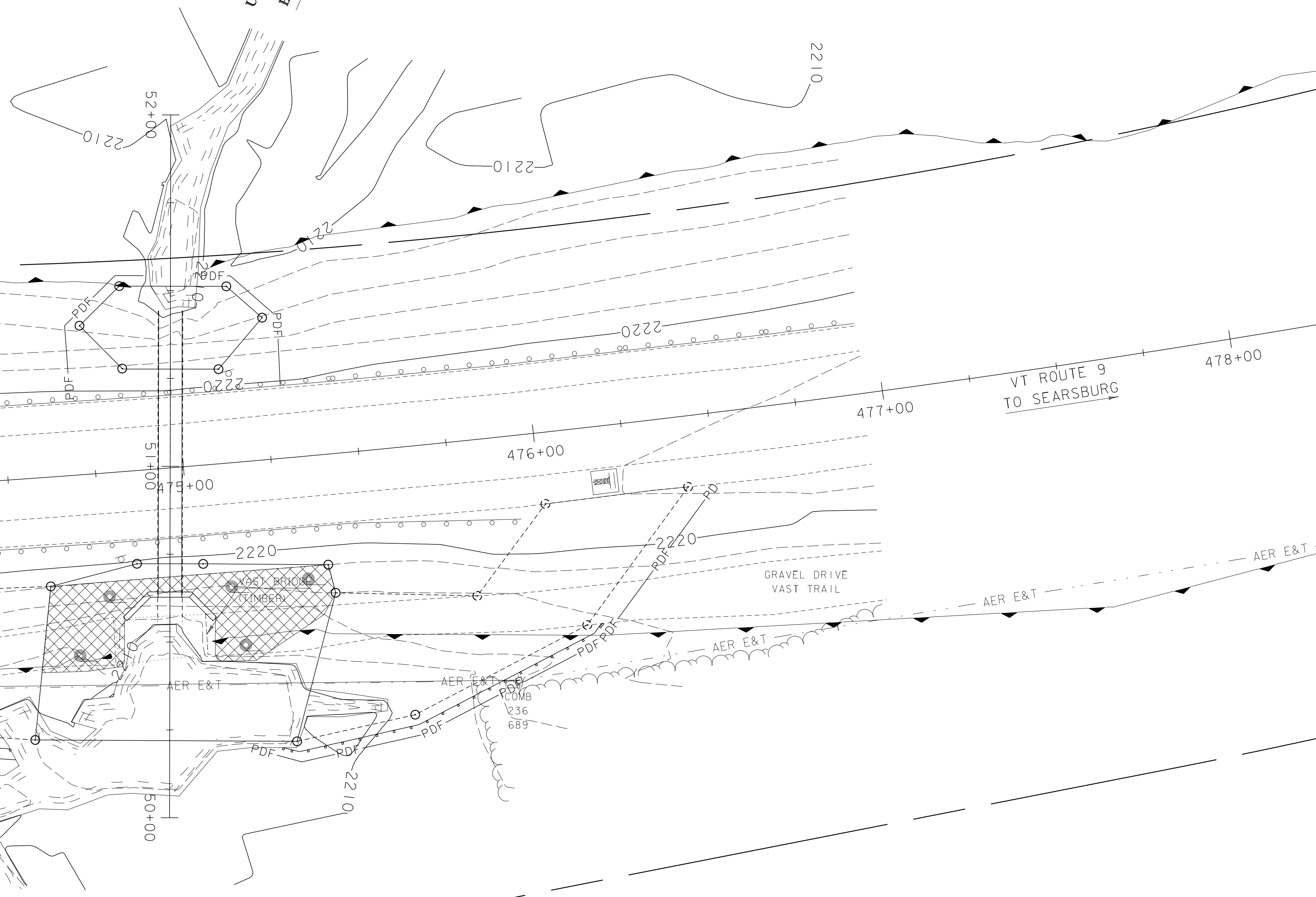




GREEN MOUNTAIN NATIONAL FOREST

EXISTING RIGHT-OF-WAY

UNNAMED BROOK



VT ROUTE 9 TO BENNINGTON

VT ROUTE 9 TO SEARSBURG

GRAVEL DRIVE VAST TRAIL

GRAVEL DRIVE VAST TRAIL

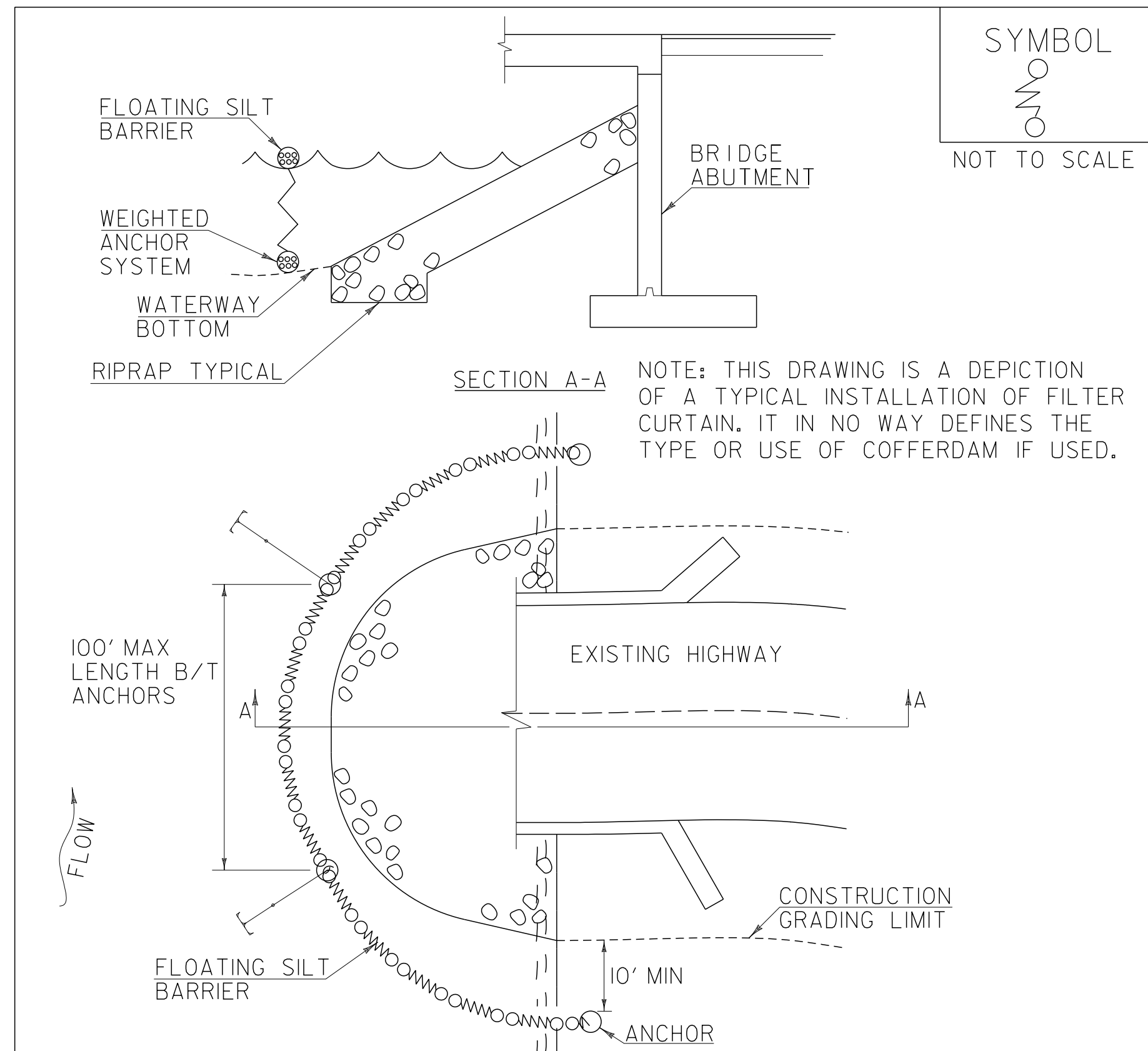
EXISTING RIGHT-OF-WAY

GREEN MOUNTAIN NATIONAL FOREST

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



PROJECT NAME:	WOODFORD	PLOT DATE:	11/14/2018
PROJECT NUMBER:	BF 010-I(52)	DRAWN BY:	B. WILLIAMS
FILE NAME:	z13b270epsc_const.dgn	CHECKED BY:	T. LEVINS
PROJECT LEADER:	T. LEVINS	DESIGNED BY:	B. WILLIAMS
EPSC CONSTRUCTION SITE PLAN			SHEET 22 OF 41



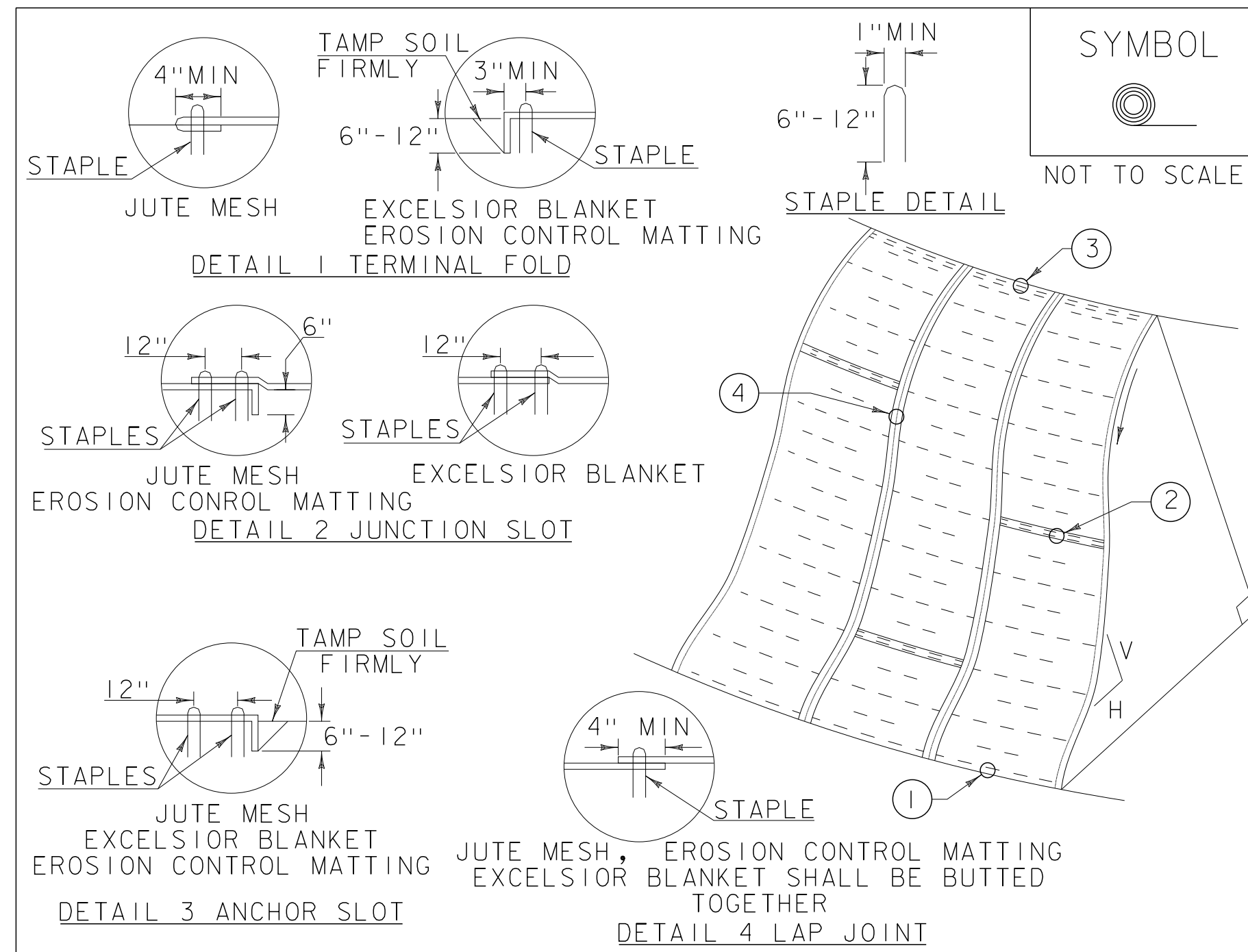
**CONSTRUCTION SPECIFICATIONS**

1. FILTER CURTAIN SHALL NOT BE PLACED ACROSS A FLOWING WATERWAY, OR IN A WATERWAY WITH STREAM VELOCITIES GREATER THAN 1.5 FEET/SECOND.
2. MAXIMUM 100' LENGTH BETWEEN ANCHORS.
3. LAST SECTION SHALL TERMINATE A MINIMUM OF 10' BEYOND LIMIT OF DISTURBANCE.
4. THE WEIGHTED ANCHOR SYSTEM SHALL BE A TYPE WHICH ALLOWS THE CURTAIN TO CONFORM TO THE BOTTOM OF THE WATERWAY.
5. THE CURTAIN SHALL BE REMOVED BY SLOWLY PULLING TOWARD THE SHORE MINIMIZING THE ESCAPE OF SEDIMENTS INTO WATERWAY.

FILTER CURTAIN

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF
SEPTEMBER 4, 2009	WHF

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 FOR GEOTEXTILE FOR FILTER CURTAIN.



**CONSTRUCTION SPECIFICATIONS**

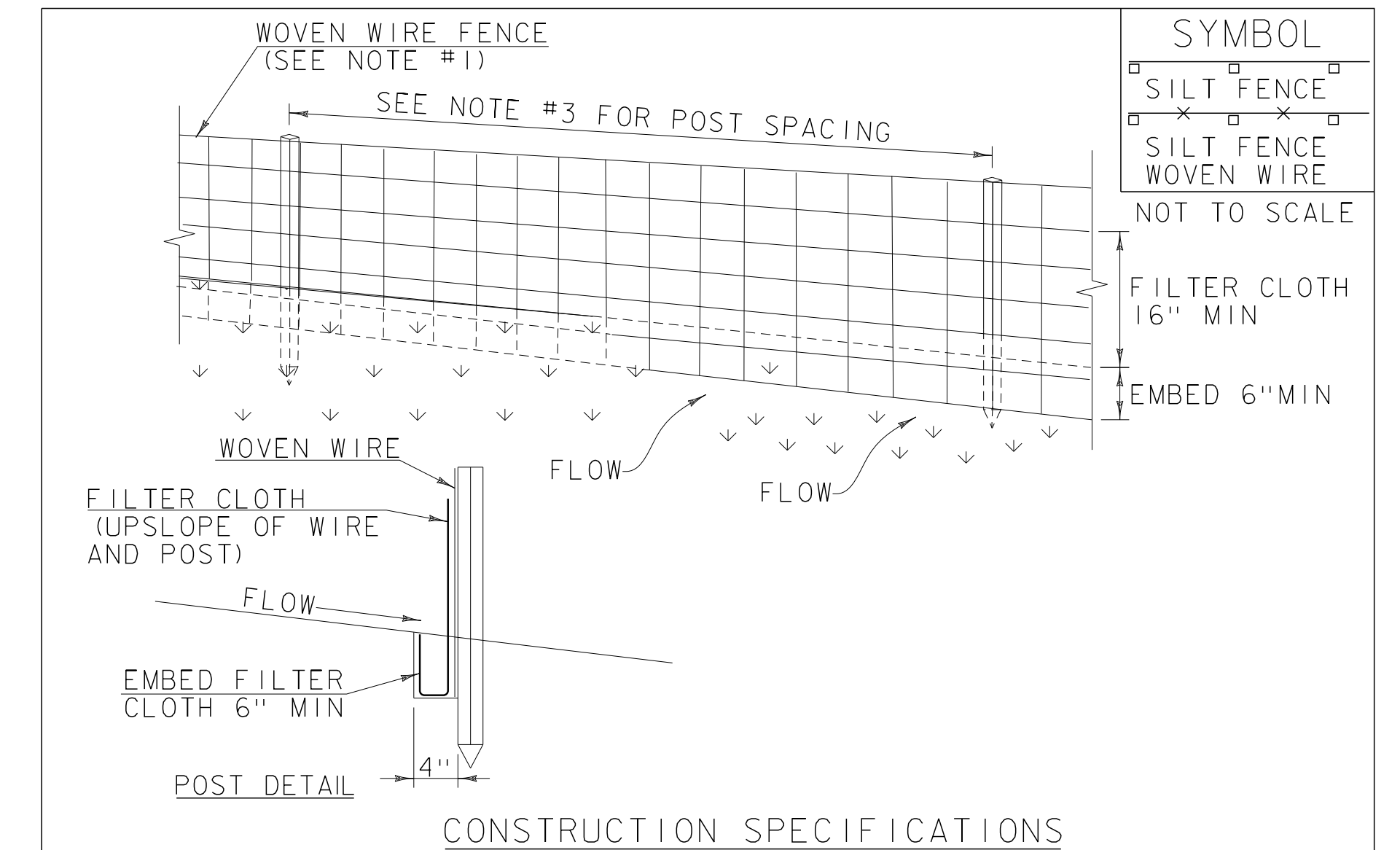
1. APPLY TO SLOPES GREATER THAN 3H:1V OR WHERE NECESSARY TO AID IN ESTABLISHING VEGETATION.
2. APPLY FERTILIZER, LIME SEED PRIOR TO PLACING MATTING.
3. STAPLES ARE TO BE PLACED ALTERNATELY, IN COLUMNS APPROXIMATELY 2' APART AND IN ROWS APPROXIMATELY 3' APART. APPROXIMATELY 175 STAPLES ARE REQUIRED PER 4' X 225' ROLL OF MATERIAL AND 125 STAPLES ARE REQUIRED PER 4' X 150' ROLL OF MATERIAL.
4. DISTURBED AREAS SHALL BE SMOOTHLY GRADED. EROSION CONTROL MATERIAL SHALL BE PLACED LOOSELY OVER GROUND SURFACE. DO NOT STRETCH.
5. ALL TERMINAL ENDS AND TRANSVERSE LAPS SHALL BE STAPLED AT APPROXIMATELY 12" INTERVALS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
ORIGINALLY DEVELOPED BY USDA-NRCS  
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ROLLED EROSION CONTROL PRODUCT (RECP) SIDE SLOPE

NOTES:  
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.  
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 AND AS SHOWN IN THE PLANS FOR TEMPORARY EROSION MATTING (PAY ITEM 653.20), OR PERMANENT EROSION MATTING (PAY ITEM 653.21).

REVISIONS	
APRIL 16, 2007	JMF
JANUARY 13, 2009	WHF



1. WOVEN WIRE REINFORCED FENCE IS REQUIRED WITHIN 100' UPSLOPE OF RECEIVING WATERS WHEN THE PROJECT FALLS UNDER A CONSTRUCTION STORMWATER PERMIT. WOVEN WIRE SHALL BE A MIN. 14 GAUGE WITH A 6" MAX. MESH OPENING.
2. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAF1100X, STABILINKA T140N OR APPROVED EQUIVALENT.
3. POST SPACING FOR WIRE-BACKED FENCE SHALL BE 10' MAXIMUM. FOR FILTER-CLOTH FENCE, WHEN ELONGATION IS >50%, POST SPACING SHALL NOT EXCEED 4' AND WHEN ELONGATION IS <50%, POST SPACING SHALL NOT EXCEED 6'.
4. WOVEN WIRE FENCE IS TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. FILTER CLOTH IS TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN SEDIMENT REACHES HALF OF FABRIC HEIGHT.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
ORIGINALLY DEVELOPED BY USDA-NRCS  
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SILT FENCE

NOTES:  
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 AND AS SHOWN IN THE PLANS FOR GEOTEXTILE FOR SILT FENCE (PAY ITEM 649.51), OR GEOTEXTILE FOR SILT FENCE, WOVEN WIRE REINFORCED (PAY ITEM 649.515).

REVISIONS	
MARCH 21, 2008	WHF
DECEMBER 11, 2008	WHF
JANUARY 13, 2009	WHF

PROJECT NAME: WOODFORD  
PROJECT NUMBER: BF 010-1(52)

FILE NAME: sl3b270epsc_det1.dgn PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
EPSC DETAILS 1 SHEET 23 OF 41

VAOT LOW GROW/FINE FESCUE MIX						
WEIGHT	LBS/AC		NAME	LATIN NAME	GERM	PURITY
	BROADCAST	HYDROSEED				
38%	57	95	CREEPING RED FESCUE	FESTUCA RUBRA VAR. RUBRA	90%	98%
29%	43.5	72.5	HARD FESCUE	FESTUCA LONGIFOLIA	85%	95%
15%	22.5	37.5	CHEWINGS FESCUE	FESTUCA RUBRA VAR. COMMUTATA	87%	95%
15%	22.5	37.5	ANNUAL RYEGRASS	LOLIUM MULTIFLORUM	90%	95%
3%	4.5	7.5	INERTS			
100%	150	250				

VAOT RURAL AREA MIX						
WEIGHT	LBS/AC		NAME	LATIN NAME	GERM	PURITY
	BROADCAST	HYDROSEED				
37.5%	22.5	45	CREEPING RED FESCUE	FESTUCA RUBRA VAR. RUBRA	85%	98%
37.5%	22.5	45	TALL FESCUE	FESTUCA ARUNDINACEA	90%	95%
5.0%	3	6	RED TOP	AGROSTIS GIGANTEA	90%	95%
15.0%	9	18	WHITE FIELD CLOVER	TRIFOLIUM REPENS	85%	98%
5.0%	3	6	ANNUAL RYE GRASS	LOLIUM MULTIFLORUM	85%	95%
100%	60	120				

GENERAL AMENDMENT GUIDANCE		
FERTILIZER	LIME	
10/20/10	AG LIME	PELLITIZED
500 LBS/AC	2 TONS/AC	1 TONS/AC

#### CONSTRUCTION GUIDANCE

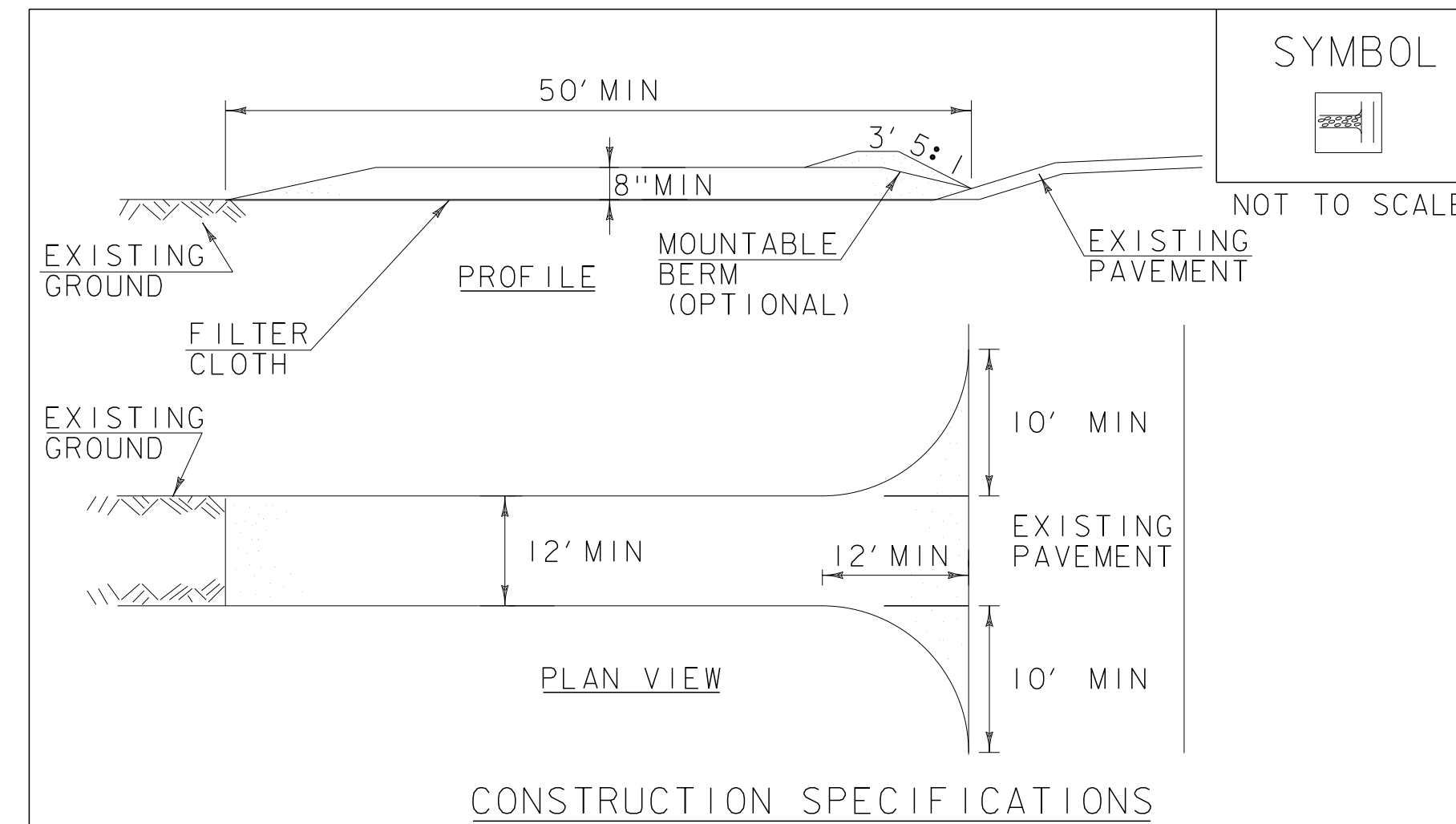
- SEED MIX: THE CONTRACTOR SHALL COORDINATE WITH THE RESIDENT ENGINEER ON WHICH SEED MIX TO USE.
- SEED MIX: USE AS INDICATED IN THE PLANS AND/OR FOR ALL ESTABLISHED UPLAND (NON WETLAND) AREAS DISTURBED BY THE CONTRACTOR.
- ALL SEED MIXTURES: SHALL NOT HAVE A WEED CONTENT EXCEEDING 0.40% BY WEIGHT AND SHALL BE FREE OF ALL NOXIOUS SEED.
- FERTILIZER AND LIMESTONE: SHALL FOLLOW RATES SHOWN ON PLAN OR AS DIRECTED BY THE ENGINEER.
- HAY MULCH: TO BE PLACED ON EARTH SLOPES AT THE RATE OF 2 TONS/ACRE, ACHIEVE 90% GROUND COVER OR AS DIRECTED BY THE ENGINEER.
- HYDROSEEDING: ALTHOUGH GUIDANCE IS GIVEN ABOVE THE SITE CONDITIONS AND THE TYPE OF HYDROSEED PROPOSED FOR USE WILL ULTIMATELY DICTATE THE AMOUNTS AND TYPES OF SOIL AMENDMENTS TO BE APPLIED.
- TURF ESTABLISHMENT: PLACING SEED, FERTILIZER, LIME AND MULCH PRIOR TO SEPTEMBER 15 AND AFTER APRIL 15 CAN BETTER ENSURE A VIGOROUS GROWTH OF GRASS.

ADAPTED FROM VTRANS TECHNICAL LANDSCAPE MANUAL FOR ROADWAYS AND TRANSPORTATION FACILITIES

#### TURF ESTABLISHMENT

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 651 FOR SEED (PAY ITEM 651.15)

REVISIONS	
JANUARY 12, 2015	WHF



#### CONSTRUCTION SPECIFICATIONS

- STONE SIZE- USE 1-4" STONE, RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
- LENGTH- NOT LESS THAN 50' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MINIMUM LENGTH APPLIES).
- THICKNESS- NOT LESS THAN 8".
- WIDTH- 12' MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24' IF SINGLE ENTRANCE TO SITE.
- GEOTEXTILE MUST BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
- SURFACE WATER- ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- MAINTENANCE- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
- WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED ACCORDING TO PERMIT REQUIREMENTS.

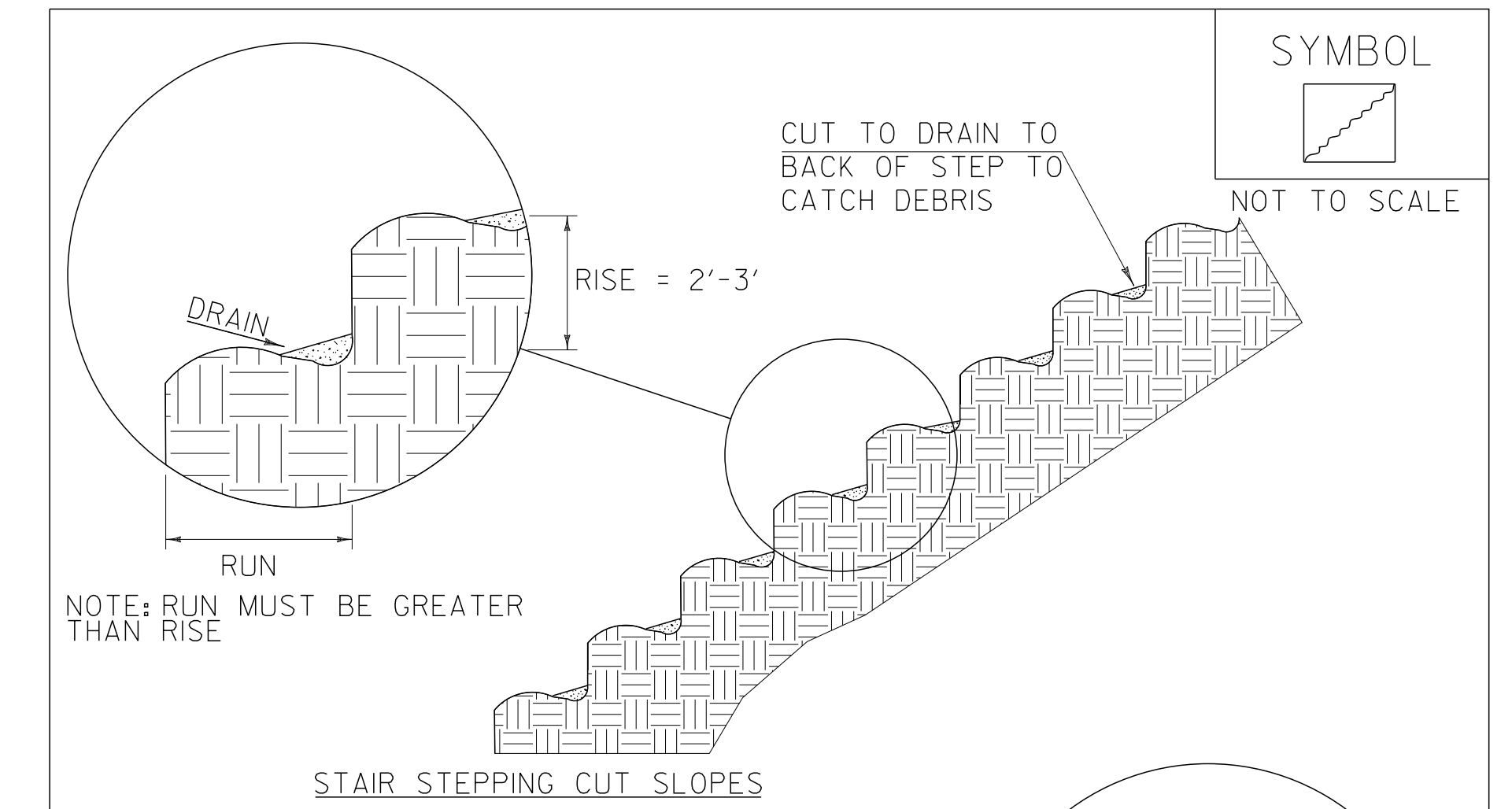
ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
ORIGINALLY DEVELOPED BY USDA-NRCS  
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

#### STABILIZED CONSTRUCTION ENTRANCE

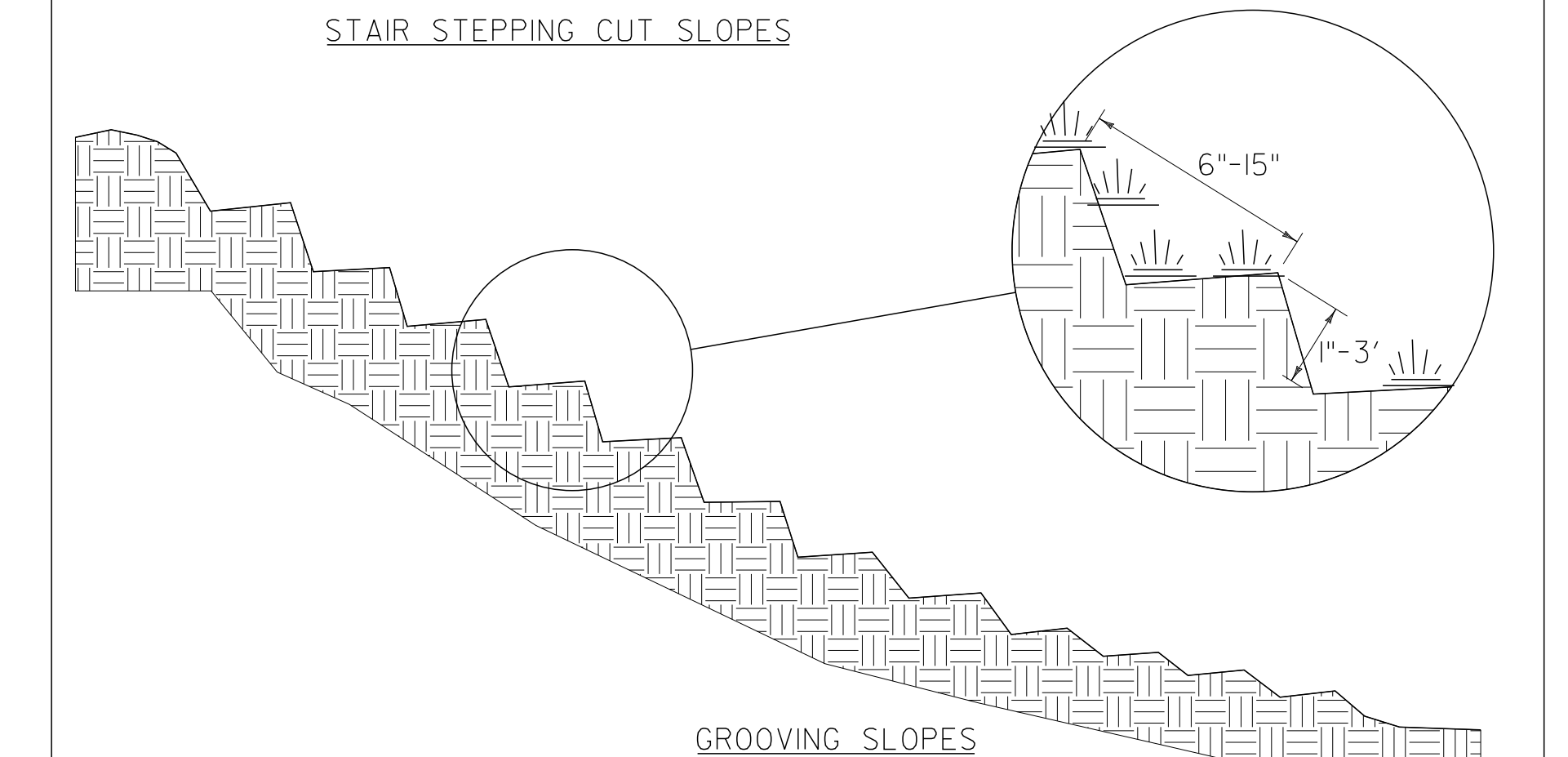
NOTES:  
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR VEHICLE TRACKING PAD (PAY ITEM 653.35) OR AS SPECIFIED IN THE CONTRACT.

REVISIONS	
MARCH 24, 2008	WHF
JANUARY 13, 2009	WHF



#### STAIR STEPPING CUT SLOPES



NOTE: GROOVE SLOPE BY CUTTING FURROWS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND RETAIN LIME, FERTILIZER AND SEED.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
ORIGINALLY DEVELOPED BY USDA-NRCS  
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

#### SURFACE ROUGHENING

NOTES:  
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

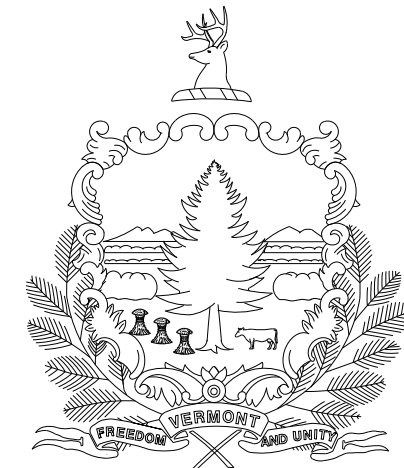
THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF

PROJECT NAME: WOODFORD  
PROJECT NUMBER: BF 010-1(52)

FILE NAME: sl3b270epsc_det2.dgn PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
EPSC DETAILS 2 SHEET 24 OF 41

# STATE OF VERMONT AGENCY OF TRANSPORTATION



## PROPOSED IMPROVEMENT BRIDGE PROJECT

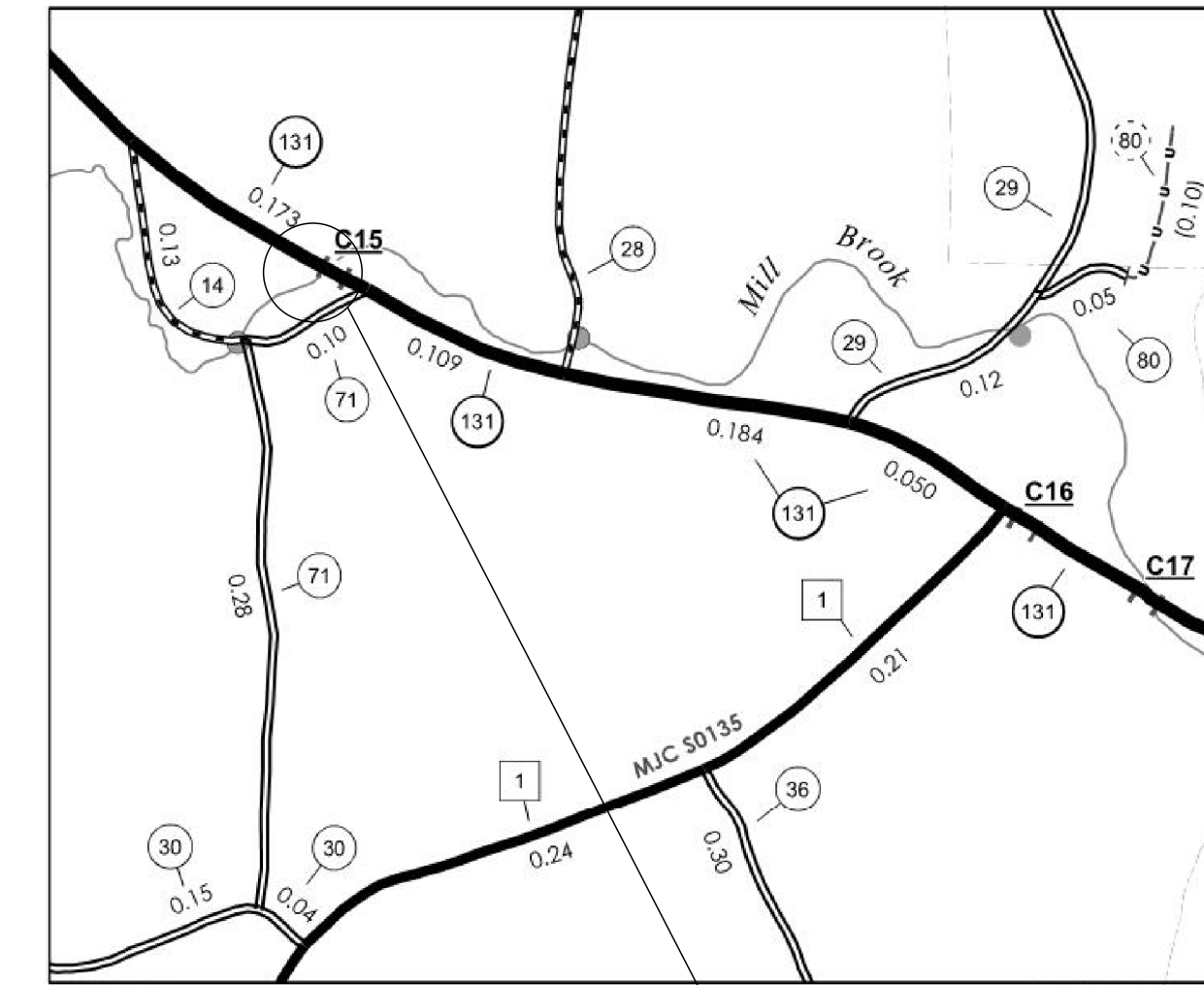
TOWN OF WEATHERSFIELD  
COUNTY OF WINDSOR

ROUTE NO : VT ROUTE 131, BRIDGE NO : 15

PROJECT LOCATION: APPROXIMATELY 0.33 MILES WEST OF THE INTERSECTION OF VT 131 AND TH-1 (WEATHERSFIELD CENTER ROAD).

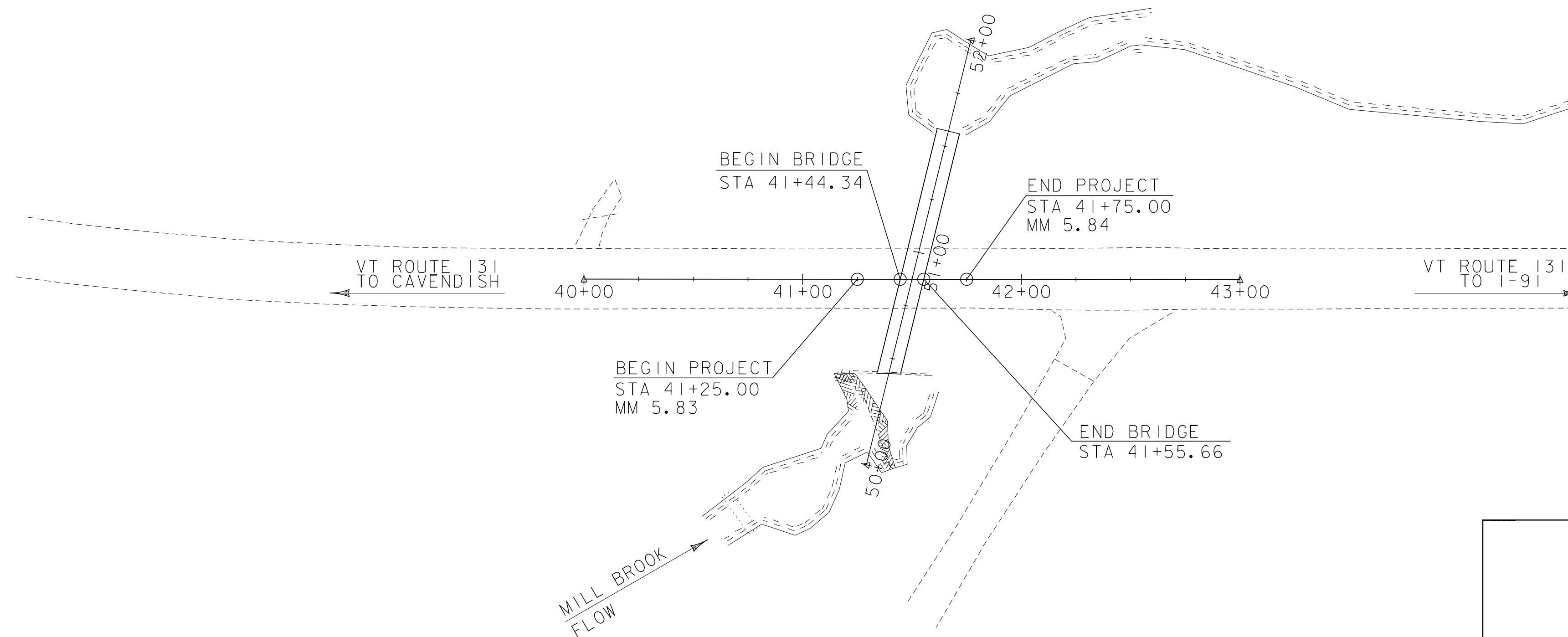
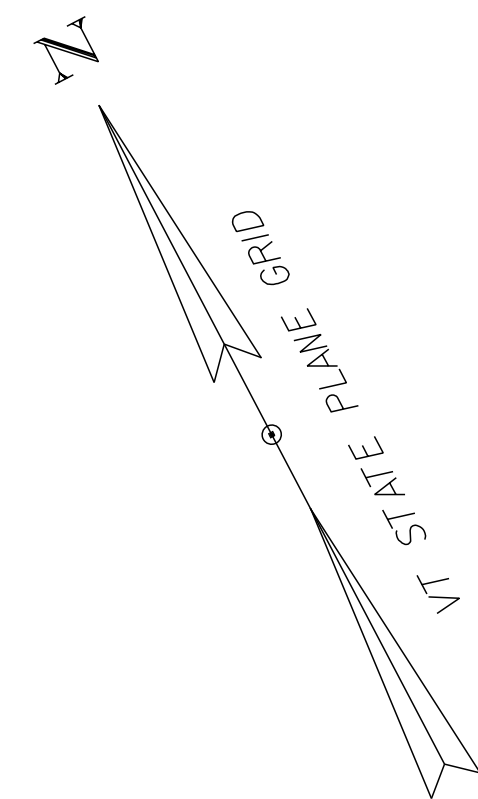
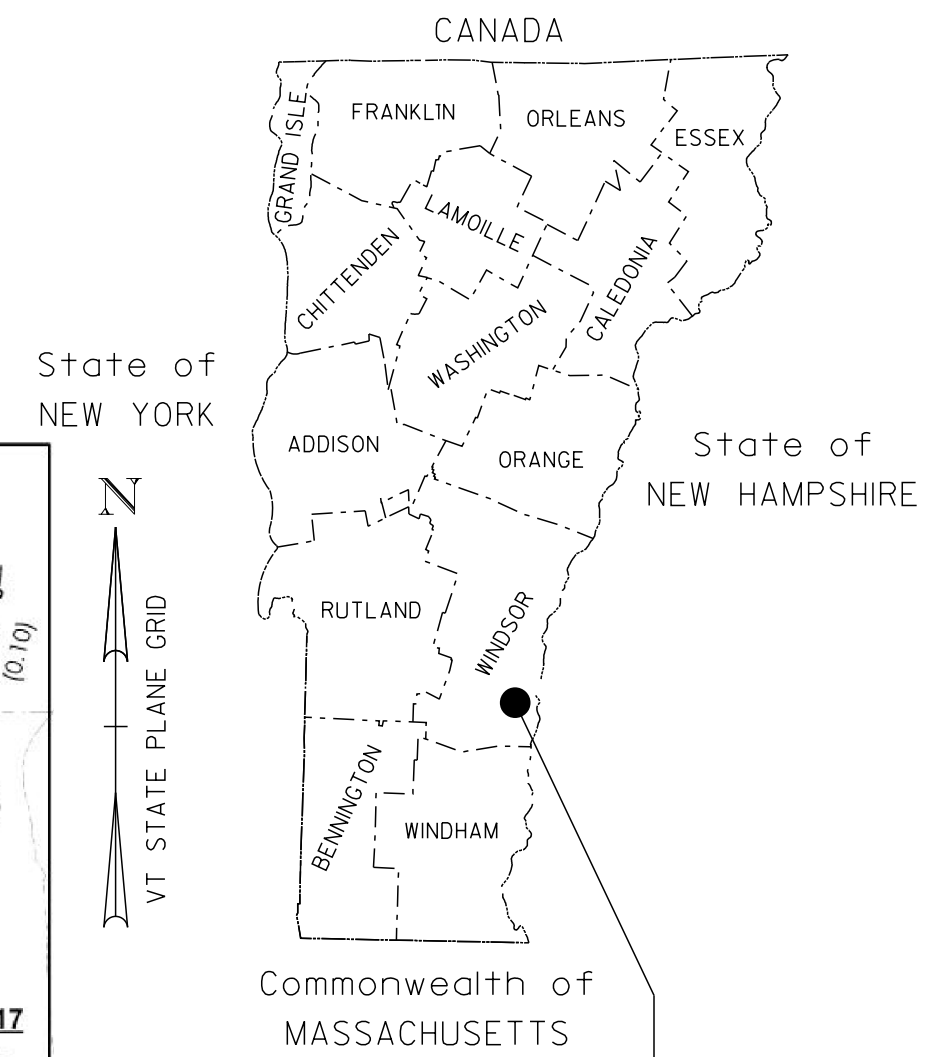
PROJECT DESCRIPTION: THE PROJECT SHALL CONSIST OF LINING THE EXISTING CULVERT WITH A CONCRETE SPRAY-ON LINER AND MINOR HEADWALL REPAIRS.

LENGTH OF STRUCTURE: 11.32 FEET  
LENGTH OF PROJECT: 50.00 FEET



LOCATION MAP

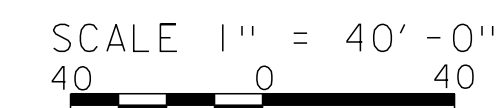
WEATHERSFIELD  
STP 0146 (16)



**CONTRACT PLANS  
14-NOV-2018**

CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL 2	
SURVEYED BY :	VTRANS
SURVEYED DATE :	02/21/2014
DATUM	
VERTICAL	NAVD88
HORIZONTAL	NAVD83 (1996)



GM2 Associates, Inc.  
197 Loudon Road, Suite 310  
Concord, NH 03301  
Tel: 603-856-7854  
Fax: 603-856-7855

DIRECTOR OF PROJECT DELIVERY	
APPROVED _____	DATE _____
PROJECT MANAGER : N. WARK	
PROJECT NAME :	WEATHERSFIELD
PROJECT NUMBER :	STP 0146 (16)
SHEET 25 OF 41 SHEETS	

# PRELIMINARY INFORMATION SHEET (CULVERT)

INDEX OF SHEETS

FINAL HYDRAULIC REPORT

PLAN SHEETS

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27	QUANTITY SHEET
28	TYPICAL SECTION
29	PROJECT NOTES
30	TIE SHEET
31	EXISTING CONDITIONS
32	LAYOUT SHEET
33	PROFILE
34	CHANNEL CROSS SECTIONS 1
35	CHANNEL CROSS SECTIONS 2
36	CHANNEL CROSS SECTIONS 3
37	EPSC NARRATIVE
38	EPSC CONSTRUCTION SITE PLAN
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STANDARDS LIST

T-1	TRAFFIC CONTROL GENERAL NOTES	4/25/2016
T-10	CONVENTIONAL ROADS CONSTRUCTION APPROACH SIGNING	8/6/2012

STRUCTURES DETAIL SHEETS

HYDROLOGIC DATA

Date: April 2017

DRAINAGE AREA : 2.9 Sq Mi  
 CHARACTER OF TERRAIN : Hilly to mountainous, forested with some open areas  
 STREAM CHARACTERISTICS : Sinuous perennial stream  
 NATURE OF STREAMBED : Cobbles and boulders

PEAK FLOW DATA - ANNUAL EXCEEDANCE PROBABILITY (AEP)

43% =	100 CFS	2% =	340
10% =	210	1% =	410
4% =	280	0.2% =	480

DATE OF FLOOD OF RECORD : Unknown  
 ESTIMATED DISCHARGE : Unknown  
 WATER SURFACE ELEV. : Unknown  
 NATURAL STREAM VELOCITY : @ 2% AEP = 9.0 fps ***  
 ICE CONDITIONS : Low  
 DEBRIS : Moderate  
 DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? No  
 IS ORDINARY RISE RAPID? No  
 IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? No  
 IF YES, DESCRIBE:

WATERSHED STORAGE: 4% HEADWATERS:  
 UNIFORM: X  
 IMMEDIATELY ABOVE SITE:

EXISTING STRUCTURE INFORMATION

STRUCTURE TYPE: Corrugated Metal Plate Pipe  
 YEAR BUILT: 1959  
 CLEAR SPAN(NORMAL TO STREAM): 11'  
 VERTICAL CLEARANCE ABOVE STREAMBED: 11'  
 WATERWAY OF FULL OPENING: 95 SQ FT  
 DISPOSITION OF STRUCTURE: Repair  
 TYPE OF MATERIAL UNDER SUBSTRUCTURE: Unknown

WATER SURFACE ELEVATIONS AT:

43% AEP =	785.00'	VELOCITY =	9.8 fps
10% AEP =	786.44'	"	12
4% AEP =	787.18'	"	13
2% AEP =	787.77'	"	13
1% AEP =	788.45'	"	14.0

LONG TERM STREAMBED CHANGES:

IS THE ROADWAY OVERTOPPED BELOW 1% AEP: No  
 FREQUENCY:  
 RELIEF ELEVATION:  
 DISCHARGE OVER ROAD @ 1% AEP:

UPSTREAM STRUCTURE

TOWN: Weathersfield DISTANCE: 330'  
 HIGHWAY #: TH 14 STRUCTURE #: BR 39  
 CLEAR SPAN: 12' CLEAR HEIGHT: 6'  
 YEAR BUILT:  
 FULL WATERWAY:  
 STRUCTURE TYPE: Concrete Slab Bridge

DOWNSTREAM STRUCTURE

TOWN: Weathersfield DISTANCE: 680'  
 HIGHWAY #: TH 28 STRUCTURE #: BR 45  
 CLEAR SPAN: 14'-6" CLEAR HEIGHT: 7'-6"  
 YEAR BUILT:  
 FULL WATERWAY:  
 STRUCTURE TYPE: Open Bottom CMPA

LRFR LOAD RATING FACTORS

LOADING LEVELS	TRUCK						
	H-20	HL-93	3S2	6 AXLE	3A STR.	4A STR.	5A SEMI
TONNAGE	20	36	36	66	30	34.5	38
INVENTORY							
POSTING							
OPERATING							
COMMENTS:	TABLE TO BE COMPLETED BY CONTRACTOR'S DESIGNER						

CULVERT DESIGN CRITERIA

- PROPOSED CULVERT IS A LINING
- CULVERT END IS NOT SKEWED AT OUTLET. SKEWED AT INLET HEADWALL.
- CULVERT WILL BE SET AT A SLOPE OF 3.03 IN. ON 10 FT.
- CULVERT WILL NOT REQUIRE FISH PASSAGE ACCOMODATIONS
- CULVERT CONSTRUCTION WILL REQUIRE TEMPORARY STREAM FLOW RELOCATION.

AS BUILT "REBAR" DETAIL

AS BUILT "REBAR" DETAIL		
LEVEL I	LEVEL II	LEVEL III
TYPE:	TYPE:	TYPE:
GRADE:	GRADE:	GRADE:

TRAFFIC DATA

YEAR	ADT	DHV	% D	% T	ADTT	
2017	4500	510	55	4	370	20 year ESAL for flexible pavement from 2017 to 2037 : N/A
2037	4800	540	55	5.9	590	40 year ESAL for flexible pavement from 2017 to 2057 : N/A
Design Speed : 50 mph						

PROPOSED STRUCTURE

STRUCTURE TYPE: Line Existing CMPP, Including Beveled Inlet Headwall

CLEAR SPAN(NORMAL TO STREAM): 10'-8"  
 VERTICAL CLEARANCE ABOVE STREAMBED: 10'-8"  
 WATERWAY OF FULL OPENING: 89.4 Sq Ft

WATER SURFACE ELEVATIONS AT:

43% AEP =	785.16'	VELOCITY =	11.7 fps
10% AEP =	786.60'	"	14.1
4% AEP =	787.34'	"	15.0
2% AEP =	788.00'	"	15.7
1% AEP =	788.72'	"	16.3

IS THE ROADWAY OVERTOPPED BELOW 1% AEP: No  
 FREQUENCY: N/A  
 RELIEF ELEVATION: N/A  
 DISCHARGE OVER ROAD @ 1% AEP: N/A

BRIDGE LOW CHORD ELEVATION: Top of Pipe = 792.8'  
 FREEBOARD: @ 2% AEP = 4.8'

SCOUR: N/A

REQUIRED CHANNEL PROTECTION: Stone Fill, Type IV / E4 Below OHW

PERMIT INFORMATION

AVERAGE DAILY FLOW: - DEPTH OR ELEVATION:  
 ORDINARY LOW WATER: -  
 ORDINARY HIGH WATER: -

TEMPORARY BRIDGE REQUIREMENTS

STRUCTURE TYPE: N/A  
 CLEAR SPAN (NORMAL TO STREAM): N/A  
 VERTICAL CLEARANCE ABOVE STREAMBED: N/A  
 WATERWAY AREA OF FULL OPENING: N/A

ADDITIONAL INFORMATION

*** Natural channel velocities vary greatly due to the waterfall upstream and other changes slope. 9.0 fps is based on an 2.5% channel slope.

TRAFFIC MAINTENANCE NOTES

- MAINTAIN TWO-WAY TRAFFIC ON THE EXISTING STRUCTURE.
- INSTALL AND MAINTAIN TRAFFIC SIGNALS.
- SIDEWALKS ARE NOT NECESSARY

DESIGN VALUES

1. DESIGN LIVE LOAD	HL-93
2. FUTURE PAVEMENT	dp: ---
3. CULVERT OPENING	D: 11.00 FT
4. MIN. MID-SPAN POS. CAMBER @ RELEASE (PRESTRESSED UNITS)	Δ: ---
5. PRESTRESSING STRAND	f _y : ---
6. PRESTRESSED CONCRETE STRENGTH	f' _c : ---
7. PRESTRESSED CONCRETE RELEASE STRENGTH	f' _{cr} : ---
8. CONCRETE, HIGH PERFORMANCE CLASS AA	f' _c : --- KSI
9. CONCRETE, HIGH PERFORMANCE CLASS A	f' _c : --- KSI
10. CONCRETE, HIGH PERFORMANCE CLASS B	f' _c : --- KSI
11. CONCRETE, CLASS C	f' _c : --- KSI
12. REINFORCING STEEL	f _y : 60 KSI
13. STRUCTURAL STEEL AASHTO M270	f _y : ---
14. NOMINAL BEARING RESISTANCE OF SOIL	q _n : --- KSF
15. SOIL BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: ---
16. NOMINAL BEARING RESISTANCE OF ROCK	q _n : --- KSF
17. ROCK BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	φ: ---
18. PILE RESISTANCE FACTOR	φ: ---
19. LATERAL PILE DEFLECTION	Δ: --- INCH
20. BASIC WIND SPEED	V _{3s} : ---
21. MINIMUM GROUND SNOW LOAD	p _g : ---
22. SEISMIC DATA	PGA: --- S _s : --- S ₁ : ---
23.	---
24.	---
25.	---
26.	---

PROJECT NAME: WEATHERSFIELD

PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266pi.dgn PLOT DATE: 11/14/2018  
 PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
 DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
 PRELIMINARY INFORMATION SHEET SHEET 26 OF 41



# QUANTITY SHEET 1

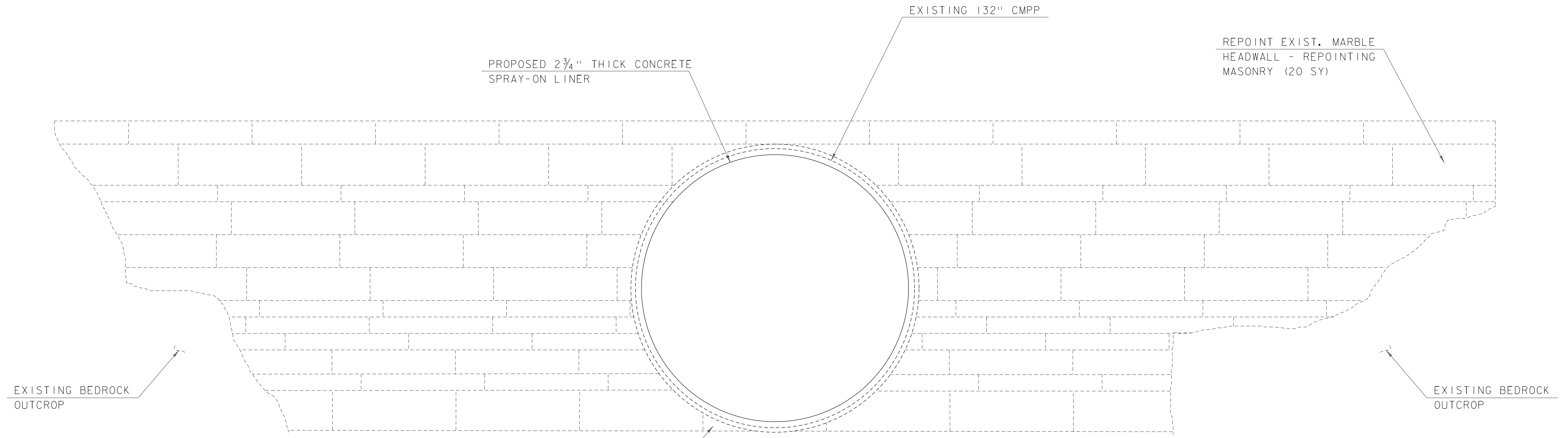
SUMMARY OF ESTIMATED QUANTITIES										TOTALS		DESCRIPTIONS				DETAILED SUMMARY OF QUANTITIES			
							ROADWAY	EROSION CONTROL	BRIDGE	FULL C.E. ITEMS	GRAND TOTAL	FINAL	UNIT	ITEMS	ITEM NUMBER	ROUND	QUANTITIES	UNIT	ITEMS
							0.09				0.09		ACRE	THINNING AND TRIMMING	201.30				
									1		1		CY	TRENCH EXCAVATION OF EARTH, EXPLORATORY (N.A.B.I.)	204.22				
									1		1		GAL	WATER REPELLENT, SILANE	514.10				
									1		1		CY	CONCRETE, CLASS D	541.31				
									2		2		CY	CONTROLLED DENSITY (FLOWABLE) FILL	541.45				
									20		20		SY	REPOINTING MASONRY	602.30				
									1		1		CY	REBUILT STONE MASONRY	602.35				
									2		2		SY	REPAIRING STONE MASONRY	602.40				
							200				200		HR	FLAGGERS	630.15				
										1	1		LS	FIELD OFFICE, ENGINEERS (STP 0146(16))	631.10				
										1	1		LS	TESTING EQUIPMENT, CONCRETE (STP 0146(16))	631.16				
										3000	3000		DL	FIELD OFFICE COMMUNICATIONS (N.A.B.I.) (STP 0146(16))	631.26				
							1				1		LS	MOBILIZATION/DEMobilIZATION (STP 0146(16))	635.11				
								38			38		SY	GEOTEXTILE FOR SILT FENCE	649.51				
								57			57		SY	GEOTEXTILE FOR FILTER CURTAIN	649.61				
								2			2		LB	SEED	651.15				
								20			20		LB	FERTILIZER	651.18				
								0.1			0.1		TON	AGRICULTURAL LIMESTONE	651.20				
								0.1			0.1		TON	HAY MULCH	651.25				
								20			20		CY	TOPSOIL	651.35				
								1			1		LS	EPSC PLAN (STP 0146(16))	652.10				
								20			20		HR	MONITORING EPSC PLAN	652.20				
								1			1		LU	MAINTENANCE OF EPSC PLAN (N.A.B.I.) (STP 0146(16))	652.30				
								110			110		SY	PERMANENT EROSION MATTING	653.21				
								15			15		CY	VEHICLE TRACKING PAD	653.35				
								1			1		EACH	FILTER BAG	653.45				
								40			40		LF	BARRIER FENCE	653.50				
								470			470		LF	PROJECT DEMARCATION FENCE	653.55				
									114		114		LF	SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 132" PIPE)	900.640				
									1		1		LS	SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM) (STP 0146(16))	900.645				
							1				1		LS	SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE) (STP 0146(16))	900.645				

PROJECT NAME: WEATHERSFIELD  
PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266qs.dgn  
PROJECT LEADER: T. LEVINS  
DESIGNED BY: B. WILLIAMS  
QUANTITY SHEET

PLOT DATE: 11/14/2018  
DRAWN BY: B. WILLIAMS  
CHECKED BY: T. LEVINS  
SHEET 27 OF 41





PROPOSED 2 3/4" THICK CONCRETE  
SPRAY-ON LINER

EXISTING 132" CMPP

REPOINT EXIST. MARBLE  
HEADWALL - REPOINTING  
MASONRY (20 SY)

EXISTING BEDROCK  
OUTCROP

EXISTING BEDROCK  
OUTCROP

FILL VOIDS BETWEEN INLET HEADWALL AND EXISTING  
PIPE WITH CONTROLLED DENSITY (FLOWABLE) FILL  
ABOVE ORDINARY HIGH WATER (OHW) FLOW LINE AND  
WITH CONCRETE, CLASS D BELOW OHW FLOW LINE (TYP.)

**TYPICAL SECTION**

SCALE: 1/2" = 1'-0"

**NOTE:**  
THE CONCRETE LINER SHALL BE  
BEVELED 45° AT THE INLET END.



PROJECT NAME: WEATHERSFIELD	
PROJECT NUMBER: STP 0146(16)	
FILE NAME: z00c266typical.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
TYPICAL SECTION	SHEET 28 OF 41

**GENERAL NOTES:**

1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO STATE OF VERMONT AGENCY OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR CONSTRUCTION, DATED 2011, AND THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION, DATED 2014, AND ITS LATEST REVISIONS.
2. ALL WORK AND ANY ASSOCIATED ACTIVITY ON THIS PROJECT SHALL BE PERFORMED WITHIN THE PROPOSED PROJECT LIMITS AS SHOWN ON THE PLANS. ALL WORK TO BE COMPLETED WITHIN THE PROJECT LIMITS, BUT OUTSIDE OF THE RIGHT-OF-WAY SHALL BE DONE SO IN ACCORDANCE WITH TRAFFIC CONTROL NOTE 2 ON THIS SHEET.
3. DIMENSIONS, ANGLES, AND ELEVATIONS SHOWN ON THESE PLANS HAVE BEEN OBTAINED FROM SURVEY INFORMATION AND LIMITED FIELD INVESTIGATION, AND MAY NOT ACCURATELY REFLECT ACTUAL FIELD CONDITIONS. ACCORDINGLY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING FIELD MEASUREMENTS FOR ALL STRUCTURE COMPONENTS IMPACTED BY THE WORK (EXISTING OR PROPOSED) TO ASSURE CONSISTENCY WITH THE PROPOSED MODIFICATIONS. ANY DISCREPANCIES IN DIMENSIONS, CHARACTER, OR EXTENT OF THE EXISTING FEATURES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ADVANCING THE WORK. FABRICATION DRAWINGS REQUIRED FOR VARIOUS ITEMS OF THE WORK SHALL INDICATE THE ACTUAL FIELD MEASUREMENTS AND SHALL BE SO NOTED.
4. ALL DIMENSIONS ARE HORIZONTAL OR VERTICAL, AND ARE GIVEN AT 68 DEGREES FAHRENHEIT, UNLESS OTHERWISE NOTED.
5. IT IS EXPECTED THAT CULVERT LINING AND MASONRY HEADWALL REPAIRS WILL BE THE EXTENT OF THE WORK, AS NOTED ON THE PLANS. DURING THE COURSE OF CONSTRUCTION, IF THE CONTRACTOR SEES AN AREA OF CONCERN, SUCH AS VOIDS AROUND THE EXISTING CULVERT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE ENGINEER SHALL MAKE A DETERMINATION AS TO THE NEED FOR FURTHER EXPLORATION.
6. THE CONTRACTOR SHALL TAKE MEASURES TO ENSURE OVERHEAD UTILITY LINES ARE NOT IMPACTED BY CONSTRUCTION. SEE THE SPECIAL PROVISIONS FOR ADDITIONAL UTILITY INFORMATION AND REQUIREMENTS.

**CONCRETE NOTES:**

1. CONCRETE PAYMENT AND CLASSIFICATION WILL BE AS FOLLOWS:
  - A. FILLING VOIDS BELOW PIPE OHW FLOW LINE: ITEM 541.31, CONCRETE CLASS D.
  - B. FILLING VOIDS ABOVE PIPE OHW FLOW LINE: ITEM 541.45, CONTROLLED DENSITY (FLOWABLE) FILL.
2. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1 INCH BY 1 INCH, UNLESS OTHERWISE NOTED.
3. WATER REPELLENT, SILANE SHALL BE APPLIED TO ALL EXPOSED CONCRETE SURFACES. PAYMENT WILL BE MADE UNDER ITEM 514.10, "WATER REPELLENT, SILANE". APPLICATION RATE OF "WATER REPELLENT, SILANE" SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

**PIPE REHABILITATION NOTES:**

1. TREE REMOVAL AND THINNING AND TRIMMING OF TREES MUST BE COORDINATED WITH THE TOWN OF WEATHERSFIELD.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR ANY DAMAGE THAT OCCURS TO THE SIDE SLOPES OR TOWN HIGHWAY AS A RESULT OF CONSTRUCTION ACTIVITIES.
3. THE EXISTING CULVERT SHALL REMAIN UNDISTURBED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATION OF THE EXISTING PIPE TO THE SATISFACTION OF THE ENGINEER. THE CONTRACTOR SHALL REMOVE SEDIMENT, LARGE STONES, AND/OR LARGE DEBRIS FROM THE INSIDE OF THE EXISTING CULVERT PRIOR TO INSTALLATION OF THE NEW LINER. PAYMENT FOR THIS WORK WILL BE INCIDENTAL TO CONTRACT ITEM 900.640, "SPECIAL PROVISION (CONCRETE SPRAY-ON LINER) (EXISTING 132" PIPE)".
4. THE CONTRACTOR SHALL FILL ANY VOIDS BELOW THE ORDINARY HIGH WATER MARK IN THE CULVERT FROM WITHIN THE CULVERT BEFORE INSTALLING THE LINER. PAYMENT FOR THIS WORK SHALL BE MADE UNDER ITEM 541.31, "CONCRETE, CLASS D".
5. THE CONTRACTOR SHALL FILL ANY VOIDS ABOVE THE ORDINARY HIGH WATER MARK IN THE CULVERT FROM WITHIN THE CULVERT BEFORE INSTALLING THE LINER. PAYMENT FOR THIS WORK SHALL BE MADE UNDER ITEM 541.45, "CONTROLLED DENSITY (FLOWABLE) FILL".
6. THE EXISTING MARBLE HEADWALL SHALL BE RETAINED AT THE UPSTREAM END OF THE CULVERT. REPAIRS TO THE EXISTING HEADWALL SHALL BE COMPLETED AS SHOWN IN THE PLANS. DURING THE COURSE OF CONSTRUCTION, IF THE CONTRACTOR SEES ADDITIONAL REPAIRS THAT SHOULD BE MADE TO THE EXISTING HEADWALLS, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE ENGINEER WILL MAKE A DETERMINATION IF THE ADDITIONAL REPAIRS SHALL BE MADE. THIS WORK SHALL BE PAID UNDER ITEM 602.40, "REPAIRING STONE MASONRY", ITEM 602.35, "REBUILT STONE MASONRY", OR ITEM 602.30, "REPOINTING MASONRY".
7. VOIDS LOCATED BETWEEN THE EXISTING HEADWALL AND PIPE SHALL BE FILLED WITH FLOWABLE FILL AND/OR CONCRETE AS SHOWN ON THE PLANS. IF ADDITIONAL VOIDS ARE FOUND DURING CONSTRUCTION, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE ENGINEER WILL DETERMINE IF THE VOIDS ARE REQUIRED TO BE FILLED. THIS WORK SHALL BE PAID UNDER ITEM 541.45, "CONTROLLED DENSITY (FLOWABLE) FILL" OR ITEM 541.31, "CONCRETE, CLASS D", DEPENDING UPON THE LOCATION RELATIVE TO THE OHW.

**TEMPORARY RELOCATION OF STREAM NOTES:**

1. ITEM 900.645, "SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM)," SHALL BE USED TO DIVERT THE MILL BROOK FLOW AROUND THE CONSTRUCTION AREA. THE CONTRACTOR SHALL SUBMIT A PLAN SHOWING THE PROPOSED METHOD OF DIVERTING THE BROOK AND ALLOWING THE REPAIRS TO THE EXISTING HEADWALL. THE INSTALLATION OF THE CONCRETE LINER TO BE PERFORMED IN THE DRY. ANY METHOD USED SHALL BE PAID UNDER ITEM 900.645, "SPECIAL PROVISION (TEMPORARY RELOCATION OF STREAM)" AND SHALL INCLUDE, BUT NOT BE LIMITED TO:
  - A. THE TEMPORARY PIPE HARDWARE, PUMP RENTALS, AND MONITORING OF THE PUMP DIVERSION.
  - B. ANY EXCAVATION, IMPACTS, OR EROSION CONTROL MEASURES NEEDED TO INSTALL THE TEMPORARY DIVERSION AND REMOVE THE TEMPORARY DIVERSION OUTSIDE THE IMPACTS SHOWN ON THE PLANS.
  - C. INCIDENTALS USED WHILE DIVERTING THE WATER TO THE TEMPORARY DIVERSION (SANDBAGS, PUMPS, ETC.).
2. MILL BROOK SHALL BE DIVERTED DURING LOW FLOW CONDITIONS ONLY. SEE PERMIT FOR REQUIREMENTS.

**TRAFFIC CONTROL NOTES:**

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF A SITE SPECIFIC TRAFFIC CONTROL PLAN FOR ALL STAGES OF CONSTRUCTION. THE PLAN SHALL CLEARLY DETAIL HOW TRAFFIC WILL BE MAINTAINED. THE PLAN SHALL SPECIFY ALL CONSTRUCTION ACTIVITIES REQUIRING ALTERNATING ONE-WAY TRAFFIC, RELATE THOSE ACTIVITIES TO THE CONSTRUCTION SCHEDULE, AND SHOW APPROPRIATE TEMPORARY TRAFFIC CONTROL. ALL COSTS WILL BE INCLUDED IN ITEM 900.645 "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".
2. JARVIS ROAD, TH 71, MAY BE CLOSED TO TWO-WAY TRAFFIC FOR UP TO A 72-HOUR DURATION. THE CONTRACTOR SHALL COORDINATE THE CLOSURE WITH THE TOWN MANAGER AND ADJACENT PROPERTY OWNERS A MINIMUM OF THREE WEEKS PRIOR TO THE ROAD CLOSURE. COORDINATION SHALL BE SUBSIDIARY TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".

ED MORRIS, TOWN MANAGER PHONE: (802) 674-2626  
 TOWN OF WEATHERSFIELD  
 P.O. BOX 550  
 ASCUTNEY, VT 05030

PROJECT NAME: WEATHERSFIELD  
 PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266notes.dgn PLOT DATE: 11/14/2018  
 PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
 DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
 PROJECT NOTES SHEET 29 OF 41



GPS CONTROL POINTS

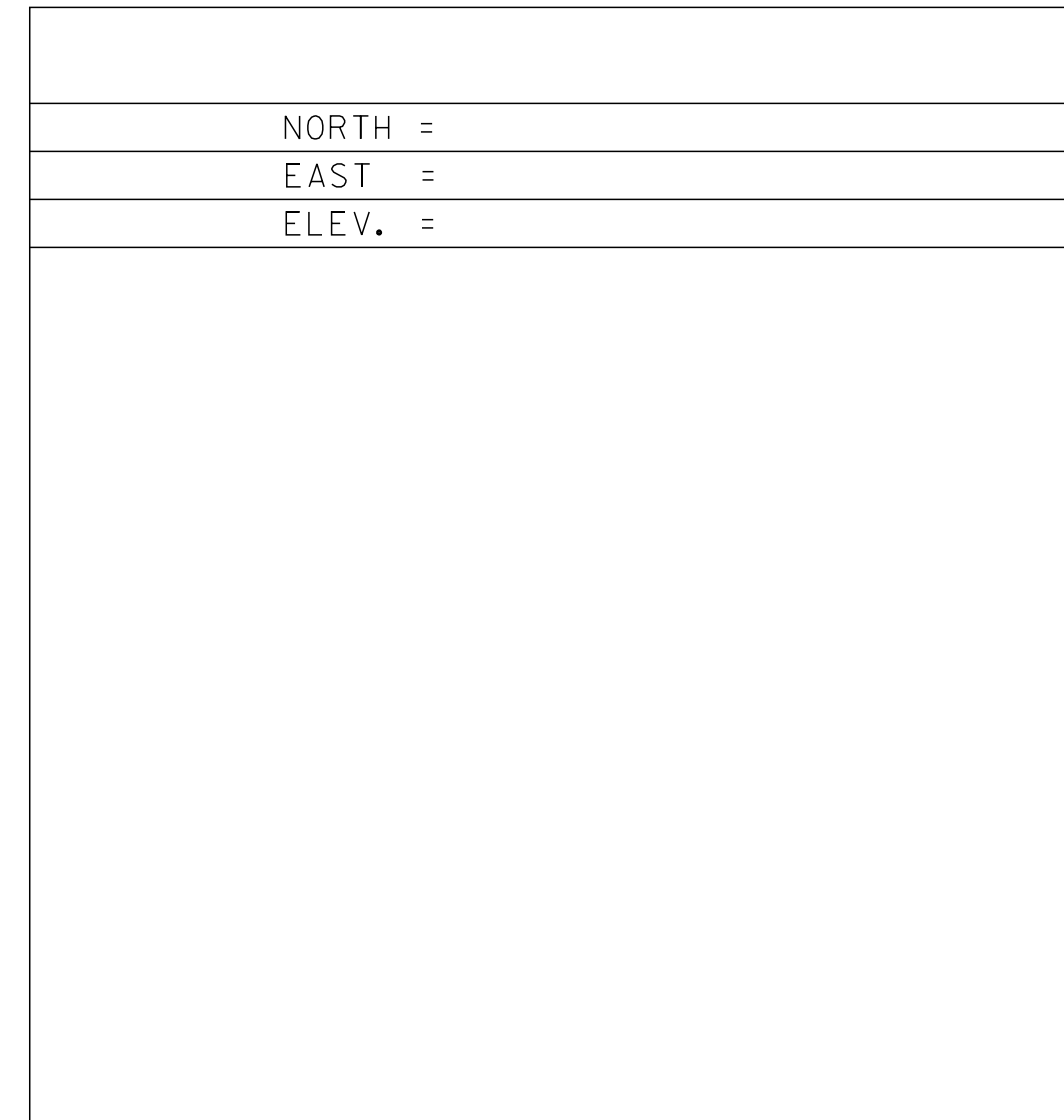
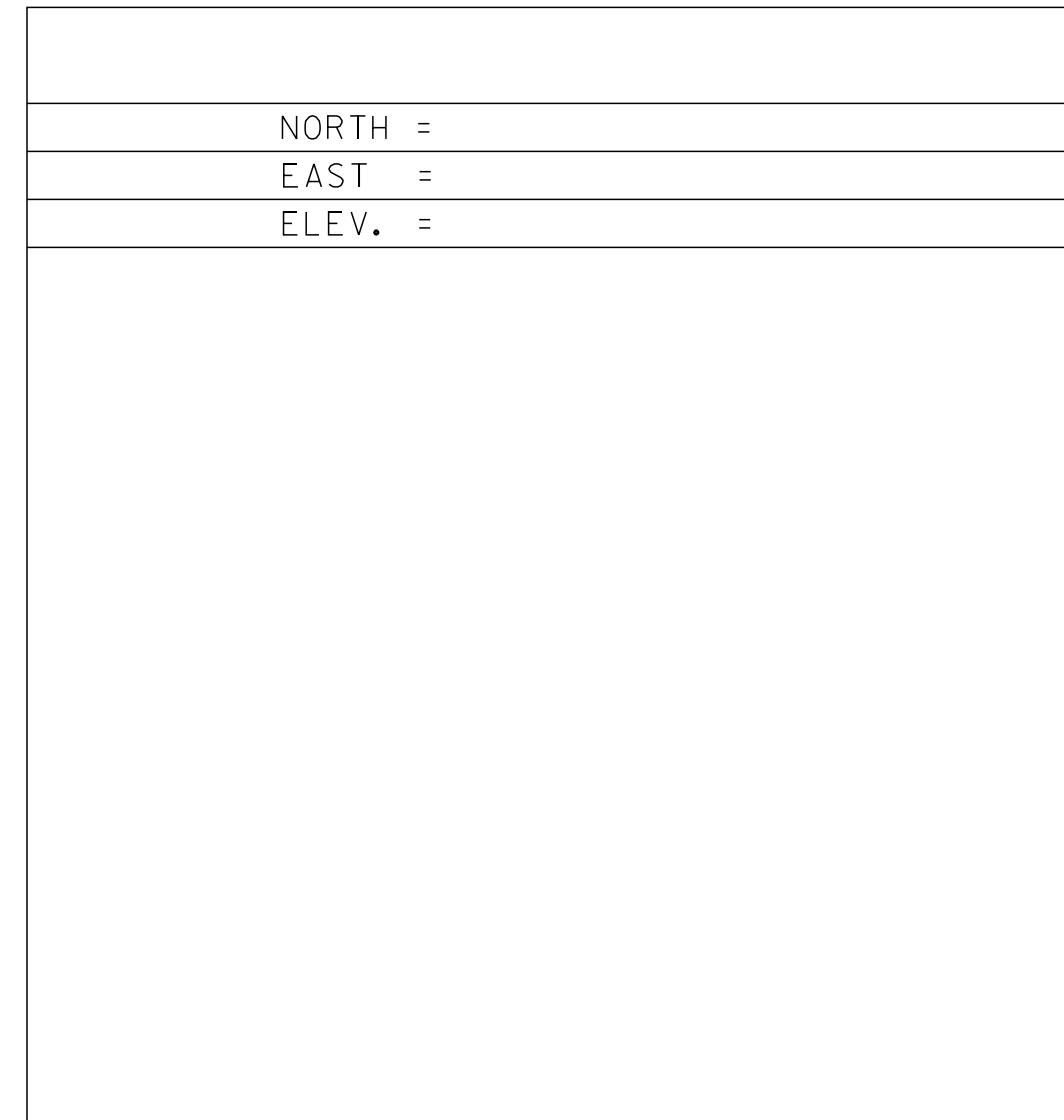
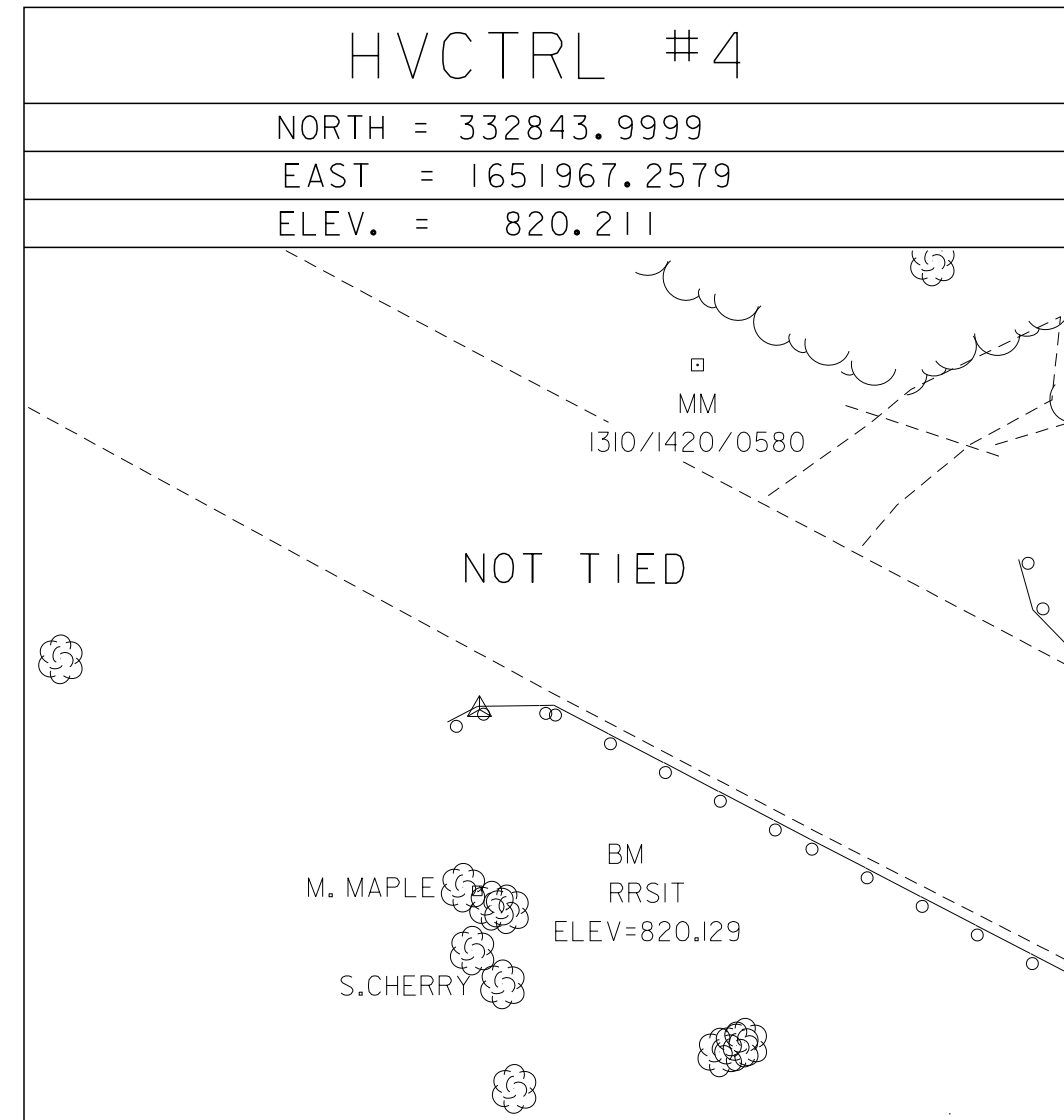
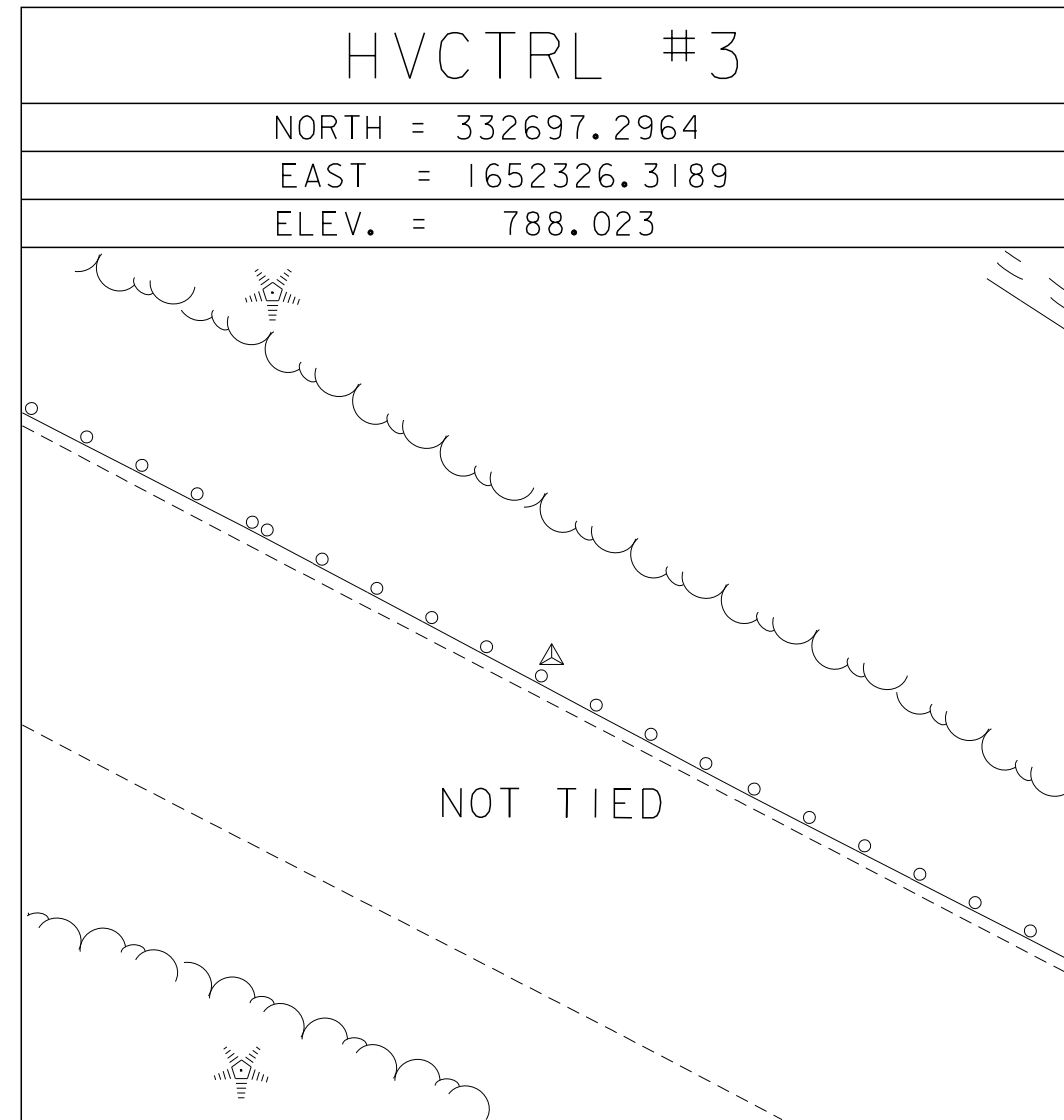
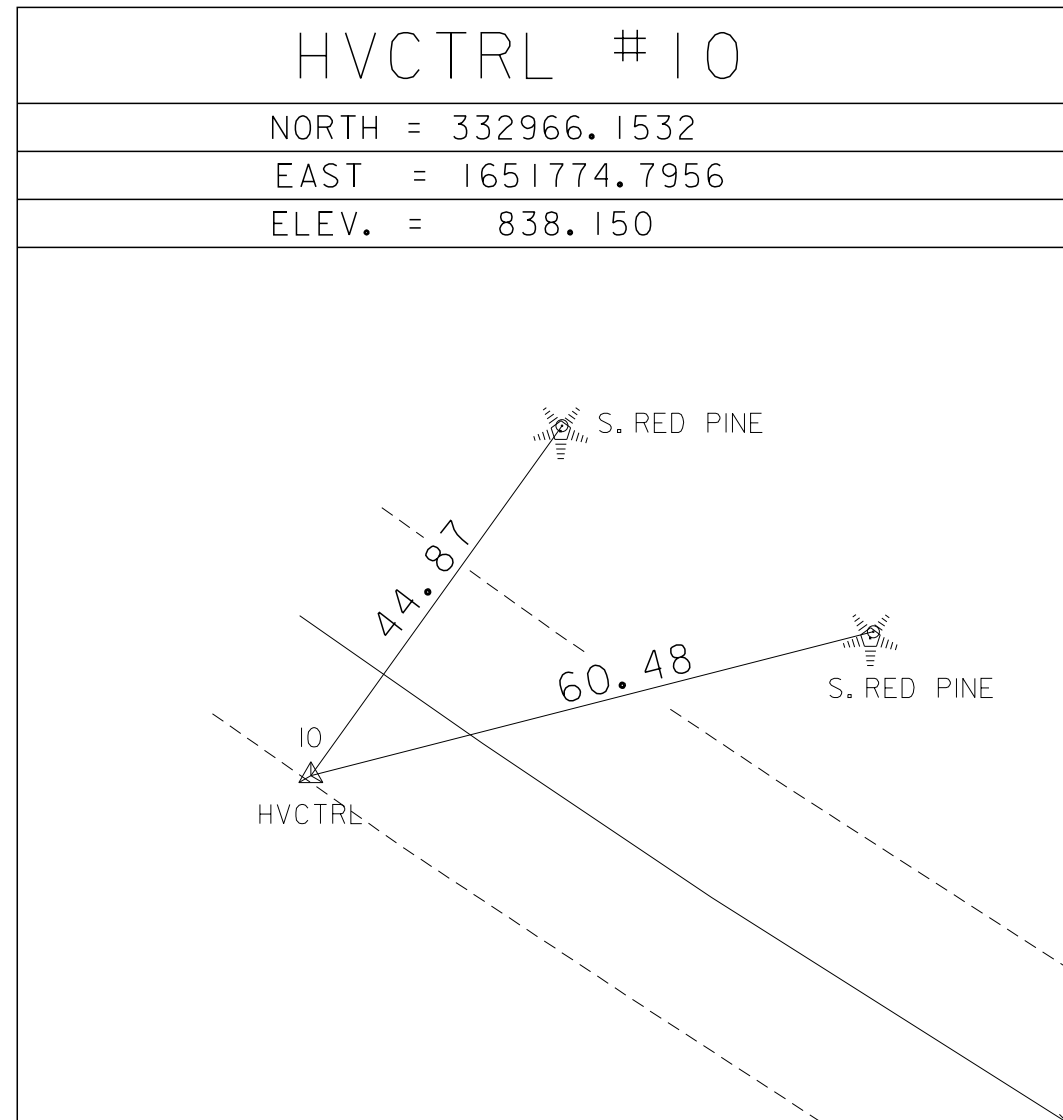
PT #1 STOODLEY AZ MK  
 NORTH = 333903.4530  
 EAST = 1650841.3370  
 ELEV. = 864.660

GENERAL LOCATION, WEATHERSFIELD, VT. TO REACH FROM THE I-91 BRIDGES OVER VT ROUTE 131 AT EXIT 8 IN ASCUTNEY GO WEST ALONG VT ROUTE 131 FOR 2.7 MI (4.3 KM) TO THE INTERSECTION OF A GRAVEL DRIVE RIGHT, LEADING TO WRIGHTS HOUSE NO 3123, AND THE SITE OF THE MARK ON THE RIGHT IN A LAWN, JUST NORTHWEST OF THE DRIVE. THE MARK IS SET IN THE TOP OF A 0.4 M (1.3 FT) X 0.2 M (0.7 FT) ROCK OUTCROP WHICH PROJECTS ABOUT 5 CM ABOVE GROUND SURFACE. IT IS 6.7 M (22.0 FT) NORTHEAST OF AND ABOUT 0.7 M (2.3 FT) LOWER THAN THE CENTERLINE OF VT ROUTE 131, 11.8 M (38.7 FT) NORTHWEST OF THE CENTERLINE OF THE GRAVEL DRIVE, 51.8 M (169.9 FT) SOUTH SOUTHEAST OF POLE NO 14/93/144, AND 19.4 M (63.6 FT) SOUTH OF A CONCRETE RIGHT OF WAY BOUND.

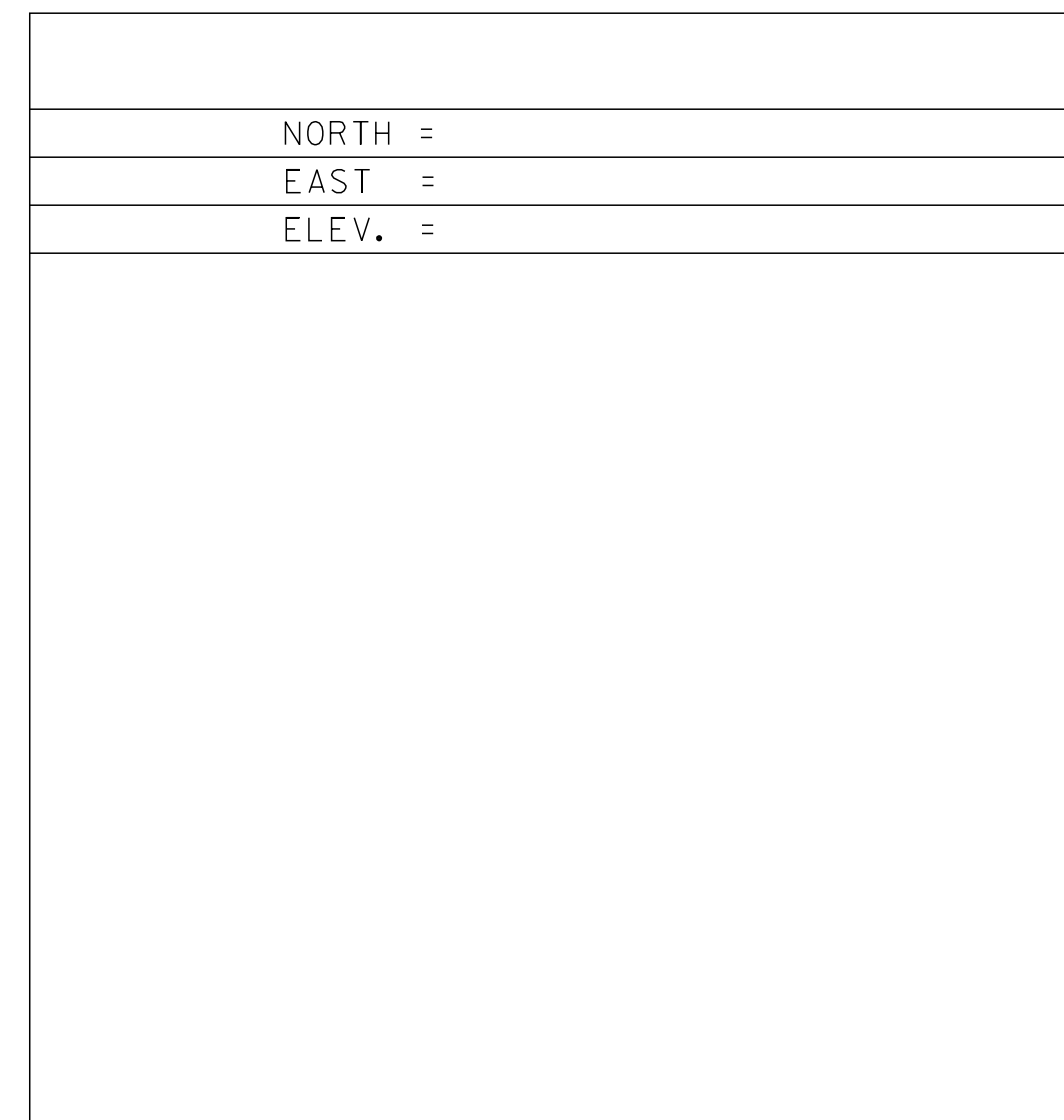
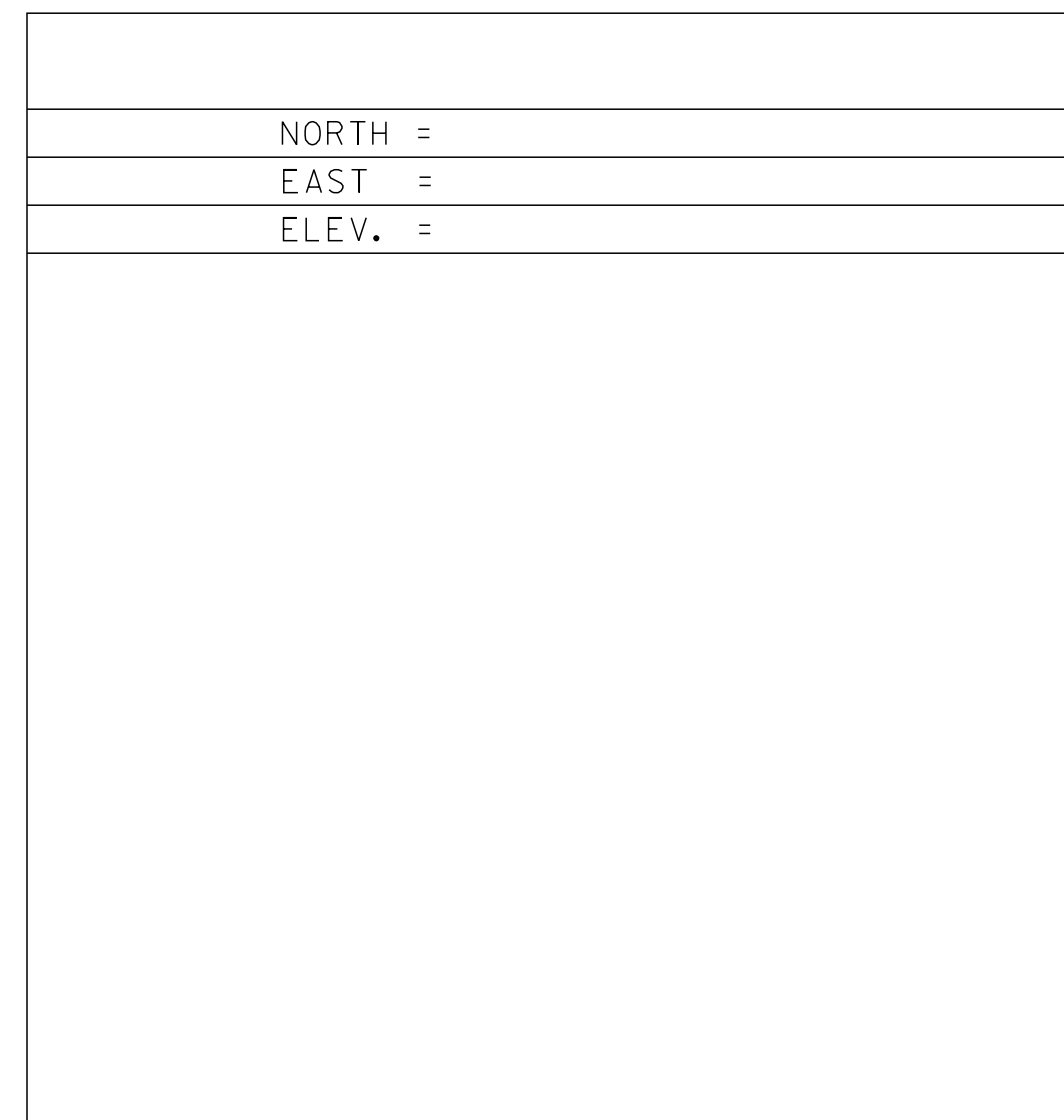
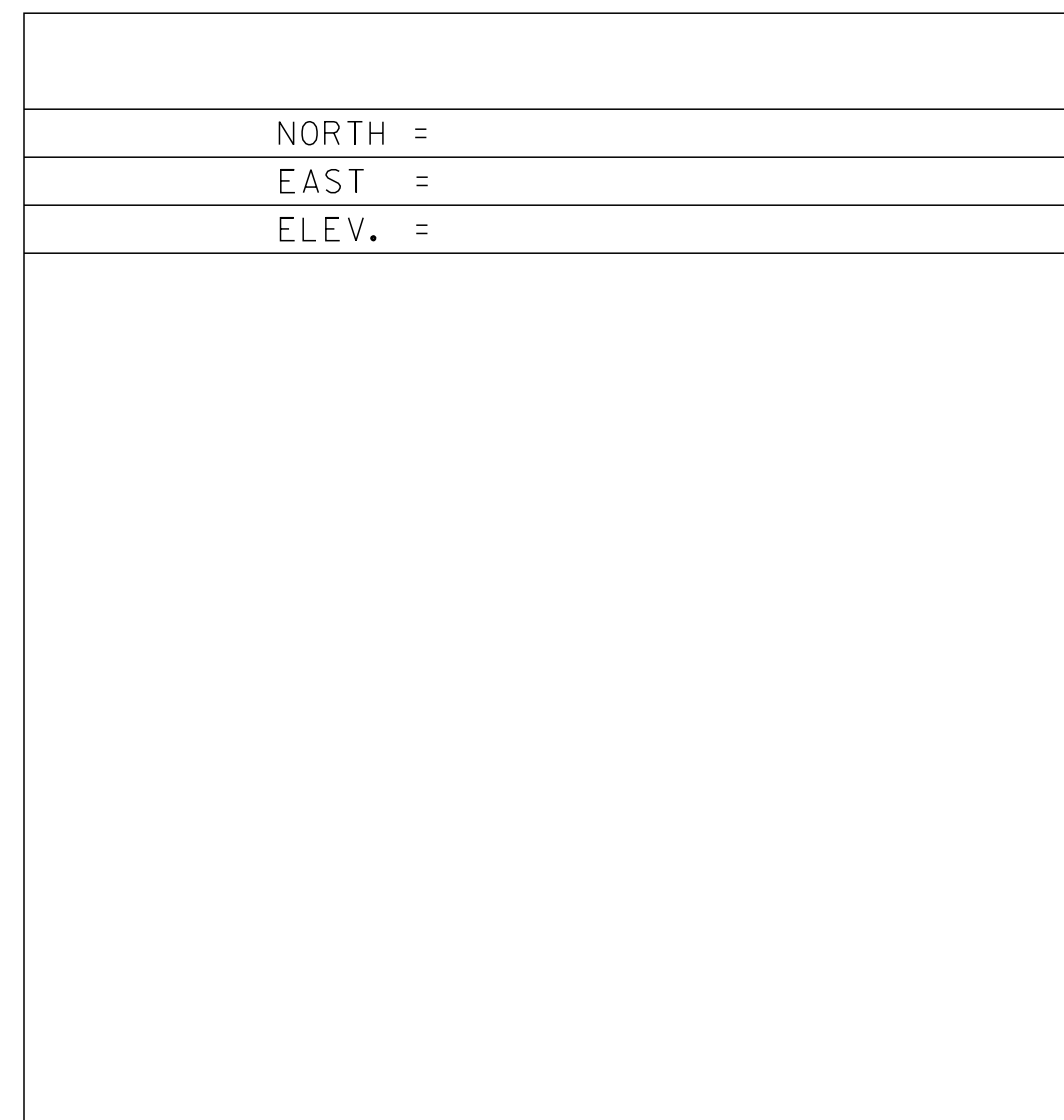
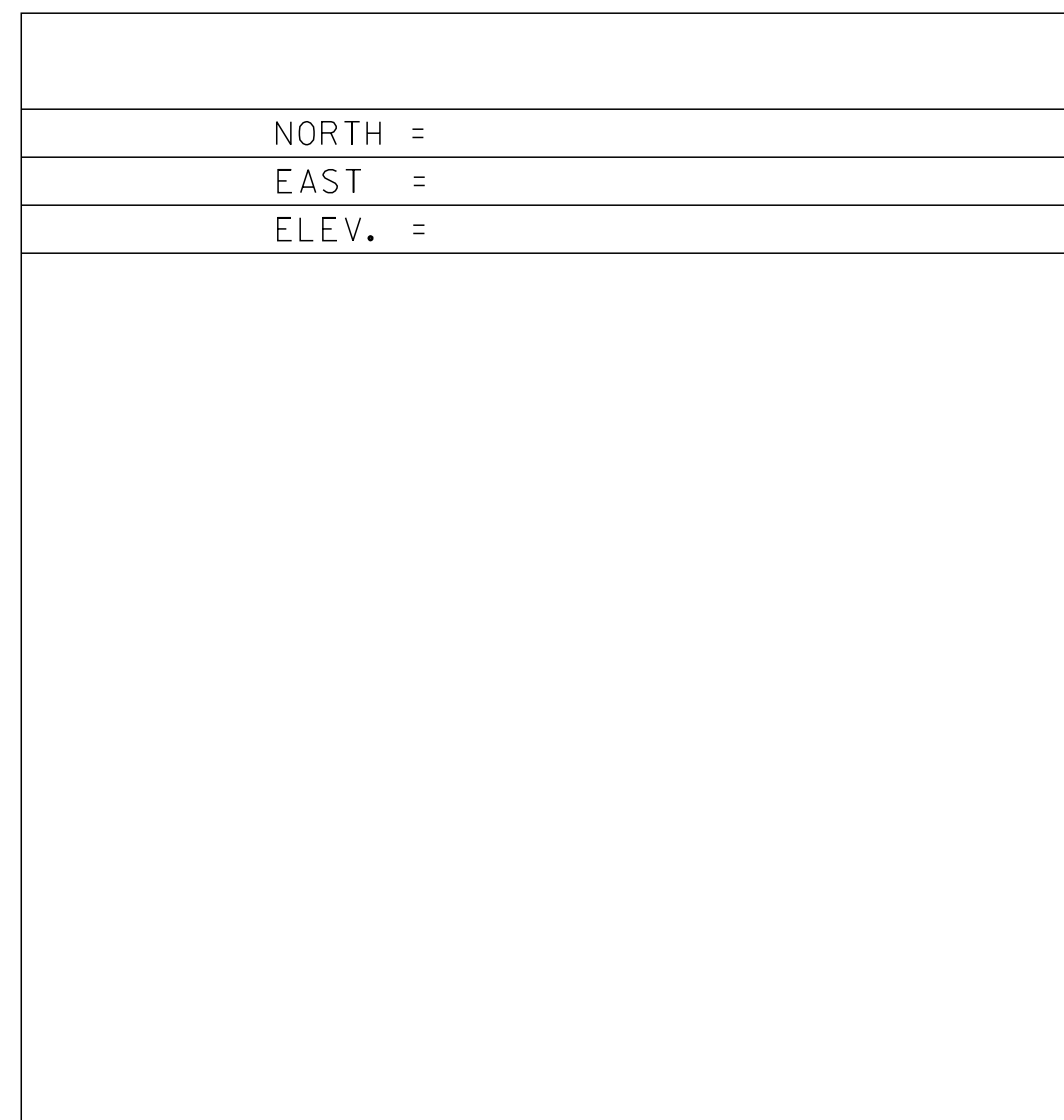
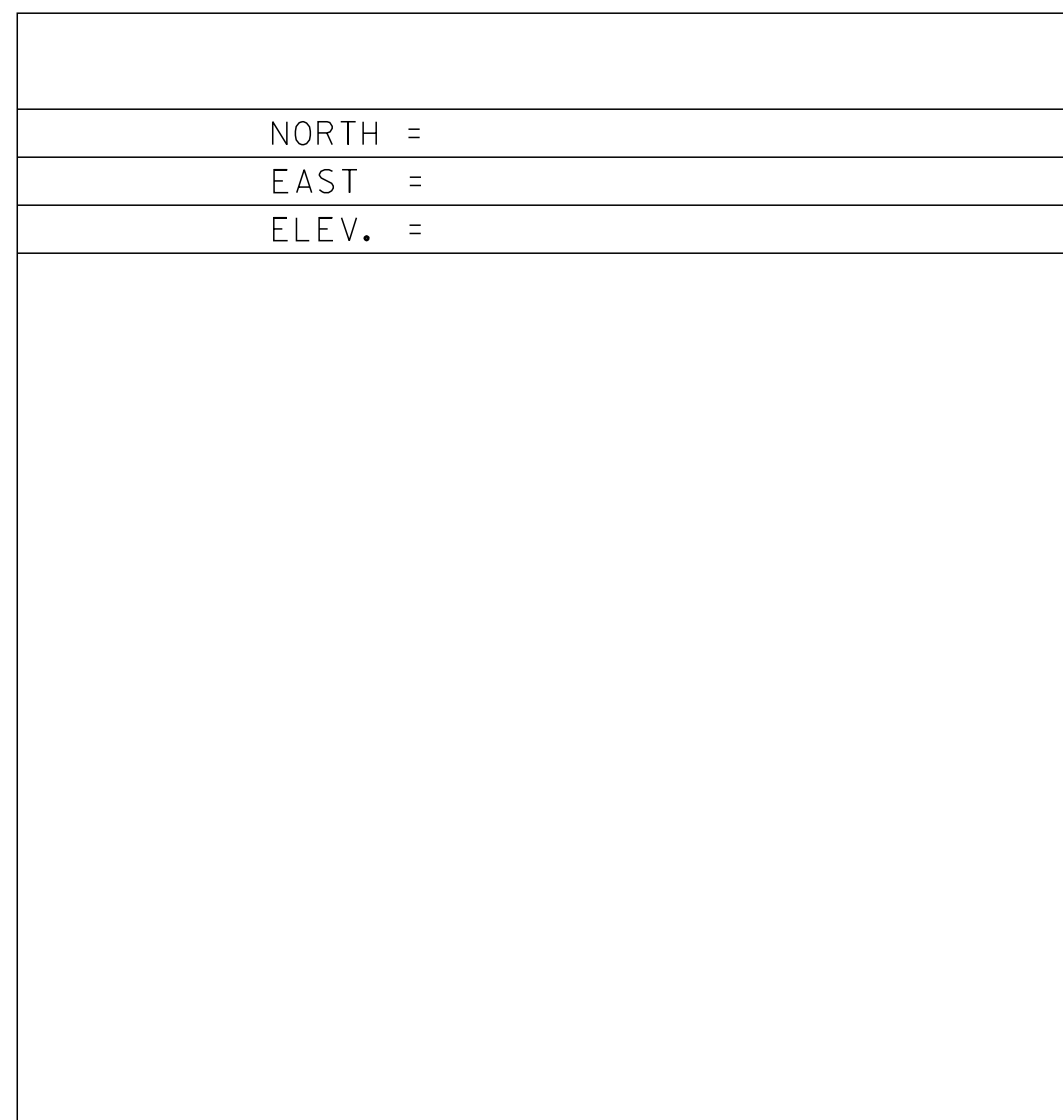
PT #2 STOODLEY  
 NORTH = 332946.9390  
 EAST = 1651726.6640  
 ELEV. = 855.740

GENERAL LOCATION, WEATHERSFIELD, VT. OWNERSHIP, GORDON STOODLEY, ROUTE 131, JARVIS ROAD EXTENSION 13, PERKINSVILLE, VT 05151. TO REACH FROM THE I-91 BRIDGES OVER VT ROUTE 131 AT EXIT 8 IN ASCUTNEY GO WEST ALONG VT ROUTE 131 FOR 2.4 MI (3.9 KM) TO THE SITE OF THE MARK ON THE LEFT, ON TOP OF A SMALL KNOLL. IT IS ABOUT 65 M (213.3 FT) SOUTHEAST OF THE INTERSECTION OF VT ROUTE 131 AND JARVIS ROAD EXTENSION. THE MARK IS SET IN THE TOP OF A 1.8 M (5.9 FT) X 1.6 M (5.2 FT) ROCK OUTCROP WHICH PROJECTS ABOUT 0.5 M (1.6 FT) ABOVE GROUND SURFACE. IT IS 17.0 M (55.8 FT) SW OF AND ABOUT 10 M (32.8 FT) HIGHER THAN THE CENTERLINE OF VT ROUTE 131, 20.6 M (67.6 FT) EAST OF THE CENTERLINE OF A GRAVEL DRIVE LEADING TO MR. STOODLEYS RESIDENCE, 32.0 M (105.0 FT) EAST NORTHEAST OF POLE NO 4/8/149, 52.0 M (170.6 FT) NORTH OF THE NORTH CORNER OF MR. STOODLEYS GARAGE, AND 3.7 M (12.1 FT) SW OF A FIBERGLASS WITNESS POST.

TRAVERSE TIES



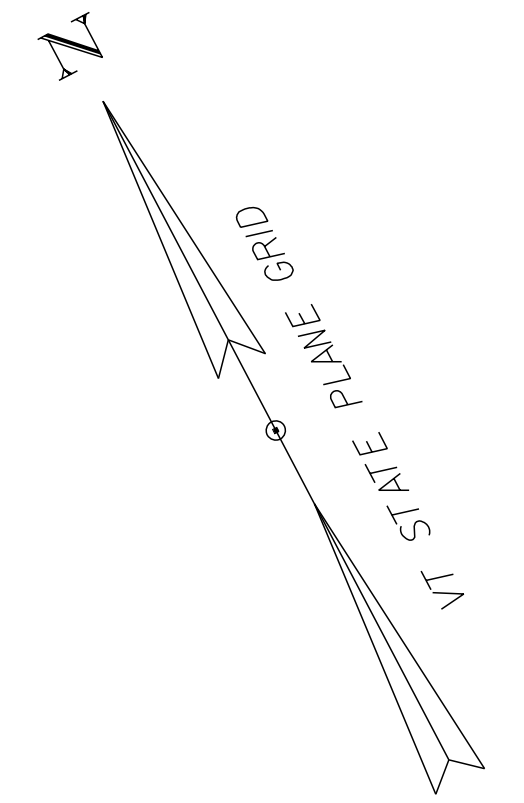
ALIGNMENT TIES



DATUM	
VERTICAL	NAVD88
HORIZONTAL	NAD83 (96)
ADJUSTMENT	COMPASS

PROJECT NAME: WEATHERSFIELD	
PROJECT NUMBER: STP 0146(16)	
FILE NAME: x00266T1.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: C. WILLIAMS	DRAWN BY: C. CYR
DESIGNED BY: VTRANS	CHECKED BY: P. BEYOR
TIE SHEET	SHEET 30 OF 41

DUMMERSTON FINE SANDY LOAM  
 15% - 35% SLOPES  
 VERY STONY  
 "K" VALUE = 0.32



**ROSSI, PELLEGRINO A. &  
 DONNA M.**

**LUTZ, IAN R. &  
 JENNIFER C.**

**EXISTING ROW**

**STATE OF VERMONT PROJECT  
 S'0146 (1) 1959**

VT ROUTE 131  
 TO CAVENDISH

VT ROUTE 131  
 TO I-91

**EXISTING ROW**

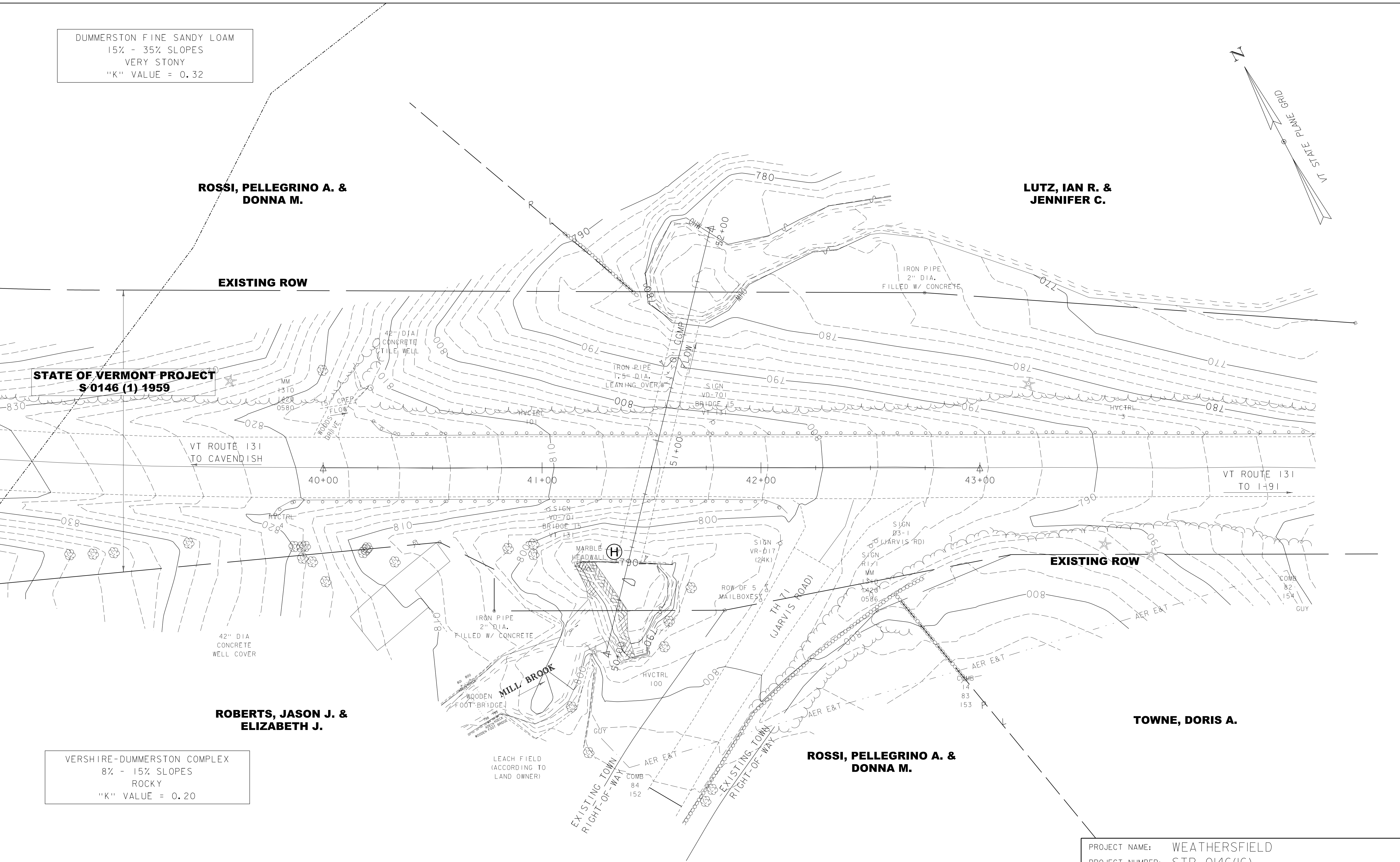
**ROBERTS, JASON J. &  
 ELIZABETH J.**

**TOWNE, DORIS A.**

**ROSSI, PELLEGRINO A. &  
 DONNA M.**

VERSHIRE-DUMMERSTON COMPLEX  
 8% - 15% SLOPES  
 ROCKY  
 "K" VALUE = 0.20

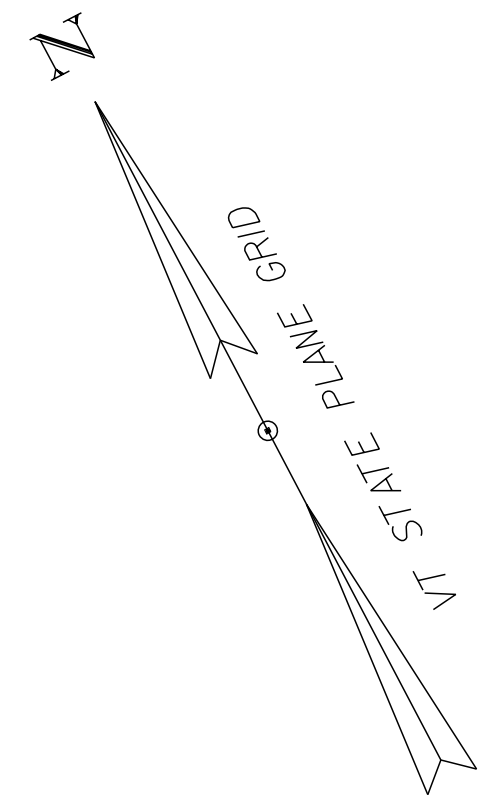
LEACH FIELD  
 (ACCORDING TO  
 LAND OWNER)



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



PROJECT NAME: WEATHERSFIELD	
PROJECT NUMBER: STP 0146(16)	
FILE NAME: z00c266erobdr.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
EXISTING CONDITIONS	SHEET 31 OF 41



**ROSSI, PELLEGRINO A. &  
DONNA M.**

**LUTZ, IAN R. &  
JENNIFER C.**

EXISTING STATE  
RIGHT-OF-WAY

MAINLINE POB  
STA 40+00.00  
N = 332851.0634  
E = 1651994.0681

EXISTING 132" CMPP  
NEW 2 3/4" CONCRETE  
SPRAY-ON LINER

PROJECT CONSTRUCTION  
LIMITS (TYP)

MAINLINE POE  
STA 43+00.00  
N = 332711.5859  
E = 1652259.6731

VT ROUTE 131  
TO CAVENDISH

S 62° 17' 40.56" E

BEGIN BRIDGE  
STA 41+44.34

BEGIN PROJECT  
STA 41+25.00

END PROJECT  
STA 41+75.00

END BRIDGE 42+00  
STA 41+55.66

VT ROUTE 131  
TO I-91

REPAIR EXISTING  
HEADWALL, (SEE DETAILS  
ON SHEET 4)

EXISTING STATE  
RIGHT-OF-WAY

TEMPORARY CONSTRUCTION  
LIMITS

BENCH MARK  
RAIL ROAD SPIKE  
IN TREE  
ELEV. = 820.13

CHANNEL POB  
STA 50+00.00  
N = 332715.8892  
E = 1652069.0058

MILL BROOK

**ROBERTS, JASON J. &  
ELIZABETH J.**

**TOWNE, DORIS A.**

**ROSSI, PELLEGRINO A. &  
DONNA M.**

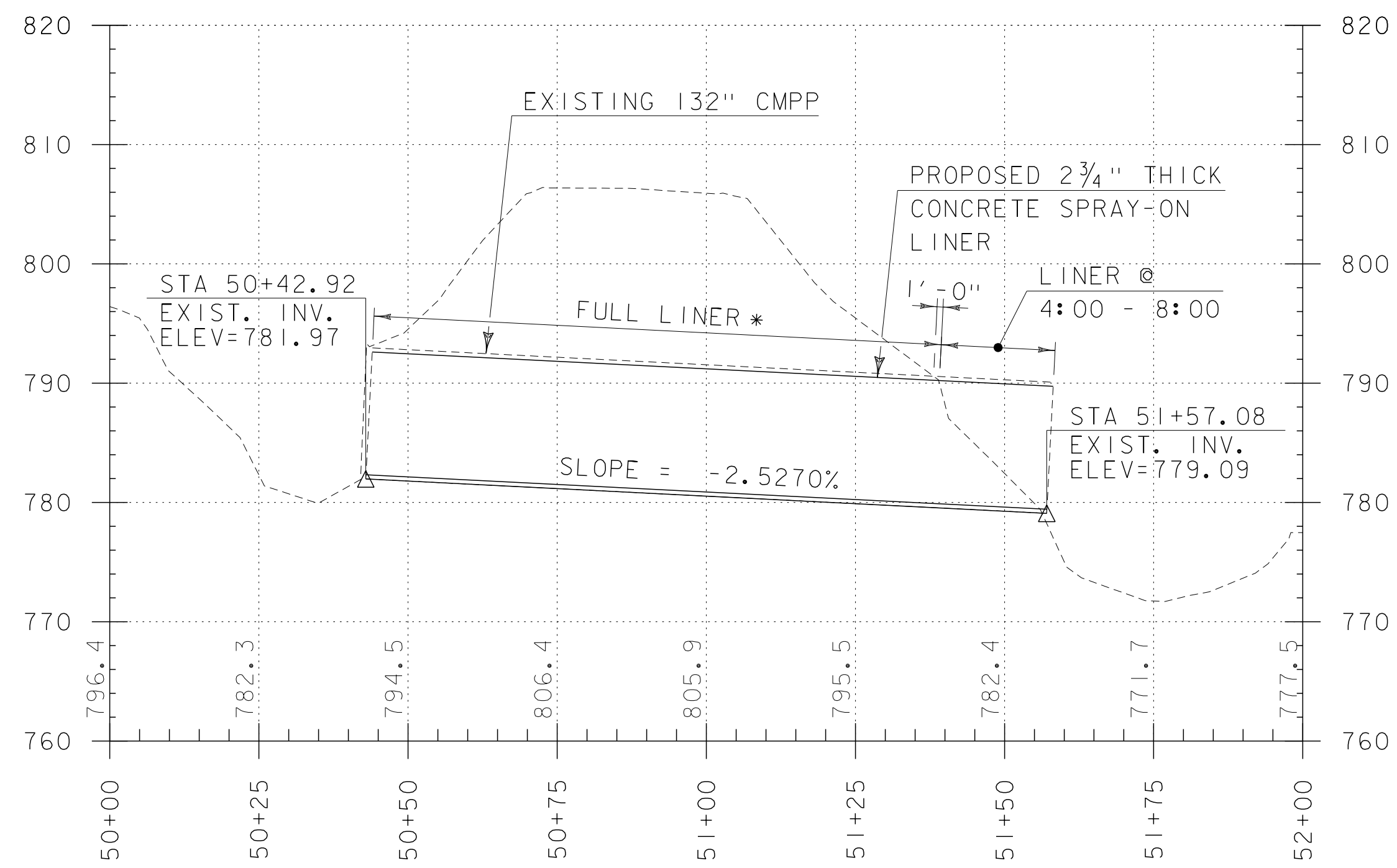
EXISTING CULVERT DATA  
11'-0" CORRUGATED MULTI  
PLATE PIPE (CMPP)  
114'-0" LONG  
WATERWAY AREA = 95 SQFT  
16' AVERAGE COVER  
YEAR BUILT: 1959

LAYOUT

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



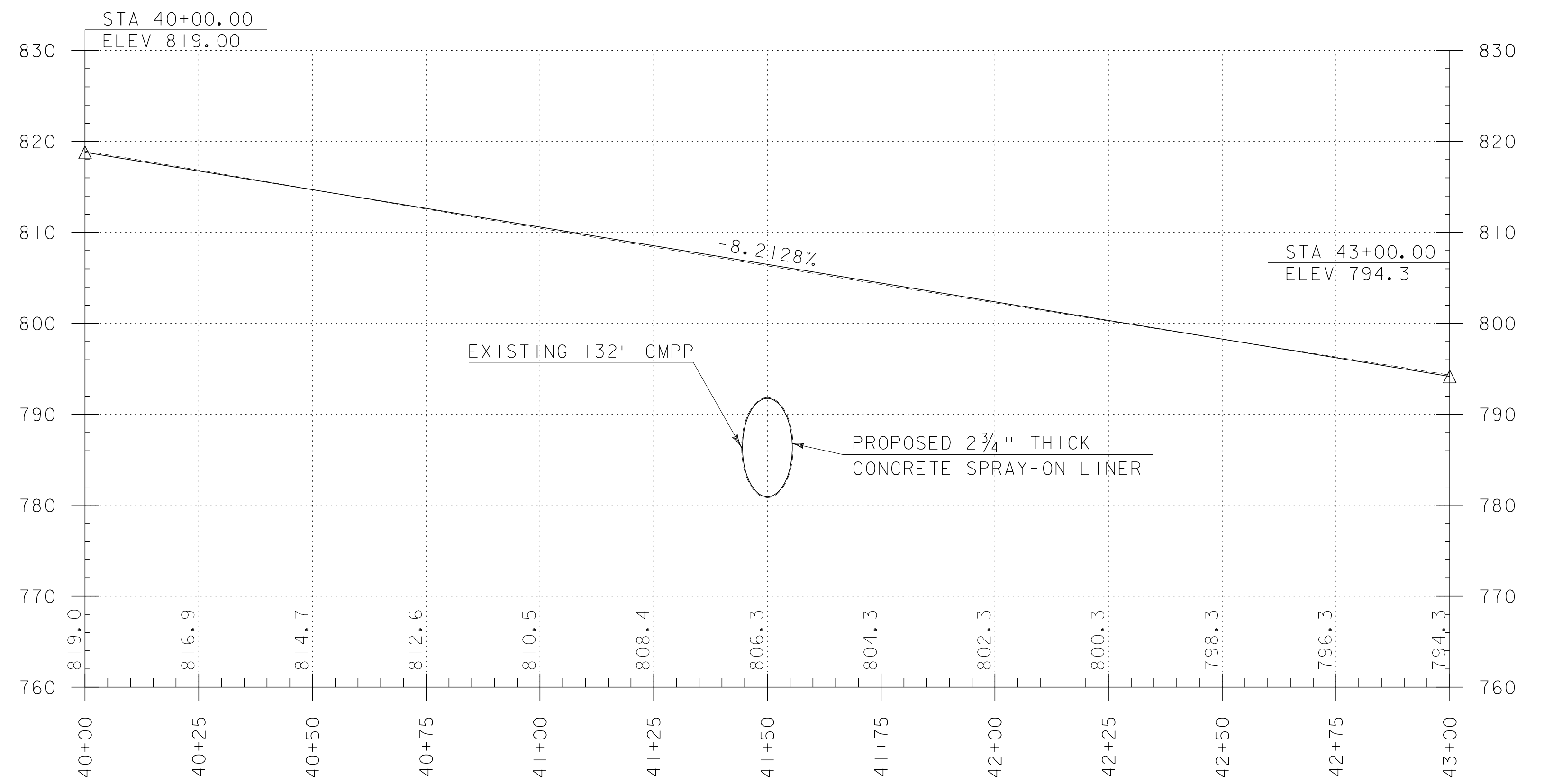
PROJECT NAME: WEATHERSFIELD	
PROJECT NUMBER: STP 0146(16)	
FILE NAME: z00C266layout.dgn	PLOT DATE: 11/14/2018
PROJECT LEADER: T. LEVINS	DRAWN BY: B. WILLIAMS
DESIGNED BY: B. WILLIAMS	CHECKED BY: T. LEVINS
LAYOUT SHEET	SHEET 32 OF 41



**CULVERT PROFILE**

HORIZONTAL SCALE 1" = 20'  
 VERTICAL SCALE 1" = 10'

* NOTE: EXTEND FULL LINER 1'-0" PAST WHERE PIPE IS COMPLETELY BURIED



**VT 131 PROFILE**

HORIZONTAL SCALE 1" = 20'  
 VERTICAL SCALE 1" = 10'

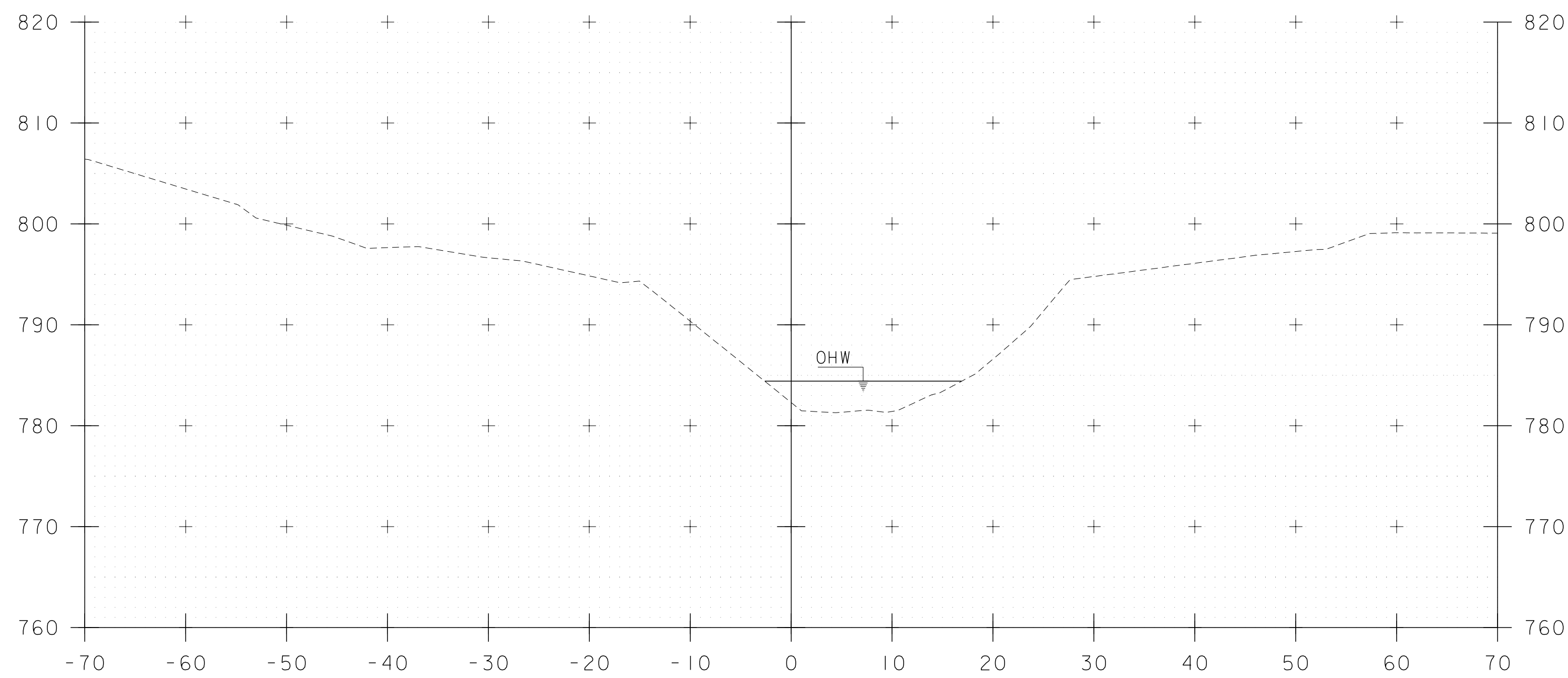
**NOTES:**

1. ELEVATIONS SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG @
2. ELEVATIONS SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG @

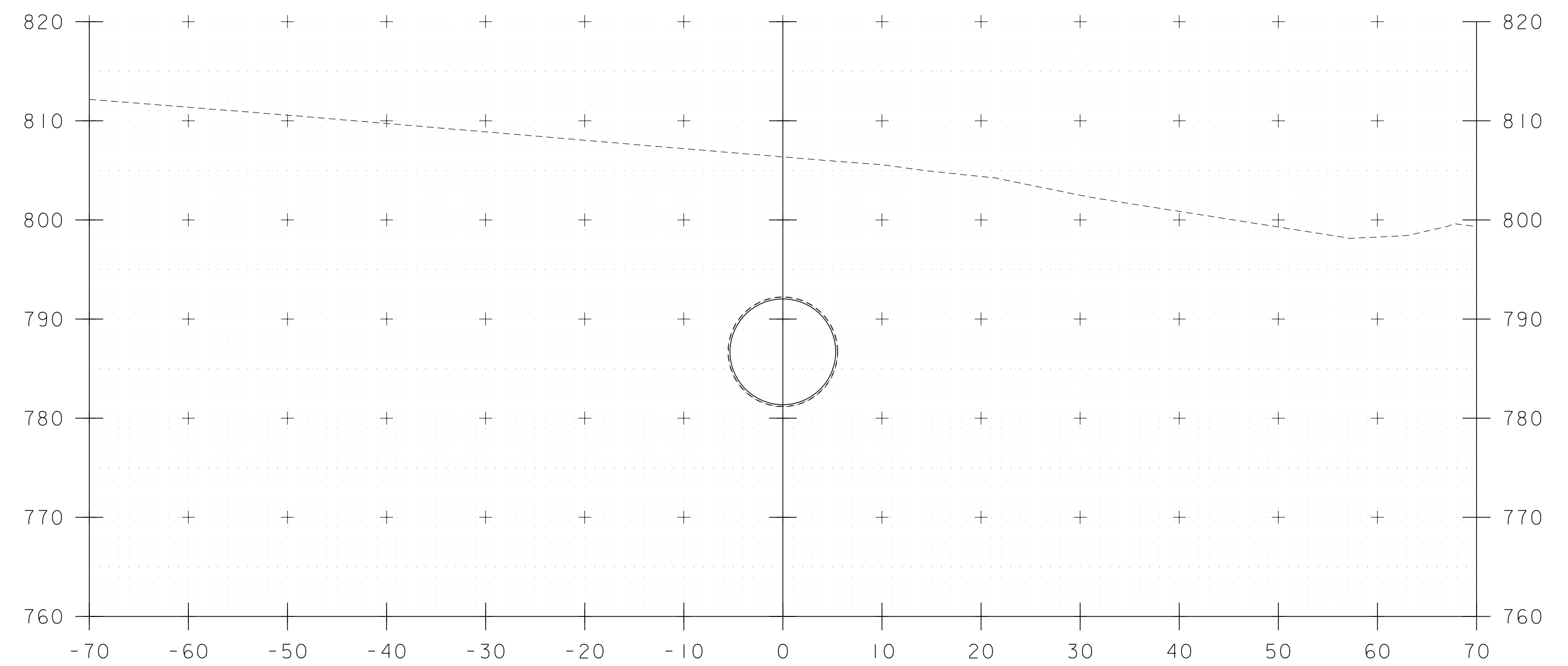
PROJECT NAME: WEATHERSFIELD  
 PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266prprofile.dgn PLOT DATE: 11/14/2018  
 PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
 DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
 PROFILE SHEET 33 OF 41

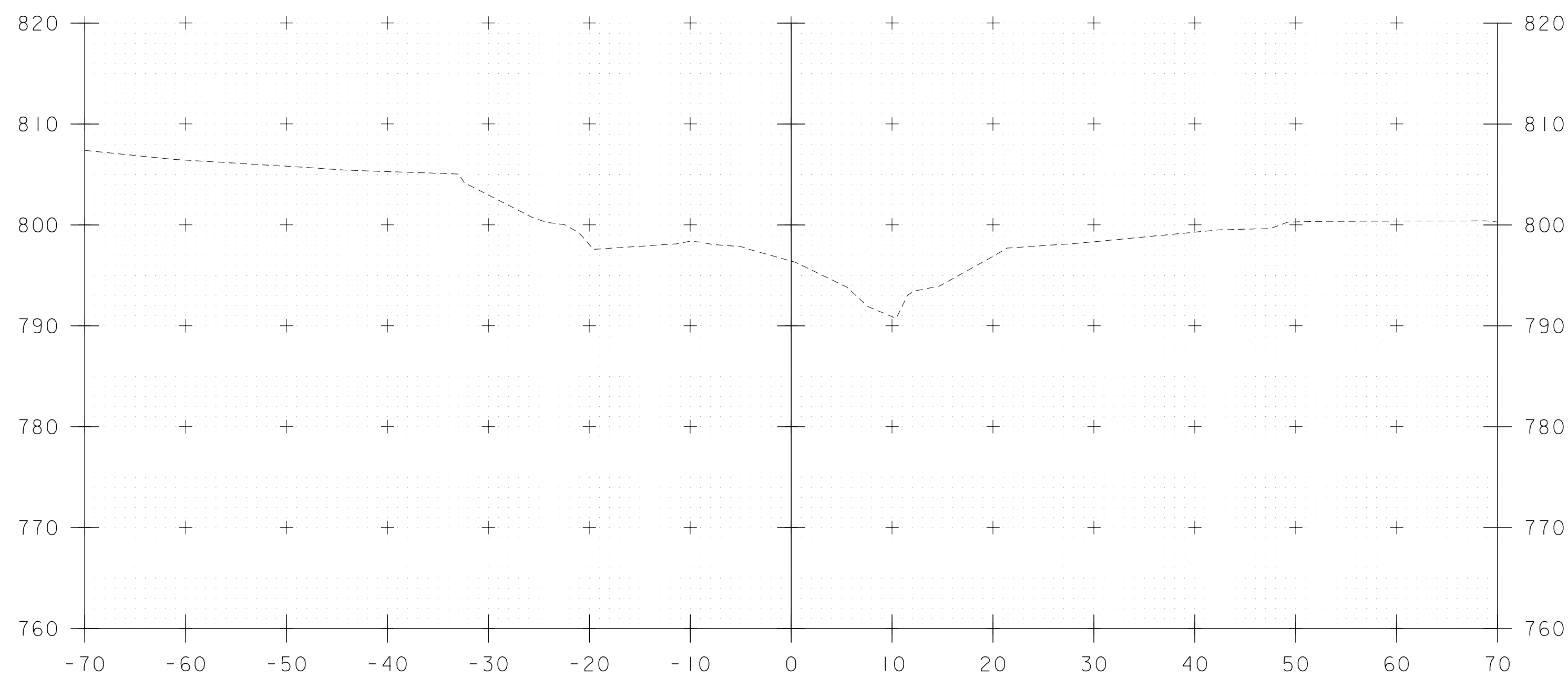




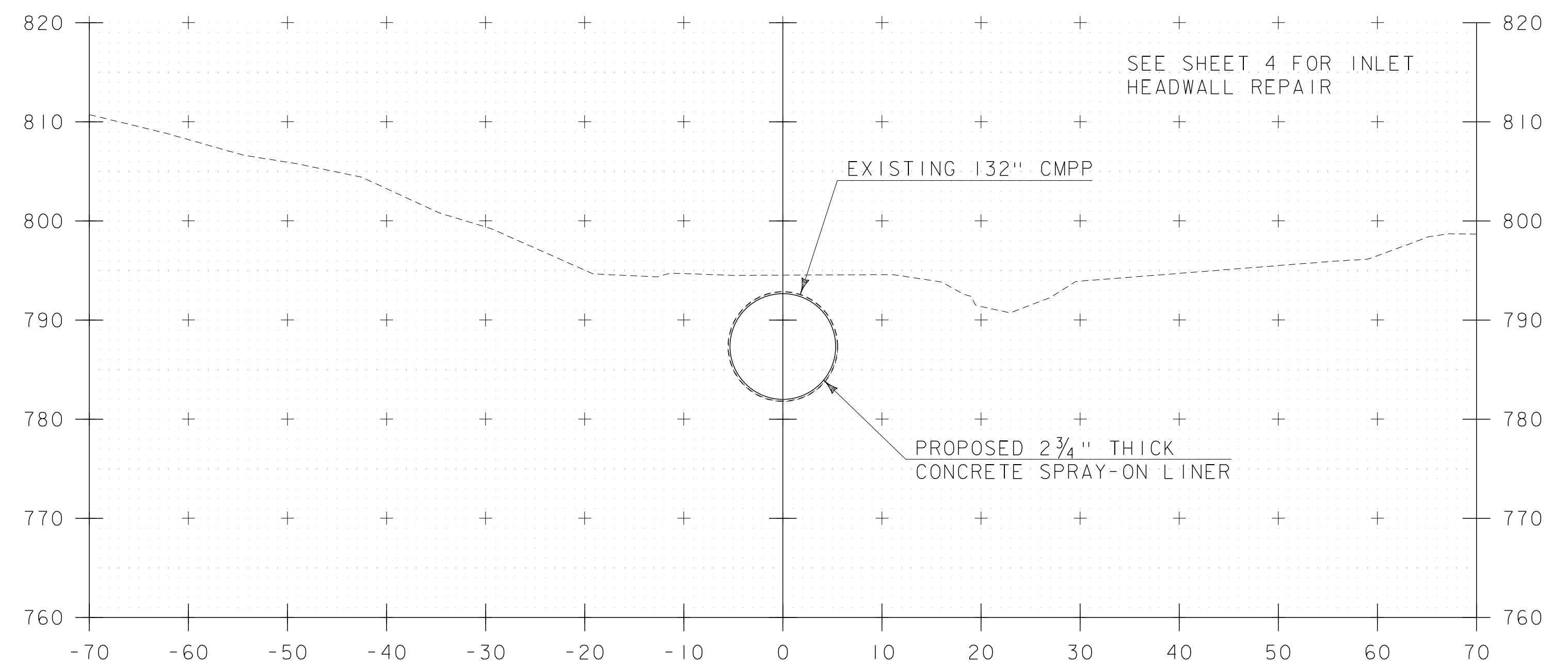
50+25



50+75



50+00



50+50

STA. 50+00 TO STA. 50+75

SCALE 1" = 10'-0"

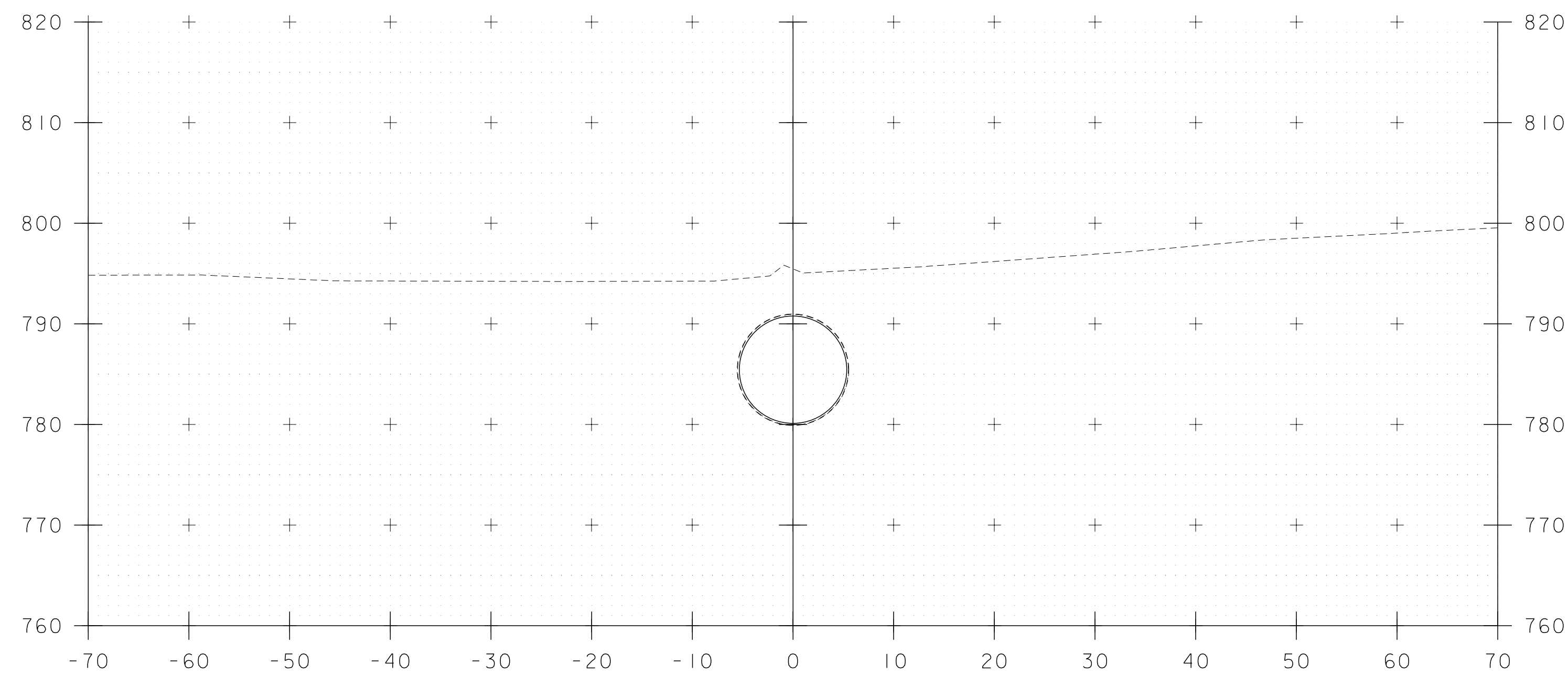


PROJECT NAME: WEATHERSFIELD  
 PROJECT NUMBER: STP 0146(16)

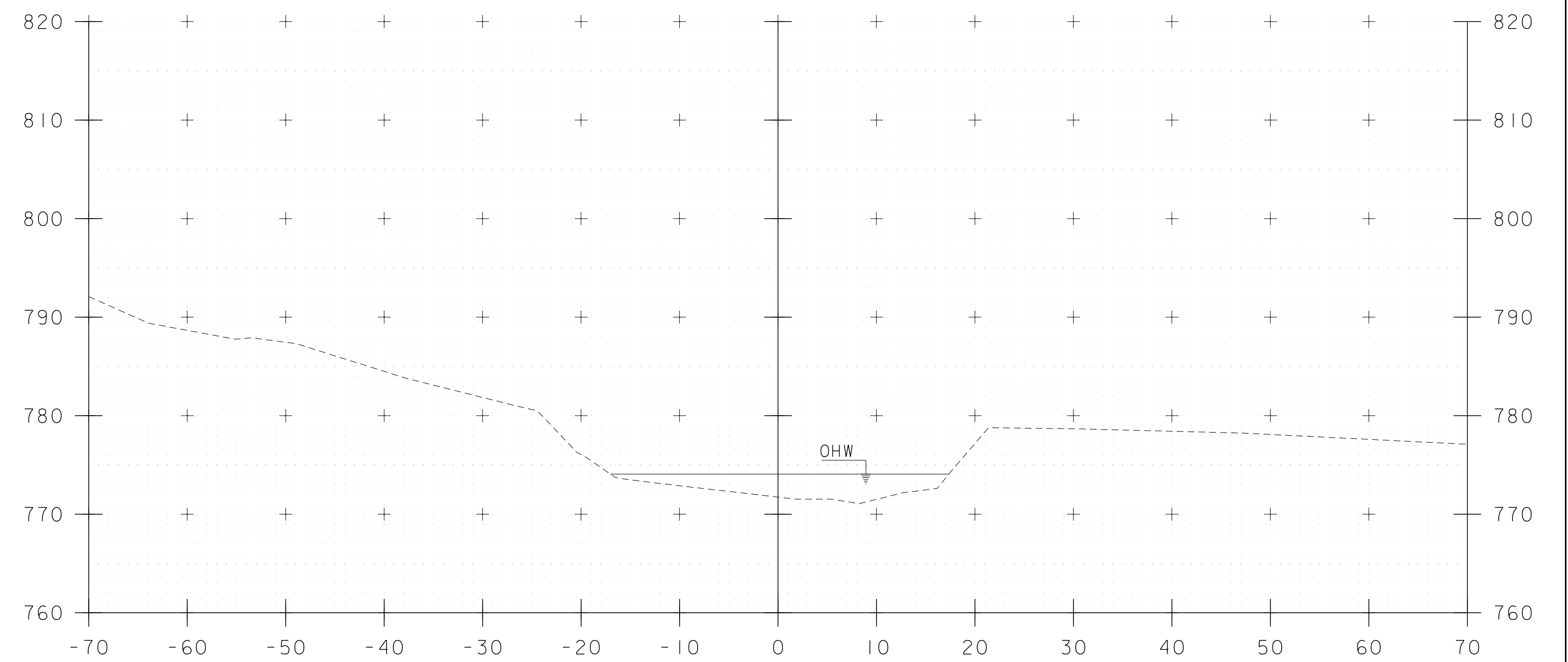
FILE NAME: z00c266xs.dgn  
 PROJECT LEADER: T. LEVINS  
 DESIGNED BY: B. WILLIAMS  
 CHANNEL CROSS SECTIONS 1

PLOT DATE: 11/14/2018  
 DRAWN BY: B. WILLIAMS  
 CHECKED BY: T. LEVINS  
 SHEET 34 OF 41

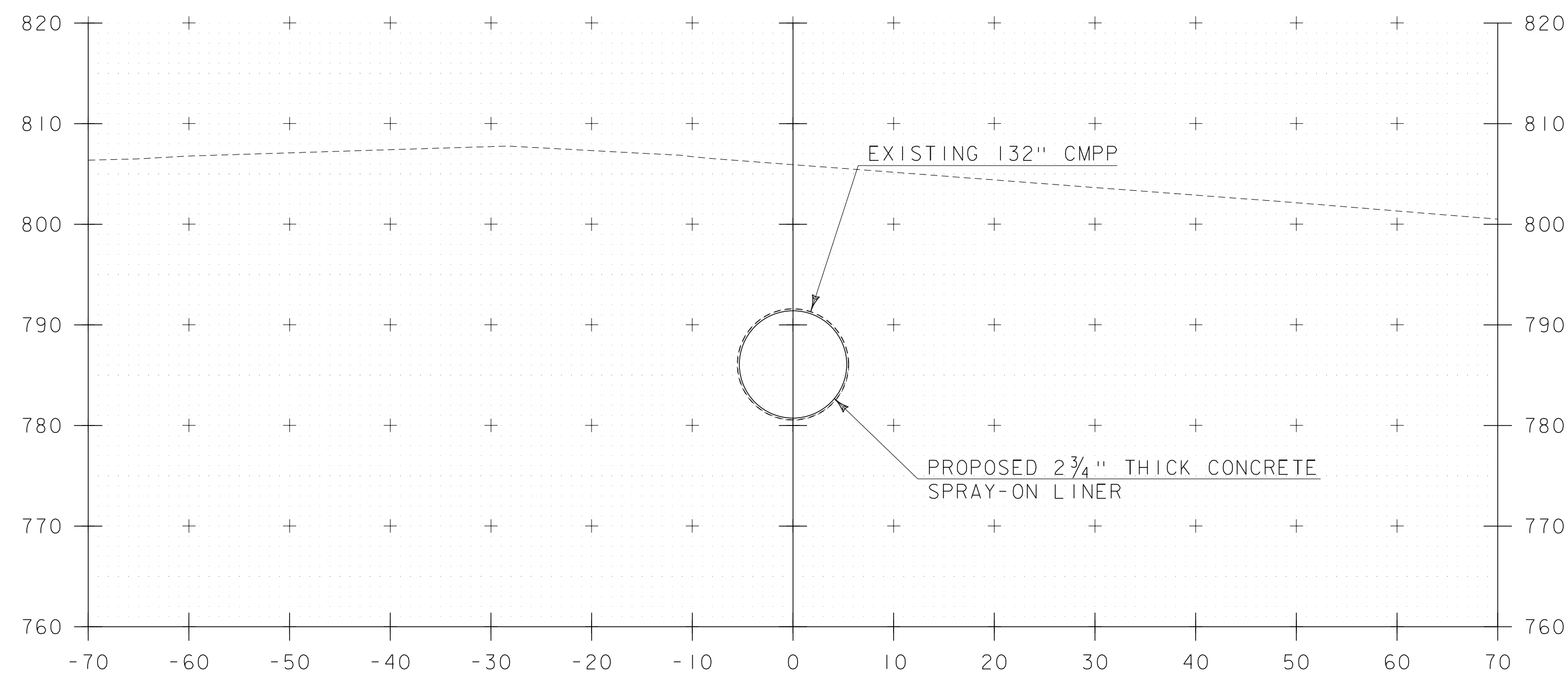




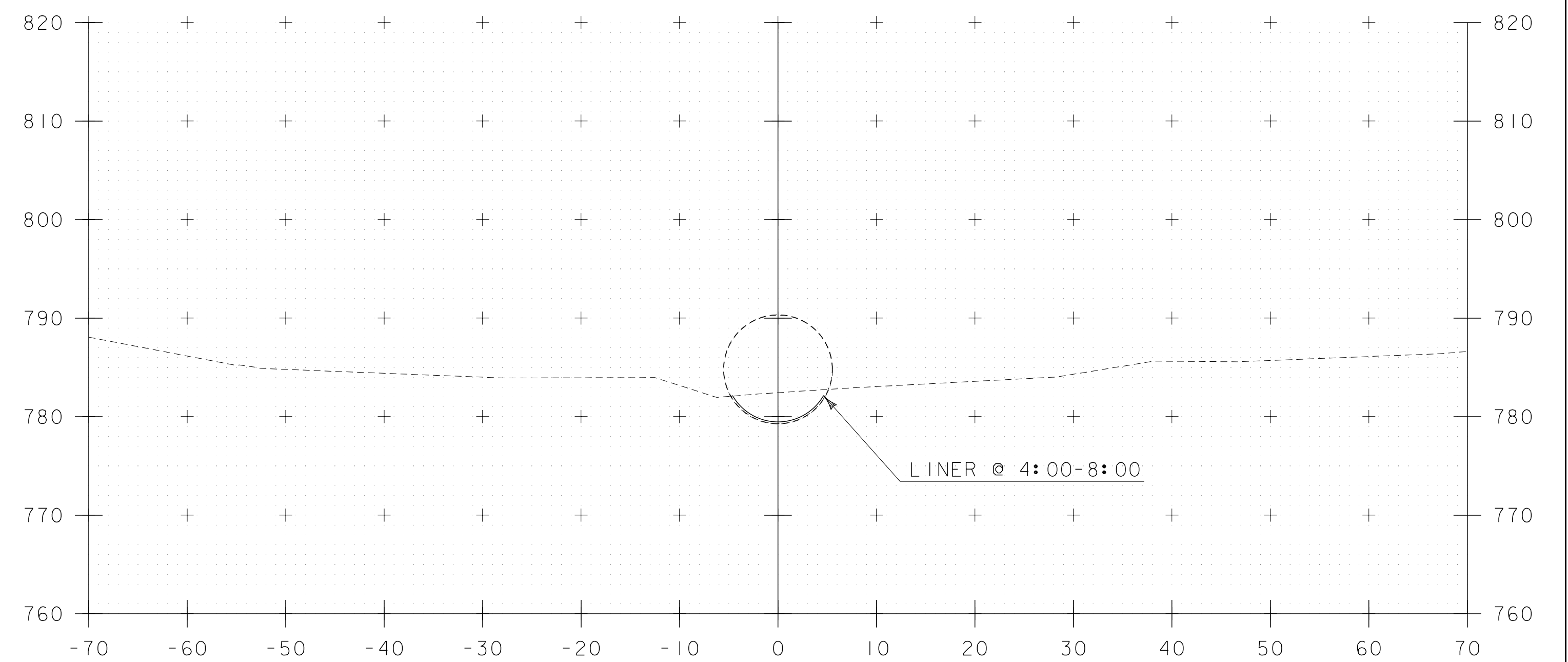
51+25



51+75

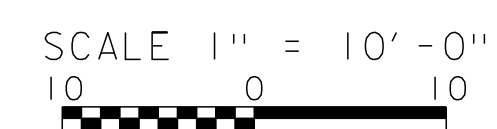


51+00



51+50

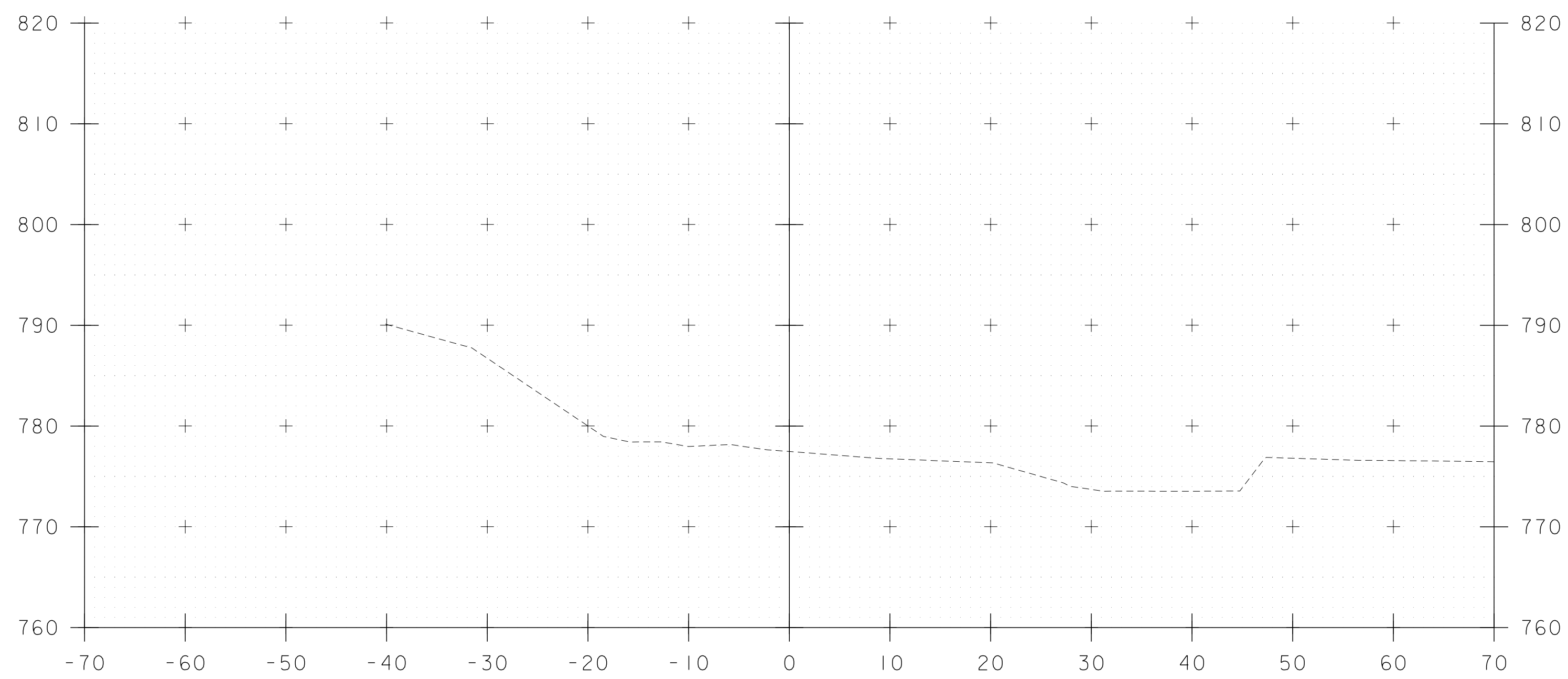
STA. 51+00 TO STA. 51+75



PROJECT NAME: WEATHERSFIELD  
PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266xs.dgn  
PROJECT LEADER: T. LEVINS  
DESIGNED BY: B. WILLIAMS  
CHANNEL CROSS SECTIONS 2

PLOT DATE: 11/14/2018  
DRAWN BY: B. WILLIAMS  
CHECKED BY: T. LEVINS  
SHEET 35 OF 41



52+00

SCALE 1" = 10'-0"

STA. 52+00 TO STA. 52+00



PROJECT NAME: WEATHERSFIELD  
 PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266xs.dgn  
 PROJECT LEADER: T. LEVINS  
 DESIGNED BY: A. KURDEKAR  
 CHANNEL CROSS SECTIONS 3

PLOT DATE: 11/14/2018  
 DRAWN BY: A. KURDEKAR  
 CHECKED BY: T. LEVINS  
 SHEET 36 OF 41

## EPSC PLAN NARRATIVE

### 1.1 PROJECT DESCRIPTION

THE WEATHERSFIELD STP 0146(16) PROJECT PROPOSES THE REHABILITATION OF THE CURRENT BRIDGE ON VT ROUTE 131 SPANNING MILL BROOK IN THE TOWN OF WEATHERSFIELD. THE EXISTING CULVERT WILL BE LINED WITH A 2¾" THICK SPRAY ON CONCRETE LINER. THE SHOULDER WIDTHS ARE SUBSTANDARD BUT DO NOT WARRANT IMPROVEMENT UNDER THE PROPOSED REHABILITATION.

NOTE: AREA OF DISTURBANCE INCLUDES LIMITS OF EARTH DISTURBANCE WITHIN THE PROJECT AREA, AS WELL AS WASTE, STAGING AREAS, AND OTHER EARTH DISTURBING ACTIVITIES WITHIN OR DIRECTLY ADJACENT TO THE PROJECT LIMITS AS SHOWN ON THE ATTACHED EPSC PLAN.

TOTAL AREA OF DISTURBANCE AS SHOWN ON THE ATTACHED EPSC PLAN IS APPROXIMATELY 0.12 ACRES.

IT IS ANTICIPATED THAT THIS PROJECT WILL LAST ONE TO TWO WEEKS.

### 1.2 SITE INVENTORY

#### 1.2.1 TOPOGRAPHY

THE AREA SURROUNDING THE PROJECT IS GRASS AND WOODS IN A RURAL SETTING.

#### 1.2.2 DRAINAGE, WATERWAYS, BODIES OF WATER, AND PROXIMITY TO NATURAL OR MAN-MADE WATER FEATURES

MILL BROOK IS THE ONLY WATER SOURCE ON THE PROJECT SITE. THE BROOK IS CLASSIFIED AS STEEP, SINUOUS, NARROW, WITH A CONFINED AND ARMORED CHANNEL AT THE SITE. THE STREAM BED CONSISTS OF GRAVEL, COBBLES AND BOULDERS. THE TRIBUTARY AREA AT THE CULVERT CROSSING IS 2.9 SQ. MI. DUE TO THE NATURE OF THE SURROUNDING TERRAIN THE PROJECT SITE COULD RECEIVE RUNOFF WATER FROM A FEW NEARBY SLOPES.

#### 1.2.3 VEGETATION

THE VEGETATION IN THE PROJECT AREA CONSISTS OF HARDWOOD TREES AND UNDERGROWTH. THE IMPACT TO VEGETATION WILL BE LIMITED TO THAT WHICH IS DIRECTLY AFFECTED BY ACCESS TO THE INLET OF EXISTING CULVERT DURING CONSTRUCTION. DISTURBED VEGETATION WILL BE REESTABLISHED WITH STANDARD SEED AND MULCH PRACTICES.

#### 1.2.4 SOILS

ALL SOIL DATA CAME FROM THE U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE FOR THE COUNTY OF WINDSOR, VERMONT. SOILS ON THE PROJECT SITE ARE DUMMERSTON, FINE SANDY LOAM, VERY STONY 15% TO 35% SLOPES, "K" VALUE = 0.32 AND VESHIRE-DUMMERSTON COMPLEX, 8% TO 15% SLOPES, ROCKY, "K" VALUE = 0.20. THE SOIL IS CONSIDERED HIGHLY ERODIBLE DUE TO SIGNIFICANT SLOPES.

NOTE: "K" VALUES GENERALLY INDICATE THE FOLLOWING:

0.0-0.23 = LOW EROSION POTENTIAL

0.24-0.36 = MODERATE EROSION POTENTIAL

0.37 AND HIGHER = HIGH EROSION POTENTIAL

#### 1.2.5 SENSITIVE RESOURCE AREAS

CRITICAL HABITATS: NO

HISTORICAL OR ARCHEOLOGICAL AREAS: MARBLE HEADWALL @ INLET

PRIME AGRICULTURAL LAND: NO

THREATENED AND ENDANGERED SPECIES: NORTHERN LONG-EARED BAT

WATER RESOURCE: MILL BROOK

WETLANDS: THERE ARE NO MAPPED WETLANDS WITHIN THE PROJECT AREA.

### 1.3 RISK EVALUATION

THIS PROJECT DOES NOT REQUIRE A PERMIT FOR STORMWATER RUNOFF FROM CONSTRUCTION SITES FOR LOW RISK PROJECTS. ANY MODIFICATIONS TO THE PROJECT THAT INCREASE THE RISK TO ENVIRONMENTAL RESOURCES SHALL BE EVALUATED IN ACCORDANCE WITH THE PERMIT REQUIREMENTS. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY ADDITIONAL PERMITTING.

### 1.4 EROSION PREVENTION AND SEDIMENT CONTROL

THE EROSION CONTROL PLANS ARE MEANT AS A GUIDELINE FOR PREVENTING EROSION AND CONTROLLING SEDIMENT TRANSPORT. THE PRINCIPLES OUTLINED IN THIS NARRATIVE CONSIST OF APPLYING MEASURES THROUGHOUT CONSTRUCTION OF THE PROJECT IN ORDER TO MINIMIZE SEDIMENT TRANSPORT TO THE RECEIVING WATERS. THE MEASURES INCLUDE STABILIZATION AND STRUCTURAL PRACTICES, STORM WATER CONTROLS AND OTHER POLLUTION PREVENTION PRACTICES. THEY HAVE BEEN PROPOSED BY THE DESIGNER AS A BASIS FOR PROTECTING RESOURCES AND WILL NEED TO BE BUILT UPON BASED ON THE SPECIFIC MEANS AND METHODS OF THE CONTRACTOR. REFER TO THE LOW RISK SITE HANDBOOK AND APPROPRIATE DETAIL SHEETS FOR SPECIFIC GUIDANCE AND CONSTRUCTION DETAILING. ALL MEASURES

SHALL BE REGULARLY MAINTAINED AND SHALL BE CHECKED FOR SEDIMENT BUILD-UP. SEDIMENT SHALL BE DISPOSED OF AT AN APPROVED SITE WHERE IT WILL NOT BE SUBJECT TO EROSION.

#### 1.4.1 MARK SITE BOUNDARIES

SITE BOUNDARIES AND AREAS CONSTRUCTION EQUIPMENT CAN ACCESS SHALL BE DELINEATED.

PROJECT DEMARCATION FENCING (PDF) AND BARRIOR FENCE(BF) SHALL BE USED TO PHYSICALLY MARK SITE BOUNDARIES.

#### 1.4.2 LIMIT DISTURBANCE AREA

PREVENTING INITIAL SOIL EROSION BY MINIMIZING THE EXPOSED AREA IS MUCH MORE EFFECTIVE THAN TREATING ERODED SEDIMENT. EARTH DISTURBANCE CAN BE MINIMIZED THROUGH CONSTRUCTION PHASING BY ONLY OPENING UP EARTH AS NECESSARY. THIS CAN LIMIT THE AREA THAT WILL BE DISTURBED AND EXPOSED TO EROSION. EMPLOY TEMPORARY CONSTRUCTION STABILIZATION PRACTICES IN INCREMENTAL STAGES AS PHASES CHANGE. FOR PROJECTS WHICH FALL UNDER THE CONSTRUCTION GENERAL PERMIT, ONLY THE ACREAGE LISTED ON THE PERMIT AUTHORIZATION MAY BE EXPOSED AT ANY GIVEN TIME.

MAINTAINING VEGETATED BUFFERS ALONG STREAM BANKS, WETLANDS OR OTHER SENSITIVE AREAS IS A CRUCIAL EROSION AND SEDIMENT CONTROL MEASURE THAT SHOULD BE ESTABLISHED WHEREVER POSSIBLE.

#### 1.4.3 SITE ENTRANCE/EXIT STABILIZATION

TRACKING OF SEDIMENT ONTO PUBLIC HIGHWAYS SHALL BE MINIMIZED TO REDUCE THE POTENTIAL FOR RUNOFF ENTERING RECEIVING WATERS. INSTALLATION SHALL COINCIDE WITH THE CONTRACTORS PROGRESS SCHEDULE.

STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN AND ANYWHERE EQUIPMENT WILL BE GOING FROM AREAS OF EXPOSED SOILS TO PAVED SURFACES.

#### 1.4.4 INSTALL SEDIMENT BARRIERS

SEDIMENT BARRIERS SHALL BE UTILIZED TO INTERCEPT RUNOFF AND ALLOW SUSPENDED SEDIMENT TO SETTLE OUT. THEY SHALL BE INSTALLED PRIOR TO ANY UP SLOPE WORK.

GEOTEXTILE FOR SILT FENCE SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN. A FILTER CURTAIN SHALL BE INSTALLED NEAR THE OUTLET END OF THE CULVERT AS PROPOSED ON THE EPSC PLAN.

#### 1.4.5 DIVERT UPLAND RUNOFF

DIVERSIONARY MEASURES SHALL BE USED TO INTERCEPT RUNOFF FROM ABOVE THE CONSTRUCTION AND DIRECT IT AROUND THE DISTURBED AREA SO THAT CLEAN WATER DOES NOT BECOME MUDDIED WHILE TRAVELING OVER EXPOSED SOILS ON THE CONSTRUCTION SITE.

NONE ANTICIPATED.

#### 1.4.6 SLOW DOWN CHANNELIZED RUNOFF

CHECK STRUCTURES SHALL BE UTILIZED TO REDUCE THE VELOCITY, AND THUS THE EROSION POTENTIAL, OF CONCENTRATED FLOW IN CHANNELS.

NONE ANTICIPATED.

#### 1.4.7 CONSTRUCT PERMANENT CONTROLS

PERMANENT STORMWATER TREATMENT DEVICES SHALL BE INSTALLED AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH PERMIT CONDITIONS.

NONE ANTICIPATED.

#### 1.4.8 STABILIZE EXPOSED SOILS DURING CONSTRUCTION

ALL AREAS OF DISTURBANCE MUST HAVE TEMPORARY STABILIZATION IN PLACE WITHIN 48 HOURS OF DISTURBANCE OR IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT 3-9020 AUTHORIZATION.

SURFACE ROUGHENING OF ALL EXPOSED SLOPES, COMBINED WITH TEMPORARY MULCHING, SHALL BE UTILIZED ON A REGULAR BASIS. BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED TO STABILIZE ALL SLOPES STEEPER THAN 1:3.

THE FORECAST OF RAINFALL EVENTS SHALL TRIGGER IMMEDIATE PROTECTION OF EXPOSED SOILS.

#### 1.4.9 WINTER STABILIZATION

VARIOUS MEASURES SPECIFIC TO WINTER MAY BE NECESSARY SHOULD THE PROJECT EXTEND INTO WINTER (OCTOBER 15 THROUGH APRIL 15). REFER TO THE LOW RISK SITE HANDBOOK FOR GUIDANCE. NONE ANTICIPATED.

#### 1.4.10 STABILIZE SOIL AT FINAL GRADE

EXPOSED SOIL MUST BE STABILIZED WITHIN 48 HOURS OF REACHING FINAL GRADE.

SEED, MULCH, FERTILIZER AND LIME SHALL BE USED TO ESTABLISH PERMANENT VEGETATION. FOR SLOPES STEEPER THAN 1:3, BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED INSTEAD OF MULCH.

#### 1.4.11 DE-WATERING ACTIVITIES

DISCHARGE FROM DEWATERING ACTIVITIES THAT FLOWS OFF OF THE CONSTRUCTION SITE MUST NOT CAUSE OR CONTRIBUTE TO A VIOLATION OF THE VERMONT WATER QUALITY STANDARDS.

#### 1.4.12 INSPECT YOUR SITE

INSPECT THE PROJECT SITE BASED ON SPECIAL PROVISION REQUIREMENTS OR CONSTRUCTION GENERAL PERMIT AUTHORIZATION STIPULATIONS.

### 1.5 SEQUENCE AND STAGING

THIS SECTION WILL BE DEVELOPED BY THE CONTRACTOR USING THE GUIDANCE OUTLINED IN THE VTRANS EPSC PLAN CONTRACTOR CHECKLIST.

#### 1.5.1 CONSTRUCTION SEQUENCE

#### 1.5.2 OFF-SITE ACTIVITIES

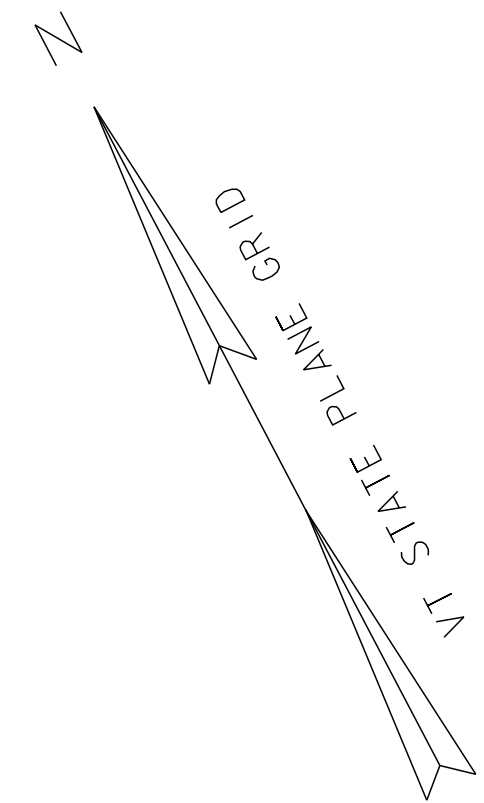
IN ADDITION TO THE CONTRACTOR CHECKLIST ANY ACTIVITIES OUTSIDE THE CONSTRUCTION LIMITS SHALL FOLLOW SPECIFICATION 105.25- 105.29 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

PROJECT NAME: WEATHERSFIELD

PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266epsnarrative PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
EPSC NARRATIVE SHEET 37 OF 41





**EXISTING ROW**

**STATE OF VERMONT PROJECT  
S 0146 (1) 1959**

VT ROUTE 131  
TO CAVENDISH

VT ROUTE 131  
TO 1-91

**EXISTING ROW**

BENCH MARK  
RAIL ROAD SPIKE  
IN TREE  
ELEV. = 820.13

MILL BROOK

LEACH FIELD  
(ACCORDING TO  
LAND OWNER)

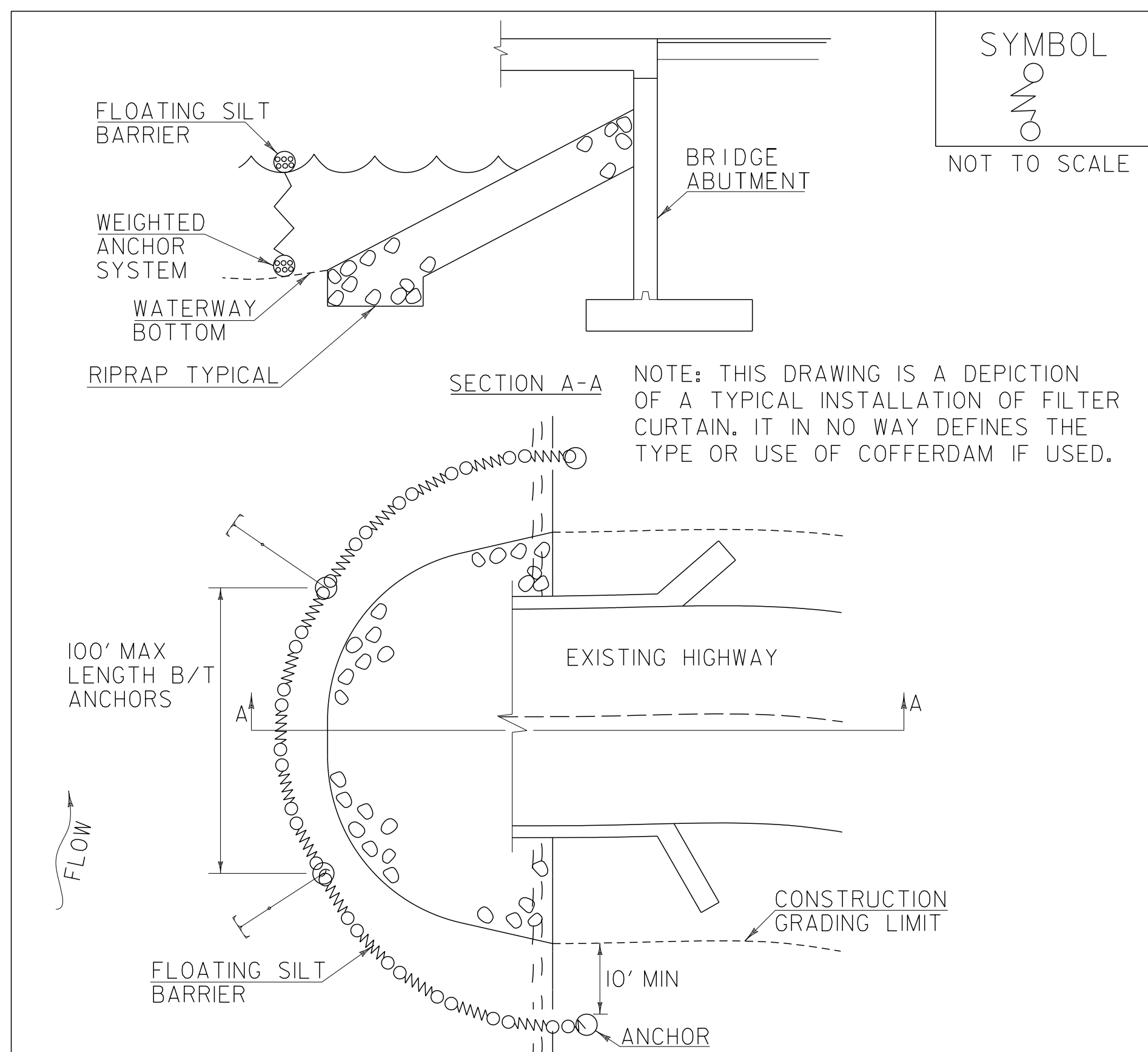
THAL  
(JARVIS ROAD)

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



PROJECT NAME: WEATHERSFIELD  
PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266epsc const.dgn PLOT DATE: 11/14/2018  
PROJECT LEADER: T. LEVINS DRAWN BY: B. WILLIAMS  
DESIGNED BY: B. WILLIAMS CHECKED BY: T. LEVINS  
EPSC CONSTRUCTION SITE PLAN SHEET 38 OF 41



SYMBOL  
  
 NOT TO SCALE

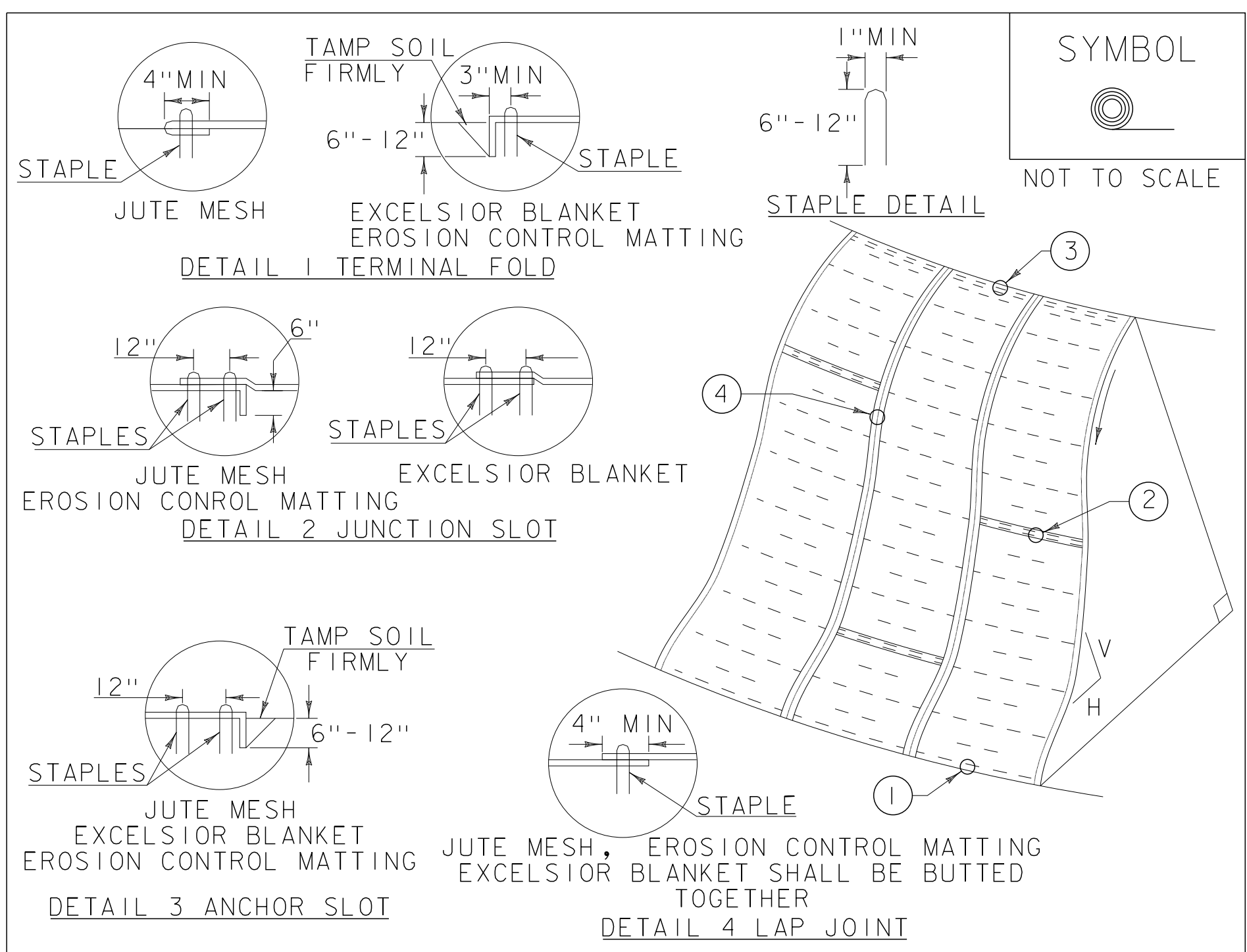
**CONSTRUCTION SPECIFICATIONS**

1. FILTER CURTAIN SHALL NOT BE PLACED ACROSS A FLOWING WATERWAY, OR IN A WATERWAY WITH STREAM VELOCITIES GREATER THAN 1.5 FEET/SECOND.
2. MAXIMUM 100' LENGTH BETWEEN ANCHORS.
3. LAST SECTION SHALL TERMINATE A MINIMUM OF 10' BEYOND LIMIT OF DISTURBANCE.
4. THE WEIGHTED ANCHOR SYSTEM SHALL BE A TYPE WHICH ALLOWS THE CURTAIN TO CONFORM TO THE BOTTOM OF THE WATERWAY.
5. THE CURTAIN SHALL BE REMOVED BY SLOWLY PULLING TOWARD THE SHORE MINIMIZING THE ESCAPE OF SEDIMENTS INTO WATERWAY.

FILTER CURTAIN

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF
SEPTEMBER 4, 2009	WHF

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 FOR GEOTEXTILE FOR FILTER CURTAIN.



SYMBOL  
  
 NOT TO SCALE

**CONSTRUCTION SPECIFICATIONS**

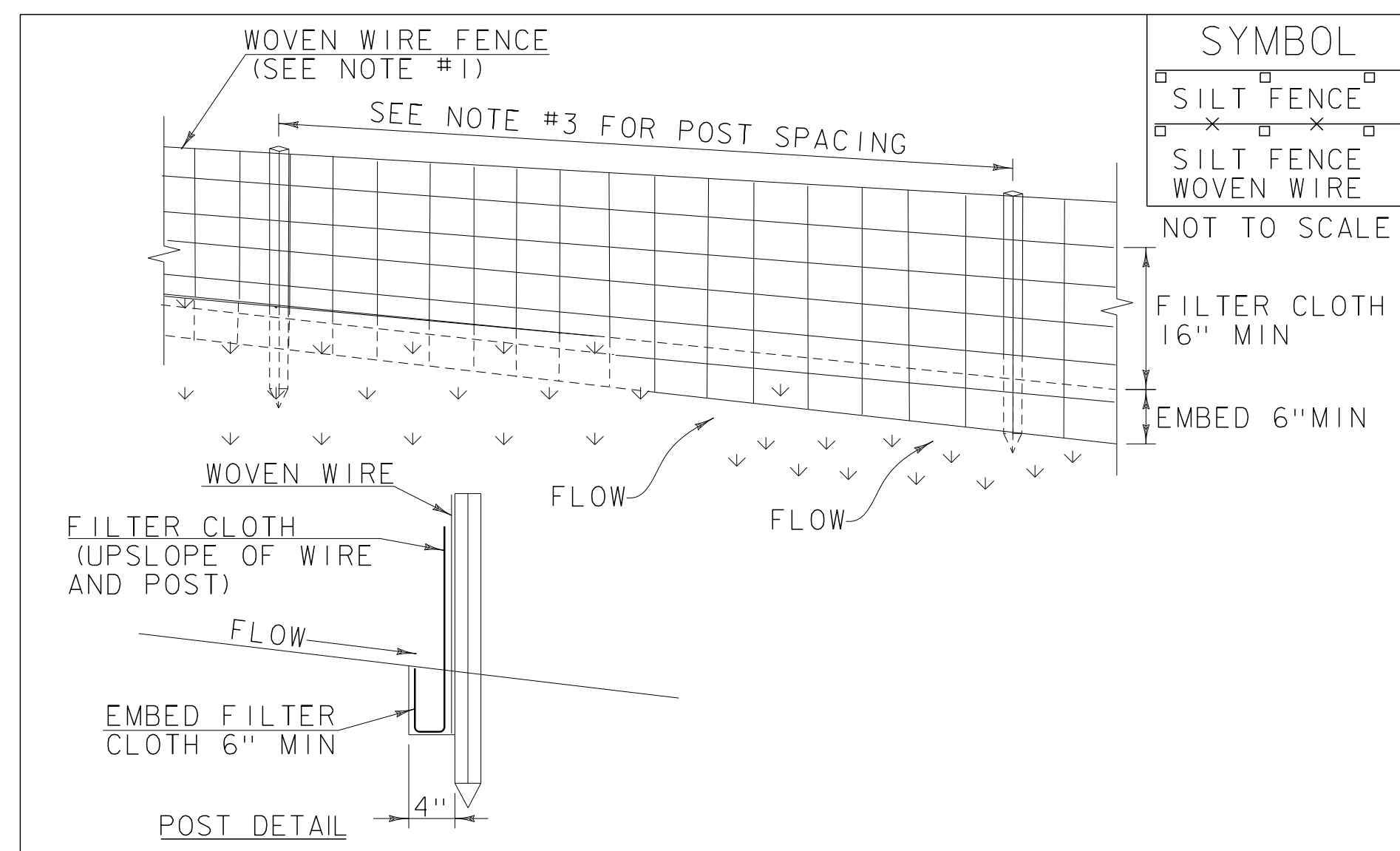
1. APPLY TO SLOPES GREATER THAN 3H:1V OR WHERE NECESSARY TO AID IN ESTABLISHING VEGETATION.
2. APPLY FERTILIZER, LIME SEED PRIOR TO PLACING MATTING.
3. STAPLES ARE TO BE PLACED ALTERNATELY, IN COLUMNS APPROXIMATELY 2' APART AND IN ROWS APPROXIMATELY 3' APART. APPROXIMATELY 175 STAPLES ARE REQUIRED PER 4' X 225' ROLL OF MATERIAL AND 125 STAPLES ARE REQUIRED PER 4' X 150' ROLL OF MATERIAL.
4. DISTURBED AREAS SHALL BE SMOOTHLY GRADED. EROSION CONTROL MATERIAL SHALL BE PLACED LOOSELY OVER GROUND SURFACE. DO NOT STRETCH.
5. ALL TERMINAL ENDS AND TRANSVERSE LAPS SHALL BE STAPLED AT APPROXIMATELY 12" INTERVALS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
 ORIGINALLY DEVELOPED BY USDA-NRCS  
 VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ROLLED EROSION CONTROL PRODUCT (RECP) SIDE SLOPE

NOTES:  
 REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.  
 THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 AND AS SHOWN IN THE PLANS FOR TEMPORARY EROSION-MATTING (PAY ITEM 653.20) OR PERMANENT EROSION MATTING (PAY ITEM 653.21).

REVISIONS	
APRIL 16, 2007	JMF
JANUARY 13, 2009	WHF



SYMBOL  
  
 NOT TO SCALE

**CONSTRUCTION SPECIFICATIONS**

1. WOVEN WIRE REINFORCED FENCE IS REQUIRED WITHIN 100' UPSLOPE OF RECEIVING WATERS WHEN THE PROJECT FALLS UNDER A CONSTRUCTION STORMWATER PERMIT. WOVEN WIRE SHALL BE A MIN. 14 GAUGE WITH A 6" MAX. MESH OPENING.
2. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAF1100X, STABILINKA T140N OR APPROVED EQUIVALENT.
3. POST SPACING FOR WIRE-BACKED FENCE SHALL BE 10' MAXIMUM. FOR FILTER-CLOTH FENCE, WHEN ELONGATION IS >50%, POST SPACING SHALL NOT EXCEED 4' AND WHEN ELONGATION IS <50%, POST SPACING SHALL NOT EXCEED 6'.
4. WOVEN WIRE FENCE IS TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. FILTER CLOTH IS TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN SEDIMENT REACHES HALF OF FABRIC HEIGHT.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC  
 ORIGINALLY DEVELOPED BY USDA-NRCS  
 VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SILT FENCE

NOTES:  
 REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

REVISIONS	
MARCH 21, 2008	WHF
DECEMBER 11, 2008	WHF
JANUARY 13, 2009	WHF

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 AND AS SHOWN IN THE PLANS FOR GEOTEXTILE FOR SILT FENCE (PAY ITEM 649.51), OR GEOTEXTILE FOR SILT FENCE, WOVEN WIRE REINFORCED (PAY ITEM 649.515).

PROJECT NAME: WEATHERSFIELD  
 PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266epsc_det1.dgn  
 PROJECT LEADER: T. LEVINS  
 DESIGNED BY: B. WILLIAMS  
 EPSC DETAILS I

PLOT DATE: 11/14/2018  
 DRAWN BY: B. WILLIAMS  
 CHECKED BY: T. LEVINS  
 SHEET 39 OF 41



VAOT LOW GROW/FINE FESCUE MIX						
WEIGHT	LBS/AC		NAME	LATIN NAME	GERM	PURITY
	BROADCAST	HYDROSEED				
38%	57	95	CREeping RED FESCUE	FESTUCA RUBRA VAR. RUBRA	90%	98%
29%	43.5	72.5	HARD FESCUE	FESTUCA LONGIFOLIA	85%	95%
15%	22.5	37.5	CHEWINGS FESCUE	FESTUCA RUBRA VAR. COMMUTATA	87%	95%
15%	22.5	37.5	ANNUAL RYEGRASS	LOLIUM MULTIFLORUM	90%	95%
3%	4.5	7.5	INERTS			
100%	150	250				

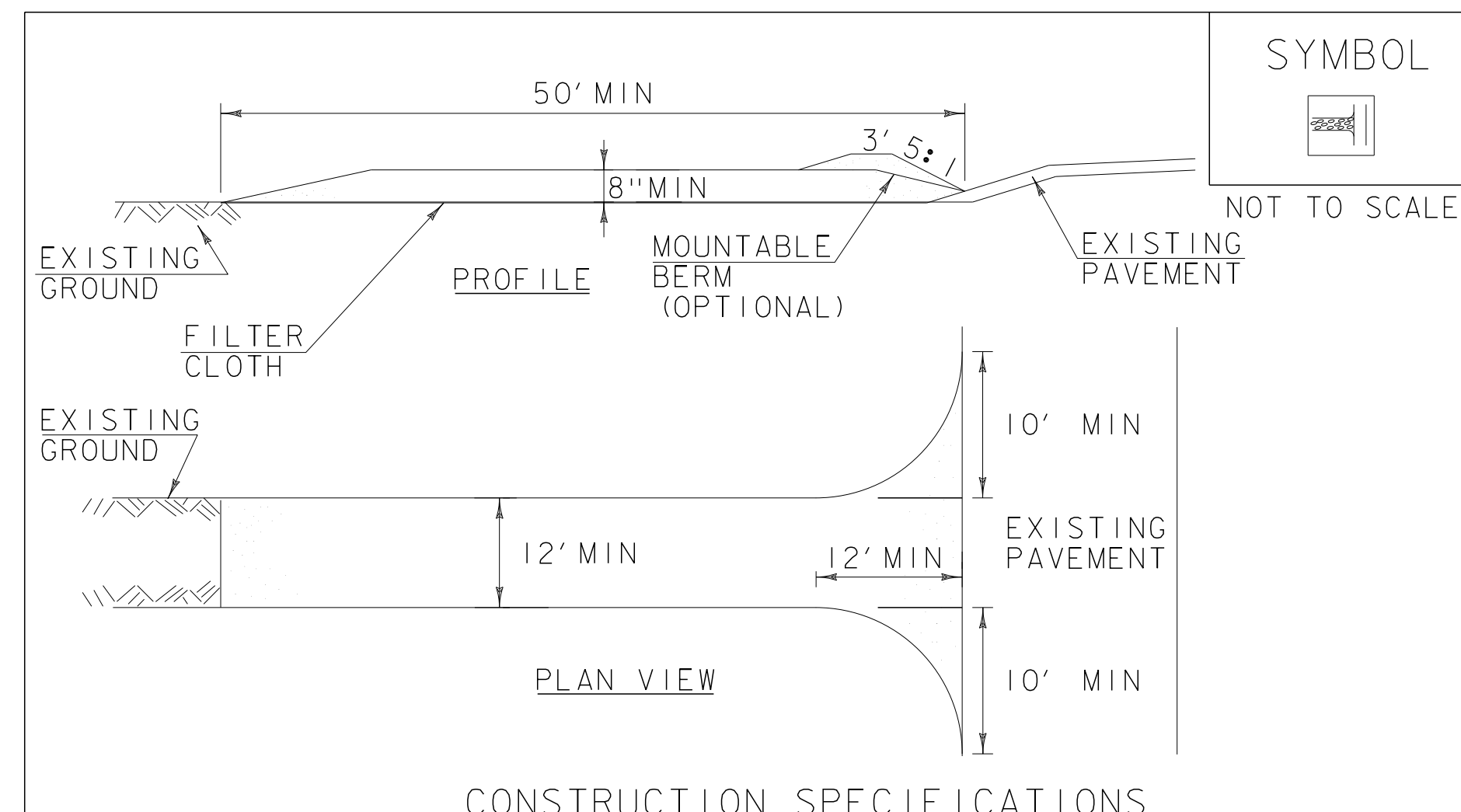
VAOT RURAL AREA MIX						
WEIGHT	LBS/AC		NAME	LATIN NAME	GERM	PURITY
	BROADCAST	HYDROSEED				
37.5%	22.5	45	CREeping RED FESCUE	FESTUCA RUBRA VAR. RUBRA	85%	98%
37.5%	22.5	45	TALL FESCUE	FESTUCA ARUNDINACEA	90%	95%
5.0%	3	6	RED TOP	AGROSTIS GIGANTEA	90%	95%
15.0%	9	18	WHITE FIELD CLOVER	TRIFOLIUM REPENS	85%	98%
5.0%	3	6	ANNUAL RYE GRASS	LOLIUM MULTIFLORUM	85%	95%
100%	60	120				

GENERAL AMENDMENT GUIDANCE		
FERTILIZER	LIME	
10/20/10	AG LIME	PELLITIZED
500 LBS/AC	2 TONS/AC	1 TONS/AC

**CONSTRUCTION GUIDANCE**

- SEED MIX: THE CONTRACTOR SHALL COORDINATE WITH THE RESIDENT ENGINEER ON WHICH SEED MIX TO USE.
- SEED MIX: USE AS INDICATED IN THE PLANS AND/OR FOR ALL ESTABLISHED UPLAND (NON WETLAND) AREAS DISTURBED BY THE CONTRACTOR.
- ALL SEED MIXTURES: SHALL NOT HAVE A WEED CONTENT EXCEEDING 0.40% BY WEIGHT AND SHALL BE FREE OF ALL NOXIOUS SEED.
- FERTILIZER AND LIMESTONE: SHALL FOLLOW RATES SHOWN ON PLAN OR AS DIRECTED BY THE ENGINEER.
- HAY MULCH: TO BE PLACED ON EARTH SLOPES AT THE RATE OF 2 TONS/ACRE, ACHIEVE 90% GROUND COVER OR AS DIRECTED BY THE ENGINEER.
- HYDROSEEDING: ALTHOUGH GUIDANCE IS GIVEN ABOVE THE SITE CONDITIONS AND THE TYPE OF HYDROSEED PROPOSED FOR USE WILL ULTIMATELY DICTATE THE AMOUNTS AND TYPES OF SOIL AMENDMENTS TO BE APPLIED.
- TURF ESTABLISHMENT: PLACING SEED, FERTILIZER, LIME AND MULCH PRIOR TO SEPTEMBER 15 AND AFTER APRIL 15 CAN BETTER ENSURE A VIGOROUS GROWTH OF GRASS.

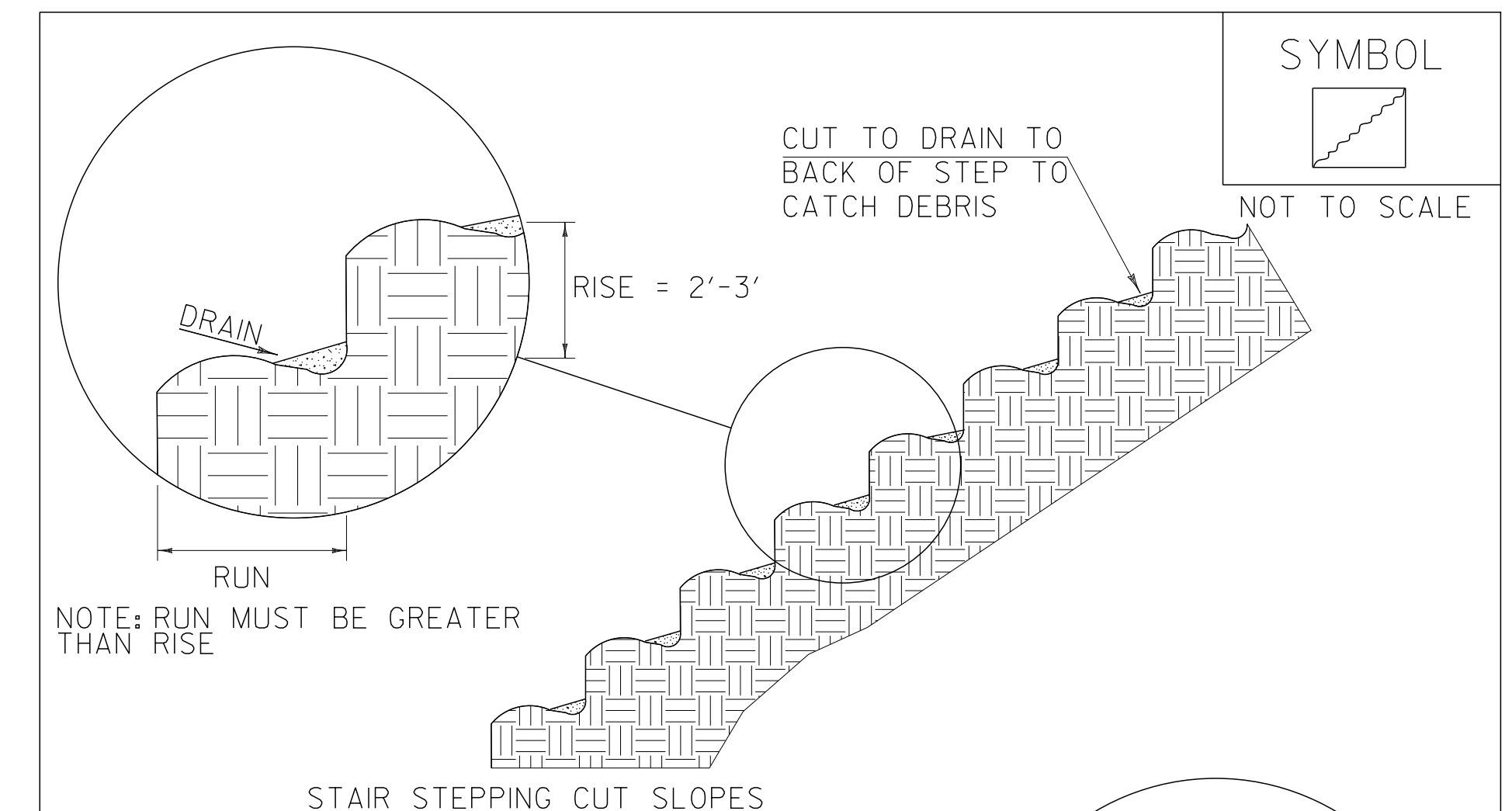
ADAPTED FROM VTRANS TECHNICAL LANDSCAPE MANUAL FOR ROADWAYS AND TRANSPORTATION FACILITIES	<b>TURF ESTABLISHMENT</b>								
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 651 FOR SEED (PAY ITEM 651.15)	<table border="1"> <tr> <th colspan="2">REVISIONS</th> </tr> <tr> <td>JANUARY 12, 2015</td> <td>WHF</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	REVISIONS		JANUARY 12, 2015	WHF				
REVISIONS									
JANUARY 12, 2015	WHF								



**CONSTRUCTION SPECIFICATIONS**

- STONE SIZE- USE 1-4" STONE, RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
- LENGTH- NOT LESS THAN 50' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MINIMUM LENGTH APPLIES).
- THICKNESS- NOT LESS THAN 8".
- WIDTH- 12' MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24' IF SINGLE ENTRANCE TO SITE.
- GEOTEXTILE MUST BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
- SURFACE WATER- ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- MAINTENANCE- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
- WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED ACCORDING TO PERMIT REQUIREMENTS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC ORIGINALLY DEVELOPED BY USDA-NRCS VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION	<b>STABILIZED CONSTRUCTION ENTRANCE</b>										
NOTES: REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.	<table border="1"> <tr> <th colspan="2">REVISIONS</th> </tr> <tr> <td>MARCH 24, 2008</td> <td>WHF</td> </tr> <tr> <td>JANUARY 13, 2009</td> <td>WHF</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	REVISIONS		MARCH 24, 2008	WHF	JANUARY 13, 2009	WHF				
REVISIONS											
MARCH 24, 2008	WHF										
JANUARY 13, 2009	WHF										
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR VEHICLE TRACKING PAD (PAY ITEM 653.35) OR AS SPECIFIED IN THE CONTRACT.											



**STAIR STEPPING CUT SLOPES**

- NOTE: RUN MUST BE GREATER THAN RISE
- NOTE: GROOVE SLOPE BY CUTTING FURROWS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND RETAIN LIME, FERTILIZER AND SEED.

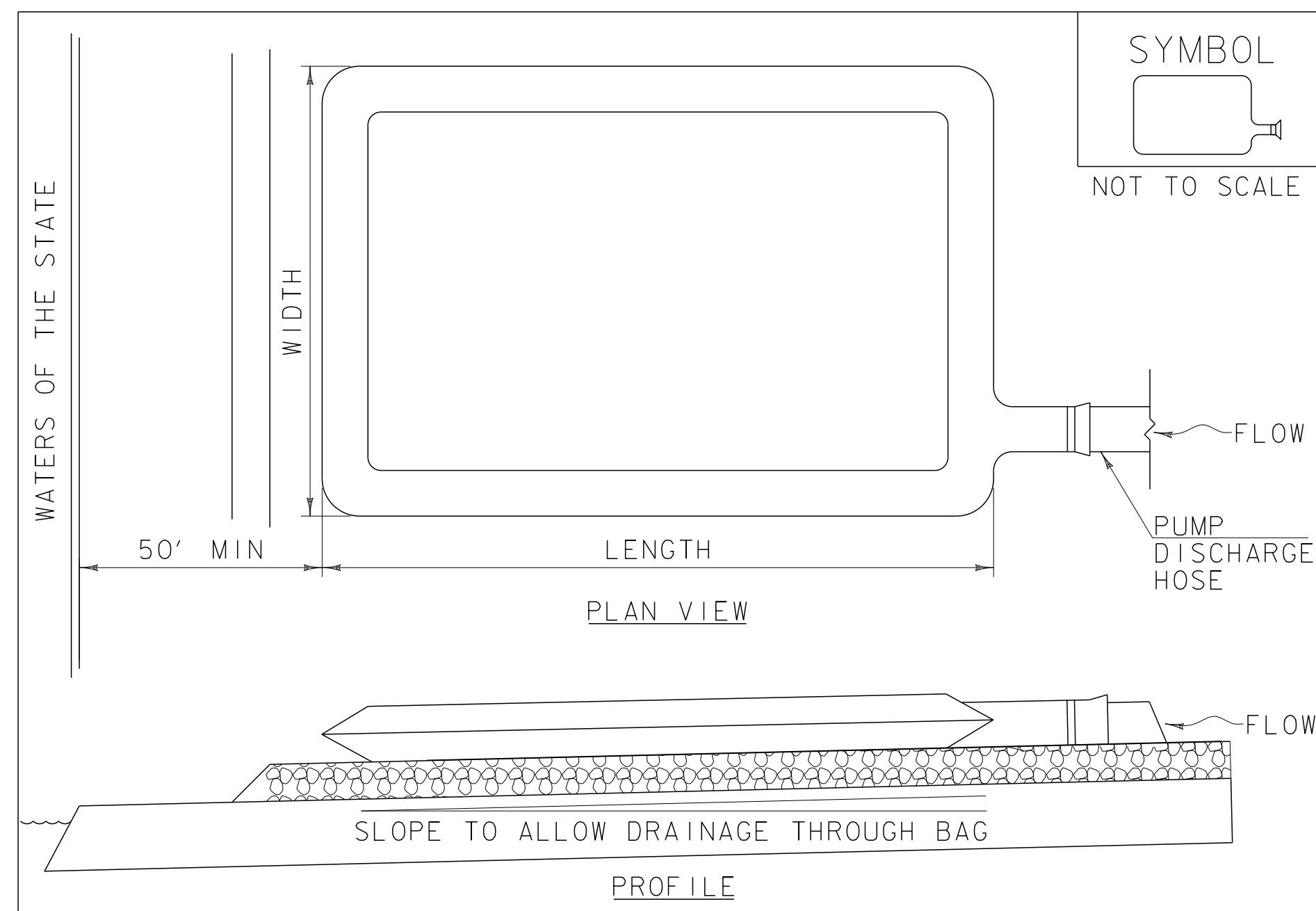
ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC ORIGINALLY DEVELOPED BY USDA-NRCS VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION	<b>SURFACE ROUGHENING</b>										
NOTES: REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.	<table border="1"> <tr> <th colspan="2">REVISIONS</th> </tr> <tr> <td>APRIL 1, 2008</td> <td>WHF</td> </tr> <tr> <td>JANUARY 13, 2009</td> <td>WHF</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	REVISIONS		APRIL 1, 2008	WHF	JANUARY 13, 2009	WHF				
REVISIONS											
APRIL 1, 2008	WHF										
JANUARY 13, 2009	WHF										
THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT											

PROJECT NAME: WEATHERSFIELD  
PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266epsc_de+2.dgn  
PROJECT LEADER: T. LEVINS  
DESIGNED BY: B. WILLIAMS  
EPSC DETAILS 2

PLOT DATE: 11/14/2018  
DRAWN BY: B. WILLIAMS  
CHECKED BY: T. LEVINS  
SHEET 40 OF 41





CONSTRUCTION SPECIFICATIONS

1. THE PRIMARY PURPOSE OF FILTER BAG IS TO RETAIN SILT, SAND, AND FINES DURING DEWATERING OPERATIONS.
2. FILTER BAGS SHALL BE INSTALLED ON A VEGETATED SLOPE GRADED TO ALLOW INCOMING WATER TO FLOW THROUGH THE BAG.
3. FILTER BAGS MAY ALSO BE PLACED ON COARSE AGGREGATE, STONE, OR HAYBALES TO INCREASE FILTRATION EFFICIENCY.
4. FILTER BAGS SHALL BE LOCATED A MINIMUM OF 50' FROM WATERS OF THE STATE UNLESS OTHERWISE APPROVED BY THE ENGINEER.
5. THE NECK OF THE FILTER BAG SHALL BE STRAPPED TIGHTLY TO THE DISCHARGE HOSE.
6. A FILTER BAG IS FULL WHEN IT NO LONGER CAN EFFICIENTLY FILTER SEDIMENT OR ALLOW WATER TO PASS AT A REASONABLE RATE.
7. FILTER BAG SHALL BE DISPOSED OF AS APPROVED IN THE EPSC PLAN OR AS DIRECTED BY THE ENGINEER.

FILTER BAG

NOTES:  
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- " FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR FILTER BAG (PAY ITEM 653.45) AND AS SPECIFIED IN THE CONTRACT.

REVISIONS	
MARCH 24, 2008	WHF
JANUARY 13, 2009	WHF

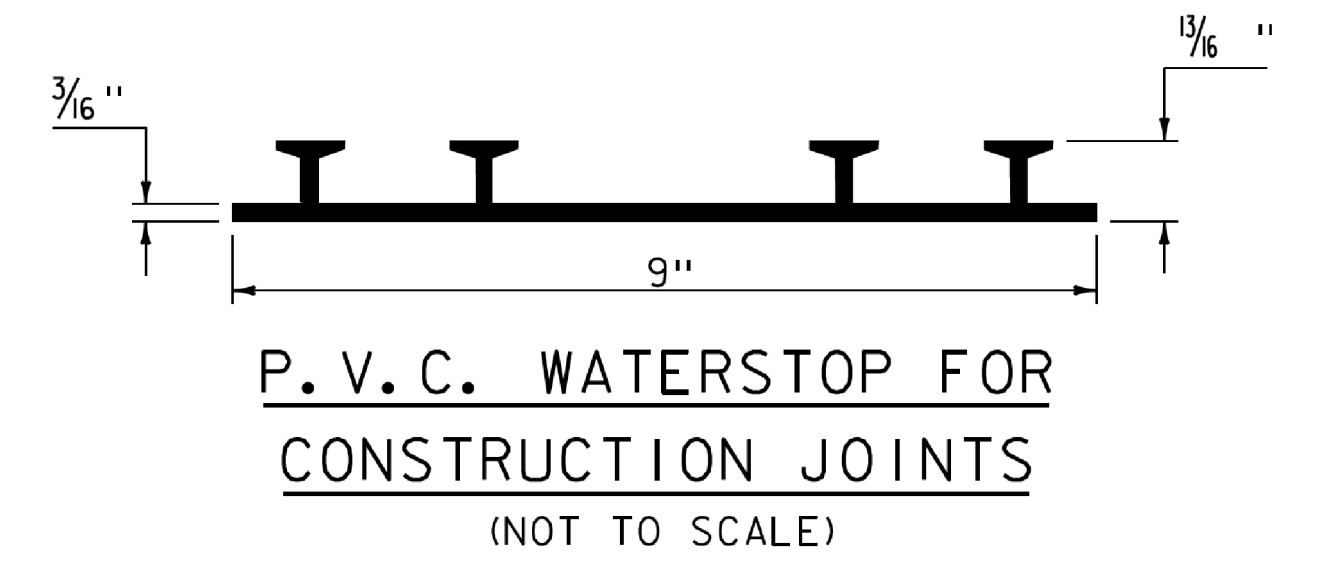
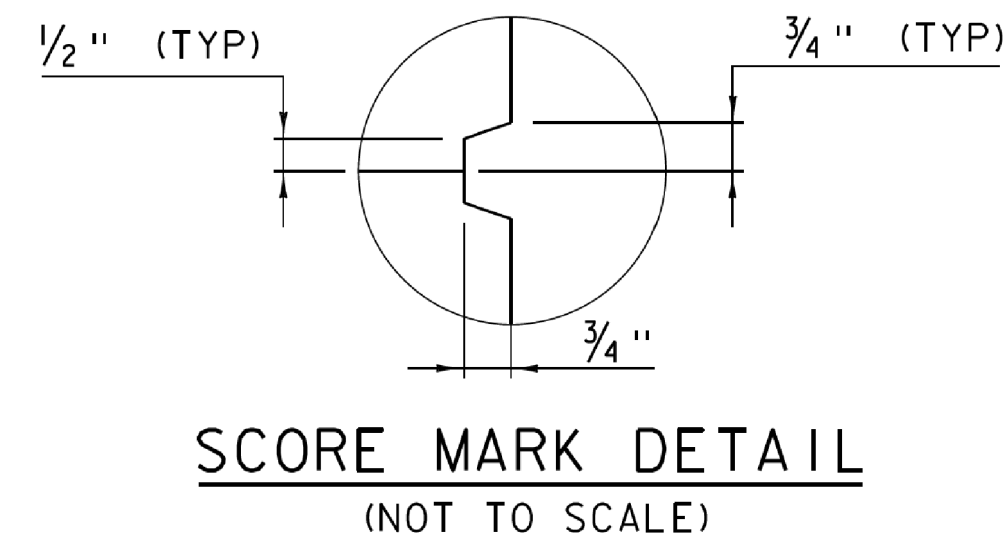
PROJECT NAME: WEATHERSFIELD  
PROJECT NUMBER: STP 0146(16)

FILE NAME: z00c266epsc_det+3.dgn  
PROJECT LEADER: T. LEVINS  
DESIGNED BY: B. WILLIAMS  
EPSC DETAILS 3

PLOT DATE: 11/14/2018  
DRAWN BY: B. WILLIAMS  
CHECKED BY: T. LEVINS  
SHEET 41 OF 41

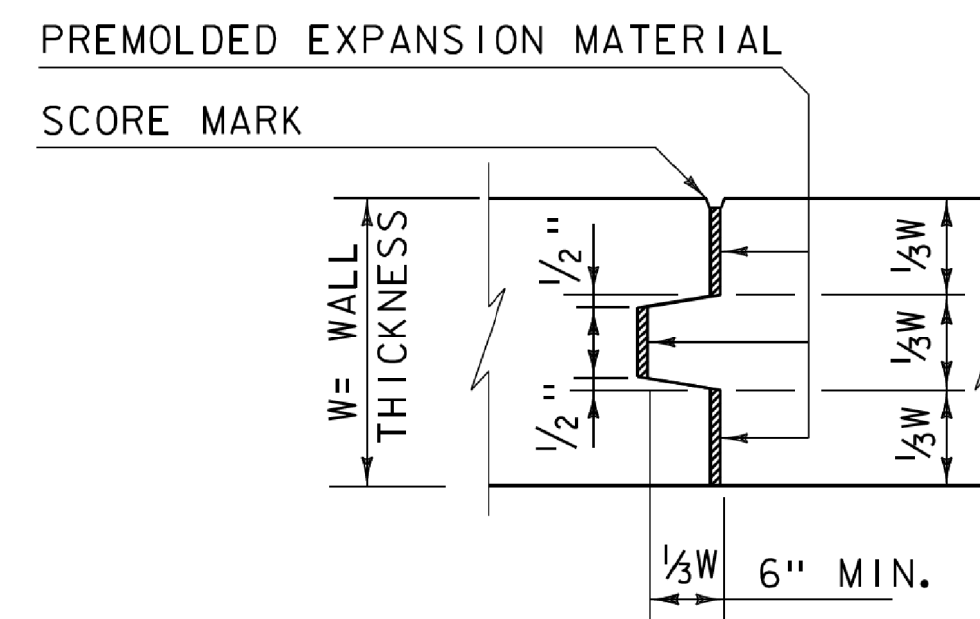
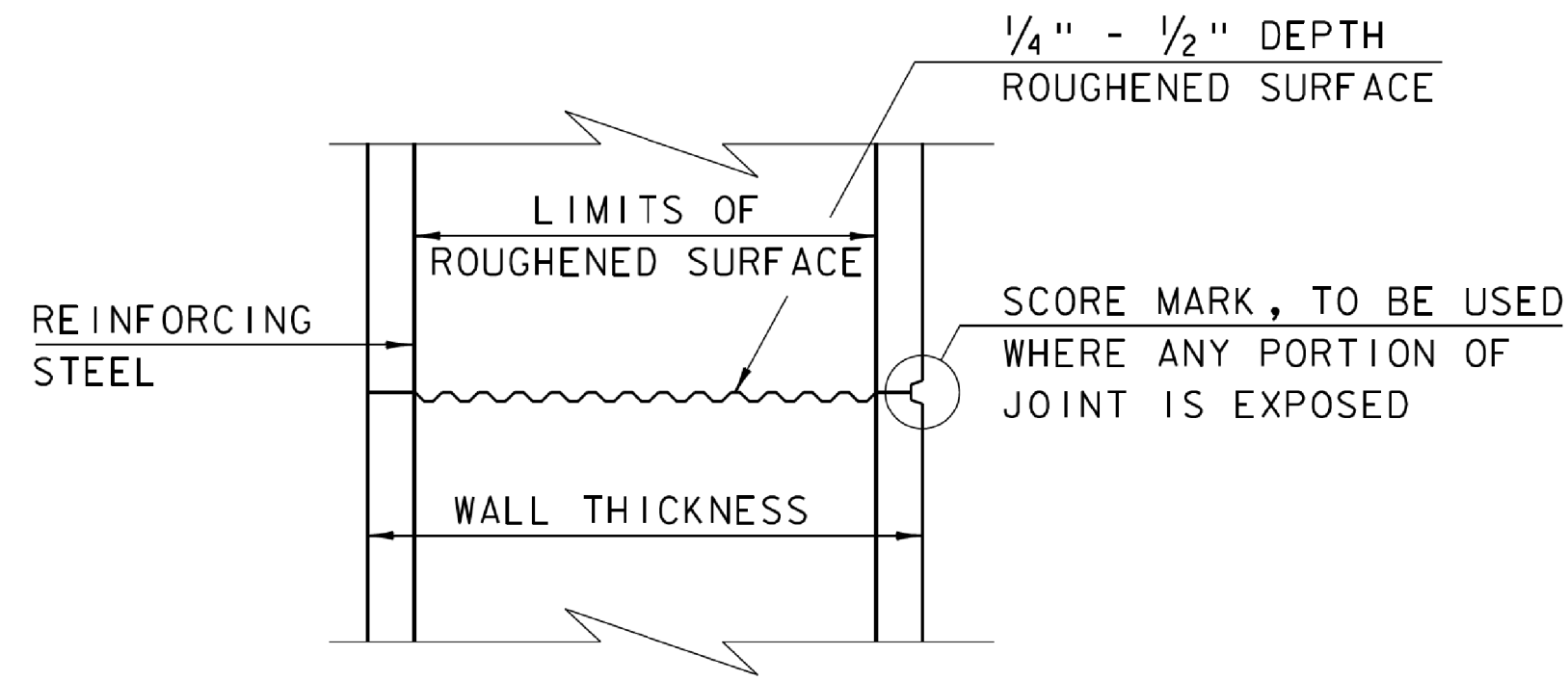
**CONCRETE GENERAL NOTES**

1. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1" x 1"
2. REINFORCING STEEL SIZE AND SPACING SHOWN IN THE PLANS IS BASED ON 60 KSI STEEL, UNLESS NOTED OTHERWISE. WITH THE ENGINEER'S PERMISSION, BAR SIZE AND SPACING MAY BE MODIFIED ACCORDING TO THE LATEST AASHTO LRFD BRIDGE DESIGN SPECIFICATION AND STRUCTURES DESIGN MANUAL WHEN USING HIGHER STRENGTH STEEL.

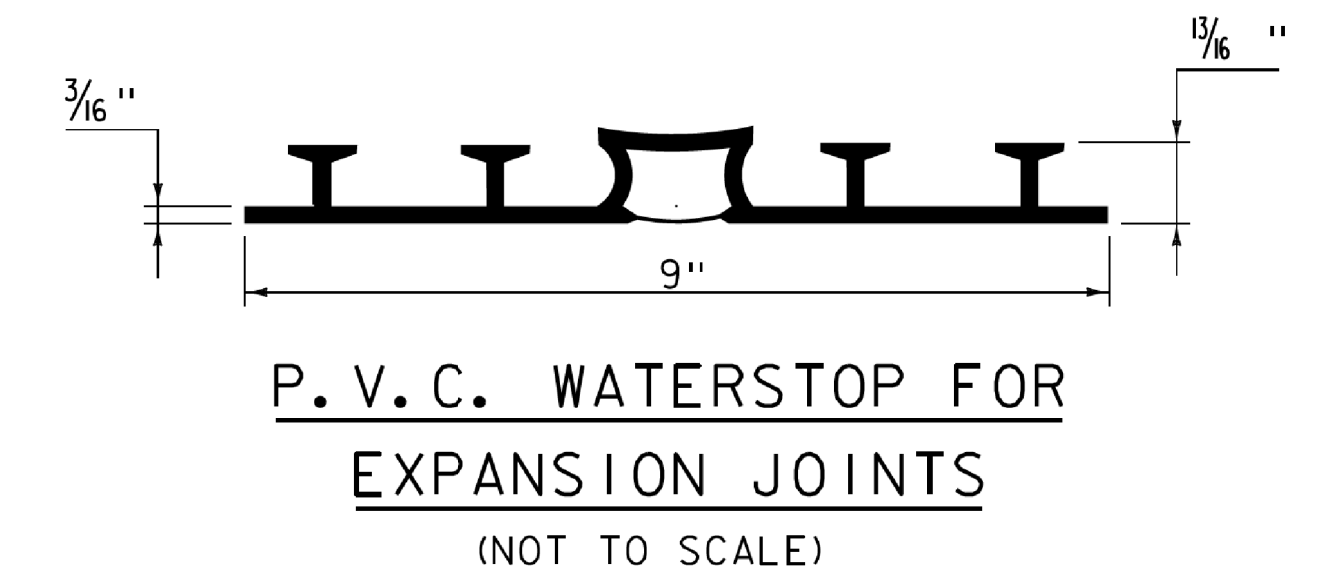


PAYMENT FOR THE P.V.C. WATERSTOP SHALL BE INCIDENTAL TO THE UNIT BID PRICE FOR THE ADJACENT CONCRETE.

OTHER CONFIGURATIONS OF WATERSTOP MAY BE USED UPON APPROVAL OF THE ENGINEER.



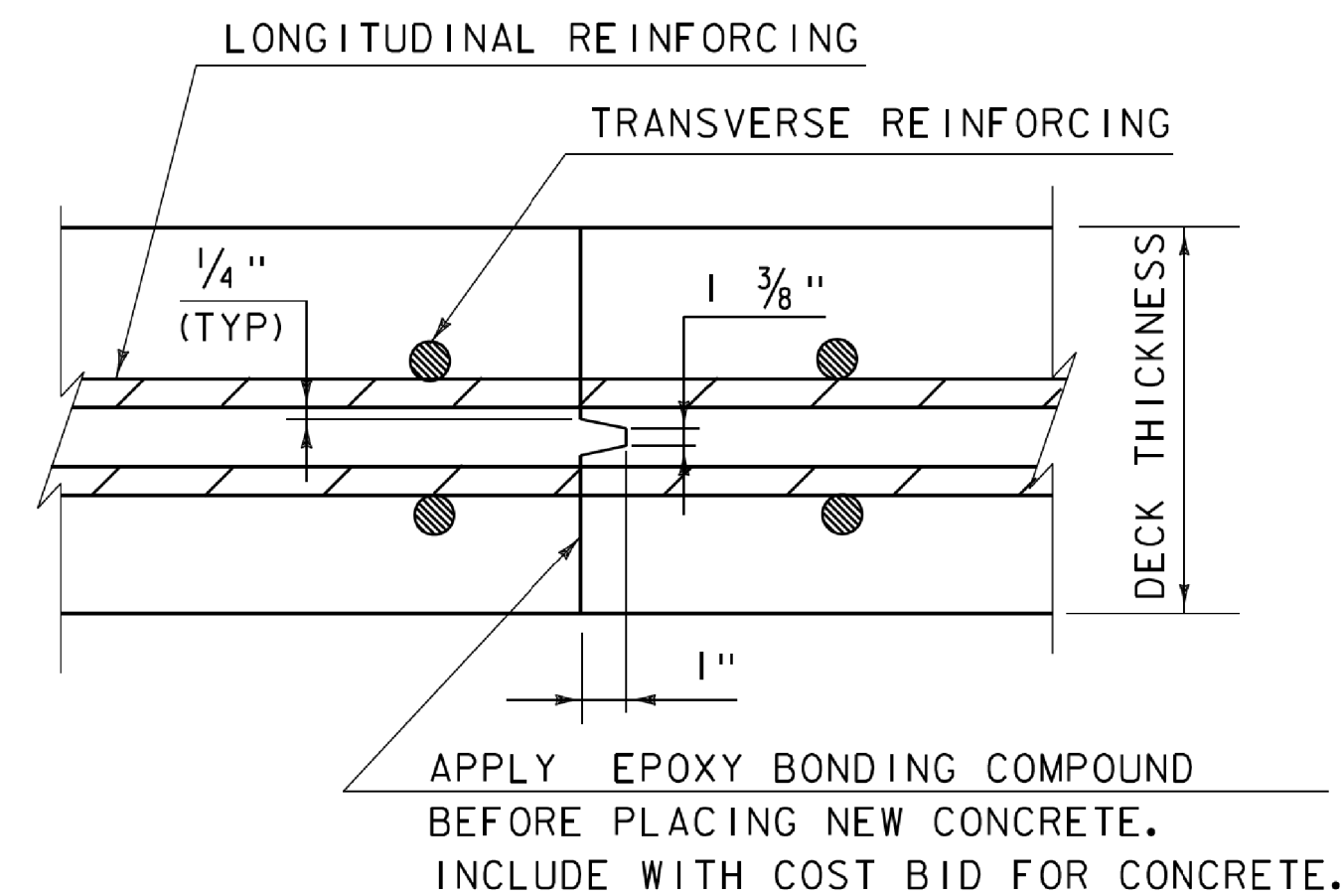
**TYPICAL CONCRETE EXPANSION JOINT**  
(NOT TO SCALE)



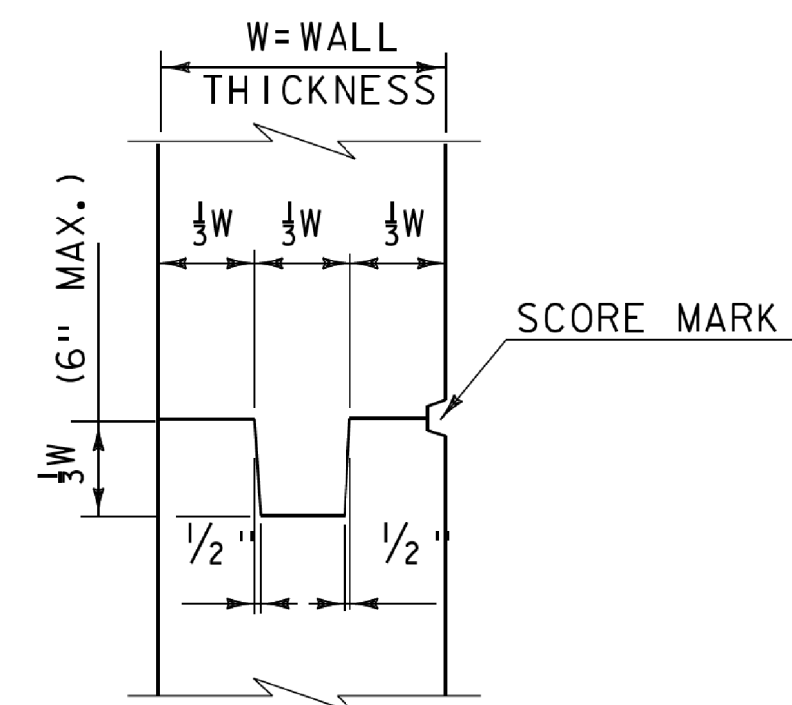
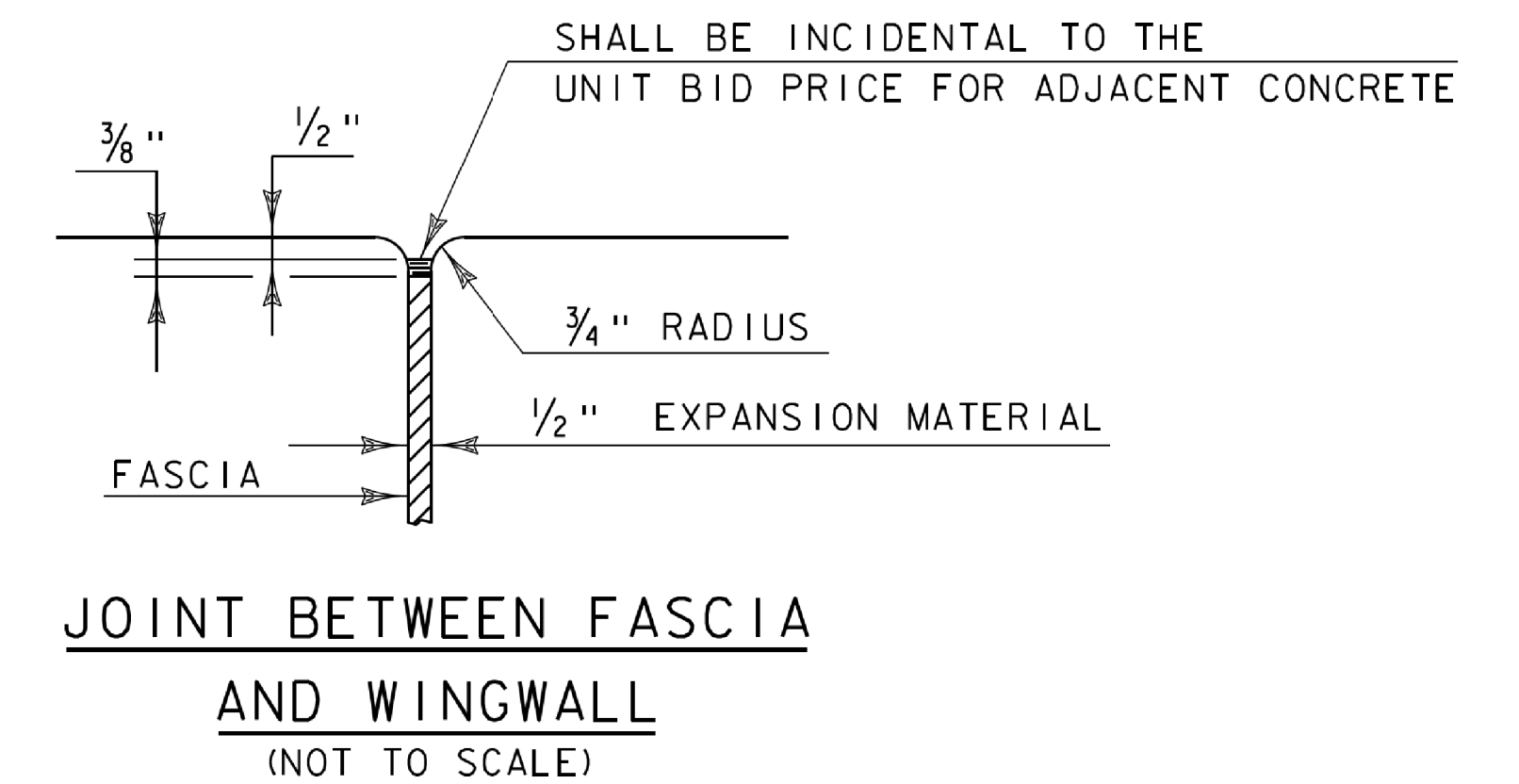
PAYMENT FOR THE P.V.C. WATERSTOP SHALL BE INCIDENTAL TO THE UNIT BID PRICE FOR THE ADJACENT CONCRETE.

OTHER CONFIGURATIONS OF WATERSTOP MAY BE USED UPON APPROVAL OF THE ENGINEER.

1. THE SURFACE OF THE CONCRETE CONSTRUCTION JOINTS SHALL BE CLEANED AND FREE OF LAITANCE.
2. IMMEDIATELY BEFORE NEW CONCRETE IS PLACED, ALL CONSTRUCTION JOINTS SHALL BE WETTED AND STANDING WATER REMOVED.



**TRANSVERSE BRIDGE SLAB CONSTRUCTION JOINT DETAILS**  
(NOT TO SCALE)

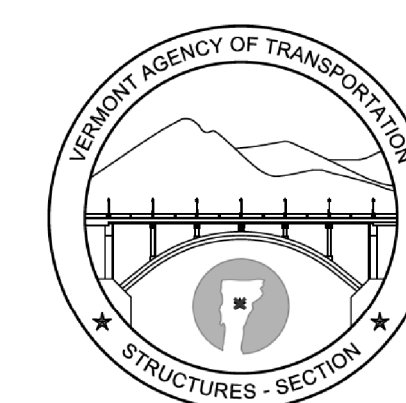


**TYPICAL CONCRETE CONSTRUCTION JOINT**  
(NOT TO SCALE)

**REVISIONS**

MAY 7, 2010	APPROVED FOR USE BY VAOT STRUCTURES SECTION
FEBRUARY 9, 2012	REBAR SUBSTITUTION ALLOWANCE ADDED TO CONCRETE GENERAL NOTES.

**CONCRETE  
DETAILS AND NOTES**



**STRUCTURES  
DETAIL  
SD-501.00**