

UTILITY BRIDGE REPAIR AND REPLACEMENT PROJECT

PLAN OF
SCHOOL STREET OVER ASSABET RIVER
& OTIS STREET OVER HOP BROOK
IN THE TOWN OF
NORTHBOROUGH
WORCESTER COUNTY

THESE PLANS ARE SUPPLEMENTED BY THE 2025 MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE MASSDOT OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE MASSDOT WORKZONE SAFETY TEMPORARY TRAFFIC CONTROL, THE MASSDOT 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 2023 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) WITH MASSACHUSETTS AMENDMENTS AND THE STANDARD MUNICIPAL TRAFFIC CODE, THE TOWN OF NORTHBOROUGH SUBDIVISION RULES AND REGULATIONS, THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, AND NORTHBOROUGH WATER REGULATIONS, ADOPTED 2023.



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TEC, Inc.
282 Merrimack Street, 2nd Floor
Lawrence, MA 01843
978-794-1792

311 Main Street
2nd Floor
Worcester, MA 01608
508-868-5104

2 Monument Square, Unit 301
Portland, ME 04101
603-601-8154

www.TheEngineeringCorp.com

DESIGNED BY SWM
DRAWN BY SWM
CHECKED BY CMR
DATE 12/30/2025
SCALE AS SHOWN

PREPARED FOR
Town of Northborough
63 Main Street
Northborough, MA, 01532

REVISIONS

ISSUED FOR
Final Plans

PROJECT TITLE
Northborough
Utility Bridges

PROJECT LOCATION
Northborough, MA

DRAWING TITLE
Title Sheet

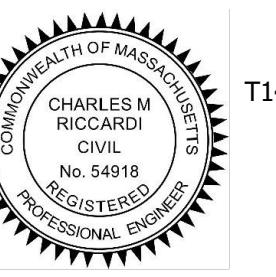
PROJECT NO.
T1487

TEC CAD FILE
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Phase1

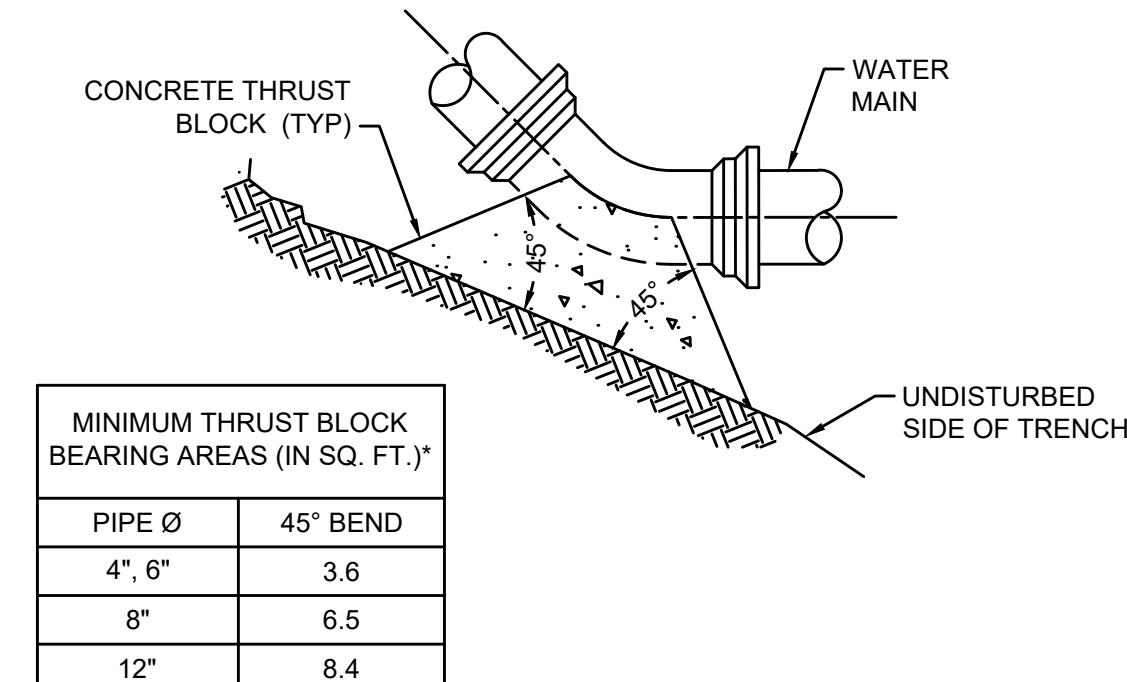
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S-1

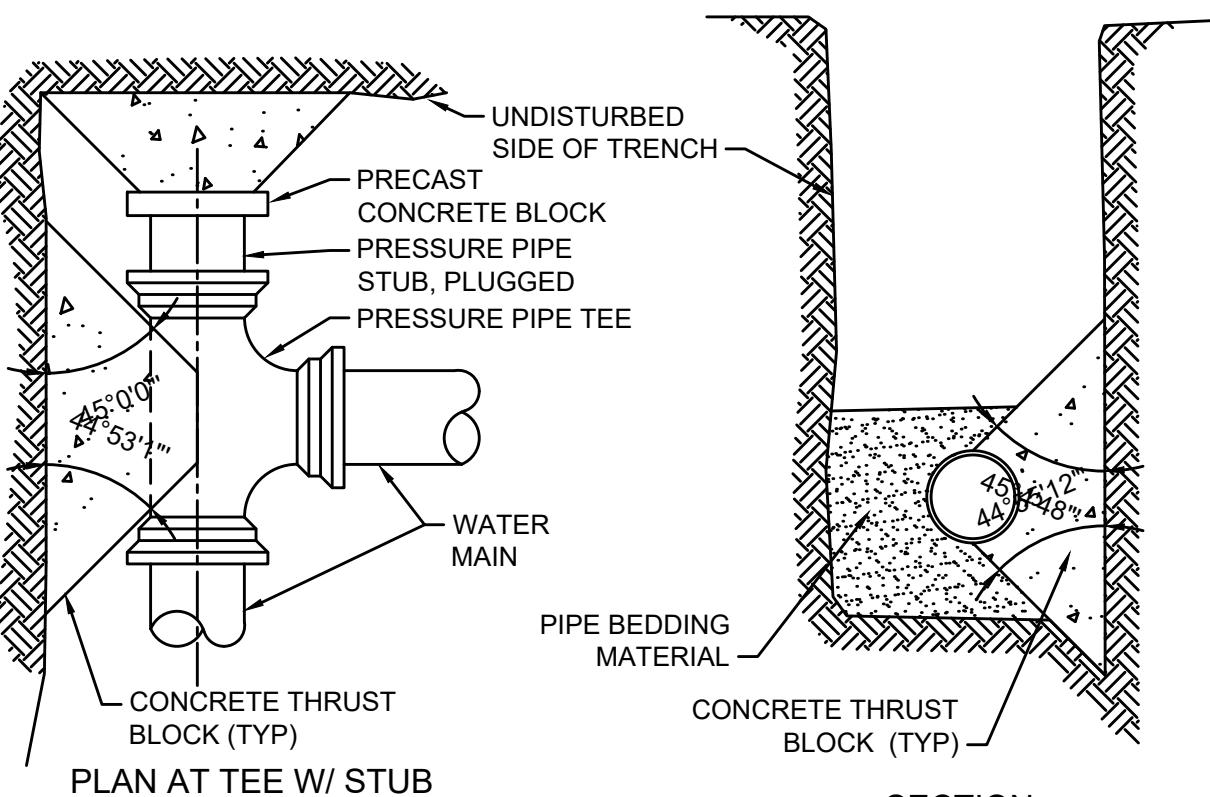


SHEET 1 OF 10

Clk A.

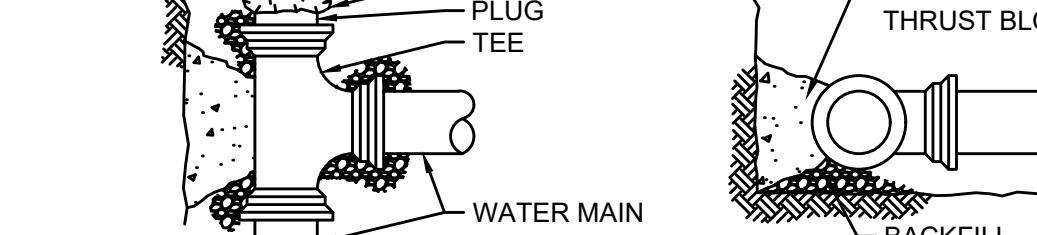


PLAN AT UPWARD VERTICAL BEND

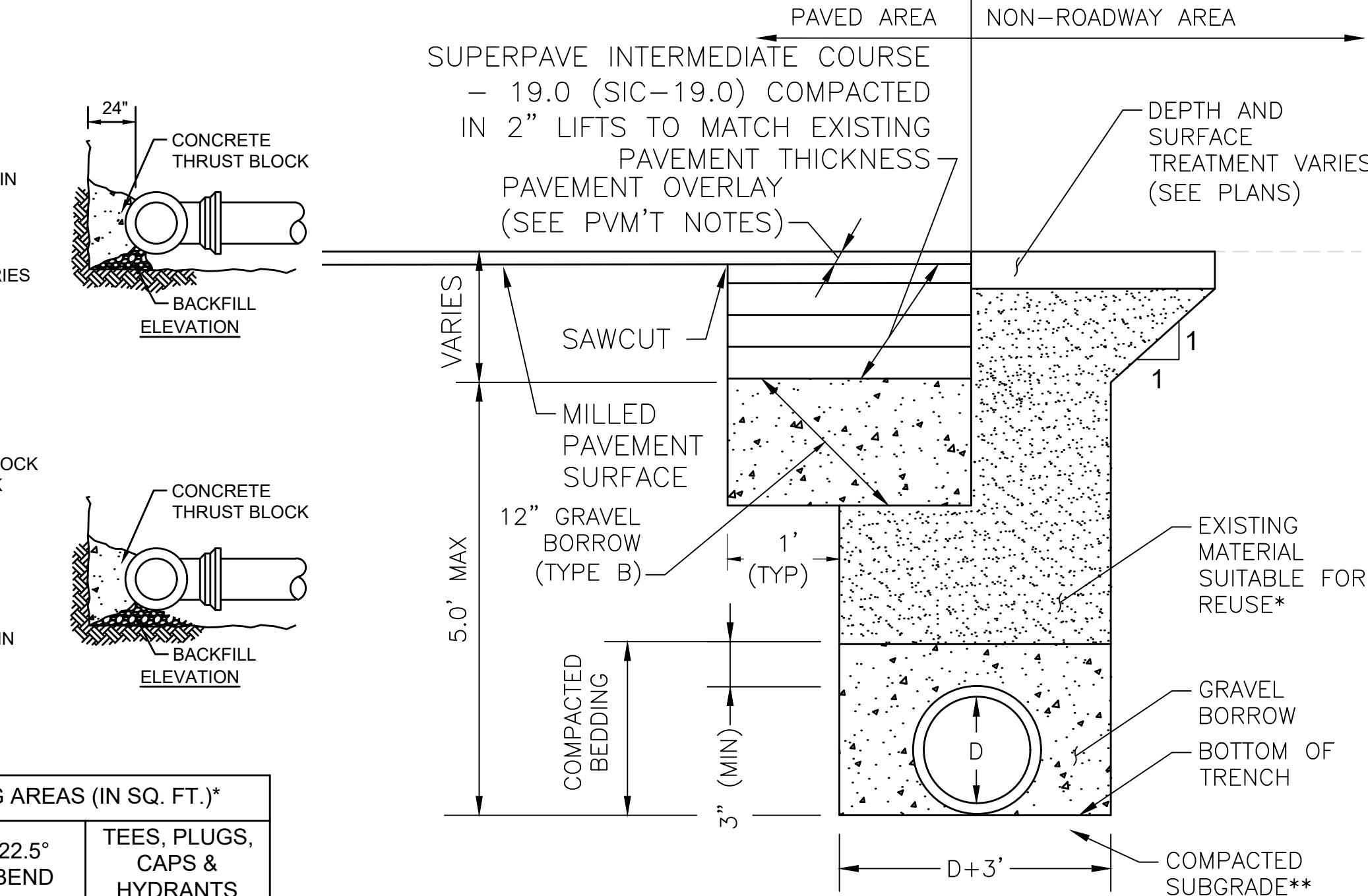


PLAN AT TEE W/ STUB FOR FUTURE USE

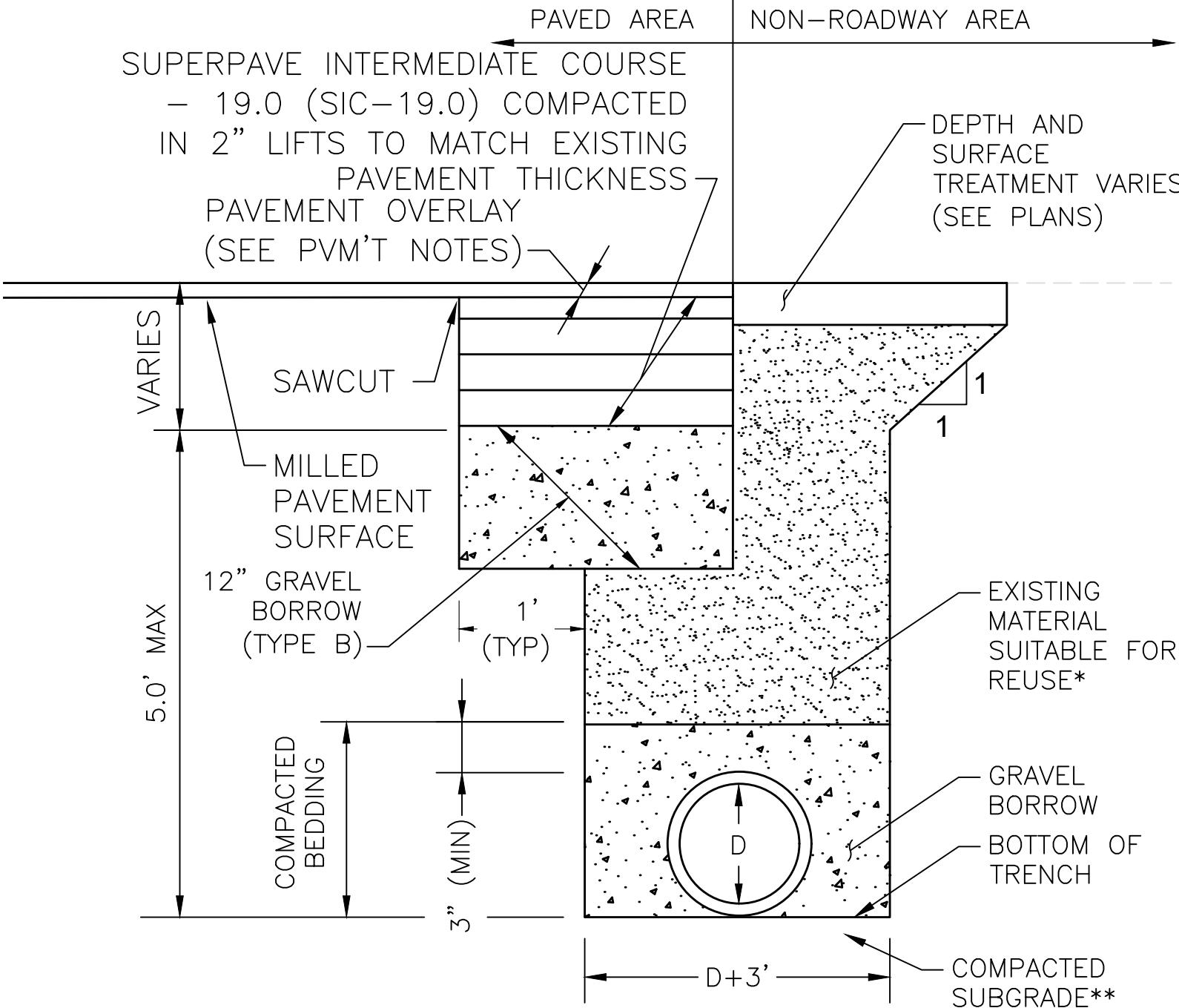
SECTION



PLAN



PLAN



PLAN

MINIMUM THRUST BLOCK BEARING AREAS (IN SQ. FT.)*		
PIPE Ø	45° BEND	
4"	.9	
6"	1.6	
8"	3.3	

RESTRAINING BAR DIMENSIONS		
PIPE Ø	BAR SIZE	EMBEDMENT LENGTH
4", 6"	#4	15"
8"	#4	15"
12"	#6	2'-0"

PLAN AT DOWNWARD VERTICAL BEND

NOTES:

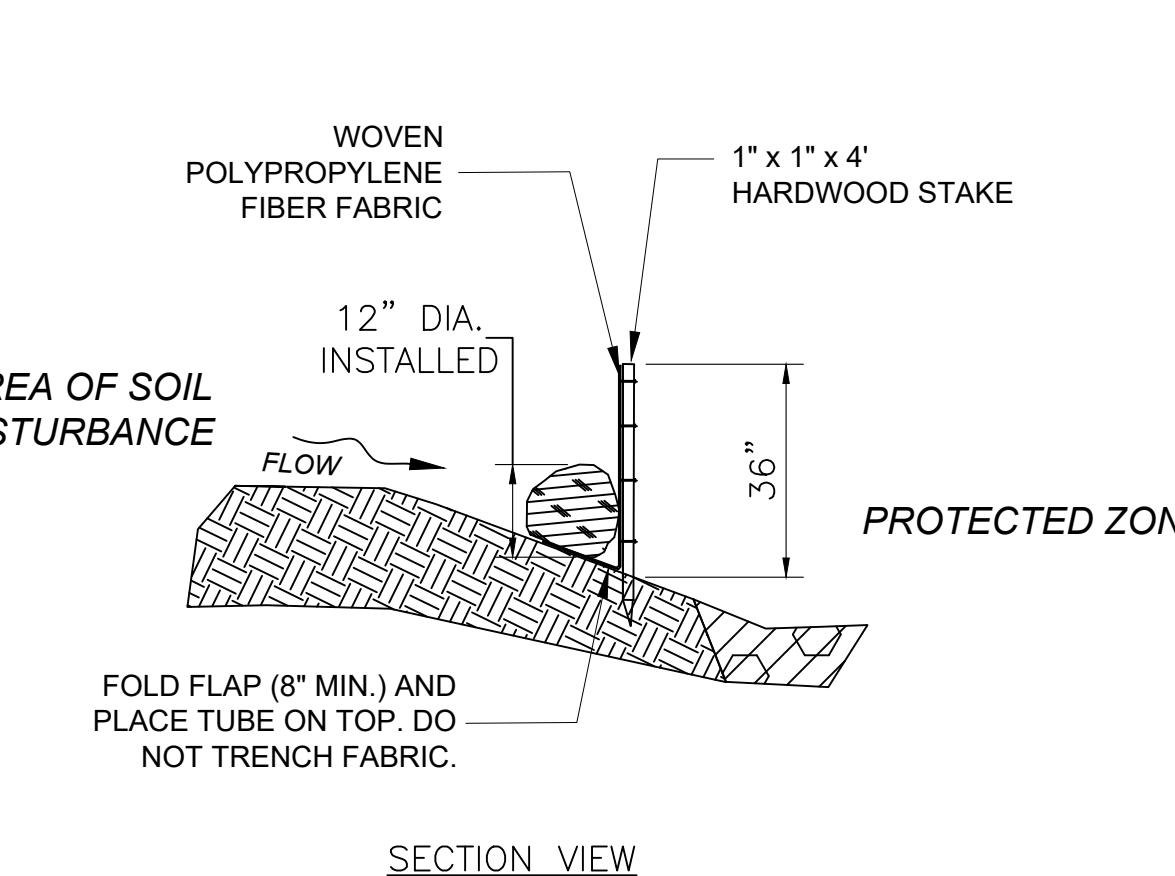
- ALL WATER MAIN BENDS SHALL BE RESTRAINED W/ THRUST BLOCKS EXCEPT WHERE NOTED.
- ALL THRUST BLOCKS & COLLARS SHALL BE INSTALLED SO THAT THEY BEAR AGAINST UNDISTURBED EARTH.
- MINIMUM COMPRESSIVE STRENGTH OF THRUST BLOCK CONCRETE SHALL BE 3,000 P.S.I.
- KEEP CONCRETE CLEAR OF MECHANICAL JOINTS.
- MINIMUM BEARING AREAS ARE BASED ON 250 P.S.I. INTERNAL PIPE PRESSURE & 1.5 TONS/F. ALLOWABLE SOIL BEARING CAPACITY.
- MINIMUM BEARING AREAS ARE BASED ON 250 P.S.I. INTERNAL PIPE PRESSURE & 1.5 TONS/F. ALLOWABLE SOIL BEARING CAPACITY.

NOTES:

- ALL WATER MAIN FITTINGS, BENDS, TEES, PLUGS ETC. SHALL BE RESTRAINED W/ THRUST BLOCKS EXCEPT WHERE NOTED.
- ALL THRUST BLOCKS & COLLARS SHALL BE INSTALLED SO THAT THEY BEAR AGAINST UNDISTURBED EARTH.
- MINIMUM COMPRESSIVE STRENGTH OF THRUST BLOCK CONCRETE SHALL BE 3,000 P.S.I.
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THRUST BLOCK - HORIZONTAL BENDS & PIPE RESTRAINT DETAILS

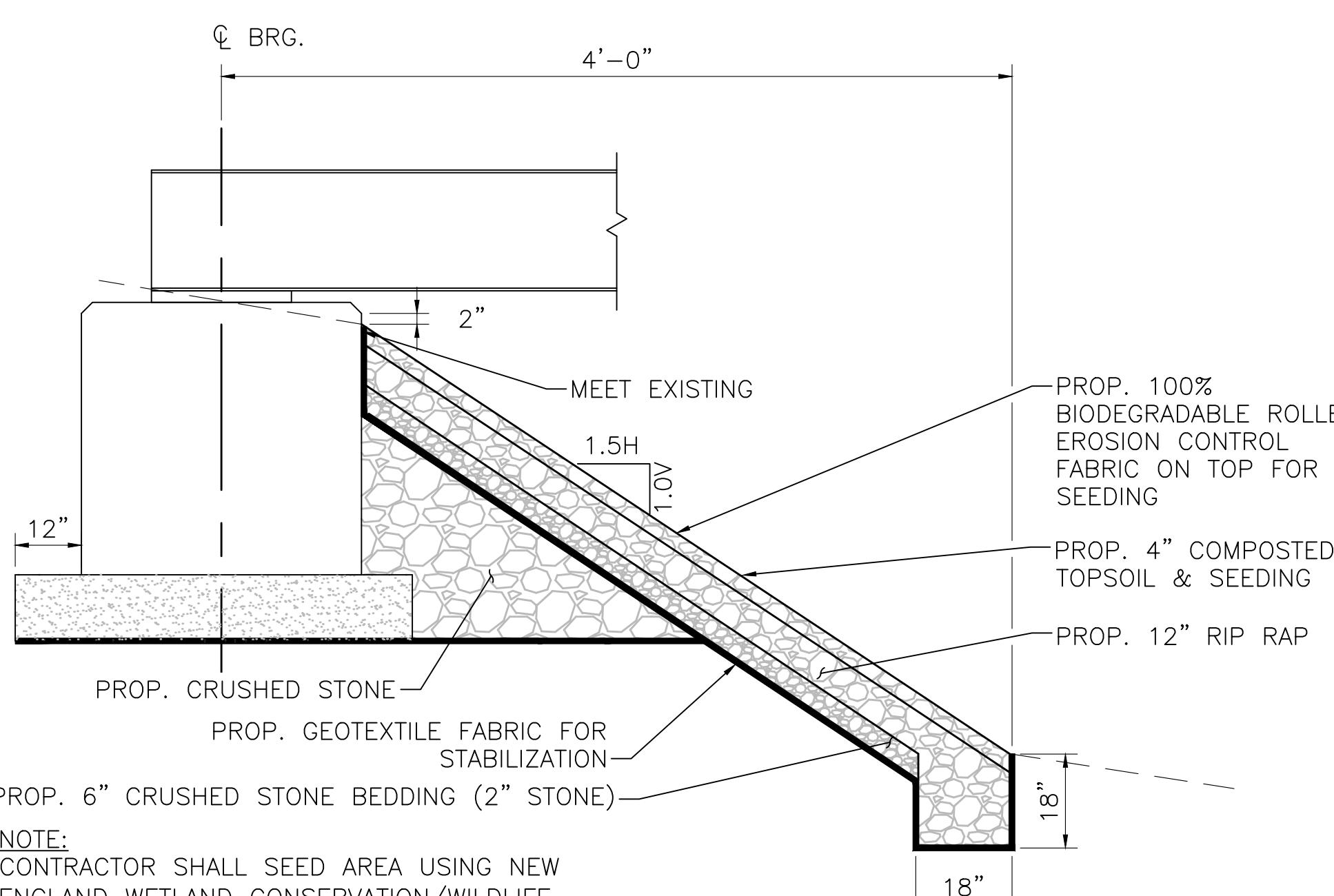
N.T.S.



SECTION VIEW

THRUST BLOCK DETAILS - VERTICAL BENDS

N.T.S.



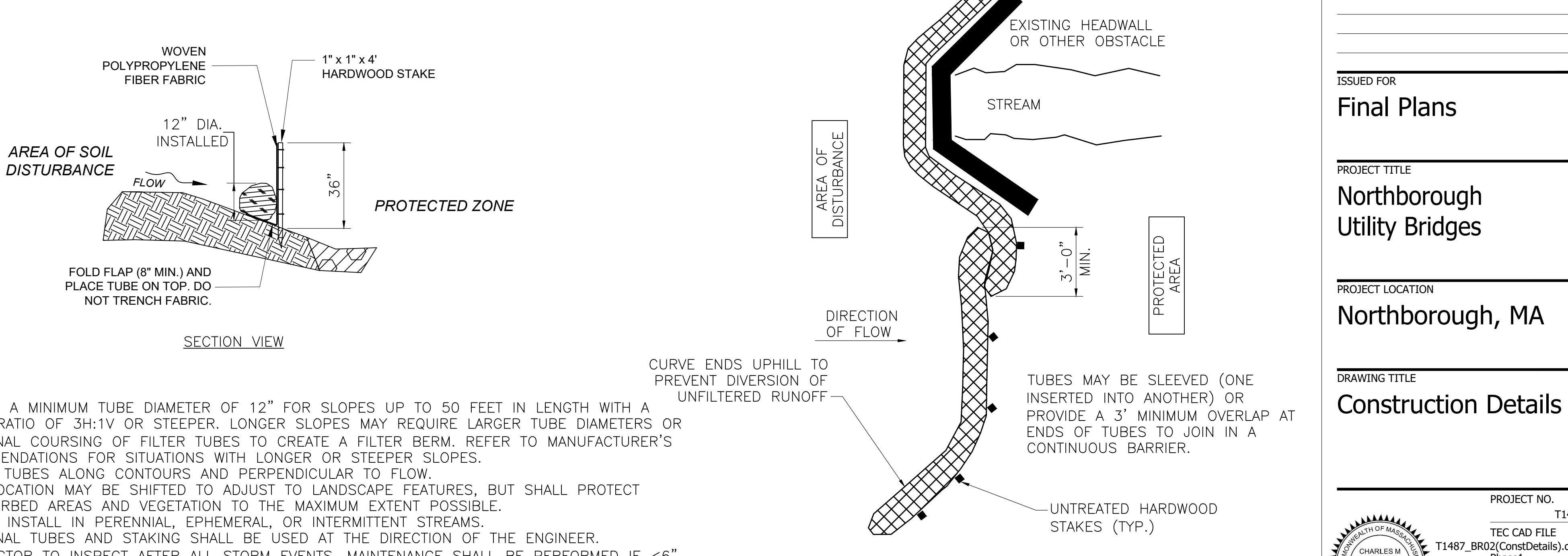
NOTES:

- PROVIDE A MINIMUM TUBE DIAMETER OF 12" FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES MAY REQUIRE LARGER TUBE DIAMETERS OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
- INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO FLOW.
- TUBE LOCATION MAY BE SHIFTED TO ADJUST TO LANDSCAPE FEATURES, BUT SHALL PROTECT UNDISTURBED AREAS AND VEGETATION TO THE MAXIMUM EXTENT POSSIBLE.
- DO NOT INSTALL IN PERENNIAL, Ephemeral, OR INTERMITTENT STREAMS.
- ADDITIONAL TUBES AND STAKING SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
- CONTRACTOR TO INSPECT AFTER ALL STORM EVENTS. MAINTENANCE SHALL BE PERFORMED IF <6" OF TUBE IS VISIBLE.

MODIFIED ROCKFILL SLOPE STABILIZATION

N.T.S.

NOTE:
CONTRACTOR SHALL SEED AREA USING NEW
ENGLAND WETLAND CONSERVATION/WILDLIFE
SEED MIX OR APPROVED REPLACEMENT.



COMPOST FILTER TUBE & SEDIMENTATION FENCE

N.T.S.

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS, ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH MASSDOT 2025 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.

EXISTING CONDITIONS:

THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND EXISTING DETAILS NECESSARY FOR THE COMPLETION OF WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF AND SHALL NOT ORDER ANY MATERIALS OR COMMENCE ANY FABRICATION UNTIL THE REQUIRED MEASUREMENTS HAVE BEEN MADE ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

SURVEY NOTES:

THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18.

ABUTTING PROPERTY LINES HAVE BEEN COMPILED FROM RECORD INFORMATION.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

SHOP DRAWINGS:

THE CONTRACTOR SHALL SUBMIT ALL SHOP DRAWINGS AS REQUIRED BY THE STANDARD SPECIFICATION AND THE LATEST MASSDOT BRIDGE MANUAL. PROPOSED COMPONENTS THAT REQUIRE FIELD MEASUREMENTS SHALL BE DESIGNED, DETAILED, AND SUBMITTED TO THE ENGINEER FOR APPROVAL.

STRUCTURAL STEEL:

1. ALL STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 GRADE 50. ALL STEEL AT OTIS STREET SHALL BE PAINTED ACCORDING TO PROJECT SPECIFICATIONS. ALL STEEL AT SCHOOL STREET SHALL BE METALLIZED ACCORDING TO PROJECT SPECIFICATIONS. IT MUST BE CONSIDERED A MAIN MEMBER AND CONFORM TO THE M270 ZONE T2 ASSHTO V-NOTCH REQUIREMENTS.
2. EXISTING STEEL MEMBERS AT OTIS STREET MUST BE CLEANED AND PAINTED AT AREAS OF PROPOSED WORK PRIOR TO INSTALLATION OF CONNECTIONS (SEE SPECIAL PROVISION FOR ITEM 961.2).
3. REMOVE ANY OBSTACLES THAT INTERFERE WITH STEEL WORK. THE CONTRACTOR SHALL PROTECT EXISTING UTILITIES DURING STEEL REPAIR OPERATIONS.

CONCRETE:

UNLESS OTHERWISE SPECIFIED, ALL CONCRETE SHALL BE 5000 HP CONCRETE. THE MAXIMUM AGGREGATE SIZE FOR CONCRETE SHALL BE $\frac{3}{8}$ ".

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60. ALL REINFORCING STEEL SHALL BE EPOXY COATED. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION:	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	17"	21"
2. 12" OF CONCRETE BELOW BAR	18"	22"	27"
3. EPOXY COATED BARS, COVER < 3DB, OR CLEAR SPACING < 6DB	21"	26"	31"
4. COATED BARS, ALL OTHER CASES	17"	21"	25"
5. CONDITION 2. AND 3.	23"	29"	35"
6. CONDITION 2. AND 4.	21"	27"	32"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ANCHOR BOLTS:

ALL ANCHOR BOLTS AT SCHOOL STREET SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

UTILITIES:

1. THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.
2. EXISTING OVERHEAD WIRES AND UTILITY POLES ARE TO REMAIN AND ACTIVE THROUGHOUT THE DURATION OF CONSTRUCTION. CONTRACTOR SHALL USE CAUTION WHILE WORKING AROUND THE EXISTING UTILITIES SCHEDULED TO REMAIN. CONTRACTOR SHALL UTILIZE LOW HEIGHT HOISTING EQUIPMENT TO SET THE ELEMENTS IN ORDER TO STAY UNDERNEATH THE EXISTING OVERHEAD WIRES. THIS SHALL BE DESIGNED AND EXPLAINED IN THE CONTRACTOR'S ERECTION PROCEDURE. CONTRACTOR SHALL COORDINATE WITH RESPECTIVE UTILITY OWNERS REGARDING ANY CLEARANCES, DE-ENERGIZING, ETC. THAT MAY NEED TO BE CONSIDERED IN THE CONTRACTOR'S ERECTION PROCEDURE.

UTILITY NOTES:

1. PROPOSED WATER MAIN SHALL BE 8" CEMENT LINED IRON PIPE (CLDIP) UNLESS OTHERWISE NOTED.
2. RUBBER GASKET PIPE SHALL BE USED UNDERGROUND AND MECHANICAL JOINTS SHALL BE USED ABOVE GROUND.
3. PROPOSED WATER MAIN SHALL MAINTAIN 5' (MAX) OF COVER.
4. PROPOSED WATER MAIN SHALL MAINTAIN A MINIMUM OF 6" CLEARANCE BETWEEN EXISTING UTILITIES.
5. WATER MAIN SHALL BE TEMPORARILY SERVICED WHILE THE REALIGNMENT OF THE PROPOSED 8" WATER MAIN IS BEING CONSTRUCTED. CONTRACTOR SHALL COORDINATE WITH THE TOWN OF NORTHBOROUGH TO DETERMINE THE METHOD FOR TEMPORARY WATER SERVICE AND LOCATE EXISTING GATE VALVES TO CLOSE DURING CONSTRUCTION OF PROPOSED WATER MAIN.
6. ANY EXISTING WATER MAIN PIPE THAT IS DEEMED REUSABLE SHALL BE REMOVED AND STACKED. WATER MAIN THAT IS NOT DEEMED REUSABLE SHALL BE REMOVED AND DISCARDED.

PROPOSED HMA MILL & OVERLAY:

LIMITS: STA 10+15 TO STA 10+55
STA 11+53 TO STA 11+73

SURFACE: $\frac{1}{2}$ " SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) OVER $\frac{1}{2}$ " PAVEMENT FINE MILLING

PROPOSED PERMANENT PAVEMENT TRENCH PATCH:

SURFACE: $\frac{1}{2}$ " SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) OVER $\frac{1}{4}$ " SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) OVER VARIABLE DEPTH (SEE GENERAL PAVEMENT NOTE 5)
SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) COMPACTED IN $2\frac{1}{4}$ " (MIN) AND 3' (MAX) LIFTS OVER

BASE: 8" GRAVEL BORROW, TYPE B OVER

SUBBASE: EXISTING MATERIAL SUITABLE FOR REUSE SUPPLEMENTED WITH GRAVEL BORROW AS NECESSARY TO MATCH GRADE.

GENERAL PAVEMENT:

1. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED BETWEEN ALL ASPHALT SURFACES AND SAWCUT JOINTS BEFORE PAVING. HMA JOINT ADHESIVE SHALL BE APPLIED TO ALL COLD JOINTS (LONGITUDINAL AND TRANSVERSE) BEFORE PAVING SURFACE COURSE. ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED AT A RATE CONSISTENT WITH MASSDOT STANDARD SPECIFICATION 460.43.G.2. ALL SURFACES SHALL BE CLEAN OF ALL ORGANICS, DEBRIS, AND SAND PRIOR TO PAVING.
2. ALL HMA SHALL BE IN ACCORDANCE WITH SECTION 460.
3. ASPHALT EMULSION FOR TACK COAT SHALL BE RS-1H TO RESIST TRACKING OF TACK BY HAUL VEHICLES.
4. ALL GRAVEL BORROW MEETING SPECIFICATION, AS DETERMINED BY THE ENGINEER, SHALL BE RETAINED IN PLACE, COMPACTED, AND LEVELED AS REQUIRED.
5. TOTAL DEPTH OF PROPOSED PAVEMENT IN TRENCH PATCH SHALL BE $6\frac{3}{4}$ " OR SHALL MATCH THE EXISTING PAVEMENT DEPTH, WHICHEVER DEPTH IS DEEPER.

DESIGNED BY SWM

DRAWN BY SWM

CHECKED BY CMR

DATE 12/30/2025

SCALE AS SHOWN

PREPARED FOR

Town of Northborough
63 Main Street
Northborough, MA, 01532

REVISIONS

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Final Plans

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Utility Bridges

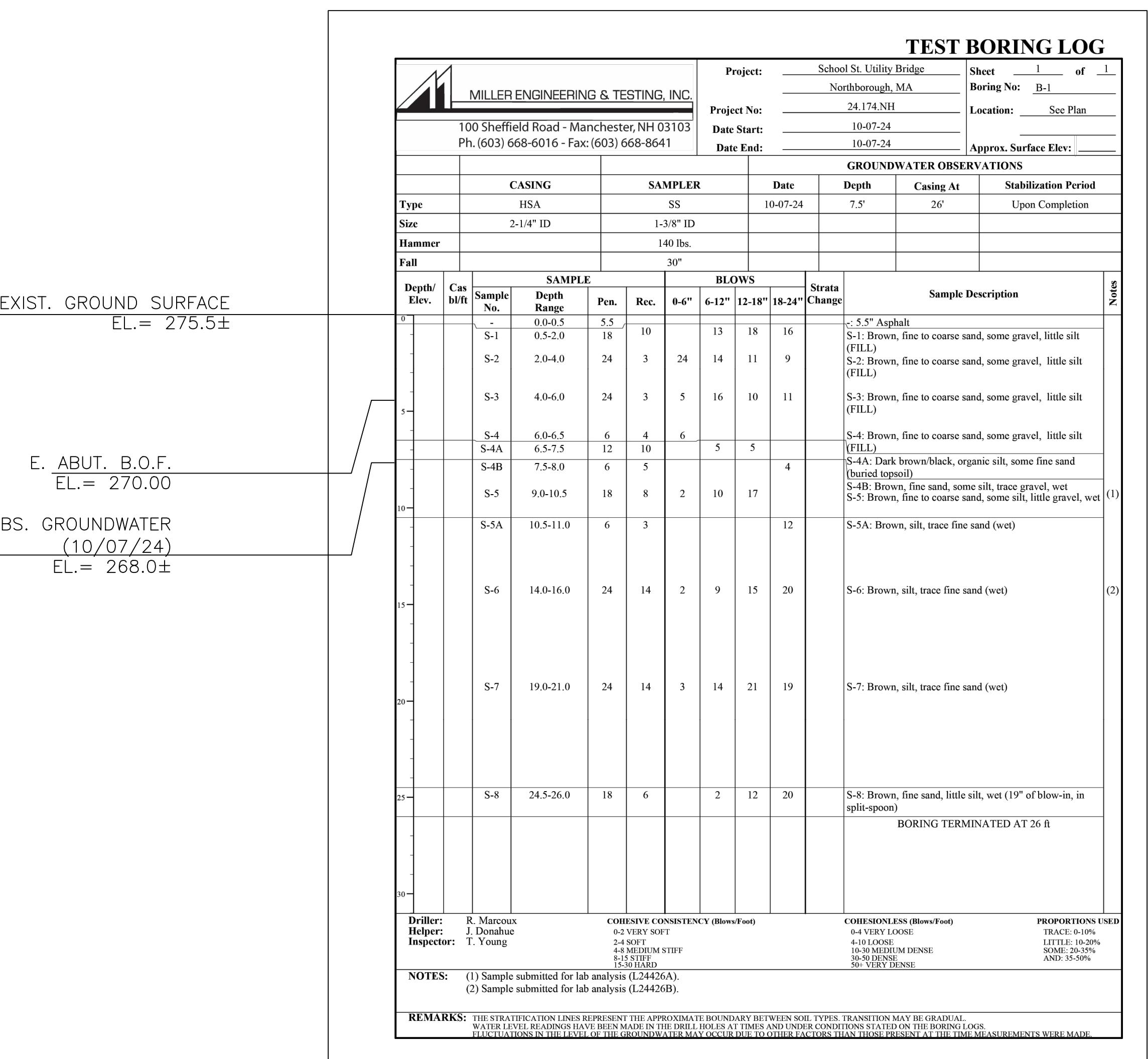
PROJECT LOCATION
Northborough, MA

DRAWING TITLE
General Notes

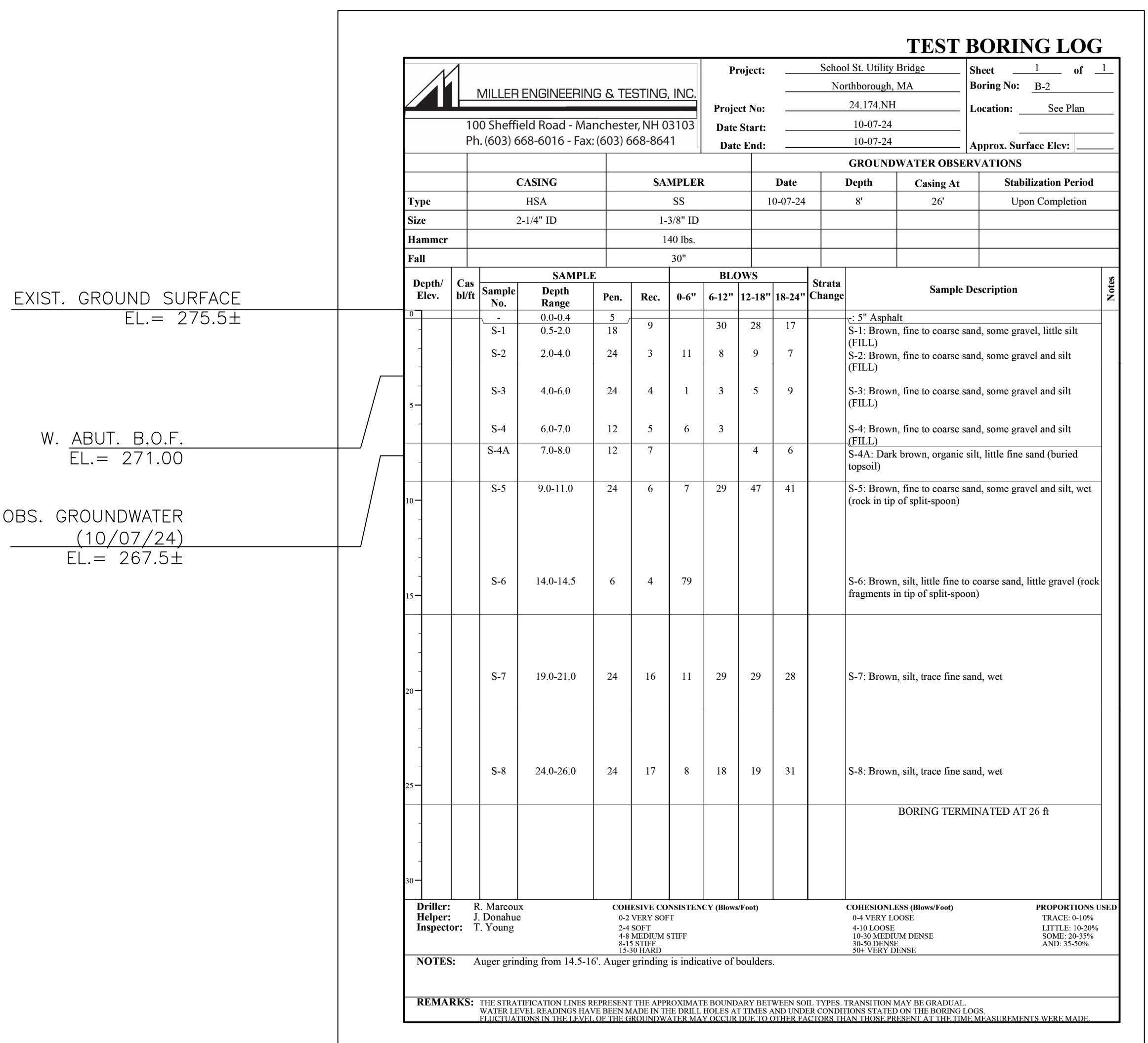
PROJECT NO. T1487
TEC CAD FILE T1487_BR03(GenNotes).dwg
Phase1
DRAWING NO. S-3
CHARLES M. RICCIARDI
No. 54918
REGISTERED
PROFESSIONAL ENGINEER

Cliff M.
SHEET 3 OF 10

BORING B-1

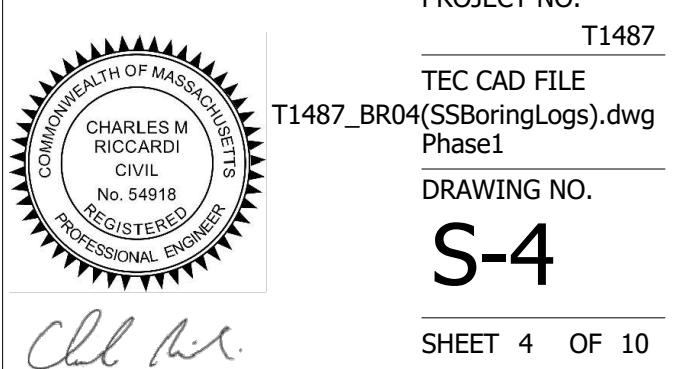


BORING B-2

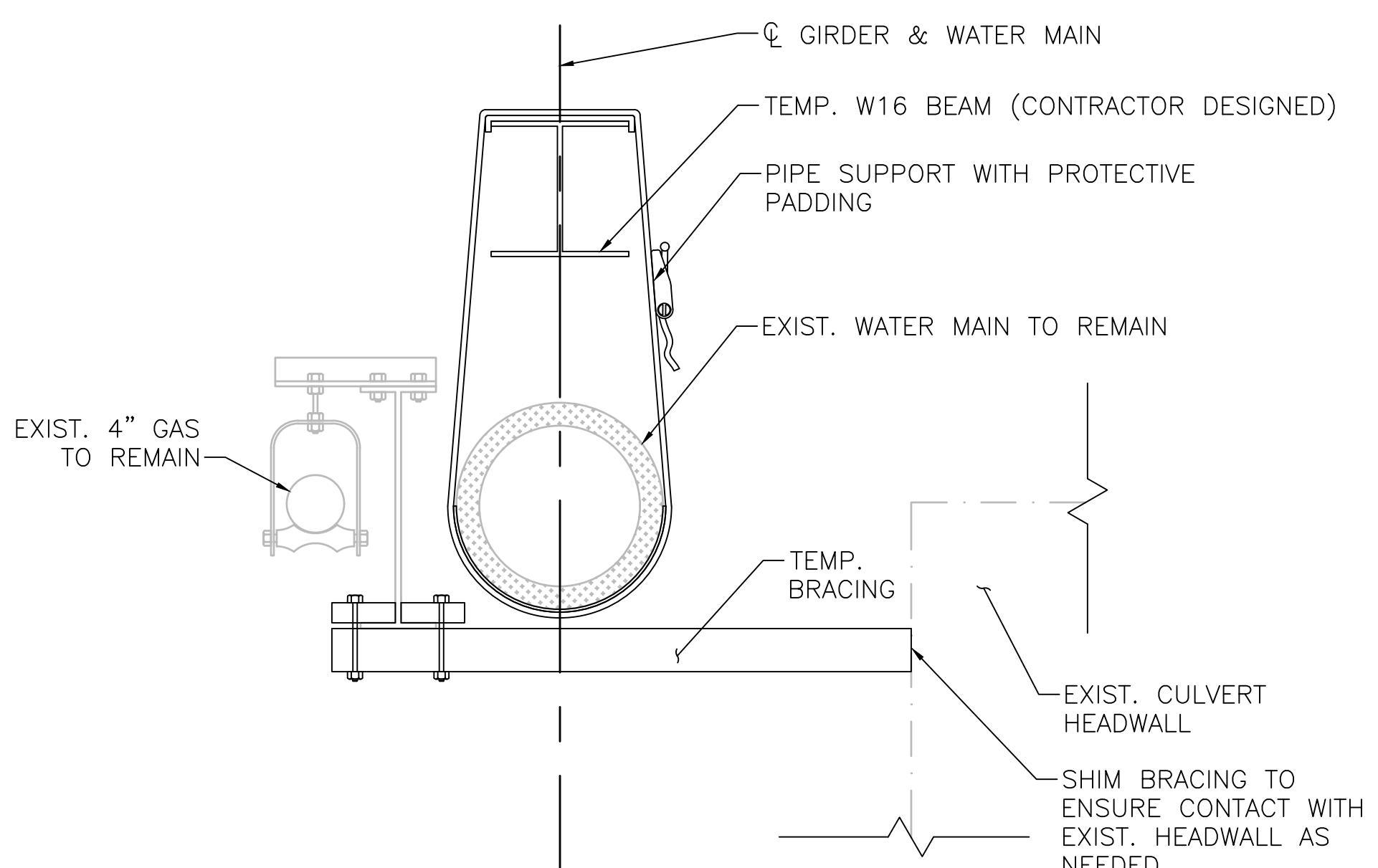
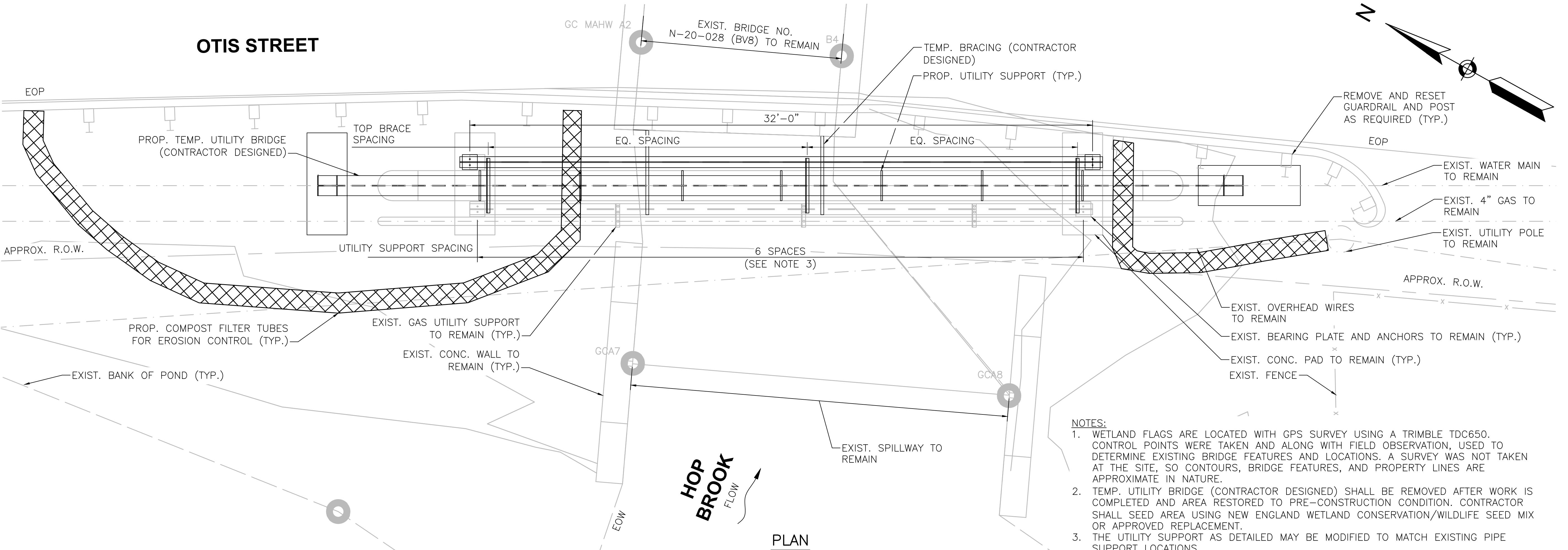


BORING NOTES:

- LOCATION OF BORINGS SHOWN ON THE PLAN THUS: 
- BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1-3/8" O.D., 24 INCH LONG, SPLIT SPOON SAMPLER IN 6" INTERVALS USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT MILLER ENGINEERING & TESTING (100 SHEFFIELD ROAD) IN MANCHESTER, NH. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE ENGINEERING CORP AT 282 MERRIMACK STREET, LAWRENCE, MA.
- ALL BORINGS WERE MADE ON OCTOBER 07, 2024 BY MILLER ENGINEERING & TESTING INC.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.



OTIS STREET

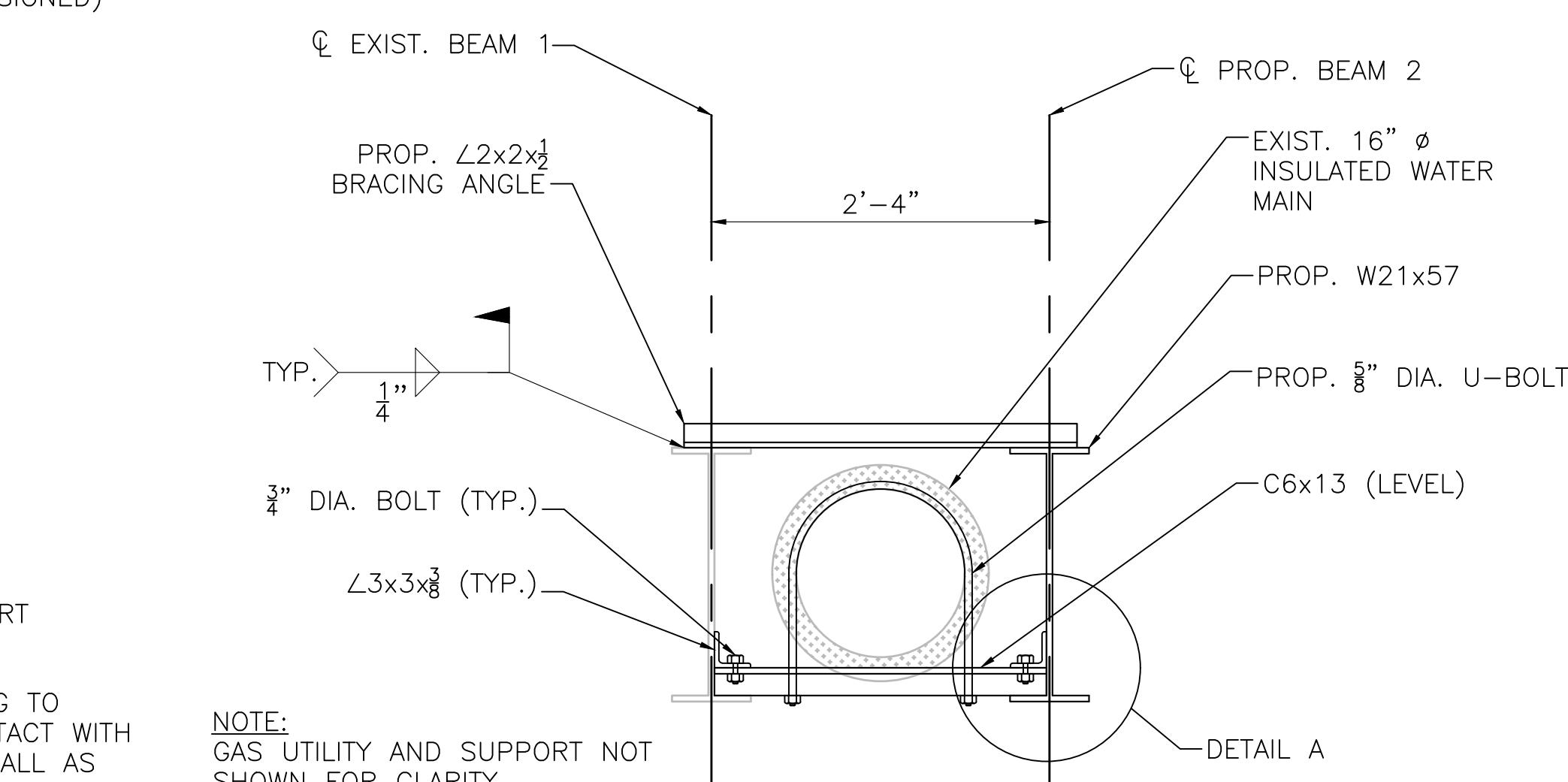


TEMPORARY UTILITY BRIDGE SCHEMATIC

SCALE: 1" = 1'-0"

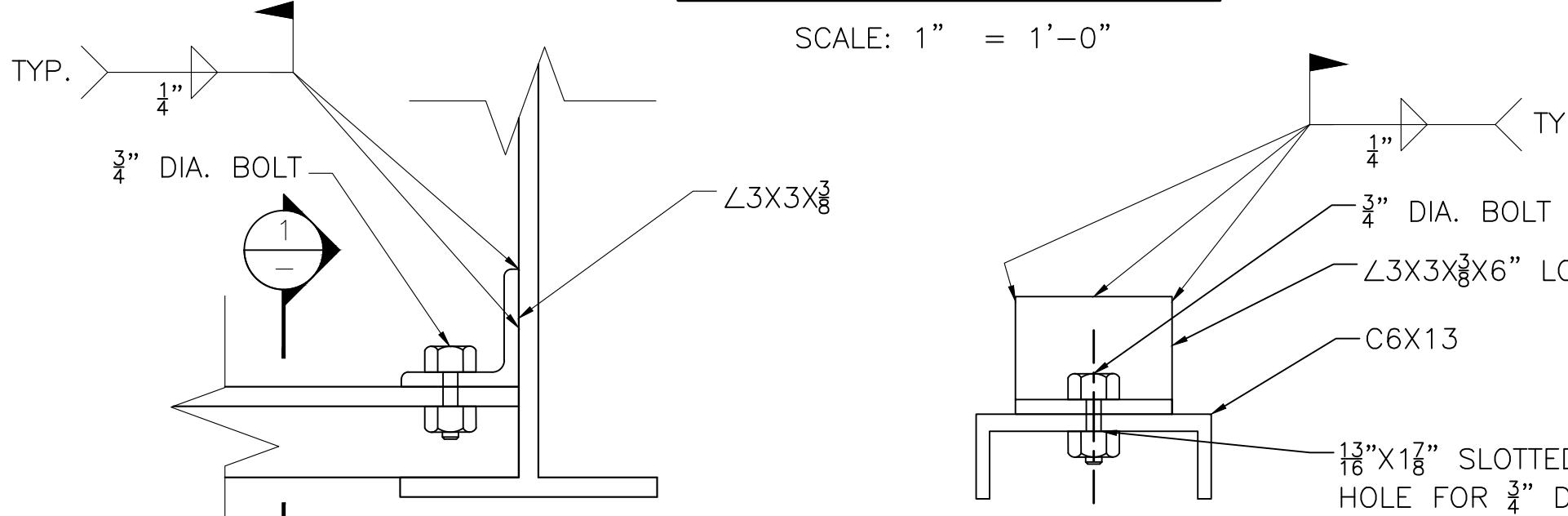
NOTES:

1. DETAIL IS CONCEPTUAL ONLY. ALL BRIDGE ELEMENTS (SUPERSTRUCTURE AND SUBSTRUCTURE) FOR THE TEMPORARY UTILITY BRIDGE SHALL BE RESPONSIBILITY OF THE CONTRACTOR. THE DESIGN SHALL ENSURE THAT THE EXISTING STEEL GIRDERS TO REMAIN ARE BRACED TO PREVENT MISALIGNMENT.
2. THE TEMPORARY UTILITY BRIDGE SHALL BE LOCATED WITHIN THE EXISTING R.O.W.
3. SEE ITEM 992.31 FOR STIPULATED REQUIREMENTS.
4. TEMPORARY BRACING MAY BE CLAMPED TO BOTTOM FLANGE BUT SHALL NOT BE WELDED OR BOLTED TO EXISTING BEAM.
5. TEMPORARY BRACING SPACING SHALL NOT EXCEED 10 FEET.

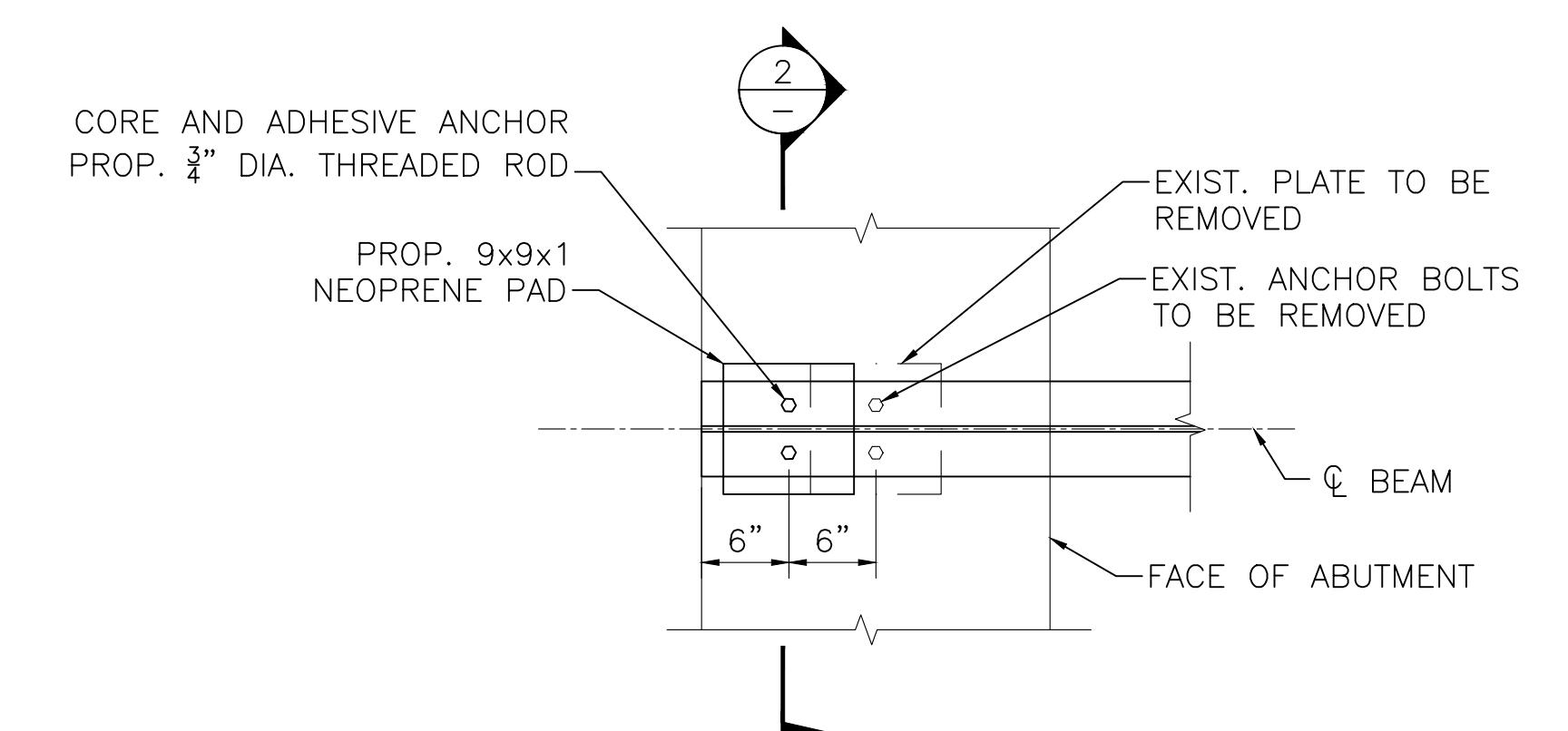


UTILITY BRIDGE SECTION

SCALE: 1" = 1'-0"

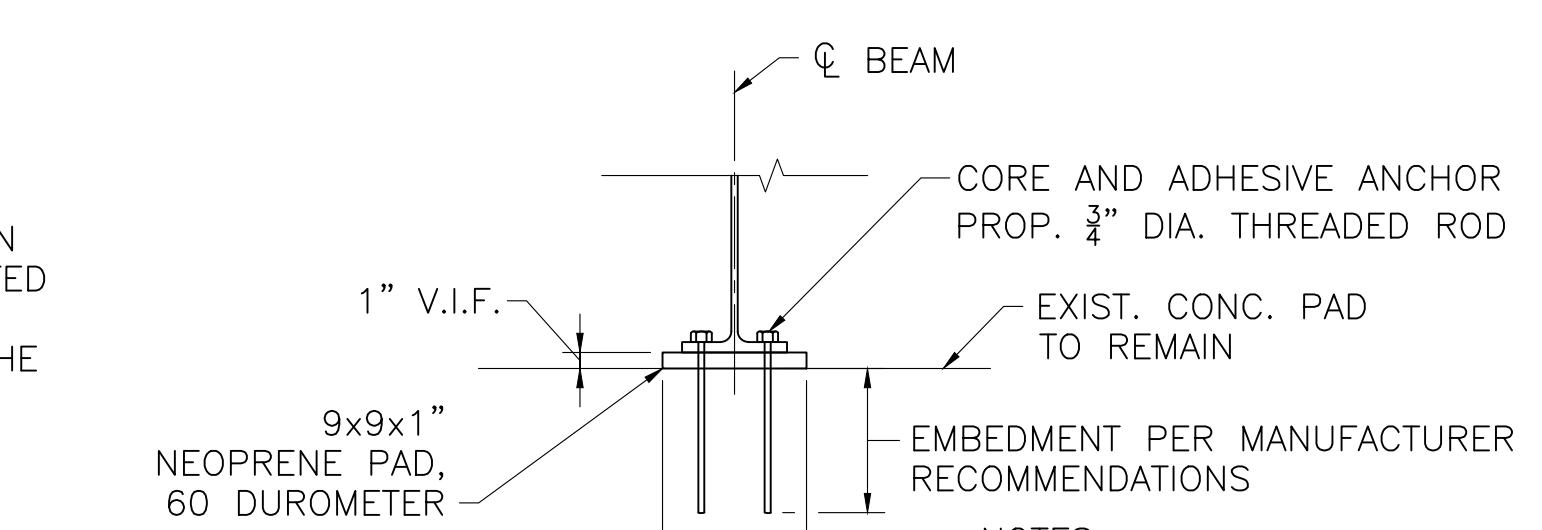


SCALE: 3" = 1'-0"

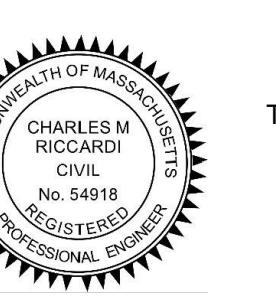


BEARING ASSEMBLY PLAN

SCALE: 1" = 1'-0"



SCALE: 1" = 1'-0"



TEMPORARY TRAFFIC CONTROL NOTES:

- TEMPORARY TRAFFIC CONTROL LAYOUTS ARE AN ASSUMPTION BASED ON THE NOTED SCOPE OF WORK BUT ADDITIONAL OR SLIGHTLY MODIFIED SET-UPS MAY BE USED BY THE CONTRACTOR WITH CONSULTATION FROM MASSDOT, THE TOWN OF NORTHBOROUGH, AND THE ENGINEER.
- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS AT THE DISCRETION OF THE CONTRACTOR.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR THE "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- THE FIRST TEN (10) PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH SEQUENTIAL FLASHING LIGHTS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER IN CONSULTATION WITH MASSDOT.
- DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
- ALL DRUMS AND/OR CONES ALONG THE INTERSTATE ROADWAYS SHALL BE SET AT 20' O.C. MAXIMUM UNLESS OTHERWISE NOTED OR ADJUSTED BY THE ENGINEER.
- MINIMUM LANE WIDTH IS TO BE ELEVEN (11) FEET UNLESS OTHERWISE SHOWN ON THE PLANS.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO REPLACE ALL PAVEMENT MARKINGS WITHIN THE OUTSIDE LIMITS OF EACH BRIDGE, FOLLOWING THE COMPLETION OF WORK.

TEMPORARY TRAFFIC CONTROL PHASING:

BRIDGE NO. N-20-012
- SCHOOL STREET OVER ASSABET RIVER, SHOULDER CLOSURE

BRIDGE NO. N-20-028
- OTIS STREET OVER HOP BROOK, LANE CLOSURE

TTC CONSTRUCTION STANDARD DETAILS		
DRAWING NUMBER	TITLE	VERSION
851.1.1	CONES & DRUMS	JAN 2025
852.4.4	ALTERNATING ONE-WAY (TRAFFIC OFFICER)	JAN 2025

NOTES:
1. SEE MOST RECENT MASSDOT CONSTRUCTION STANDARD DETAILS

SUGGESTED WORK ZONE WARNING SIGN SPACING

ROAD TYPE	DISTANCE BETWEEN SIGNS			
	A	B	C	D
URBAN (30MPH OR LESS)	100 FEET	100 FEET	100 FEET	100 FEET
URBAN (35MPH OR GREATER)	350 FEET	350 FEET	350 FEET	350 FEET
RURAL	500 FEET	500 FEET	500 FEET	500 FEET
EXPRESSWAY/FREEWAY	1,000 FEET	1,500 FEET	2,640 FEET	500 FEET

SIGN SPACING NOTES:

- ROAD TYPE TO BE DETERMINED BY MASSDOT OFFICE OF TRANSPORTATION PLANNING
- THE "A" DIMENSION SHOULD BE MEASURED FROM THE START OF THE TRAVEL LANE RESTRICTION OR THE SHOULDER / BREAKDOWN LANE RESTRICTION, WHICHEVER IS APPLICABLE.
- THE "D" DIMENSION SHOULD BE THE DISTANCE FOLLOWING THE TERMINATION OF THE WORK ZONE TO THE PLACEMENT OF THE MA-R2-10e "END WORK ZONE - DOUBLE FINES END" SIGN.
- MA-R2-10a SIGNS SHALL BE PLACED HALFWAY BETWEEN THE SECOND AND THIRD SIGNS NOTED ABOVE.
- SIGN SPACING MAY NEED TO BE INCREASED IF ADDITIONAL SIGNS ARE REQUIRED PER THE DETAIL / TYPICAL SETUP FIGURES.

DESIGNED BY CMF
DRAWN BY CMF
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DRAWING NO. S-8
S-8
Cll M.

TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES

TAPER TYPE	TAPER LENGTH
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE-LANE, TWO-WAY TRAFFIC TAPER	50 FEET MIN, 100 FEET MAX
DOWNTREAM TAPER	50 FEET MIN., 100 FEET MAX (PER LANE)
TANGENT LENGTH	AT LEAST 2L

SPEED LIMIT	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = WS^2/60$
45 MPH OR GREATER	$L = WS$

WHERE: L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR
OFF-PEAK 85TH-PERCENTILE
SPEED PRIOR TO WORK
STARTING, OR THE
ANTICIPATED OPERATING
SPEED IN MPH

SPEED (MPH)	DISTANCE (FEET)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

BUFFER SPACING NOTES:

- SPEED NOTED EQUALS TO POSTED SPEED, OFF-PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED.

TEC, Inc.
282 Merrimack Street, 2nd Floor
Lawrence, MA 01843
978-794-1792

311 Main Street
2nd Floor
Worcester, MA 01608
508-868-5104

2 Monument Square, Unit 301
Portland, ME 04101
603-601-8154

www.TheEngineeringCorp.com

DESIGNED BY CMF
DRAWN BY CMF
CHECKED BY SWG
DATE 12/30/2025
SCALE AS SHOWN

PREPARED FOR

Town of Northborough
63 Main Street
Northborough, MA, 01532

REVISIONS

ISSUED FOR
Final Plans

PROJECT TITLE
Northborough
Utility Bridges

PROJECT LOCATION
Northborough, MA

DRAWING TITLE
TTCP Plans
Utility Bridge

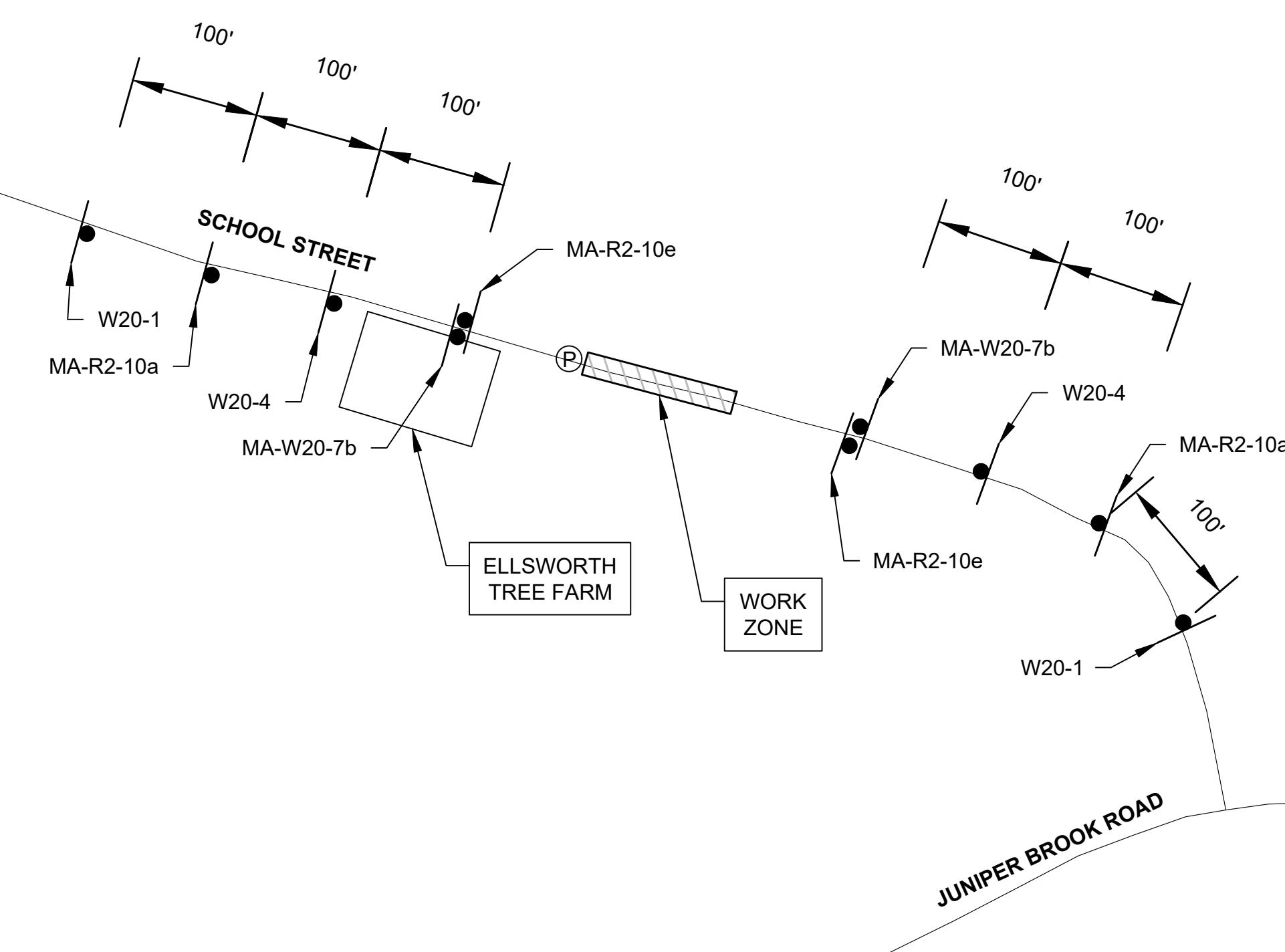
PROJECT NO.
T1487
TEC CAD FILE
T1487_BR07-10(TTCP).dwg
Phase1
DRAWING NO.
S-9

CHARLES M.
Riccardi
No. 54918
REGISTERED
PROFESSIONAL ENGINEER

COMMISSION OF MASSACHUSETTS
S-9

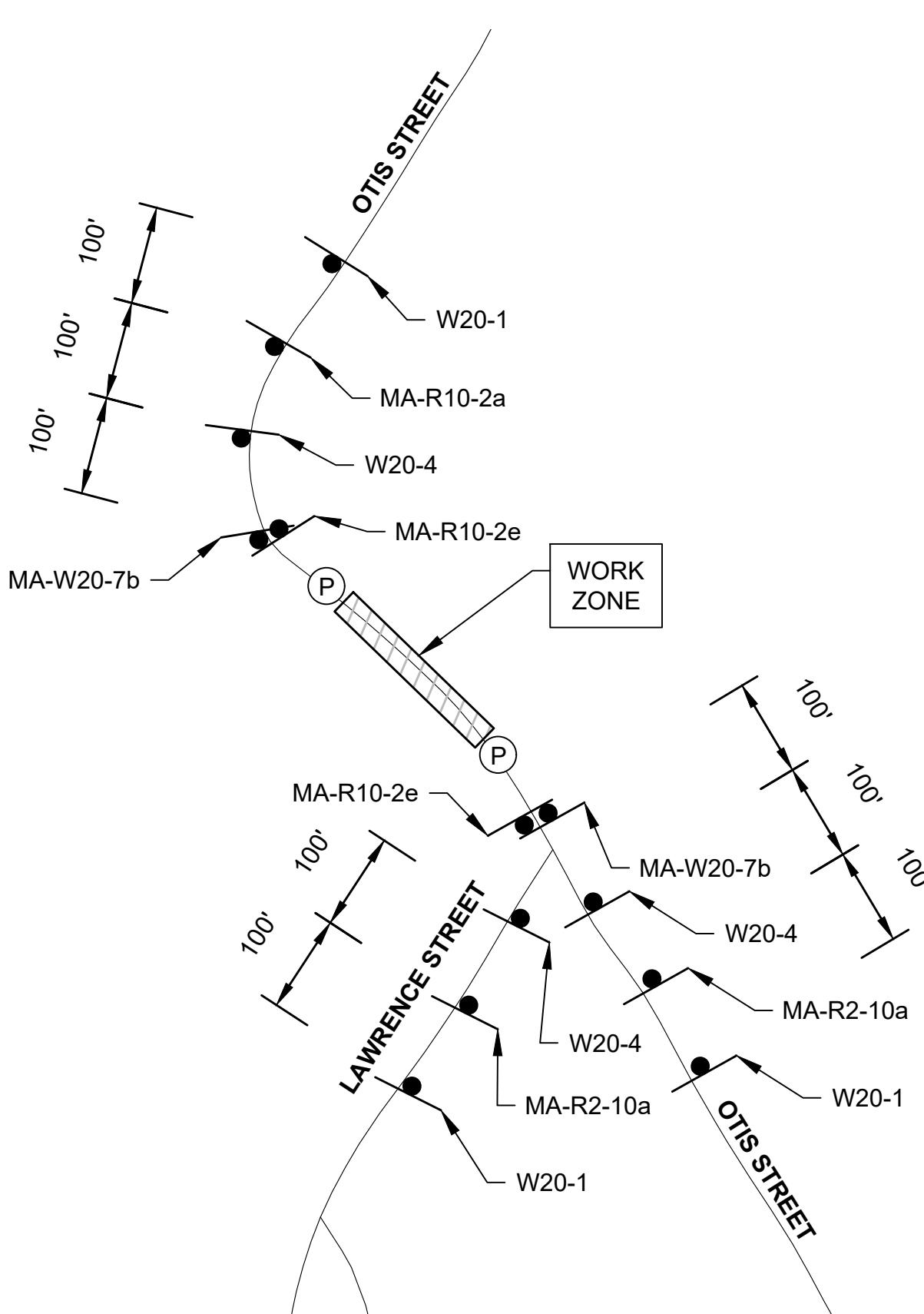
Cliff M.

SHEET 9 OF 10



ADVANCED SIGNAGE SCHEMATIC FOR SCHOOL STREET

SCALE: 1" = 100'



ADVANCED SIGNAGE SCHEMATIC FOR OTIS STREET

SCALE: 1" = 150'

IDENTIFICATION NUMBER	SIZE OF SIGN (INCHES)		LEGEND	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACKGROUND	LEGEND	BORDER		
MA-R2-10a	48	36					1.	FLUORESCENT ORANGE / WHITE	BLACK	BLACK	12.00	24.00
MA-R2-10e	36	48					2	FLUORESCENT ORANGE / WHITE	BLACK	BLACK	12.00	24.00
MA-W20-7b	36	36					2	ORANGE	BLACK	BLACK	9.00	18.00
W20-1	36	36					2	FLUORESCENT ORANGE	BLACK	BLACK	9.00	18.00
W20-4	36	36					2	FLUORESCENT ORANGE	BLACK	BLACK	9.00	18.00

SIGN SUMMARY NOTES:

- MASSDOT STANDARD SIGNS.
- CONTRACTOR SHALL FURNISH SIGNS CONSISTENT WITH 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (OR LATEST EDITION). SEE MANUAL FOR TEXT AND DIMENSIONS.

TEC CAD FILE
T1487_BR07-10(TTCP).dwg

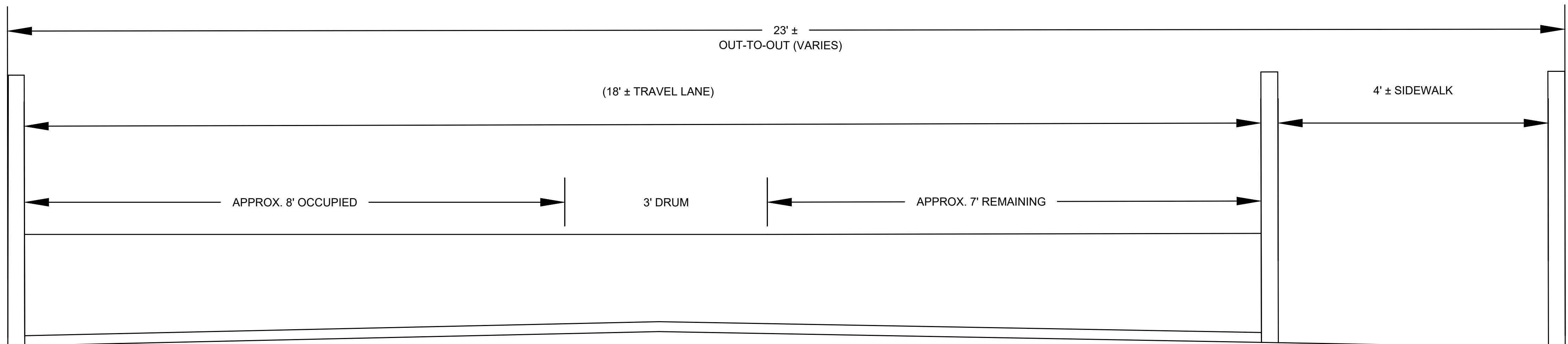
Phase1

DRAWING NO.

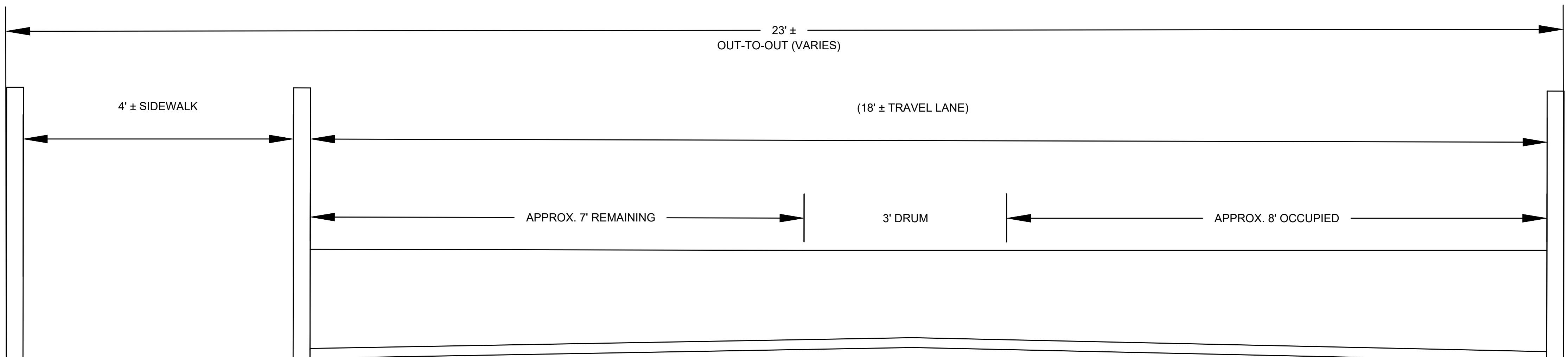
S-9

Cliff M.

SHEET 9 OF 10



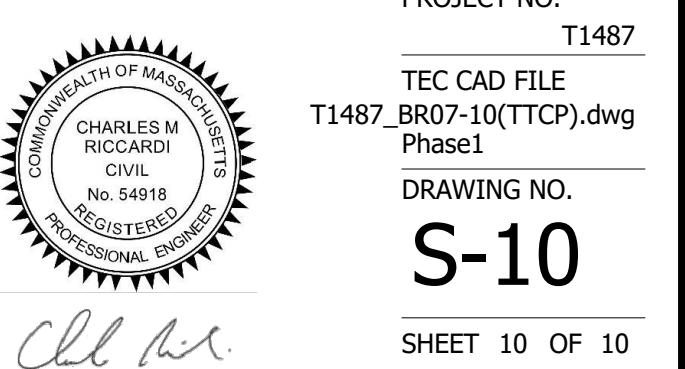
TYPICAL SECTION
SCHOOL STREET BRIDGE OVER ASSABET RIVER EB APPROACH
NTS



TYPICAL SECTION
SCHOOL STREET BRIDGE OVER ASSABET RIVER WB APPROACH
NTS

SCHOOL STREET BRIDGE NOTE:

1. WHEN STATIONARY CONSTRUCTION VEHICLE IS ATOP THE BRIDGE CROSSING, POLICE DETAIL MUST BE PRESENT TO ASSIST WITH GUIDING VEHICLES AND PEDESTRIANS THROUGH THE NARROW SPACE BETWEEN THE BRIDGE RAIL AND THE CONSTRUCTION DRUMS SURROUNDING THE STATIONARY CONSTRUCTION VEHICLE.
2. SEE UPSTREAM/DOWNSTREAM APPROACH FOR ADVANCE TEMPORARY TRAFFIC CONTROL SIGNAGE AND DRUM LAYOUT DETAIL DEPICTED ON DRAWING 852.4.4 AND ON ADVANCED SIGNING SCHEMATIC ON PAGE 9.



REVISIONS

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Northborough
Utility Bridges

PROJECT LOCATION
Northborough, MA

DRAWING TITLE
TTCP
Sections

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Phase1
DRAWING NO.
S-10
SHEET 10 OF 10
Ch. M.
12/10/2025

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Northborough, MA, 01532