TOWN OF WESTFORD, MASSACHUSETTS

OLD LOWELL ROAD OVER POND BROOK CULVERT REPLACEMENT

DECEMBER 2023

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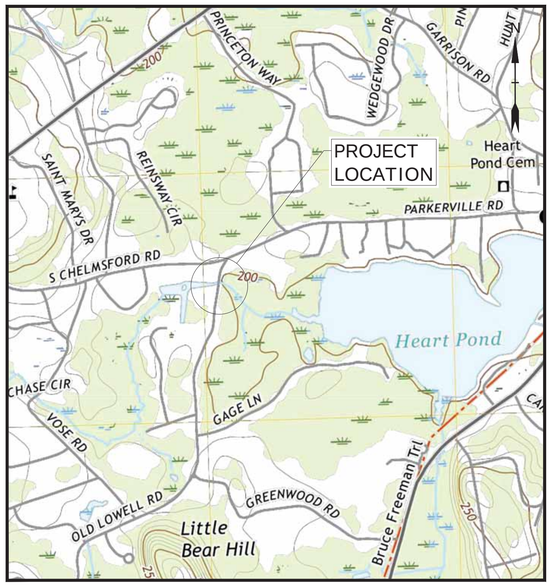

LOCATION MAP
SCALE: 1" = 2000'

PREPARED BY:

Tighe&Bond

DANIEL S. HOLMES, PE, LEED AP

ERIC OHANIAN, PE

PREPARED FOR:

TOWN OF WESTFORD
DEPARTMENT OF PUBLIC WORKS
PAUL STARRATT, PE, TOWN ENGINEER
STEPHEN CRONIN, DIRECTOR OF PUBLIC WORKS

COMPLETE SET 18 SHEETS

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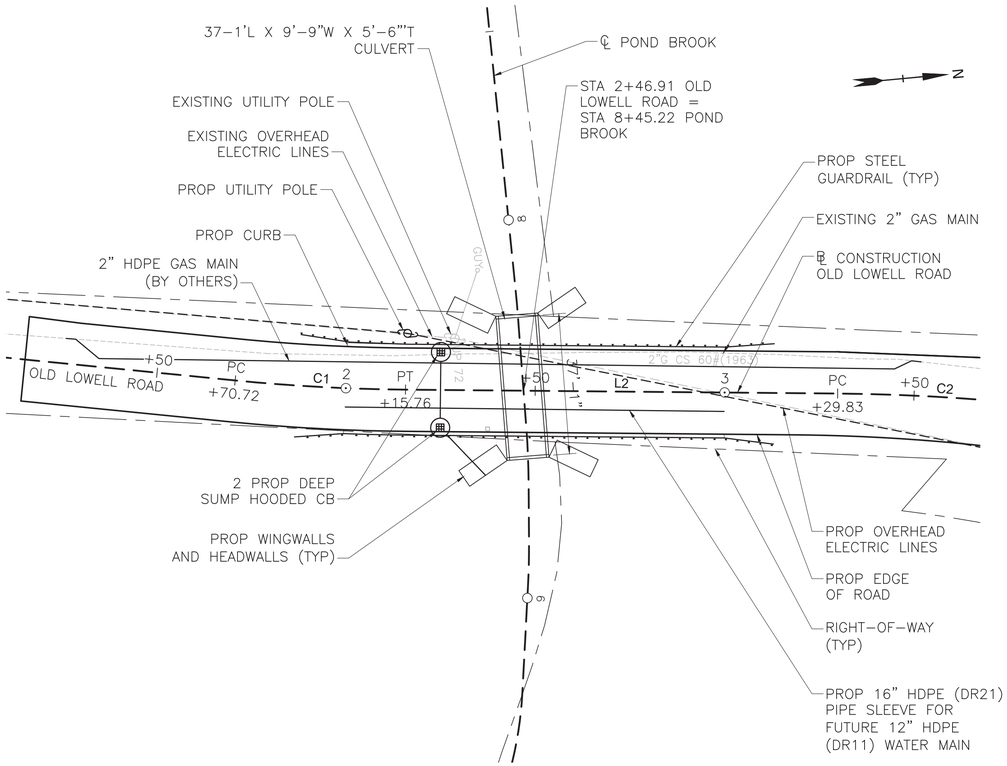
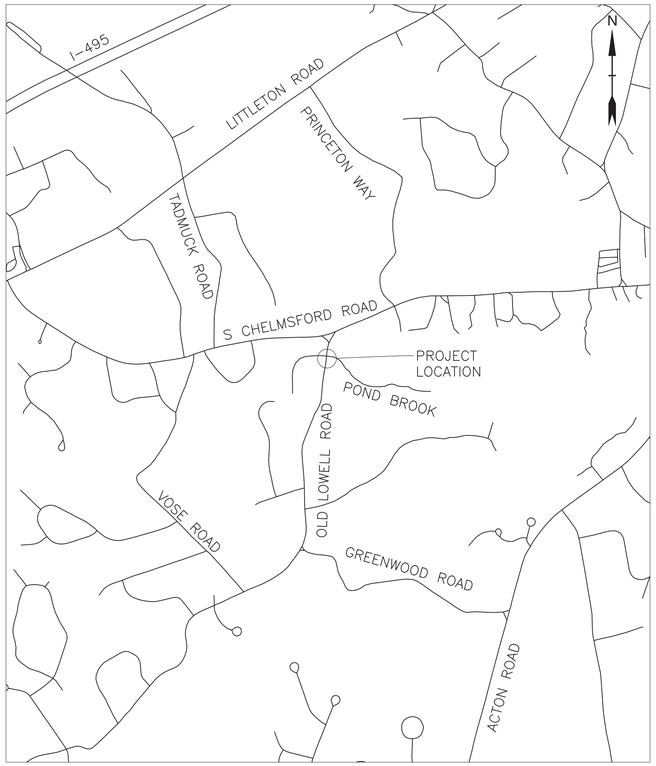


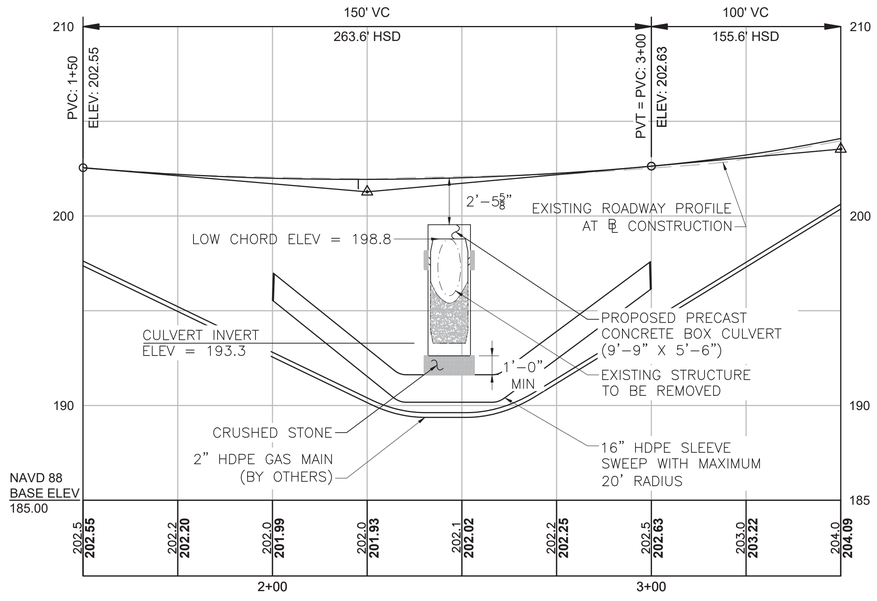
KEY PLAN

SCALE: 1" = 20'



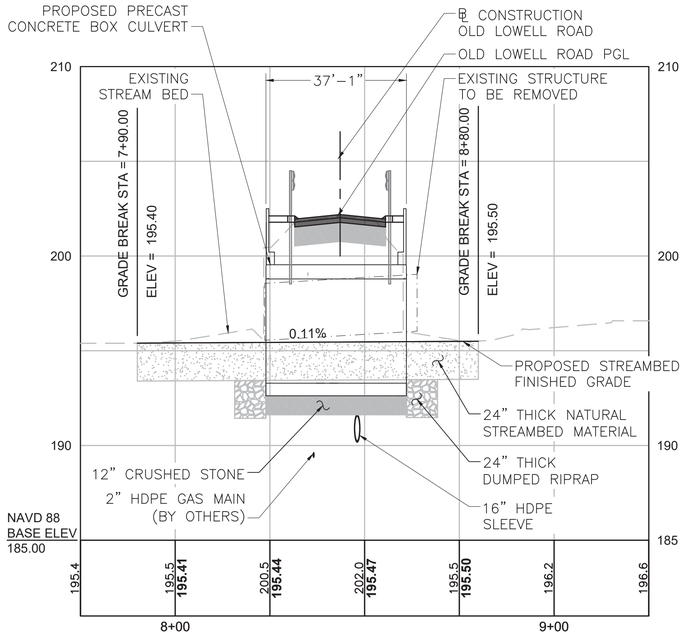
LOCUS

SCALE: 1" = 1000'



OLD LOWELL ROAD PROFILE – ℄ PROPOSED ROADWAY

HORIZ.: 1" = 20' VERT.: 1" = 4'



PROFILE ALONG ℄ POND BROOK

HORIZ.: 1" = 20' VERT.: 1" = 4'

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

MARK	DATE	DESCRIPTION

PROJECT NO:	W5005-029
DATE:	DECEMBER 2023
FILE:	W5005-029_02_BRIDGE-COVER.dwg
DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

CULVERT KEY PLAN, PROFILES, LOCUS, & INDEX

SCALE: AS SHOWN

SHEET 02 OF 18

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BASE PLAN NOTES:

1. THE EXISTING CONDITIONS INFORMATION SHOWN ON THE DRAWINGS IS BASED ON SURVEY DRAWINGS PROVIDED BY LANDTECH CONSULTANTS TITLED: "EXISTING CONDITIONS SURVEY, POND BROOK CULVERTS – ROAD, OLD LOWELL ROAD & S. CHELMSFORD ROAD, WESTFORD, MA" AND DATED AUGUST 10, 2022
2. UTILITY LOCATIONS SHOWN WERE PLOTTED FROM INFORMATION SUPPLIED BY RESPECTIVE UTILITY COMPANIES AND DATA OBTAINED FROM FIELD SURVEYS AND AS BUILT DRAWINGS. THE ACCURACY AND COMPLETENESS OF SUBSURFACE INFORMATION SHOWN ON THESE DRAWINGS IS NOT GUARANTEED.
3. THE HORIZONTAL COORDINATE SYSTEM IS THE NORTH AMERICAN DATUM OF 1983, MASSACHUSETTS STATE PLANE, MAINLAND ZONE, US FEET. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988.
4. THE EXISTING CONDITIONS SHOWN ARE APPROXIMATE. FIELD VERIFY EXISTING CONDITIONS.
5. THE RIGHT OF WAY SHOWN IS BASED ON A VARIABLE WIDTH PUBLIC WAY LOCATED BY LANDTECH CONSULTANTS. THE PROPERTY LINES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND ARE NOT BASED ON DEED OR PLAN RESEARCH. TEMPORARY AND PERMANENT EASEMENTS SHOWN WILL BE SECURED PRIOR TO CONSTRUCTION.
6. THE RESOURCE AREA BOUNDARIES DEPICTED ON THE DRAWINGS WERE DELINEATED BY TIGHE & BOND, INC. ON 12/17/2021.
7. THE ROADWAY IS NOT LOCATED WITHIN THE 100–YEAR FLOOD ZONE BASED ON THE FEMA FLOOD INSURANCE STUDY (FIS) FOR MIDDLESEX COUNTY, MA, STUDY NUMBER 25017CV001C EFFECTIVE 7/6/2016 AND FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY PANEL NUMBER 25017C0234F EFFECTIVE 7/7/2014. POND BROOK AND AREAS ADJACENT TO ROADWAY ARE IDENTIFIED AS ZONE A WITH NO BASE FLOOD ELEVATION DETERMINED.
8. TEST PITS IDENTIFIED ON SHEET 6 WERE COMPLETED BY THE TOWN OF WESTFORD AND WITNESSED BY TIGHE & BOND, INC. ON 11/14/2022.

GENERAL NOTES:

1. NOTIFY DIGSAFE AT 1–888–344–7233 AND OTHER UTILITY OWNERS IN THE AREA NOT ON THE DIGSAFE LIST AT LEAST 72 HOURS PRIOR TO ANY DIGGING, TRENCHING, ROCK REMOVAL, DEMOLITION, BORING, BACKFILLING, GRADING, LANDSCAPING, OR ANY OTHER EARTH MOVING OPERATIONS.
2. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IN ADDITION, SOME UTILITIES MAY NOT BE SHOWN. DETERMINE THE EXACT LOCATION OF UTILITIES BY TEST PIT OR OTHER METHODS, AS NECESSARY TO PREVENT DAMAGE TO UTILITIES AND/OR INTERRUPTIONS IN UTILITY SERVICE OR CONSTRUCTION OPERATIONS. PERFORM TEST PIT EXCAVATIONS AND OTHER INVESTIGATIONS TO LOCATE UTILITIES, AND PROVIDE THIS INFORMATION TO THE ENGINEER, PRIOR TO CONSTRUCTING THE PROPOSED IMPROVEMENTS. LOCATE ALL EXISTING UTILITIES TO BE CROSSED BY HAND EXCAVATION.
3. TIGHE & BOND ASSUMES NO RESPONSIBILITY FOR ANY ISSUES, LEGAL OR OTHERWISE, RESULTING FROM CHANGES MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM TIGHE & BOND.
4. NOTIFY THE ENGINEER OF ANY UTILITIES IDENTIFIED DURING CONSTRUCTION THAT ARE NOT SHOWN ON THE DRAWINGS OR THAT DIFFER IN SIZE OR MATERIAL.
5. EXCAVATE ADDITIONAL TEST PITS TO LOCATE EXISTING UTILITIES AS DIRECTED OR APPROVED BY THE ENGINEER.
6. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY; COORDINATION WITH THE OWNER, ALL SUBCONTRACTORS, WITH OTHER CONTRACTORS WORKING WITHIN THE LIMITS OF WORK, AND THE MEANS AND METHODS OF CONSTRUCTING THE PROPOSED WORK.
7. OBTAIN, PAY FOR AND COMPLY WITH PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK. ARRANGE AND PAY FOR NECESSARY INSPECTIONS AND APPROVALS FROM THE JURISDICTIONAL AUTHORITIES.
8. SHORE UTILITY TRENCHES WHERE FIELD CONDITIONS DICTATE AND/OR WHERE REQUIRED BY LOCAL, STATE AND FEDERAL HEALTH AND SAFETY CODES.
9. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT VARY FROM THOSE SHOWN ON THE DRAWINGS, IMMEDIATELY NOTIFY THE ENGINEER IN WRITING FOR RESOLUTION OF THE CONFLICTING INFORMATION.
10. PROTECT AND MAINTAIN ALL UTILITIES IN THE AREAS UNDER CONSTRUCTION DURING THE WORK. LEAVE ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THE CONTRACT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE DRAINAGE SYSTEM.
11. NOTIFY THE ENGINEER IN WRITING OF ANY CONFLICT, ERROR, AMBIGUITY, OR DISCREPANCY WITH THE PLANS OR BETWEEN THE PLANS AND ANY APPLICABLE LAW, REGULATION, CODE, STANDARD SPECIFICATION, OR MANUFACTURER'S INSTRUCTIONS.
12. THE CONTRACTOR IS RESPONSIBLE FOR SUPPORT OF EXISTING UTILITIES AND REPAIR OR REPLACEMENT COSTS OF UTILITIES DAMAGED DURING CONSTRUCTION, WHETHER ABOVE OR BELOW GRADE. REPLACE DAMAGED UTILITIES IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER AND AT NO COST TO THE PROPERTY OWNER.
13. TAKE NECESSARY MEASURES AND PROVIDE CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE, AND STRENGTH TO PREVENT ACCESS TO ALL WORK AND STAGING AREAS AT THE COMPLETION OF EACH DAYS WORK.
14. PROVIDE ALL NECESSARY TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR AND PEDESTRIAN ACCESS THROUGH THE WORK AREA, OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA. PERFORM TRAFFIC CONTROL IN ACCORDANCE WITH THE APPROVED TRAFFIC CONTROL PLAN.
15. MAINTAIN EMERGENCY ACCESS TO ALL PROPERTIES WITHIN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.
16. WHEN WORKING IN THE ROAD, PROVIDE THE OWNER AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES A DETAILED PLAN OF APPROACH INDICATING METHODS OF PROPOSED TRAFFIC ROUTING ON A DAILY BASIS. PROVIDE COORDINATION TO ENSURE COMMUNICATION AND COORDINATION BETWEEN THE OWNER, CONTRACTOR AND LOCAL FIRE/POLICE/SCHOOL AUTHORITIES THROUGHOUT THE CONSTRUCTION PERIOD.
17. REMOVE AND DISPOSE OF ALL CONSTRUCTION–RELATED WASTE MATERIALS AND DEBRIS IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS.
18. THE TERM "DEMOLISH" AND "R&D" ARE USED ON THE DRAWINGS MEANS TO REMOVE AND DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS.
19. THE TERM "ABANDON" USED ON THE DRAWINGS MEANS TO LEAVE IN PLACE AND TAKE APPROPRIATE MEASURES TO DECOMMISSION AS SPECIFIED OR NOTED ON THE DRAWINGS.
20. ALL PROPOSED WORK MAY BE ADJUSTED IN THE FIELD BY THE OWNER'S PROJECT REPRESENTATIVE TO MEET EXISTING CONDITIONS.

SURFACE RESTORATION NOTES:

1. ALL PAVEMENT DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AT NO ADDITIONAL COST TO THE OWNER.
2. PROTECT PROJECT FEATURES (E.G., WALLS, FENCES, MAIL BOXES, SIGNS, SIDEWALKS, CURBING, STAIRS, UTILITY POLES, GUY WIRES, WALKWAYS, TREES, ETC.) FROM DAMAGE DURING CONSTRUCTION, INCLUDING PROVIDING TEMPORARY SUPPORTS, WHEN APPROPRIATE.
3. IF REMOVAL OF PROJECT FEATURES IS REQUIRED IN ORDER TO PERFORM THE PROPOSED WORK, REMOVE THOSE SITE FEATURES ONLY UPON APPROVAL OF ENGINEER. REPLACE ALL REMOVED PROJECT FEATURES; NEW ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND CONDITION TO THE ITEMS REMOVED.
4. EXISTING SURVEY MONUMENTS DISTURBED BY THE CONTRACTOR SHALL BE REPLACED BY A LAND SURVEYOR LICENSED IN THE STATE IN WHICH THE WORK IS PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
5. COORDINATE THE ADJUSTMENT OF EXISTING UTILITY STRUCTURES WITH EACH RESPONSIBLE UTILITY OWNER PRIOR TO RECONSTRUCTION AND/OR PAVING OPERATIONS. RAISE ALL STRUCTURES TO FINISHED GRADES PRIOR TO THE END OF THE CONSTRUCTION SEASON AND PRIOR TO FINISHED PAVING.
6. TRANSFER ALL TEMPORARY BENCHMARKS, AS NECESSARY.
7. RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE PROJECT LIMITS TO ORIGINAL CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
8. REGRADE ALL UNPAVED AREAS DISTURBED BY THE WORK AS REQUIRED. REPAIR/REPLACE PAVED SURFACES DISTURBED BY THE WORK IN–KIND, UNLESS OTHERWISE NOTED. RESTORE SURFACES TO EXISTING OR PROPOSED CONDITIONS AS INDICATED ON THE DRAWINGS.

LEGEND:

EXISTING	PROPOSED	DESCRIPTION
		MAIL BOX
		CONCRETE POST
		BOULDER
		BENCHMARK
WF ##–##		WETLAND FLAG
		SIGN AND POST
		GATE VALVE
		UTILITY POLE
		TREE
		FIRE HYDRANT
		GAS
		OVERHEAD UTILITY
		WATER MAIN
		INTERMEDIATE CONTOURS (MAJOR)
		INTERMEDIATE CONTOURS (MINOR)
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		RIGHT–OF–WAY
		EDGE OF PAVEMENT
		CENTERLINE
		GUARDRAIL
		LIMITS OF WORK
		EROSION CONTROL BARRIER
		COFFER DAM
		TEMPORARY EASEMENT
		PERMANENT EASEMENT
		STONE WALL
		MEAN HIGH WATER/BANK
		BORDER OF VEGETATED WETLAND
		LOCAL 30–FOOT NO DISTURB ZONE
		100–FOOT BUFFER ZONE
		200–FOOT RIVERFRONT AREA
		LOCAL 30–FOOT NO DISTURB ZONE
		BORDERING LAND SUBJECT TO FLOODING
		DEMOLISH
		DUMPED RIPRAP BANK RESTORATION AND STABILIZATION
		WETLANDS REPLICATION AREA
		TEST PIT

ABBREVIATIONS:

BIT	BITUMINOUS
BL	BASELINE
BLSF	BORDERING LAND SUBJECT TO FLOODING
BOT	BOTTOM
CB	CATCH BASIN
CL	CENTERLINE
CONC	CONCRETE
CPP	CORRUGATED POLYETHYLENE PIPE
CS	COATED STEEL
CY	CUBIC YARD
D/DIA	DIAMETER
DI	DUCTILE IRON
E	EAST
EL/ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
HMA	HOT MIX ASPHALT
INV	INVERT
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
MNS	MONUMENT NOT SET
N	NORTH
N/A	NOT APPLICABLE
OC	ON CENTER
PC	POINT OF CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCMS	PORTABLE CHANGEABLE MESSAGE SIGN
PGL	PROFILE GRADE LINE
PROP	PROPOSED
PROT	PROTECT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
RCP	REINFORCED CONCRETE PIPE
RET	RETAIN
RET UP	RETAIN UTILITY POLE
RT	RIGHT
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
S	SOUTH
SF	SQUARE FOOT
STA	STATION
TYP	TYPICAL
UP	UTILITY POLE

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

MARK	DATE	DESCRIPTION

PROJECT NO:	W5005-029
DATE:	DECEMBER 2023
FILE:	W5005-029_03_GENERAL.dwg
DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

GENERAL NOTES (SHEET 1 OF 2)

SCALE: NO SCALE

SHEET 03 OF 18

Last Saved: 12/6/2023
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DESIGN LOADS AND SPECIFICATIONS:

1. DESIGN LOADING: HL–93
2. DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN (LRFD)
3. SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH ED., 2020 AS AMENDED
   MASSDOT LRFD BRIDGE MANUAL, 2013, AS AMENDED
   THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 2023, AS AMENDED
4. FOUNDATION DATA: CULVERT:
   BOX CULVERT SUPPORTED ON CRUSHED STONE ON UNDISTURBED SOIL WITH A NOMINAL BEARING RESISTANCE OF 18.8 KSF IN COMBINATION WITH A RESISTANCE FACTOR OF 0.45.

   WINGWALLS:
   MODULAR BLOCKS SUPPORTED ON CRUSHED STONE ON UNDISTURBED SOIL WITH A NOMINAL BEARING RESISTANCE OF 11.5 KSF IN COMBINATION WITH A RESISTANCE FACTOR OF 0.45.
5. REINFORCING STEEL: AASHTO M31 (ASTM A 615) GRADE 60
   EPOXY COATED: ALL BARS.
6. CONCRETE: PRECAST BOX CULVERT AND HEADWALLS:
   5000 PSI, $\frac{3}{4}$", 685 HP CEMENT CONCRETE
   MODULAR BLOCK WINGWALLS:
   4000 PSI, $1\frac{1}{2}$", 565 HP CEMENT CONCRETE
7. SEISMIC: PEAK GROUND ACCELERATION (PGA) = 0.075g
   SEISMIC SITE CLASS = C
   ZONE = 1
   DESIGN PEAK SEISMIC GROUND ACCELERATION MODIFIED BY THE SHORT–PERIOD SITE FACTOR (A_S) = 0.125
   DESIGN SPECTRAL RESPONSE ACCELERATION AT 0.2–SECOND PERIODS (S_{DS}) = 0.191
   DESIGN SPECTRAL RESPONSE ACCELERATION AT 1–SECOND PERIODS (S_{D1}) = 0.070

PRECAST CONCRETE CULVERT STRUCTURE NOTES:

1. ITEM 995.011, CULVERT STRUCTURE, SHALL INCLUDE THE BOX CULVERT, HEADWALLS, WINGWALLS, JOINT MATERIALS, MEMBRANE, AND ANY OTHER MATERIALS OR ITEMS REQUIRED FOR INSTALLATION OF THE PRECAST CONCRETE CULVERT STRUCTURE SHALL BE SUBSIDIARY.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE ENGINEER FOR REVIEW AND ACCEPTANCE TO ENSURE CONFORMANCE WITH THE CONTRACT DOCUMENTS. DESIGN SHALL ENCOMPASS THE BOX CULVERT, WINGWALLS AND FOUNDATIONS, AND CONNECTION OF HEADWALLS TO BOX CULVERT. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION FOR ALL PRECAST CONCRETE ELEMENTS. SHOP DRAWINGS SHALL SHOW JOINT DETAILS AND REINFORCEMENT SIZE AND LOCATION.
3. CHANGES OR MODIFICATIONS DURING THE FABRICATION PROCESS MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL AND INCORPORATED INTO THE FINAL AS–BUILT DRAWINGS.
4. DIMENSIONS SHOWN FOR THE PRECAST CONCRETE ELEMENTS ARE APPROXIMATE AND BASED ON CONCEPTUAL DESIGN. NO ADJUSTMENTS TO PAYMENTS WILL BE MADE AS A RESULT OF PROVIDING PRECAST UNITS SIZED DIFFERENTLY THAN SHOWN ON THE PLANS. CONTRACTOR TO ADJUST OVERALL CULVERT GEOMETRY AS NEEDED IF PRECAST ELEMENT SIZES SELECTED BY CONTRACTOR DIFFER. SEE ALSO SPECIAL PROVISIONS SECTION 995.
5. THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST UNITS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.
6. JOINTS BETWEEN ABUTTING PRECAST CULVERT UNITS SHALL BE MECHANICALLY CONNECTED, WATERTIGHT, GROUTED, AND MEMBRANED.
7. WATERPROOF MEMBRANE SHALL BE PROVIDED OVER THE STRUCTURE ACROSS THE ENTIRE ROADWAY WIDTH.
8. SHEET MEMBRANE SHALL BE 2' WIDE WITH PROTECTION BOARD (SUBSIDIARY) AND PLACED CENTERED OVER ALL JOINTS.
9. EXPOSED CONCRETE SURFACES SHALL BE TREATED WITH WATER REPELLENT (SILANE/SILOXANE).
10. PRECAST CONCRETE HEADWALL ANCHORAGES, CURBS/HEADWALLS, AND BOX CULVERT SECTIONS SHALL BE DESIGNED TO ACCOUNT FOR ALL EARTH PRESSURE, LIVE LOAD SURCHARGES, AND BRIDGE RAILING LIVE LOAD AS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR NCHRP 350 TL–2 TEST LEVEL.
11. WEEP HOLES SHALL BE PLACED 1'–0" (TYP.) ABOVE THE STREAMBED AND ONE (1) WEEP SHALL BE PROVIDED ON BOTH SIDES OF EACH BOX CULVERT UNIT.
12. DEWATERING IS REQUIRED AT EACH FOUNDATION LOCATION TO CONTROL THE WATER INFLOW AND ADEQUATELY DEWATER THE FOOTING EXCAVATION. SUMP PUMPING AREAS AROUND THE ENTIRE PERIMETER SHALL BE REQUIRED, AT A MINIMUM, TO ADEQUATELY CONTROL THE GROUNDWATER WITHIN THE EXCAVATION AREAS. DEWATERING SHALL BE CONTINUOUS UNTIL THE PRECAST CONCRETE BOX CULVERT AND WINGWALLS ARE BACKFILLED EVENLY ON BOTH SIDES TO THE ELEVATIONS OF THE SURROUNDING WATER TABLE, UNLESS OTHERWISE DIRECTED.
13. ANY PROPOSED DEWATERING SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE.
14. SUBMIT DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE ENGINEER FOR REVIEW AND ACCEPTANCE OF PROPOSED SHORING AND SUPPORT OF EXCAVATION. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION AND INSTALLATION FOR ALL SHORING AND SUPPORT OF EXCAVATION ELEMENTS.
15. WATER PUMPED FROM DEWATERING LOCATIONS SHALL BE FILTERED ADEQUATELY TO REMOVE FINE MATERIALS PRIOR TO RETURNING THE WATER TO THE RIVER/BROOK. ACTUAL LOCATION OF SEDIMENTATION BASIN TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER AND THE WESTFORD CONSERVATION COMMISSION PRIOR TO INSTALLATION.
16. ANY FOUNDATION MATERIALS WEAKENED AS A RESULT OF INSUFFICIENT CARE WHILE MAINTAINING A DEWATERED CONDITION SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW (M1.03.0 TYPE A) OR CRUSHED STONE AT NO EXPENSE TO THE OWNER.
17. REINFORCEMENT OF THE PRECAST UNITS SHALL HAVE A 2" MINIMUM CLEAR COVER IN THE TOP FACE OF TOP SLAB, INSIDE FACE OF SIDEWALLS, AND HEADWALLS. ALL OTHER REINFORCEMENT IN THE PRECAST UNITS SHALL HAVE A 1½" MINIMUM CLEAR COVER. ANY CAST–IN–PLACE CONCRETE SHALL MEET AASHTO COVER REQUIREMENTS.
18. A CORROSION INHIBITOR CONCRETE ADDITIVE SHALL BE INCLUDED AS PART OF THE CONCRETE MIX FOR CONCRETE CURBS/HEADWALLS.
19. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
20. FACES OF PRECAST CONCRETE TO BE BACKFILLED AGAINST SHALL BE COATED WITH DAMP–PROOFING IN ACCORDANCE WITH THE SPECIFICATIONS.

CULVERT REMOVAL NOTES:

1. REMOVAL OF THE EXISTING CULVERT STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF THE PIPE AND STONE HEADWALLS. REFER TO SHEET 6 FOR DEMOLITION PLAN,
2. PRIOR TO THE REMOVAL OF EXISTING CULVERT, THE CONTRACTOR SHALL VERIFY THAT EXISTING UTILITIES HAVE BEEN RELOCATED OR A TEMPORARY BYPASS HAS BEEN INSTALLED.

FOUNDATION NOTES:

1. FOUNDATION MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.
2. CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
3. ALL FOUNDATIONS SHALL BE SUPPORTED FULLY ON SOIL OR BEDROCK. PARTIALLY SUPPORTED FOUNDATIONS ON BEDROCK AND SOIL IS NOT ACCEPTABLE.
4. BOTTOM OF FOUNDATION ELEVATIONS PROVIDED ON DRAWINGS SHALL BE CONSIDERED MINIMUM DEPTHS. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL AS REQUIRED.
5. ALL FINISHED EXCAVATIONS SHALL BE VERIFIED AND APPROVED BY THE ENGINEER PRIOR TO PRECAST SECTION DELIVERY.
6. ALL EXCAVATIONS FOR FOOTINGS FOUNDED ON SOIL SHALL BE FINISHED BY HAND FOR THE LAST 6".
7. ALL BACKFILL UNDER OR ADJACENT TO ANY PORTION OF THE STRUCTURE SHALL BE PLACED IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS.
8. REVIEW SOIL STRATA CONDITIONS BELOW STRUCTURE FOOTINGS WITH ENGINEER PRIOR TO INSTALLATION.
9. ANY UNSUITABLE MATERIALS SUCH AS LOOSE OR WEATHERED BEDROCK, BOULDERS, ROOTS, ORGANIC SOILS, OR SILT/CLAY ENCOUNTERED WITHIN THE FOUNDATION BEARING ZONE, DEFINED BY A 1H:1V PLAN EXTENDING DOWNWARD AND OUTWARD FROM 1 FOOT BEYOND THE EDGE OF FOOTING, SHALL BE REMOVED AND REPLACED WITH CRUSHED STONE, AS DIRECTED BY THE ENGINEER.

GEOTECHNICAL DESIGN PARAMETERS:

1. MINIMUM EMBEDMENT FOR FROST PROTECTION = 4 FEET BELOW ADJACENT GROUND SURFACE.
2. FACTORED STRENGTH LIMIT STATE BEARING RESISTANCE FOR THE PRECAST BOX CULVERT = 8.44 KIPS PER SQUARE FOOT.
3. FACTORED STRENGTH LIMIT STATE BEARING RESISTANCE FOR THE WINGWALLS = 5.18 KIPS PER SQUARE FOOT.
4. THE CULVERT DESIGNER SHALL PREPARE CALCULATIONS THAT VERIFY THE APPLIED BEARING PRESSURE IS LESS THAN THE FACTORED BEARING RESISTANCE BASED ON THE FINAL CULVERT AND WINGWALL FOUNDATION DIMENSIONS AND EMBEDMENT.
3. MAXIMUM ALLOWABLE SETTLEMENT = 0.75 INCHES TOTAL
4. MINIMUM BACKFILL UNIT WEIGHT = 130 POUNDS PER CUBIC FOOT (PCF)
5. MAXIMUM BACKFILL ANGLE OF INTERNAL FRICTION = 32 DEGREES
6. MINIMUM LATERAL EARTH PRESSURES FOR RESTRAINED CULVERT SIDE WALLS:
   a. STATIC =
      - 61 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
      - 94 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)
   b. SURCHARGE: HORIZONTAL FORCE FROM THE PRESSURE DISTRIBUTION PRODUCED BY THE AASHTO HL–93 VEHICULAR LIVE LOAD, UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL
   c. SEISMIC =
      - 47 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
      - 87 POUNDS PER CUBIC FOOT PER FOOT (PCF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)
7. MINIMUM LATERAL EARTH PRESSURES FOR UNRESTRAINED WING WALLS:
   a. STATIC =
      - 36 PCF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF MINIMUM (ABOVE GROUNDWATER)
      - 81 PCF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF MINIMUM (BELOW GROUNDWATER)
   b. SURCHARGE: HORIZONTAL FORCE FROM THE PRESSURE DISTRIBUTION PRODUCED BY THE AASHTO HL–93 VEHICULAR LIVE LOAD, UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL. THE DESIGN SHALL ACCOUNT FOR SLOPING GROUND SURFACE ABOVE THE WALLS.
   c. SEISMIC =
      - 41 POUNDS PER CUBIC FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (ABOVE GROUNDWATER)
      - 84 POUNDS PER CUBIC FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE (BELOW GROUNDWATER)

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

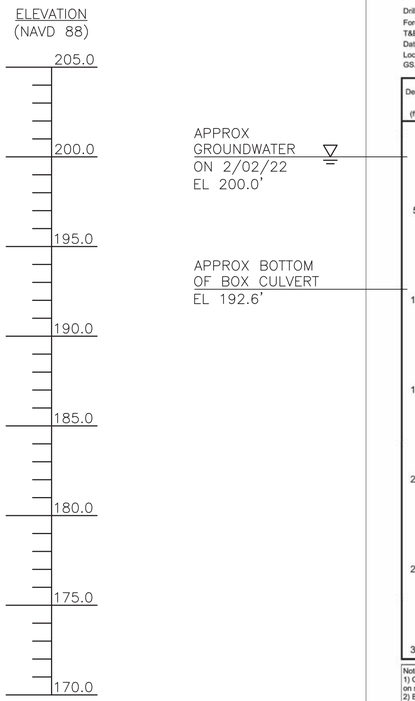
MARK	DATE	DESCRIPTION

PROJECT NO:	W5005-029
DATE:	DECEMBER 2023
FILE:	W5005-029_03_GENERAL.dwg
DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC/EAO
APPROVED BY:	DSH

GENERAL NOTES (SHEET 2 OF 2)

SCALE: NO SCALE

SHEET 04 OF 18



APPROX GROUNDWATER ON 2/02/22 EL 200.0'

APPROX BOTTOM OF BOX CULVERT EL 192.6'

Tighe&Bond Engineers | Environmental Specialists

Boring No. **B-3**
Page 1 of 1
File No. 32-5005-029
Checked by: B. Opp

Project: Blue Brook and Pond Brook Culvert Replacements
Location: Pond Brook and Old Lowell Road
Client: Town of Westford, MA

Drilling Co.: Martin GeoEnvironmental
Foreman: J. Martin
T&B Rep.: R. Gaetjens
Date Start: 02/02/22 End: 02/02/22
Location See Exploration Location Plan
GS. Elev. 202.0 Datum: NAVD88

	Casing	Sampler
Type	HSA	Split Spoon
I.D./O.D.	4-1/4"/ 7-5/8"	1-3/8"/2"
Hammer Wt.	-	140#
Hammer Fall	-	30"
Other	B-53 Rig	Auto hammer

Groundwater Readings

Date	Time	Depth	Casing	Sta. Time
Refer to note 1				

Depth (ft.)	Casing Blows Per Ft.	Sample No. / Rec.	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
		S-1 / 17	0-2	21-42	0-0.5' Asphalt 0.5-2' Brown, fine to coarse SAND, some Gravel, little Silt	0.5' Asphalt		
				39-7				
		S-2 / 7	2-4	3-4	Loose, brown, fine to coarse SAND, little Gravel,trace Silt	FILL		
				4-5				
		S-3 / 11	4-6	5-9	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt			
5				5-4		6'		No well installed
10		S-4 / 21	10-12	12-35	Dense, grey, fine to coarse SAND, some fine to coarse gravel, little Silt, wet	SAND		
				13-17				
						13'	2	
15					Boring terminated at 13' (Refusal)			
20								
25								
30								

Notes:
1) Ground water estimated to be approximately two feet below ground surface based on sample wetness.
2) Boring backfilled with cuttings and surface repaired with coldpatch asphalt upon completion.

Proportions Used		
TRACE (TR.)	0 - <10%	
LITTLE (LI.)	10 - <20%	
SOME (SO.)	20 - <35%	
AND	35 - <50%	

Density/Consistency			
VERY LOOSE	0-4	VERY SOFT	<2
LOOSE	4-10	SOFT	2-4
MEDIUM DENSE	10-30	MEDIUM	4-8
DENSE	30-50	STIFF	8-15
VERY DENSE	>50	VERY STIFF	15-30
		HARD	>30

BORING TB–3 (1 OF 1)

APPROX GROUNDWATER ON 2/02/22 EL 200.0'

APPROX BOTTOM OF BOX CULVERT EL 192.6'

Tighe&Bond Engineers | Environmental Specialists

Boring No. **B-4**
Page 1 of 1
File No. 32-5005-029
Checked by: B. Opp

Project: Blue Brook and Pond Brook Culvert Replacements
Location: Pond Brook and Old Lowell Road
Client: Town of Westford, MA

Drilling Co.: Martin GeoEnvironmental
Foreman: J. Martin
T&B Rep.: R. Gaetjens
Date Start: 02/02/22 End: 02/02/22
Location See Exploration Location Plan
GS. Elev. 202.0 Datum: NAVD88

	Casing	Sampler
Type	HSA	Split Spoon
I.D./O.D.	4-1/4"/ 7-5/8"	1-3/8"/2"
Hammer Wt.	-	140#
Hammer Fall	-	30"
Other	B-53 Rig	Auto hammer

Groundwater Readings

Date	Time	Depth	Casing	Sta. Time
Refer to note 1				

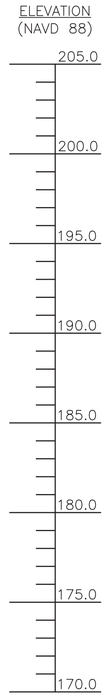
Depth (ft.)	Casing Blows Per Ft.	Sample No. / Rec.	Sample Depth (ft.)	Blows Per 6"	Sample Description	General Stratigraphy	Notes	Well Construction
		S-1 / 14	0-2	37-64	0-0.5' Asphalt 0.5-2' Very dense, brown, fine to coarse SAND, some Gravel, little Silt	0.5' Asphalt		
				30-16				
		S-2 / 0	2-4	6-5	NO RECOVERY	FILL		
				1-2				
		S-3 / 11	4-6	2-13	Medium dense, brown, fine to coarse SAND, trace fine Gravel, trace Silt			
5				8-5		6'		
10		S-4 / 2	10-12	25-10	Medium dense, gray, fine to coarse SAND, trace Gravel, trace Silt	SAND		No well installed
				12-16				
15		S-5 / 8	15-17	5-14	Medium dense, gray, fine to coarse SAND, little Clayey Silt, trace Gravel			
				20-12				
						20'		
		S-6 / 10	20-20.5	50/5"	Very dense, brown, weathered rock	WX Rock		
20		C-1 / 52	20.5-25.5	4 min		20.5'		
				7 min	Hard, slightly weathered, fine to medium grained Gneiss, slightly fractured, close, shallow dipping joints/fractures REC = 52/60 = 87% RQD = 40/60 = 67%	BEDROCK		
				6 min				
				7 min				
25				10 min		25.5'	2	
					Boring terminated at 25.5'			
30								

Notes:
1) Ground water estimated to be approximately two feet below ground surface based on sample wetness.
2) Boring backfilled with cuttings and surface repaired with coldpatch asphalt upon completion.

Proportions Used		
TRACE (TR.)	0 - <10%	
LITTLE (LI.)	10 - <20%	
SOME (SO.)	20 - <35%	
AND	35 - <50%	

Density/Consistency			
VERY LOOSE	0-4	VERY SOFT	<2
LOOSE	4-10	SOFT	2-4
MEDIUM DENSE	10-30	MEDIUM	4-8
DENSE	30-50	STIFF	8-15
VERY DENSE	>50	VERY STIFF	15-30
		HARD	>30

BORING TB–4 (1 OF 1)



BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON SHEET 6 THUS: B–1
2. BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF DRILLING. FIELD CONDITIONS WILL VARY BASED ON TIME OF YEAR AND RAIN EVENTS.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
6. ALL BORINGS WERE DRILLED IN FEBRUARY 2022.
7. BORINGS WERE DRILLED BY MARTIN GEO ENVIRONMENTAL LLC. OF BELCHERTOWN, MA.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE SURFACE ELEVATION ON EACH BORING LOG IS THE ELEVATION OF THE EXISTING GROUND AT THE TIME THE BORING WAS TAKEN.
10. ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR 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 OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

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DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

BORING LOGS & BORING NOTES

SCALE: NO SCALE

SHEET 05 OF 18

Last Saved: 12/6/2023
Plotted On: Dec 06, 2023-11:27am By: SSak
Tighe & Bond: J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_03_GENERAL.dwg

OLD LOWELL RD ALIGNMENT CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	0+00.00	3031536.537	683239.107		N10°55'46"E 170.72'	1+70.72	3031704.161	683271.476
C1	1+70.72	3031704.161	683271.476	R=500.00' Δ=5°09'39" L=45.04' T=22.53'		2+15.76	3031748.707	683278.013
L2	2+15.76	3031748.707	683278.013		N5°46'07"E 114.08'	3+29.83	3031862.205	683289.479
C2	3+29.83	3031862.205	683289.479	R=550.00' Δ=5°52'55" L=56.46' T=28.26'		3+86.30	3031917.991	683298.025
L3	3+86.30	3031917.991	683298.025		N11°39'02"E 63.70'	4+50.00	3031980.382	683310.890

OLD LOWELL ROAD TO BE CLOSED DURING CONSTRUCTION. ROADWAY TO BE USED AS STAGING AREA

ROCK WALL (TYP.)

BENCHMARK: BMK B: MAG NAIL IN UP 54/73 ELEV: 208.19'

RET UP

SUPPORT POLE

REFLECTOR SIGN

BORDERING LAND SUBJECT TO FLOODING (TYP)

STA 4+00 END FULL DEPTH RECONSTRUCTION SAW CUT LINE AT LIMIT

R&R SIGN

TEMPORARY DEWATERING SEDIMENT TRAP

2" CS GAS MAIN TOP OF GAS 3'-4" BELOW SURFACE

R&R SIGN

"SPEED LIMIT 30" SIGN

2" CS GAS MAIN TOP OF GAS 2'-10" BELOW SURFACE

PROTECT TREE

36"± CMP CULVERT, DAMAGED INV=195.55 TOP OF PIPE=198.90

R&D CULVERT

R&D TREE (20" DOUBLE)

R&D HEADWALL

N/F TOWN OF WESTFORD 0 LASALLETTE ROAD Tax Map 18, Parcel 103 Deed Book 1926, Page 519

N/F RICHARD & BEVERLY LAMBURN (LE) 47 SOUTH CHELMSFORD ROAD Tax Map 18, Parcel 106 Deed Book 31001, Page 86

N/F MIDDLESEX COUNTY 4-H FAIR INC 55 SOUTH CHELMSFORD ROAD Tax Map 18, Parcel 61 Deed Book 1333, Page 335

TB-4

TB-3

22 N: 3031786.848' E: 683289.065' EL: 201.890' MNS

FLOW

POND BROOK

2" CS GAS MAIN TOP OF GAS 2'-10" BELOW SURFACE

TEMPORARY COFFERDAM (TYP)

R&D TREE (16")

BENCHMARK: BMK A: MAG NAIL IN UP 72 ELEV: 203.43'

9 N: 3031760.340' E: 683281.991' EL: 201.994' MNS

36"± CMP CULVERT, DAMAGED INV=196.03 TOP OF PIPE=199.03

TEMPORARY VELOCITY DISSIPATER

POND BROOK

APPROXIMATE

RELOCATE UP & GUY (BY OTHERS)

PROTECT TREE

SEDIMENT CONTROL BARRIER (TYP)

R&D ROADWAY

PROTECT TREE

R&D CONC POSTS (TYP)

PROTECT TREES

PROTECT ROCK WALL

14 N: 3031727.570' E: 683284.355' EL: 201.834' MNS

N/F DOROTHY NIELD 98 OLD LOWELL ROAD Tax Map 18, Parcel 105 Deed Book 34660, Page 214

STA 1+15 BEGIN FULL DEPTH RECONSTRUCTION SAW CUT LINE AT LIMIT

MAINTAIN ACCESS TO DRIVEWAY AT ALL TIMES

LIMITS OF WORK

OLD LOWELL ROAD CONSTRUCTION BASELINE

OLD LOWELL ROAD (PUBLIC WAY)

LOCAL 30-FOOT NO DISTURB ZONE (TYP)

100-FOOT BUFFER ZONE (TYP)

RET UP

200-FOOT RIVERFRONT AREA (TYP)

N/F TOWN OF WESTFORD 0 OLD LOWELL ROAD Tax Map 18, Parcel 66

SCALE: 1" = 20'

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

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APPROVED BY:	DSH

EXISTING CONDITIONS & DEMOLITION PLAN

SCALE: 1" = 20'

SHEET 06 OF 18

Last Saved: 12/6/2023
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Tighe & Bond: J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_04_CIVIL.dwg

STA 4+00
END FULL DEPTH
RECONSTRUCTION
PROVIDE MILLING
AND OVERLAY PER
BUTT JOINT DETAIL

BORDERING LAND SUBJECT TO FLOODING (TYP)

PROP TEMPORARY
EASEMENT TO BE
SECURED PRIOR TO
CONSTRUCTION

2" HDPE GAS MAIN (BY OTHERS)
GAS MAIN TO REMAIN ACTIVE
THROUGHOUT CONSTRUCTION

STA 3+13, 13.5' LT
GUARDRAIL FLARED END
TREATMENT WITH IMPACT HEAD

PROPOSED HIGHWAY GUARDRAIL (TYP)

REGRADE STREAM BANK
SEE SHEET 10 FOR DETAILS (TYP)

PROP PERMANENT EASEMENT TO BE
SECURED PRIOR TO CONSTRUCTION

STREAMBANK SLOPE STABILIZATION (TYP)
SEE SHEET 9 FOR DETAILS

TEMPORARY COFFERDAM (TYP)

UP & GUY TO BE
RELOCATED (BY OTHERS)

GAS MAIN TO
BE RELOCATED
(BY OTHERS)

SEDIMENT CONTROL BARRIER (TYP)

STA 1+87, 13.5' LT
GUARDRAIL TRAILING ANCHORAGE
FLARED END TREATMENT

RIGHT OF WAY (TYP)

STA 1+15
BEGIN FULL DEPTH
RECONSTRUCTION
PROVIDE MILLING
AND OVERLAY PER
BUTT JOINT DETAIL

200-FOOT RIVERFRONT AREA (TYP)

PROPOSED
CONTOURS (TYP)

STA 3+13, 13.5' RT
GUARDRAIL TRAILING ANCHORAGE
FLARED END TREATMENT

PROPOSED EDGE
OF ROAD (TYP)

RESTORE ANY TEMPORARY
DISTURBED WETLANDS
SEE SHEET 10 FOR DETAILS

PROPOSED WINGWALLS
SEE SHEET 14 FOR
DETAILS AND ELEVATIONS

PROPOSED PRECAST
CONCRETE BOX CULVERT
SEE SHEET 13 FOR DETAILS

INV OUT = 198.4

PROP 12" CPP
S = 0.5%

PROP CB-02
RIM = 201.7
INV. = 198.6 (IN)
INV. = 198.5 (OUT)

PROP 12" CPP
S = 0.5%

PROP CB-01
RIM = 201.7
INV. = 198.7

STA 2+00 TO 3+00 RT & LT
PROP HMA BERM MONOLITHIC
WITH PAVING

PROPOSED WETLANDS REPLICATION AREA (160 SF)
SEE DETAIL ON SHEET 10

PROVIDE FUSED CAPS FOR
FUTURE CONNECTION (TYP)

STA 1+87, 13.5' RT
GUARDRAIL FLARED END
TREATMENT WITH IMPACT
HEAD

LOCAL 30-FOOT NO DISTURB ZONE (TYP)

LIMITS OF WORK

100-FOOT BUFFER ZONE (TYP)

STA 2+00 TO 3+00, 5'RT
PROP 16" HDPE (DR21) PIPE
SLEEVE FOR FUTURE 12" HDPE
(DR11) WATER MAIN. INSTALL
MINIMUM 1' BELOW CULVERT

PROP TEMPORARY
EASEMENT TO BE SECURED
PRIOR TO CONSTRUCTION

N/F
TOWN OF WESTFORD
0 LASALLETTE ROAD
Tax Map 18, Parcel 103
Deed Book 1926, Page 519

N/F
RICHARD & BEVERLY LAMBURN (LE)
47 SOUTH CHELMSFORD ROAD
Tax Map 18, Parcel 106
Deed Book 31001, Page 86

N/F
DOROTHY NIELD
98 OLD LOWELL ROAD
Tax Map 18, Parcel 105
Deed Book 34660, Page 214

N/F
MIDDLESEX COUNTY 4-H FAIR INC
45 SOUTH CHELMSFORD ROAD
Tax Map 18, Parcel 61
Deed Book 1333, Page 335

N/F
TOWN OF WESTFORD
0 OLD LOWELL ROAD
Tax Map 18, Parcel 66

FLOW
POND BROOK
APPROXIMATE
OLD LOWELL ROAD (PUBLIC WAY)
ROCK WALL (TYP.)
"SPEED LIMIT 30" SIGN
36"± CMP CULVERT, DAMAGED INV=196.55 TOP OF PIPE=198.90
36"± CMP CULVERT, DAMAGED INV=196.03 TOP OF PIPE=199.03
BIT. DRIVE
WELL
24" PINE
20" PINE
18" PINE
18"
SUPPORT POLE
REFLECTOR SIGN
UTILITY POLE
STONE HEADWALL
PT +86.30
PC +29.83
PT +15.76
PC +70.72
L1
L2
L3
C1
C2
C3
EOP
WF 2A-1 through WF 2E-3

0 20' 40'
SCALE: 1" = 20'

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

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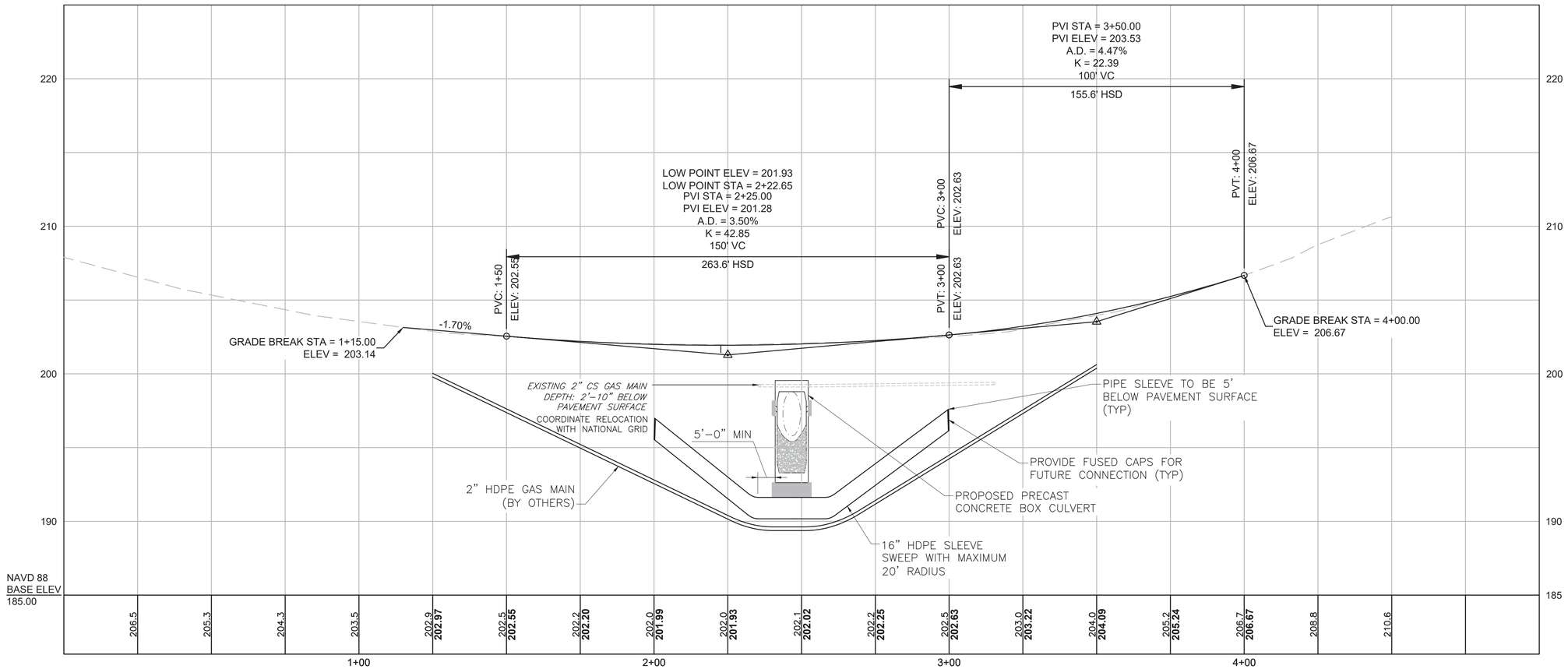
DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

SITE PLAN

SCALE: 1" = 20'

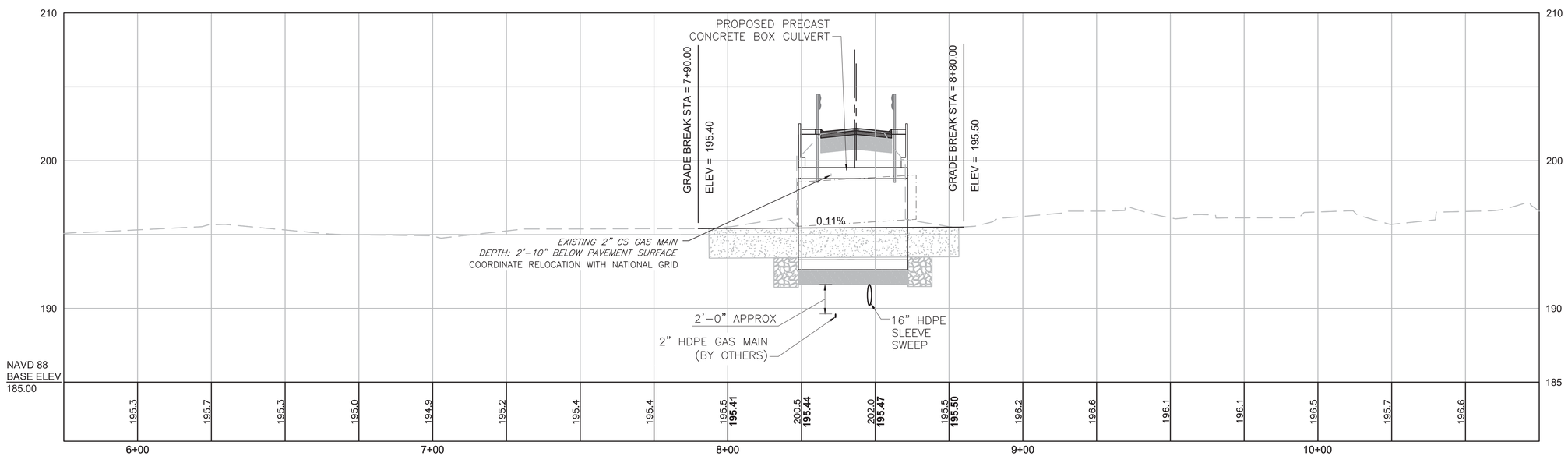
SHEET 07 OF 18

Last Saved: 12/6/2023
Plotted On: Dec 06, 2023-4:32pm By: SSak
Tighe & Bond J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_04_CIVIL.dwg



OLD LOWELL ROAD PROFILE – ℄ PROPOSED ROADWAY

HORIZ.: 1" = 20' VERT.: 1" = 4'



PROFILE ALONG ℄ POND BROOK

HORIZ.: 1" = 20' VERT.: 1" = 4'

0 20' 40'
SCALE: 1" = 20'

Tighe&Bond

Old Lowell Road Over Pond Brook

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APPROVED BY:	DSH

PROFILES

SCALE: AS SHOWN

SHEET 08 OF 18

Last Saved: 12/6/2023
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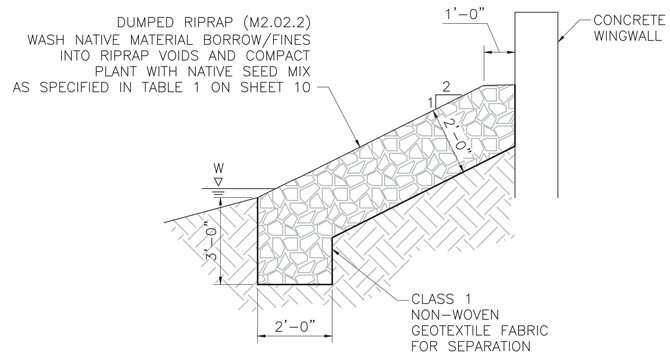
Tighe & Bond J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_04_CIVIL.dwg

EROSION CONTROL NOTES:

1. ALL EROSION CONTROL MEASURES SHOWN, SPECIFIED AND REQUIRED BY THE ENGINEER SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION OR IMMEDIATELY UPON REQUEST. MAINTAIN ALL SUCH CONTROL MEASURES UNTIL FINAL SURFACE TREATMENTS ARE IN PLACE AND/OR UNTIL PERMANENT VEGETATION IS ESTABLISHED.
2. A PRE–CONSTRUCTION MEETING WITH THE WESTFORD CONSERVATION COMMISSION AND THE ENGINEER IS REQUIRED. THE EROSION CONTROL MEASURES ARE TO BE REVIEWED BY THE COMMISSION PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
4. PRIOR TO STARTING WORK, CLEARLY STAKE WORK LIMIT LINE(S). DO NOT DISTURB VEGETATION AND TOPSOIL BEYOND THE NEW LIMIT LINE. COORDINATE WITH THE ENGINEER THE LOCATIONS FOR THE TEMPORARY STOCKPILING OF TOPSOIL DURING CONSTRUCTION.
5. SIDE SLOPES, AND DISTURBED VEGETATED AREAS, SHALL BE A MAXIMUM GRADE OF 2:1 COMPACTED, STABILIZED, LOAMED AND SEEDED AS SHOWN ON DRAWINGS. SIDE SLOPES SHALL BE IMMEDIATELY FINE GRADED AND SEEDED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
6. SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
7. INSTALL EROSION CONTROLS AT THE EDGE OF NEW WORK. EROSION CONTROLS SHALL ACT AS LIMIT OF WORK LINE TO HELP ENSURE THAT EQUIPMENT DOES NOT DISTURB ADJACENT PROPERTIES.
8. ADDITIONAL EROSION CONTROLS MAY BE REQUIRED TO LIMIT SEDIMENTS FROM DISCHARGING TO ADJACENT PROPERTIES OR WATERWAYS.
9. PROPERLY STABILIZE AND PROTECT TEMPORARY STOCKPILES OF MATERIALS RELATED TO THE CONSTRUCTION ACTIVITIES TO LIMIT MOVEMENT OF MATERIAL ONTO ADJACENT PARCELS, OR INTO THE STREAM.
10. STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY
11. PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO LIMIT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
12. ALL SILT–LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS PRIOR TO RELEASE TO AN UPLAND AREA, IN A SEDIMENTATION OR FILTER BAG LOCATED DOWN GRADIENT.
13. DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO APPROPRIATE UPLAND LOCATION AND WITHOUT SEDIMENT (SEE DEWATERING REQUIREMENTS).
14. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHTS–OF–WAY BEYOND THE PROJECT LIMITS SHALL BE REMOVED.

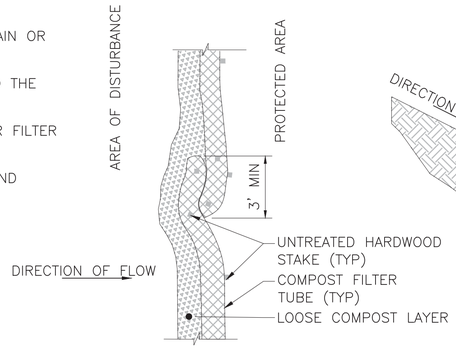


STREAMBANK SLOPE STABILIZATION

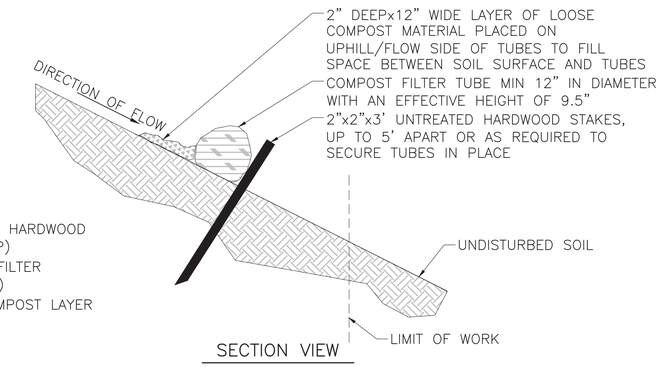
NOT TO SCALE

COMPOST FILTER TUBE NOTES:

1. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
2. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
3. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN–OFF.
4. TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
5. TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
6. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5' APART OR AS REQUIRED TO SECURE TUBES IN PLACE.
7. PROVIDE 3' MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW.
8. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
9. SECURE ENDS OF TUBES WITH STAKES SPACED 18" APART THROUGH TOPS OF TUBES.



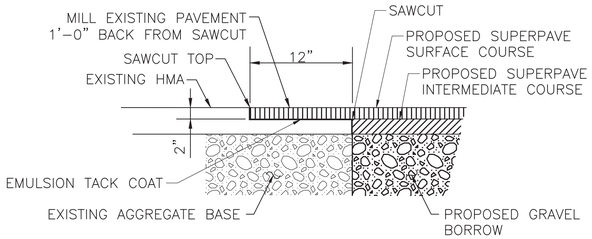
PLAN VIEW – JOINT DETAIL



SECTION VIEW

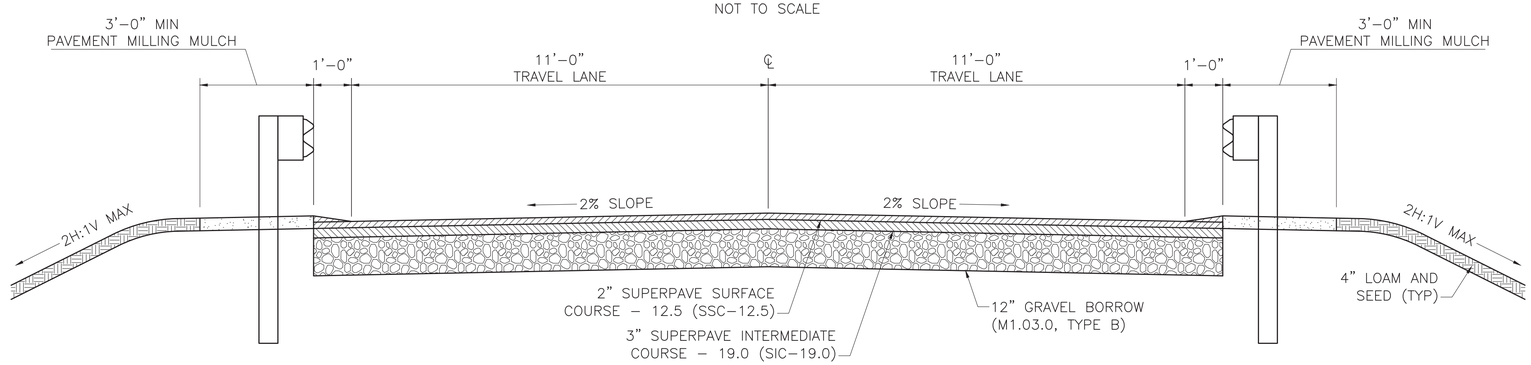
COMPOST FILTER TUBES

NOT TO SCALE



TYPICAL BUTT JOINT TO EXISTING PAVEMENT

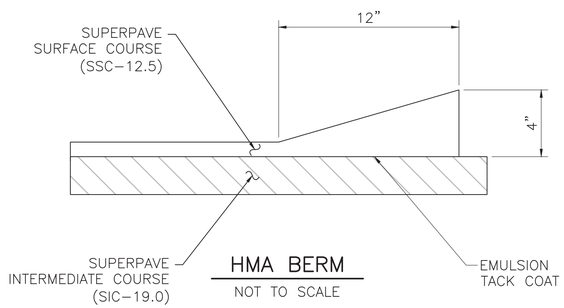
NOT TO SCALE



OLD LOWELL ROAD TYPICAL SECTION

SCALE: $\frac{1}{2}$" = 1'–0"

STA 1+15 TO 4+00



HMA BERM

NOT TO SCALE

NOTES:

1. SEE SHEET 7 FOR LIMITS OF GUARDRAIL AND HMA BERM.

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

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DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

CONSTRUCTION DETAILS (SHEET 1 OF 3)

SCALE: AS SHOWN

SHEET 09 OF 18

Last Saved: 12/6/2023
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Tighe & Bond J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_04_CIVIL.dwg

IN–SITU WETLAND RESTORATION NOTES:

1. STABILIZATION OF DISTURBED AREAS OR NEW SOIL SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY OR PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, USING HYDRO–SEEDING, BROADCASTING, OR OTHER APPROVED TECHNIQUES.
2. TREES AND SHRUBS SHOULD BE PLANTED FIRST AND THEN SEEDING WITH THE SPECIFIED SEED MIX (TABLE 1).
3. TREES AND SHRUB SPECIES PLANTING SUBSTITUTIONS MAY BE REQUIRED BASED ON THE AVAILABILITY OF NATIVE MATERIAL. SUBSTITUTIONS SHALL BE APPROVED BY A WETLAND SCIENTIST OR ENGINEER OVERSEEING THE RESTORATION.
4. MAINTAIN VEGETATED SURFACES, INCLUDING WATER, AND RE–SEEDING UNTIL ESTABLISHED CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.
5. SEED MIX SPECIFIED IN TABLE 1 SHALL BE APPLIED BASED ON THE APPLICATION RATE SPECIFIED BY THE SUPPLIER.
6. THE IN–SITU WETLAND RESTORATION AREAS SHALL BE MULCHED WITH WEED FREE STRAW FOLLOWING SEEDING.
7. AREAS WHERE WETLAND TOPSOIL IS SIGNIFICANTLY DISTURBED OR REMOVED ENTIRELY, WETLAND TOPSOIL FOR WETLAND REPLACEMENT AREAS SHALL CONSIST OF A MIXTURE OF EQUAL VOLUMES OF CLEAN, WEED AND SEED FREE ORGANIC AND MINERAL MATERIALS. WELL–DECOMPOSED CLEAN LEAF COMPOST SHALL BE USED AS A SOIL AMENDMENT TO ACHIEVE THE ORGANIC STANDARD. WOOD CHIPS, PEAT MOSS, AND PEAT MOSS BY–PRODUCTS SHALL NOT BE USED AS AS ORGANIC AMENDMENTS. SUPPLEMENTAL TOPSOIL IN WETLAND REPLACEMENT AREAS SHALL HAVE A MINIMUM ORGANIC CARBON CONTENT OF 4–12% (7 TO 21% ORGANIC MATTER) ON A DRY WEIGHT BASIS. MATCH EXISTING GRADE.

TABLE 1
Seed Mix[1] for Application to Bank and Wetland Restoration Areas and for Wetland Replacement

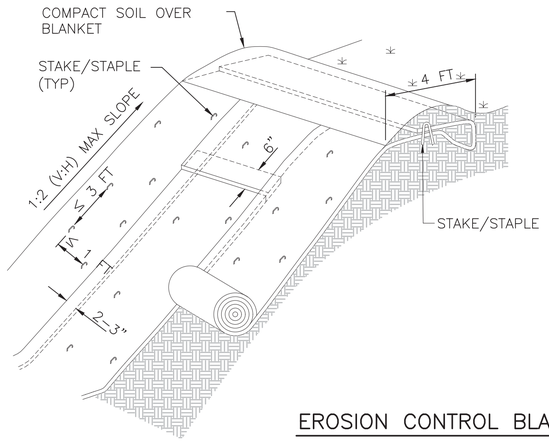
Common Name	Botanical Name[2]	Indicator Status[1]
Fox Sedge	*Carex vulpinoidea*	OBL
Blunt Broom Sedge	*Carex scoparia*	FACW
Lurid Sedge	*Carex lurida*	OBL
Hop Sedge	*Carex lupulina*	OBL
Fowl Bluegrass	*Poa palustris*	FACW
Beggar Ticks	*Bidens frondosa*	FACW
Green Bulrush	*Scirpus atrovirens*	OBL
Swamp Milkweed	*Asclepias incarnata*	OBL
Fringed Sedge	*Carex crinita*	OBL
New York Ironweed	*Vernonia noveboracensis*	FACW
Soft Rush	*Juncus effusus*	OBL
Starved/Calico Aster	*Aster lateriflorus (Symphyotrichum lateriflorum)*	FAC
Blue Flag	*Iris versicolor*	OBL
American Mannagrass	*Glyceria grandis*	OBL
Square Stemmed Monkey Flower	*Mimulus ringens*	OBL
Spotted Joe Pye Weed	*Eupatorium maculatum (Eutrochium maculatum)*	OBL

[1] New England Wetmix (Wetland Seed Mix) Species Composition (New England Wetland Plants, Inc.)
[2] This list was adapted from the New England Wetland Plants, Inc. information sheet as of October 10, 2020.
[3] Indicator status is based on the USDA NRCS Plants Database.

TABLE 2
Native Shrubs (tubelings or live stakes) for Bank and Wetland Restoration[1]

Common Name	Botanical Name	Indicator Status[2]	On center Spacing
Silky Dogwood	*Cornus amomum*	FACW	1-2′
Winterberry	*Ilex verticillata*	FACW	1-2′
Pussy Willow	*Salix discolor*	FACW	1-2′
Bebb Willow	*Salix bebbiana*	FACW	1-2′
Black Willow	*Salix nigra*	OBL	1-2′

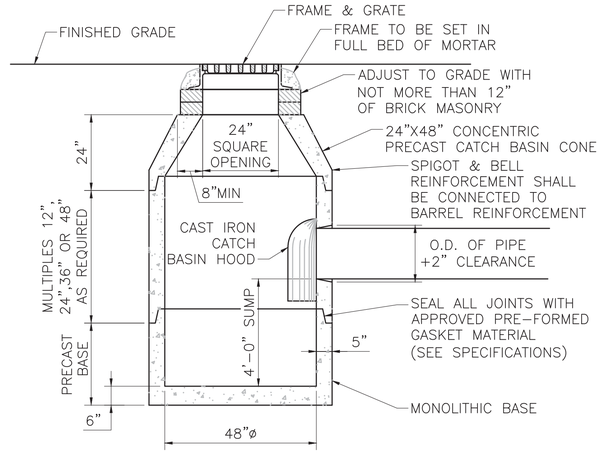
[1] Shrubs to be selected from the species listed in this table based on the availability of native nursery stock at the time of installation.
[2] Indicator status is based on the USDA NRCS Plants Database.



EROSION CONTROL BLANKET
NOT TO SCALE

INSTALLATION NOTES:

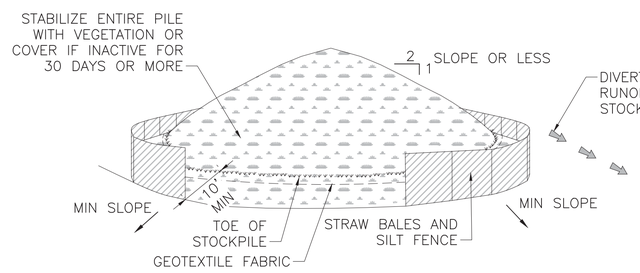
1. TEMPORARY WEAVE JUTE NET EROSION CONTROL BLANKET OVER 6" LOAM & SEED. IN ALL LOCATIONS WITH A 3:1 SLOPE OR STEEPER. SEED MIX AS SHOWN IN TABLE BELOW.
2. EROSION CONTROL BLANKET SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.
3. STAKES/STAPLES SHOULD BE PLACED NO MORE THAN 3 FT APART VERTICALLY, AND 1 FT APART HORIZONTALLY.
4. SLOPE SURFACE SHOULD BE FREE OF STICKS, ROCKS, AND OTHER OBSTRUCTIONS.
5. BLANKETS SHOULD BE ROLLED OUT LOOSELY AND STAKED/STAPLED TO MAINTAIN DIRECT SOIL CONTACT. DO NOT STRETCH THE BLANKETS.



NOTES:

1. SEAL JOINT BETWEEN PIPE AND CATCH BASIN WITH GROUT.

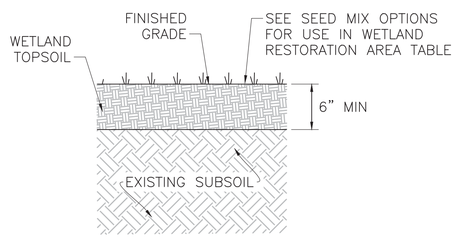
PRECAST CONCRETE CATCH BASIN
NOT TO SCALE



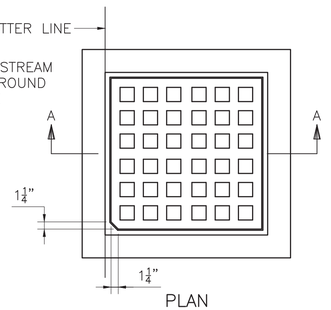
INSTALLATION NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 2H:1V.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING AND STRAW BALES, THEN STABILIZED WITH VEGETATION OR COVERED.

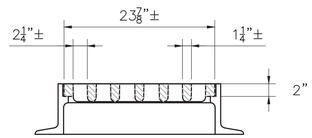
SOIL STOCKPILING
NOT TO SCALE



WETLAND TOPSOIL FOR INLAND WETLAND REPLACEMENT AREA
NOT TO SCALE



PLAN

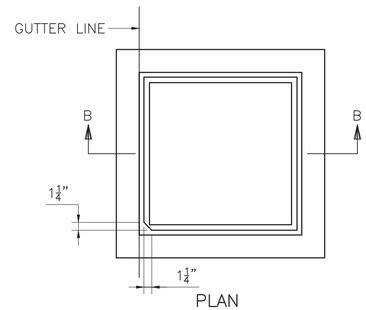


SECTION A–A

NOTES:

1. MINIMUM WEIGHT OF GRATE – 190 LBS.
2. MATERIAL – CAST IRON, SEE SPECIFICATIONS.

CATCH BASIN GRATE
NOT TO SCALE



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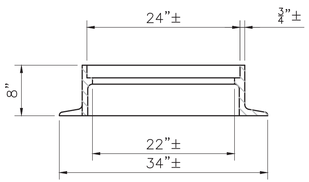

SECTION B–B

NOTES:

1. MINIMUM FRAME WEIGHT:
   4 FLANGE – 295± LBS
2. MATERIAL – CAST IRON, SEE SPECIFICATIONS.
3. FOR ADDITIONAL INFORMATION SEE MHD 201.6.0

CATCH BASIN FRAME
NOT TO SCALE

Tighe&Bond

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DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

CONSTRUCTION DETAILS (SHEET 2 OF 3)

SCALE: NO SCALE

SHEET 10 OF 18

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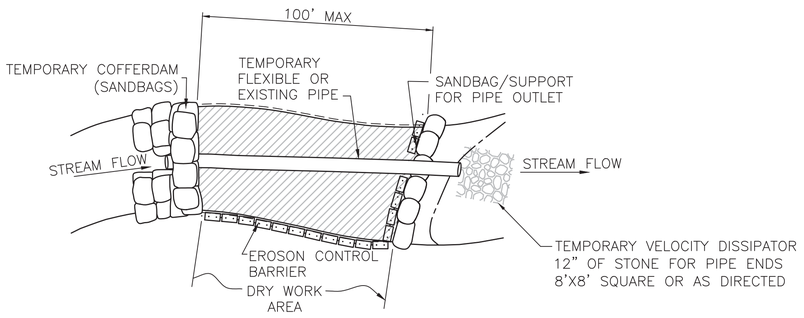
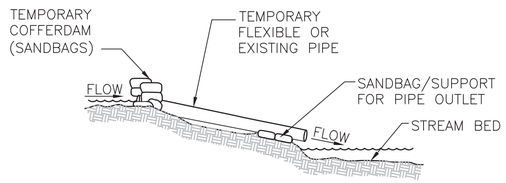


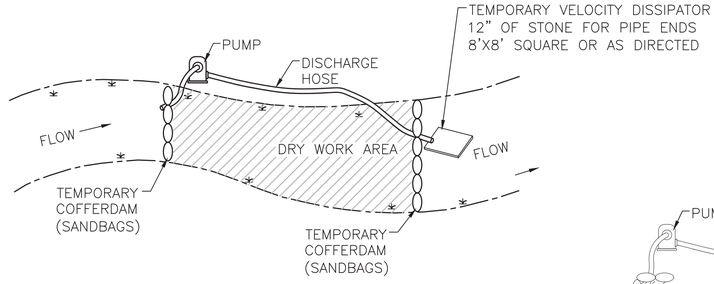
PLAN VIEW – COFFERDAM



ELEVATION VIEW

STREAM BYPASS DETAIL (PIPE)

NOT TO SCALE



STREAM BYPASS DETAIL (PUMPED)

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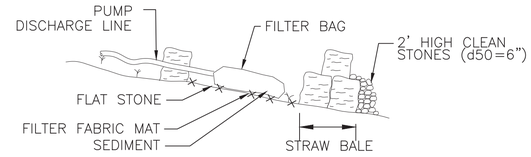
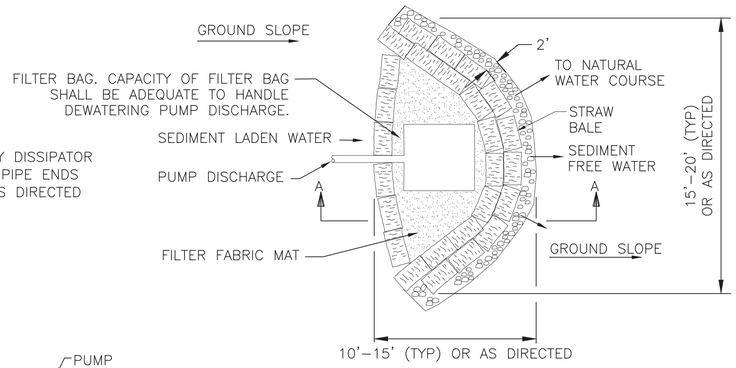
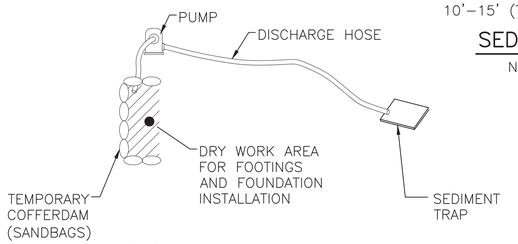


SECTION A–A



SEDIMENT TRAP

NOT TO SCALE



NOTES:

1. DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS.
2. DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION

COFFERDAM AND DEWATERING

NOT TO SCALE

WATER CONTROL SEQUENCING:

1. INSTALL A TEMPORARY COFFERDAM UPSTREAM OF THE EXISTING CULVERT PRIOR TO REMOVAL OF THE EXISTING CULVERT. PROVIDE BYPASS FLUME PIPE OR PUMP. SIZE AND PROVIDE A FLUME PIPE OR PUMP WITH ADEQUATE CAPACITY TO ACCOMMODATE STREAM FLOWS AS INDICATED IN THE WATER CONTROL NOTES. SUBMIT AN EMERGENCY CONTINGENCY PLAN FOR A STORM EVENT GREATER THAN THE 2–YEAR STORM.
2. REMOVE AND DISPOSE EXISTING CULVERTS, EXCAVATE AND DEWATER FOR BRIDGE INSTALLATION, PLACE CRUSHED STONE TO GRADE, INSTALL BRIDGE AND PLACE STREAM BED MATERIAL THROUGH BRIDGE, FOLLOWED BY SITE RESTORATION. AT NO POINT SHOULD THE STREAM FLOW OVER NEWLY EXCAVATED EARTH OR OVER AREAS THAT DO NOT HAVE THE FINISHED SURFACE TREATMENT.
3. CULVERT SHALL THEN BE INSTALLED AND STREAM DIVERSION MAY BE REMOVED AFTER ALL SURFACES HAVE BEEN PROTECTED.

WATER CONTROL NOTES:

1. THE ISOLATED WORK AREA WITHIN THE COFFERDAMS MAY BE DEWATERED AS NEEDED TO PERFORM WORK IN THE DRY. ALL WORK MUST BE PERFORMED IN THE DRY. ANY DEWATERING ACTIVITIES SHALL BE PERFORMED USING A DISCHARGE HOSE, FILTER BAG, AND SEDIMENT TRAP (SHOWN ON THIS SHEET).
2. PRIOR TO BEGINNING ANY CONSTRUCTION IN THE STREAM, SUBMIT TO THE OWNER A WORK SEQUENCE INDICATING ANTICIPATED COFFERDAM LOCATIONS, OR ALTERNATE SYSTEM. WORK SHALL ONLY BE PERFORMED DURING LOW FLOW CONDITIONS.
3. THE COFFERDAM WORK MAY BE MODIFIED TO ADDRESS THE CONTRACTOR'S SEQUENCE OF CONSTRUCTION, WITH THE APPROVAL OF THE OWNER.
4. TEMPORARY COFFERDAMS (SAND BAG, JERSEY BARRIER, WATER FILLED BARRIER OR EQUIVALENT; USE OF UNCONSOLIDATED MATERIALS STRICTLY PROHIBITED) WILL BE INSTALLED TO MAINTAIN A DRY WORK AREA DURING CONSTRUCTION ACTIVITIES AND TO LIMIT SEDIMENTATION AS A RESULT OF THE PROPOSED WORK. THE WORK AREA LOCATED WITHIN THE COFFERDAMS SHALL BE DEWATERED. THE COFFERDAMS WILL BE LOCATED WITHIN THE STREAM TO ALLOW INSTALLATION OF BRIDGE FOOTINGS AND FOUNDATIONS AND IN OTHER LOCATIONS WHERE DEWATERING NEAR THE STREAM IS REQUIRED.
5. WATER CONTROLS SHOULD BE DESIGNED FOR A 2–YEAR STORM (PEAK FLOW 33 CFS). PRIOR TO COMMENCING WORK SUBMIT TO THE ENGINEER DRAWINGS AND CALCULATIONS, STAMPED BY A PROFESSIONAL ENGINEER IN THE STATE OF MASSACHUSETTS, INDICATING THE CONTRACTOR'S METHOD FOR CONTROL OF WATER. THE SUBMITTAL SHALL INCLUDE PROPOSED IMPACT AREAS, RESTORATION METHODS, FLOW RATES, DEWATERING METHODS AND A DETAILED SCHEDULE FOR THE CONTROL OF WATER.

DEWATERING REQUIREMENTS:

PREPARE A DEWATERING PLAN TO ADDRESS THE FOLLOWING CONCERNS AND ADHERE TO THE FOLLOWING REQUIREMENTS:

1. IF THE WATER TABLE IS INTERCEPTED DURING EXCAVATION, WATER COLLECTED IN THE TRENCH SHALL BE PUMPED OUT SO THAT THE WORK CAN BE PERFORMED "IN THE DRY." PROVIDE ADEQUATELY SIZED DEWATERING EQUIPMENT WITH 100% BACKUP AND SEDIMENTATION/EROSION CONTROL STRUCTURES AS DETAILED ON THE CONTRACT DRAWINGS TO ENSURE CONSTRUCTION "IN THE DRY" AND ADEQUATELY PROTECT ADJACENT WETLAND AREAS AND WATERWAYS.
2. ALL GROUNDWATER REMOVED (PUMPED) FROM THE TRENCH EXCAVATION AND DISCHARGED SHALL BE A "CLEAN DISCHARGE." PROVIDE WHATEVER DEVICES ARE REQUIRED TO ACHIEVE THE "CLEAN DISCHARGE." IF THE OWNER'S REPRESENTATIVE DETERMINES THE PUMPED DISCHARGE IS CLEAN (LESS THAN 50 NTU), THE FLOW CAN BE DIRECTED TO AN UPLAND AREA. IF THE OWNER'S REPRESENTATIVE DETERMINES THAT THE FLOW IS NOT CLEAN, DIRECT THAT FLOW TO ONE OR MORE FILTRATION DEVICES FOR THE PURPOSE OF SUBSTANTIALLY REMOVING SUSPENDED SOLIDS FROM THE WATER. THE FILTRATION DEVICES SHALL BE AS SHOWN ON THE DRAWINGS OR APPROVED ALTERNATES SUGGESTED BY THE CONTRACTOR, OR AS REQUIRED BY THE LOCAL PERMITS.
3. OBTAIN ALL NECESSARY STATE AND LOCAL PERMITS RELATING TO DEWATERING ACTIVITIES.
4. DEWATERING DISCHARGE LOCATIONS ARE TO BE REVIEWED AND APPROVED BY THE OWNER'S REPRESENTATIVE.
5. ANY PROPOSED DEWATERING AND SHORING PROCEDURES SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND ACCEPTANCE. THE DEWATERING/WATER CONTROL AND SHORING/TEMPORARY EARTH SUPPORT SHALL BE DESIGNED AND STAMPED BY A REGISTERED PROFESSIONAL ENGINEER IN THE COMMONWEALTH OF MASSACHUSETTS.

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SHEET 11 OF 18

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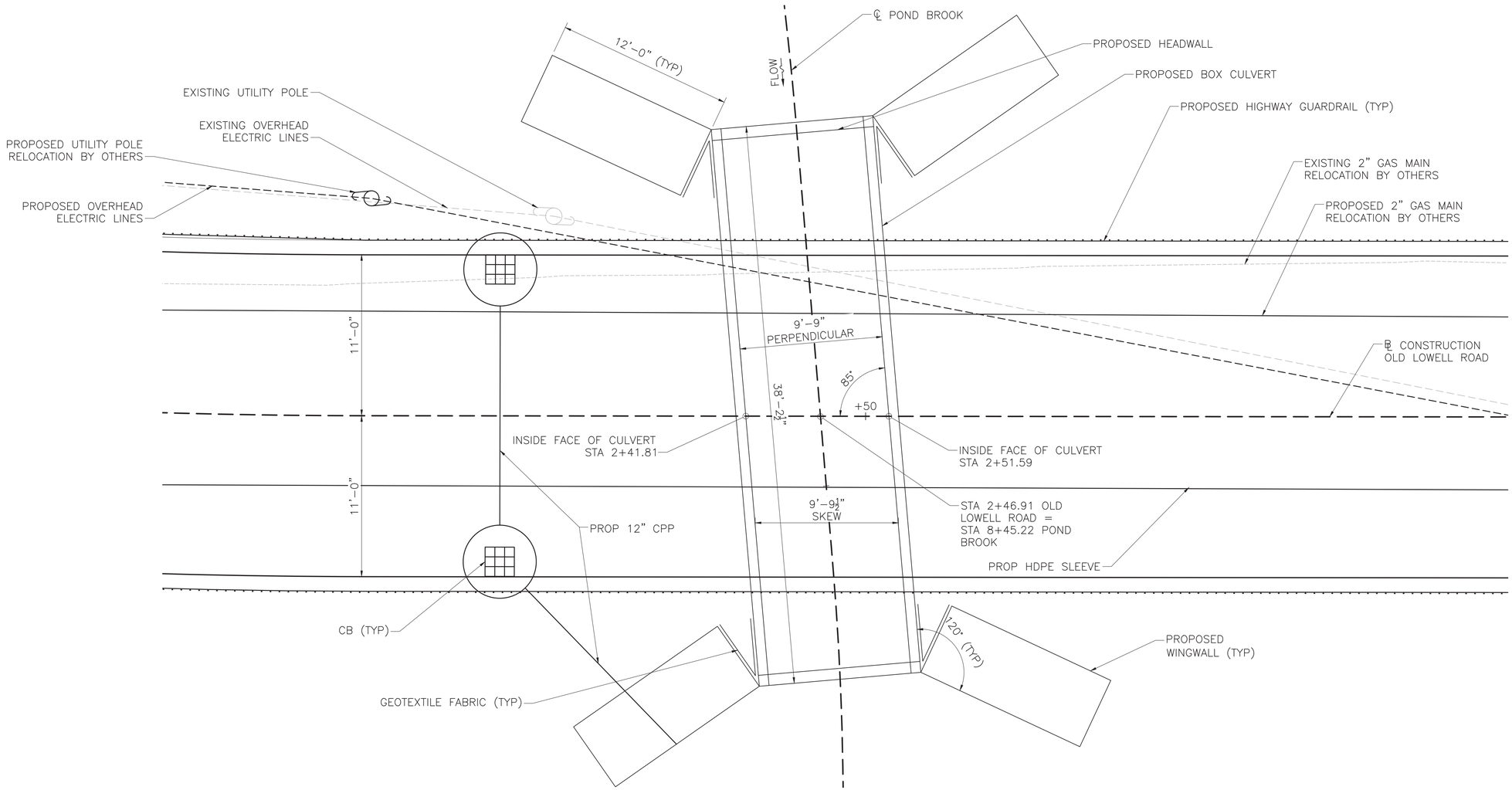
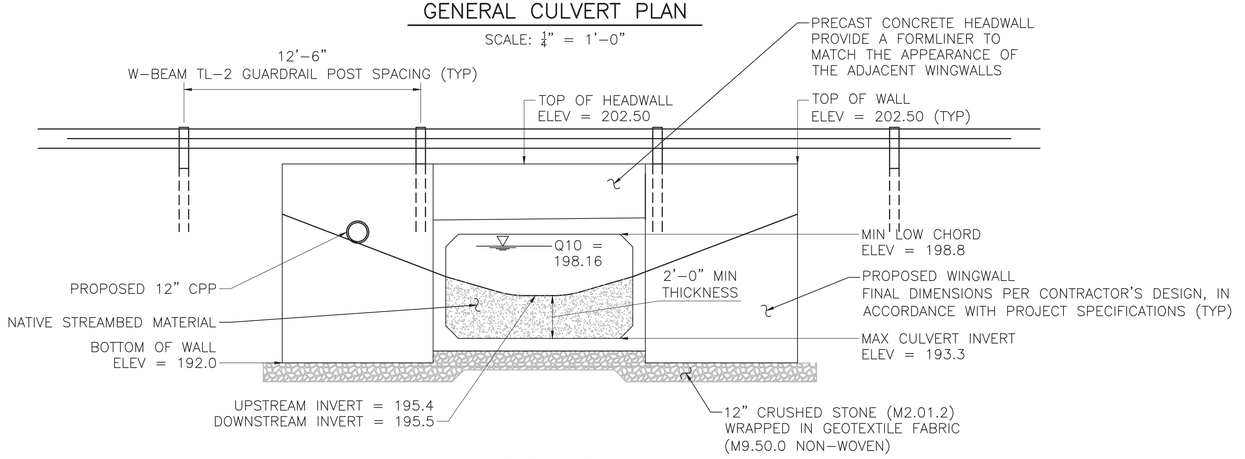


GENERAL CULVERT PLAN

SCALE: ¼" = 1'-0"



ELEVATION

SCALE: ¼" = 1'-0"

0 4' 8'

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

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APPROVED BY:	DSH

GENERAL CULVERT PLAN & ELEVATION

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

SHEET 12 OF 18

Last Saved: 12/6/2023
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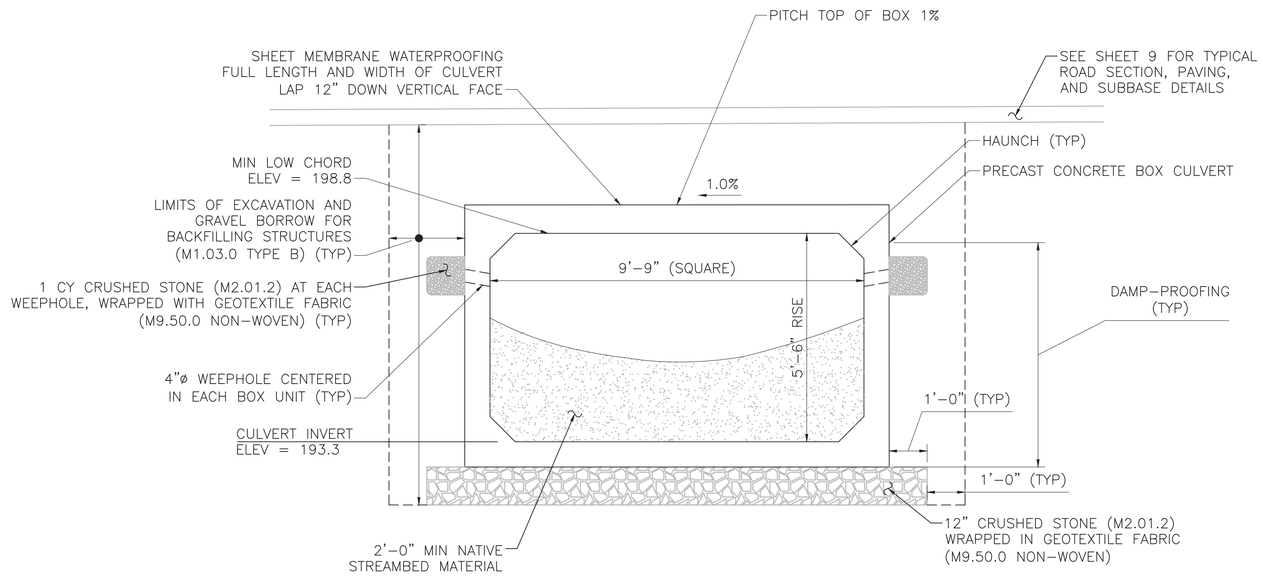
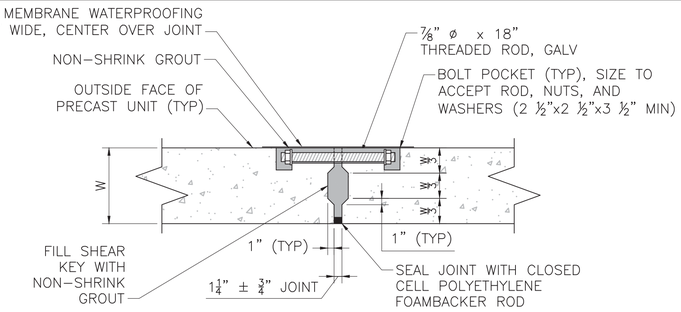
Tighe & Bond J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_05_STRC.dwg



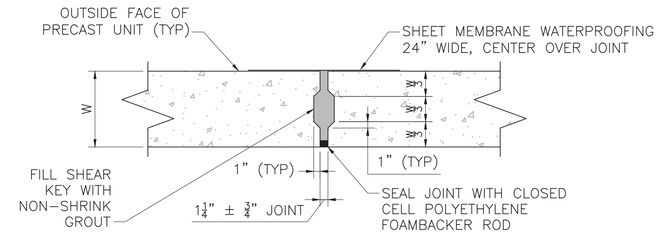
SQUARE CULVERT SECTION AT ℄ CONSTRUCTION (LOOKING WEST)

SCALE: ½" = 1'-0"



MECHANICAL JOINT

NOT TO SCALE

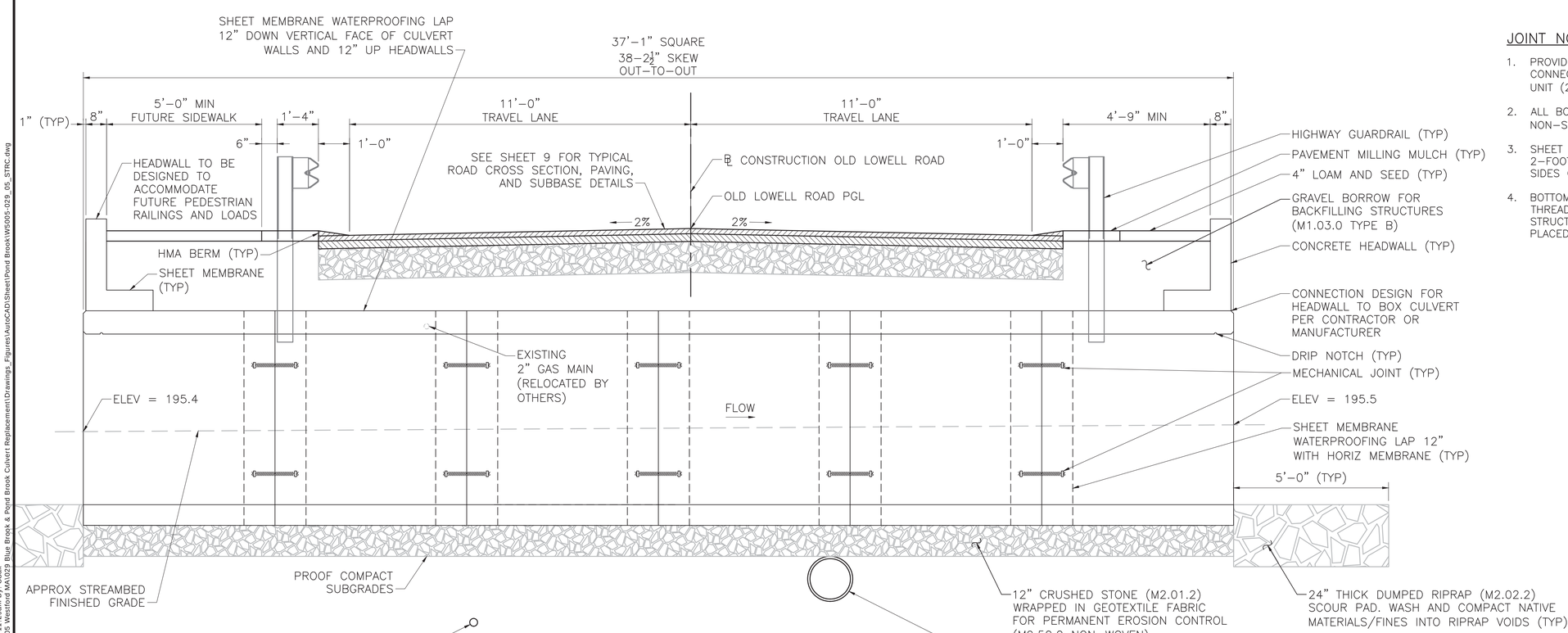


SEAL JOINT

NOT TO SCALE

JOINT NOTES:

1. PROVIDE A MINIMUM OF 8 MECHANICAL CONNECTORS BETWEEN EACH BOX CULVERT UNIT (2 ON EACH SIDE).
2. ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT (M4.04.0).
3. SHEET MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE SIDES OF EACH JOINT.
4. BOTTOM OF PRECAST BOX SHALL HAVE THREADED ROD ON INSIDE FACE OF STRUCTURE AND MEMBRANE NEED NOT BE PLACED.



TRANSVERSE SQUARE CULVERT SECTION

SCALE: ½" = 1'-0"

NOTES:

1. DIMENSIONS SHOWN ARE PERPENDICULAR TO CONSTRUCTION BASELINE.

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

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DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC/EAO
APPROVED BY:	DSH

CULVERT SECTIONS & DETAILS

SCALE: AS SHOWN

SHEET 13 OF 18

Last Saved: 12/6/2023
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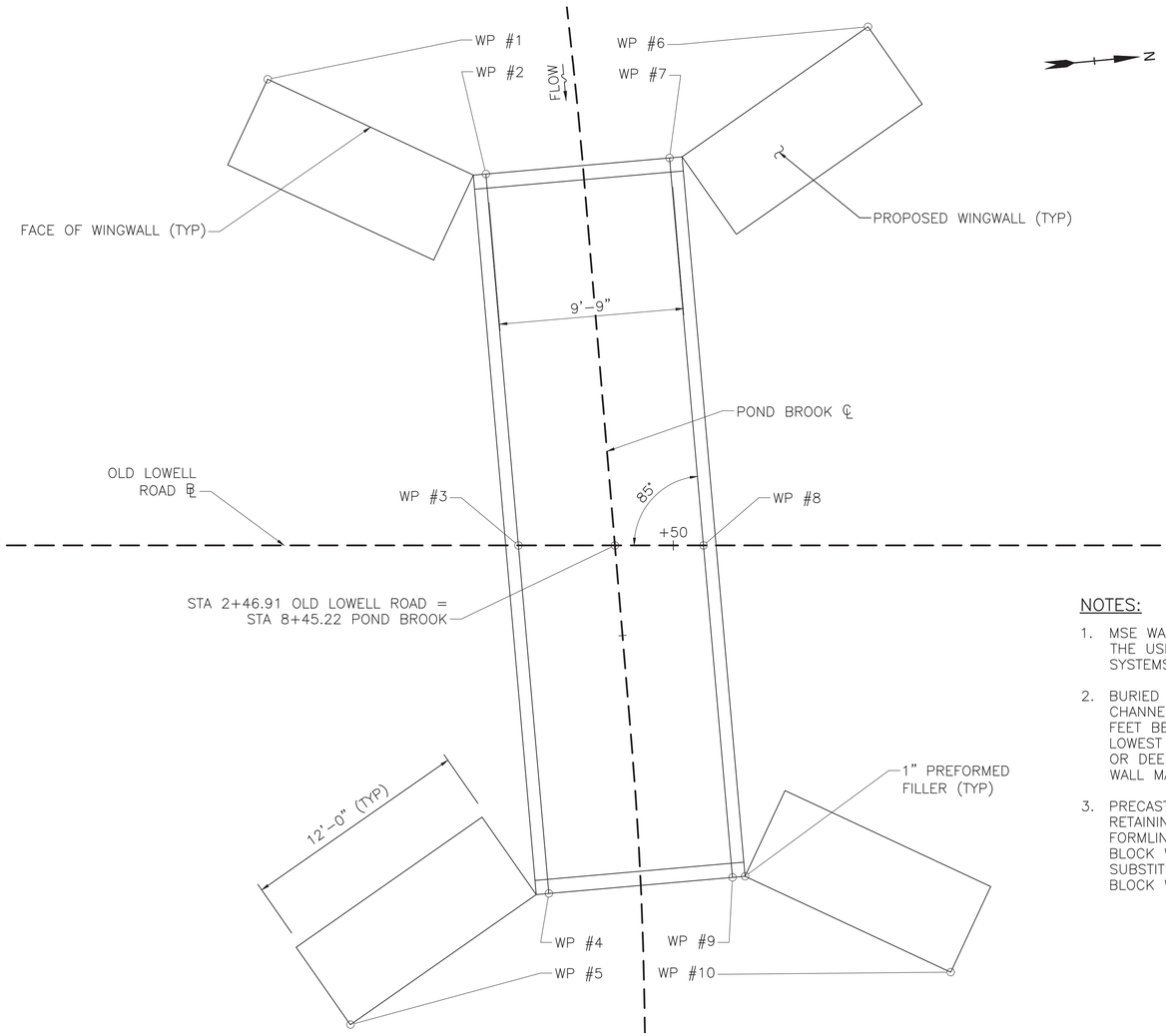
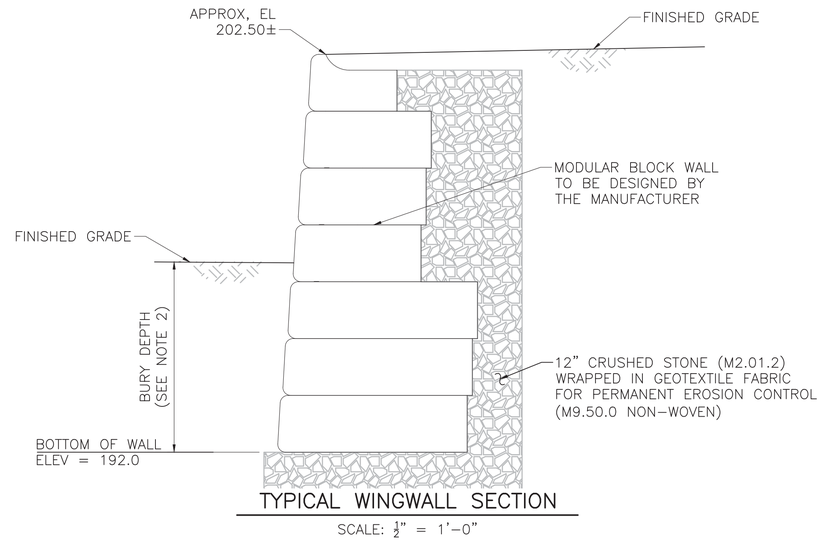


CULVERT LAYOUT PLAN

SCALE: $\frac{1}{4}$" = 1'-0"

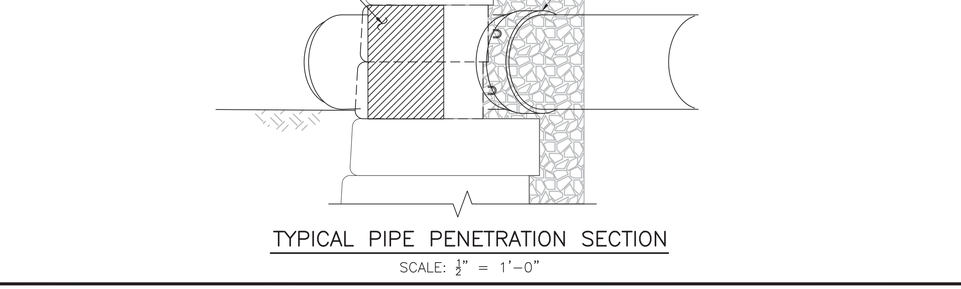


TYPICAL WINGWALL SECTION

SCALE: $\frac{1}{2}$" = 1'-0"

NOTES:

1. MSE WALLS OR WALLS THAT REQUIRE THE USE OF GEOFABRIC OR GEOGRID SYSTEMS WILL NOT BE ACCEPTED.
2. BURIED BLOCK ADJACENT TO STREAM CHANNEL TO BE A MINIMUM OF 4 FEET BELOW THE BOTTOM OF THE LOWEST STREAM CHANNEL ELEVATION, OR DEEPER IF REQUIRED BY THE WALL MANUFACTURER.
3. PRECAST CONCRETE CANTILEVER RETAINING WALLS WITH STONE FORMLINER MEETING THE MODULAR BLOCK WALL REQUIREMENTS MAY BE SUBSTITUTED IN PLACE OF MODULAR BLOCK WALLS.



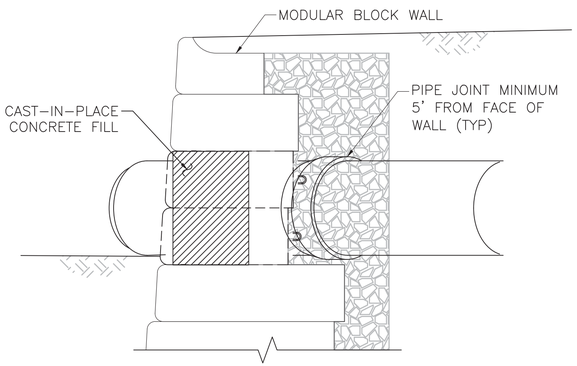
TYPICAL WINGWALL ELEVATION

SCALE: $\frac{1}{2}$" = 1'-0"

WORKING POINTS				
WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	2+28.55	LT 24.65'	3,031,763.91	683,254.77
WP #2	2+40.09	LT 19.64'	3,031,774.89	683,260.92
WP #3	2+41.81	0.00'	3,031,774.62	683,280.63
WP #4	2+43.42	RT 18.41'	3,031,774.38	683,299.11
WP #5	2+32.93	RT 25.35'	3,031,763.24	683,304.96
WP #6	2+60.30	LT 27.43'	3,031,795.78	683,255.20
WP #7	2+49.80	LT 20.49'	3,031,784.64	683,261.05
WP #8	2+51.60	0.00'	3,031,784.36	683,281.62
WP #9	2+53.13	RT 17.56'	3,031,784.13	683,299.24
WP #10	2+64.67	RT 22.57'	3,031,795.10	683,305.39

NOTES:

1. INFORMATION IN THIS TABLE IS BASED ON CONCEPTUAL DESIGN LAYOUT AND GEOMETRY. CONTRACTOR TO CONFIRM WORKING POINTS TO BE CONSISTENT WITH CONTRACTOR'S FINAL DESIGN.



TYPICAL PIPE PENETRATION SECTION

SCALE: $\frac{1}{2}$" = 1'-0"

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Westford, Massachusetts

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DESIGNED/CHECKED BY:	JJC/EAO
APPROVED BY:	DSH

CULVERT LAYOUT PLAN & WINGWALL ELEVATIONS

SCALE: AS SHOWN

SHEET 14 OF 18

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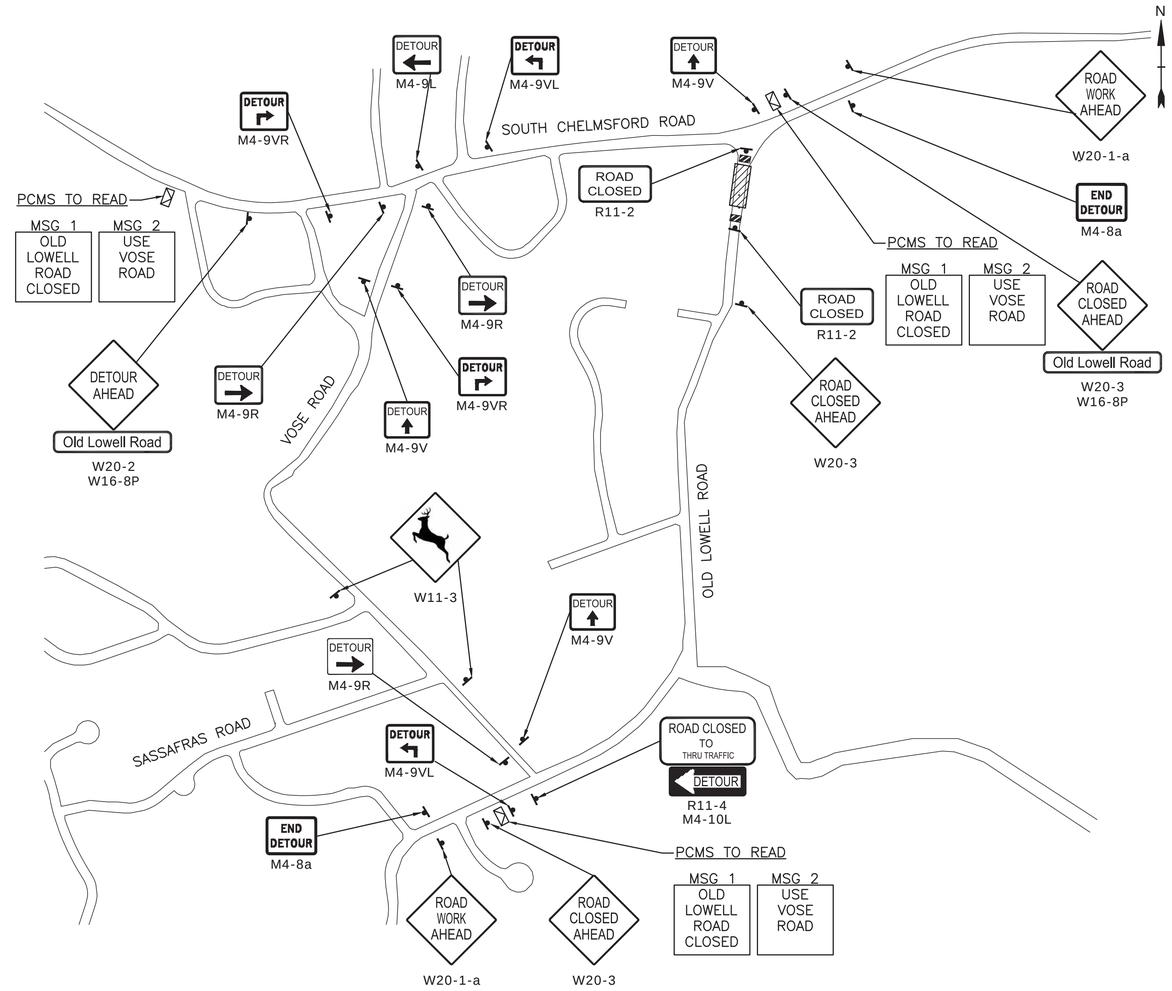
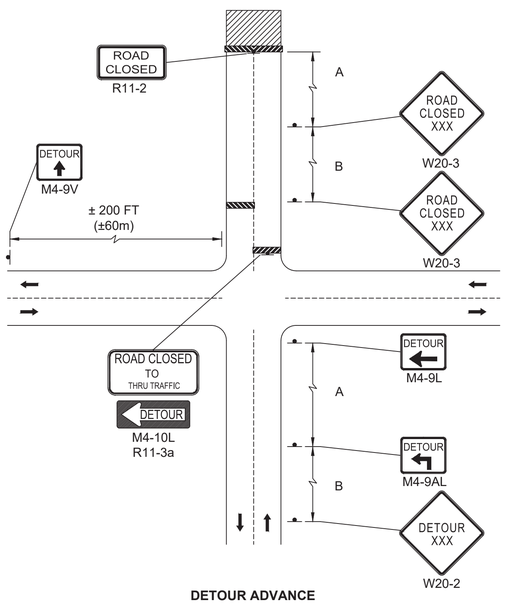
NOTES:

1. TEMPORARY FENCING AND BARRIERS SHALL BE DEPLOYED ON SITE DURING THE ROADWAY CLOSURE TO PREVENT ACCESS TO THE CROSSING.
2. NO THRU TRAFFIC SHALL BE PERMITTED UNTIL THE STRUCTURE, GUARDRAILS, AND PAVEMENT HAVE BEEN INSTALLED.
3. PLACEMENT OF SIGNS TO BE COORDINATED WITH THE ENGINEER, DEPARTMENT OF PUBLIC WORKS, POLICE DEPARTMENT, AND FIRE DEPARTMENT (WESTFORD, MASSACHUSETTS).
4. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS.
5. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
6. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
7. 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.
8. 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 REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
9. NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
10. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
11. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
12. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
13. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
14. MINIMUM LANE WIDTH IS TO BE 10 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
15. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
16. TWO-WAY TRAFFIC SHALL BE RESTORED AT THE END OF THE PROJECT.
17. THE CONTRACTOR SHALL PROVIDE ALL SIGNAGE, BARRICADES, POLICE DETAILS AND OTHER CONTROLS AS REQUIRED FOR TRAFFIC CONTROL.

LEGEND:

- TYPE III BARRICADE
- WORK ZONE
- SIGN





DETOUR ADVANCE SIGNING

SUGGESTED WORK ZONE WARNING SIGN SPACING

ROAD TYPE	DISTANCE BETWEEN SIGNS **		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350 (100)	350 (100)	350 (100)

* ROAD TYPE TO BE DETERMINED BY MASSDOT OFFICE OF TRANSPORTATION PLANNING.

** DISTANCES ARE SHOWN IN FEET (METERS). THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TTCP SETUPS. THESE ADVANCE WARNING SIGNS ARE LOCATED PRIOR TO THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT BUT ARE USED IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS AS DESCRIBED ABOVE.

R2-10a, R2-10e, AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 MUTCD LATEST EDITION

SIGN LEGEND

CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	2	18 SF
W20-2	DETOUR AHEAD	36"x36"	9 SF	1	9 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	3	27 SF
W16-8P	OLD LOWELL ROAD	36"x8"	2 SF	2	4 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	2	20 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	1	12.5 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	1	5 SF
M4-9R	DETOUR	30"x24"	5 SF	3	15 SF
M4-9V	DETOUR	30"x24"	5 SF	3	15 SF
M4-9VL	DETOUR	30"x24"	5 SF	2	10 SF
M4-9VR	DETOUR	30"x24"	5 SF	2	10 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
W11-3	LARGE ANIMAL	36"x36"	9 SF	2	18 SF
				TOTAL	=179.5 SF

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TEMPORARY TRAFFIC CONTROL PLAN

SCALE: NO SCALE

SHEET 15 OF 18

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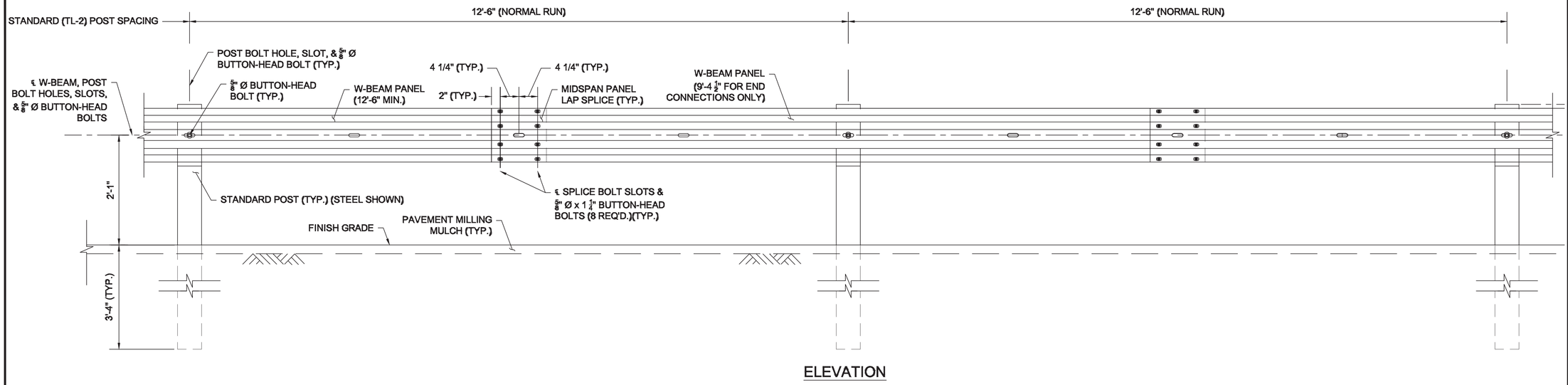
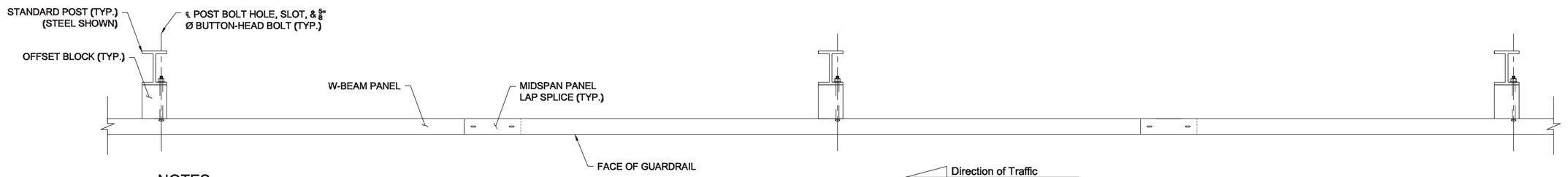


ELEVATION

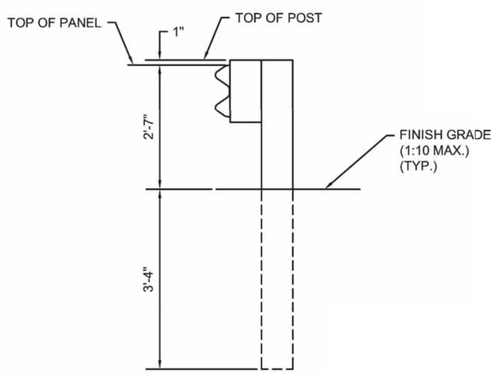


PLAN

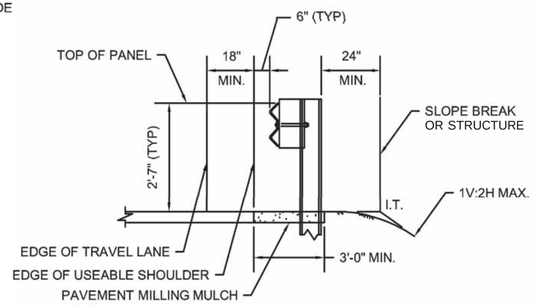
NOTES:

1. A 9'-4 3/4" PANEL IS REQUIRED WHEN TRANSITIONING TO TL-3 W-BEAM GUARDRAIL TO MAINTAIN PROPER POST SPACING.

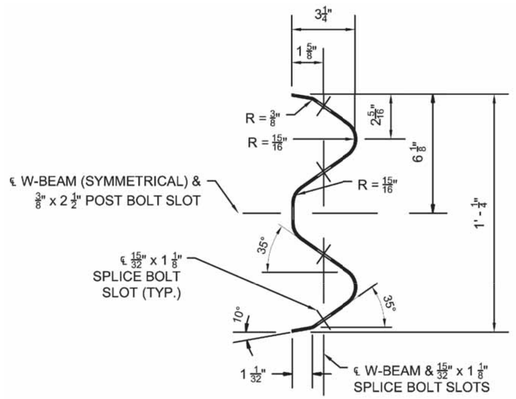
GUARDRAIL, TL2 DETAILS



W-BEAM



FLUSH WITH ROADWAY



W-BEAM PANEL SECTION

GUARDRAIL MOUNTING HEIGHTS & POST DEPTHS

MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION
CONSTRUCTION STANDARD DETAILS
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

Tighe&Bond

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DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

HIGHWAY GUARDRAIL DETAILS (SHEET 1 OF 2)

SCALE: NO SCALE

SHEET 16 OF 18

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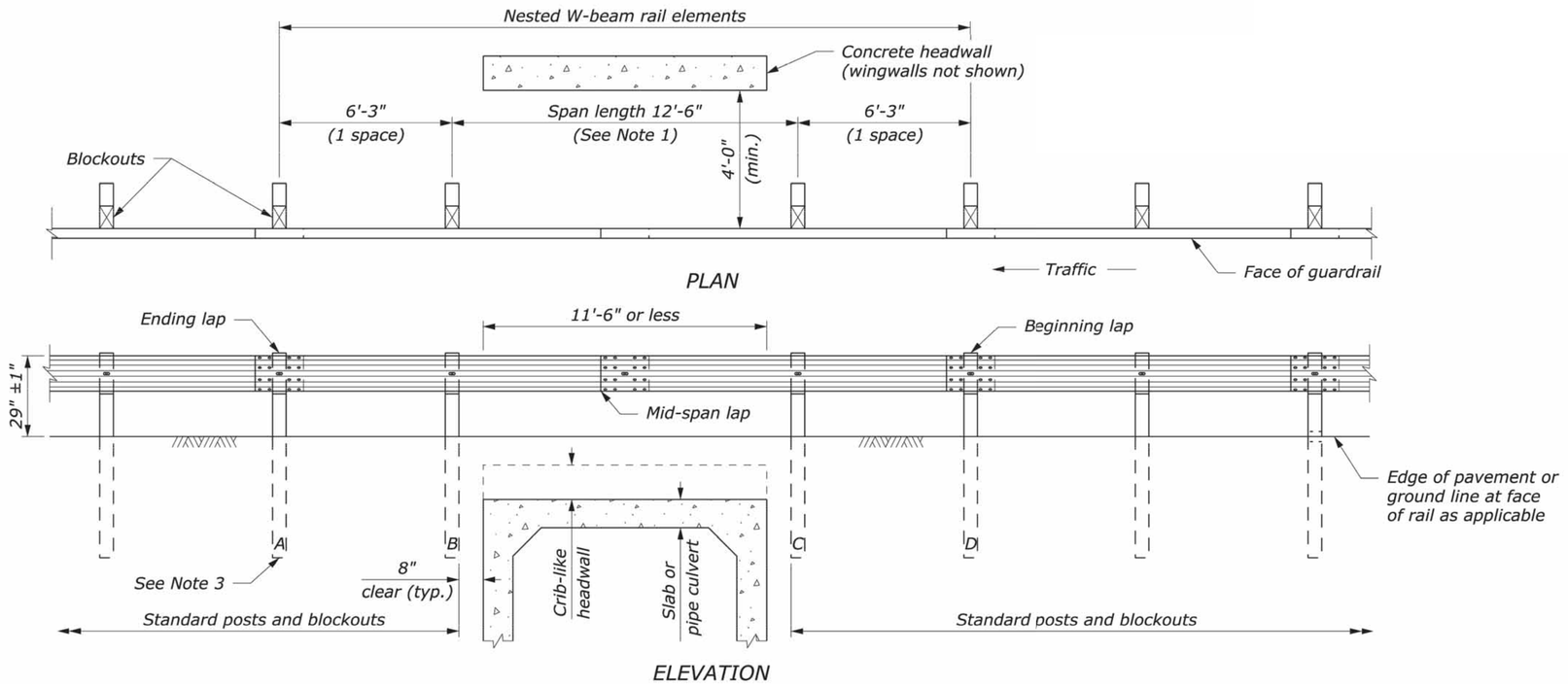
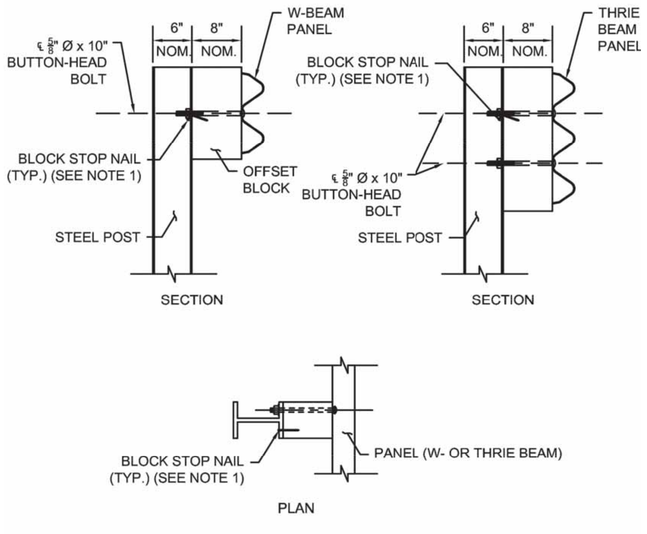


GUARDRAIL, TL–2 DETAILS TO SPAN OVER CULVERT

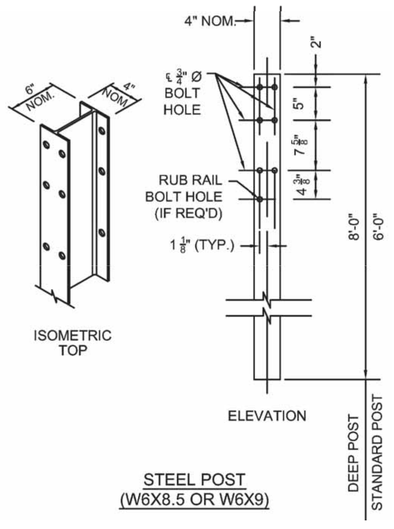


W-BEAM & THRIE BEAM
STEEL POST

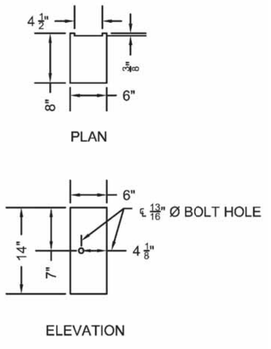
NOTES:

1. DRIVE ONE NAIL PER W BEAM TIMBER OFFSET BLOCK TO PREVENT BLOCK ROTATION. USE ASTM A153 HOT DIP GALVANIZED STEEL 3 ½" TYPE 16D NAILS. FOR STEEL POSTS, DRIVE THE NAIL THROUGH THE UNUSED FLANGE BOLT HOLE AND BEND THE NAIL SO ITS HEAD CONTACTS THE FLANGE.
2. DEEP STEEL POSTS SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.
3. WHERE BACK OF POSTS ARE EXPOSED AND PLACED WITHIN 2'-0" OF A SIDEWALK, SEPARATED BIKE FACILITY OR SHARED-USE PATH, TIMBER POSTS SHALL BE USED. ALTERNATIVELY, STEEL POSTS WITH A TIMBER BACKING, PER 400.5.1, MAY BE SUBSTITUTED AT NO ADDITIONAL COST. WHEN TIMBER POSTS ARE USED, ONE OF THE FOLLOWING SAFETY TREATMENTS IS REQUIRED FOR ALL BOLTS PROTRUDING FROM THE BACK FACE OF THE POST:
   - A. AFTER TIGHTENING THE NUT, TRIM THE PROTRUDING POST BOLT FLUSH WITH THE NUT AND GALVANIZE PER M7.04.11;
   - B. USE 15" POST BOLTS AND COUNTERSINK THE WASHER AND NUT BETWEEN 1" AND 1½" DEEP INTO THE BACK FACE OF THE POST; OR
   - C. USE 15" POST BOLT SLEEVE NUTS AND WASHERS.

END TREATMENTS AND TRANSITIONS, WHERE SPECIFIC MATERIAL TYPES ARE SPECIFIED, ARE EXEMPT FROM THESE REQUIREMENTS.



STEEL POST
(W6X8.5 OR W6X9)



W-BEAM TIMBER OFFSET BLOCK
FOR USE WITH STEEL POSTS
(6"X8" NOMINAL)

POST & OFFSET BLOCK DETAILS

MASSDOT STANDARD DETAILS:

MASSDOT HIGHWAY DIVISION
CONSTRUCTION STANDARD DETAILS
GUARDRAIL, TL2 & W-BEAM PANEL DETAILS

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HIGHWAY GUARDRAIL DETAILS (SHEET 2 OF 2)

SCALE: NO SCALE

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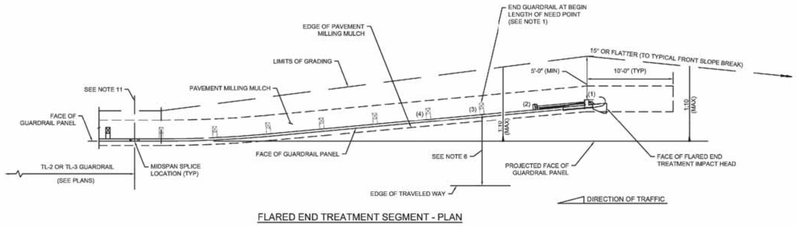
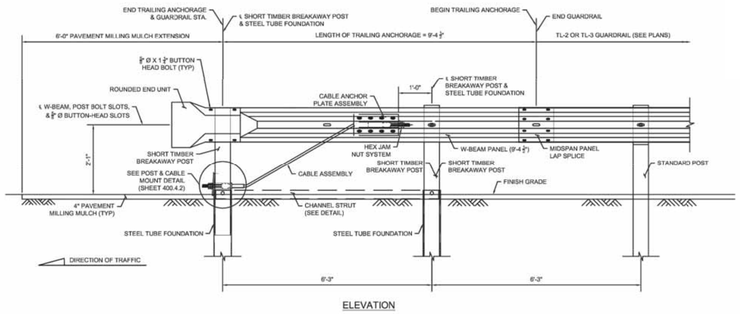


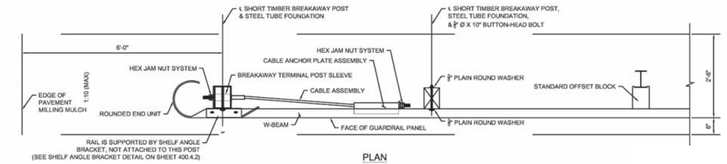
FLARED END TREATMENT SEGMENT - PLAN

NOTES:

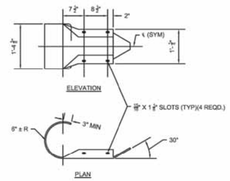
1. INSTALL GUARDRAIL AT STATION AND OFFSET SHOWN IN THE PLANS. THE END OF THE GUARDRAIL SHOWN IN THE PLANS CORRESPONDS WITH THE BEGIN LENGTH OF NEED POINT FOR THE END TREATMENT (SHOWN AT POST 3 IN THESE STANDARDS, BUT MAY VARY BY MANUFACTURER).
2. PROPRIETARY END TREATMENTS MAY VARY IN SIZE AND SHAPE FROM WHAT IS DEPICTED IN THESE STANDARDS. HOWEVER, THE MAXIMUM SLOPES AND MINIMUM OFFSETS DIMENSIONED FROM THE POSTS SHOWN HEREIN SHALL STILL APPLY.
3. END TREATMENT TEST LEVEL AND TYPE (TANGENT OR FLARED) SHALL BE SPECIFIED IN THE PLANS.
4. CONSTRUCT TANGENT AND FLARED END TREATMENTS IN ACCORDANCE WITH THE MANUFACTURER'S UNIQUE DRAWING DETAILS, PROCEDURES, AND SPECIFICATIONS.
5. AT THE DISCRETION OF THE ENGINEER, THE FACE OF ¯HE TANGENT END TREATMENT IMPACT HEAD MAY BE OFFSET UP TO 2'-0" FROM THE PROJECTED FACE OF GUARDRAIL TO MINIMIZE NUISANCE HITS. THE OFFSET SHALL OCCUR OVER THE ENTIRE LENGTH OF THE END TREATMENT UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
6. LATERAL OFFSET OF FLARED END TREATMENT SHALL BE DETERMINED BY THE DESIGN ENGINEER FOLLOWING THE METHODOLOGY FOUND IN THE *ROADSIDE DESIGN GUIDE* AND SHOULD FALL WITHIN THE ALLOWABLE TOLERANCES SPECIFIED BY THE MANUFACTURER. LATERAL OFFSET SHALL BE MEASURED FROM THE EDGE OF TRAVELED WAY TO THE FACE OF THE GUARDRAIL AT POST #3.
7. END TREATMENTS SHALL NOT TERMINATE CURVED W-BEAM SEGMENTS.
8. END TREATMENT IMPACT HEAD DELINEATION SHALL CONFORM TO 601.63.
9. INSTALL GRADING AS SHOWN HEREIN UNDER SEPARATE PAY ITEMS.
10. SEE 400.2.2 FOR APPROACH TERMINAL GEOMETRY FOR GUARDRAIL INSTALLED ADJACENT TO CURB AND DOUBLE FACED GUARDRAIL.
11. MAINTAIN 2'-0" (MIN) OFFSET TO FRONT SLOPE BREAK DOWNSTREAM OF MIDSPAN SPLICE LOCATION AT ALL TIMES. IF, DOWNSTREAM OF THE SPLICE, GRADING CONSTRAINTS INHIBIT THIS MINIMUM OFFSET THEN USE DEEP STEEL POSTS AND TRANSITION TO A SLOPE BREAK CONDITION DESIGN PER THE DETAIL IN 400.1.5 UNTIL THE 2'-0" OFFSET CAN BE MET.



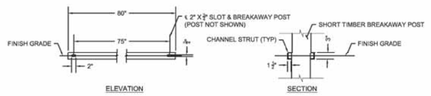
ELEVATION



PLAN



ROUNDED END UNIT



CHANNEL STRUT

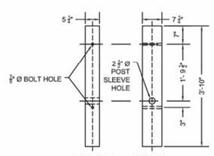
NOTES:

1. FOR ADDITIONAL DETAILS, SEE 400.4.2.
2. LAP THE ROUNDED END UNIT OVER THE FACE OF THE W-BEAM PANEL.
3. INSTALL STEEL TUBE FOUNDATIONS BY ONE OF THE FOLLOWING METHODS:

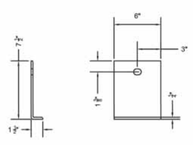
A. EXCAVATE, INSTALL TUBE, BACKFILL, AND SUITABLY COMPACT MATERIALS; OR

B. DRIVE THE TUBE USING A DUMMY TIMBER POST TO PREVENT DAMAGE TO THE SHORT BREAKAWAY POST.

STEEL TUBE FOUNDATION



SHORT TIMBER BREAKAWAY POST (6"x8" NOM.)

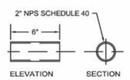


SHELF ANGLE BRACKET

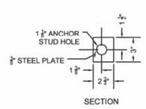
NOTES:

1. ALL DIMENSIONS OF STANDARD GUARDRAIL COMPONENTS, INCLUDING PANELS, POSTS, OFFSET BLOCKS, BOLTS, NUTS, WASHERS AND HOLES, ARE BASED UPON ENGLISH UNIT CONVERSIONS OF THE AASHTO-ARTBA-AGC JOINT COMMITTEE TASK FORCE 13 REPORT: *A GUIDE TO STANDARDIZING HIGHWAY BARRIER HARDWARE* (http://www.aashtotf13.org/Barrier-Hardware.php).
2. ALL GUARDRAIL MATERIALS SHALL CONFORM TO M8.07.0 UNLESS OTHERWISE INDICATED.
3. APPROVAL BY THE ENGINEER IS REQUIRED WHERE A DIFFERING GUARDRAIL CONFIGURATION IS REQUIRED FOR CONSTRUCTABILITY BEYOND THE OPTIONS SHOWN IN THESE STANDARDS OR THE PLANS.
4. THE BEGIN OR END STATION LABELS SHOWN IN THESE STANDARDS CORRESPOND TO THE STATION AND OFFSET CALLOUTS SPECIFIED IN THE PLANS.
5. USE 12'-6" NOMINAL LENGTH PANELS UNLESS OTHERWISE INDICATED IN THESE STANDARDS OR THE PLANS.
6. ALL LAP SPLICES SHALL BE MIDSPAN UNLESS OTHERWISE SHOWN.
7. LAP SPLICES SHALL BE CONSTRUCTED WITH THE SPLICE RIDGE ORIENTED DOWNSTREAM OF THE FINAL DIRECTION OF TRAFFIC IN THE NEAREST TRAVEL LANE. REORIENTING LAP SPLICES FOR TEMPORARY TRAFFIC CONTROL IS NOT REQUIRED.
8. STANDARD POSTS SHALL BE STEEL OR TIMBER, UNLESS OTHERWISE INDICATED IN THE PLANS, FABRICATED TO THE DIMENSIONS SHOWN ON 400.1.4. POSTS OF A SINGLE MATERIAL TYPE SHALL BE USED THROUGHOUT AN ENTIRE RUN OF GUARDRAIL; EXCEPTIONS ARE ALLOWED ONLY WHEN SPECIFIC MATERIAL TYPES ARE REQUIRED FOR TRANSITIONS, END TREATMENTS, AND/OR ANCHORAGES.
9. DEEP POST SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.
10. OFFSET BLOCKS, WHERE REQUIRED, SHALL BE TIMBER AND FABRICATED TO THE NOMINAL DIMENSIONS SHOWN ON 400.1.4. PLASTIC OR COMPOSITE OFFSET BLOCKS OF THE SAME NOMINAL DIMENSIONS THAT ARE LISTED ON THE QUALIFIED CONSTRUCTION MATERIALS LIST MAY BE SUBSTITUTED. OFFSET BLOCKS OF A SINGLE MATERIAL TYPE SHALL BE USED THROUGHOUT AN ENTIRE RUN OF GUARDRAIL; EXCEPTIONS ARE ALLOWED ONLY WHEN SPECIFIC MATERIAL TYPES ARE REQUIRED FOR TRANSITIONS, END TREATMENTS, AND/OR ANCHORAGES.
11. PAVEMENT MILLING MULCH, WHERE CALLED FOR IN THE STANDARDS, SHALL CONFORM TO SECTION 739.
12. GUARDRAIL DELINEATORS, CONFORMING TO SECTION 601, SHALL BE INSTALLED AT 25' INTERVALS WITHIN 100' OF AN END TREATMENT OR TRAILING ANCHORAGE AND AT 100' INTERVALS IN ALL OTHER AREAS UNLESS OTHERWISE SHOWN IN THE PLANS.
13. MINIMUM OFFSET DISTANCE FROM FACE OF W-BEAM PANEL TO A FIXED (NON-BREAKAWAY) OBJECT SHALL BE 48" FOR TL-2 AND 60" FOR TL-3.

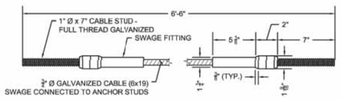
BCT BEARING PLATE



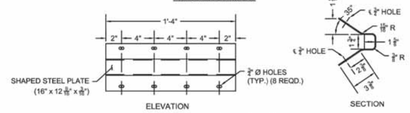
BREAKAWAY TERMINAL POST SLEEVE



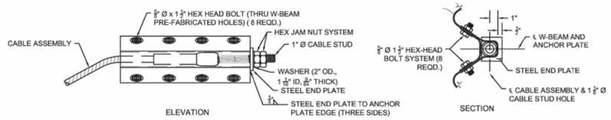
STEEL END PLATE



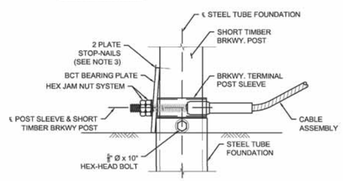
CABLE ASSEMBLY



CABLE ANCHOR PLATE



CABLE ANCHOR PLATE ASSEMBLY



POST & CABLE MOUNT ASSEMBLY

NOTES:

1. COMPONENTS SHALL BE INSTALLED PER 400.4.1.
2. HEX NUTS, HEX JAM NUTS AND WASHERS SHALL BE IN ACCORDANCE WITH AASHTO-ARTBA-AGC *A GUIDE TO STANDARDIZING HIGHWAY BARRIER HARDWARE*. TWO HEX NUTS MAY BE USED FOR THE HEX JAM SYSTEM.
3. DRIVE TWO ASTM A153 HOT DIP GALVANIZED STEEL 2 ½" TYPE 8D NAILS TO PREVENT ROTATION OF THE BCT BEARING PLATE.

MASSDOT STANDARD DETAILS:

MASSDOT 2017 CONSTRUCTION STANDARD DETAILS, 400.1.0, 400.3.6, 400.4.1, 400.4.2

Tighe&Bond

Old Lowell Road Over Pond Brook

Culvert Replacement

Town of Westford

Westford, Massachusetts

MARK	DATE	DESCRIPTION

PROJECT NO:	W5005-029
DATE:	DECEMBER 2023
FILE:	W5005-029_06_DETAILS.dwg
DRAWN BY:	SDS/MRB
DESIGNED/CHECKED BY:	JJC
APPROVED BY:	DSH

GUARDRAIL APPROACH GEOMETRY

SCALE: NO SCALE

SHEET 18 OF 18

Last Saved: 11/17/2023
Plotted On: Dec 06, 2023-11:29am By: SSak
Tighe & Bond J:\W\W5005 Westford MA\029 Blue Brook & Pond Brook Culvert Replacement\Drawings_Figures\AutoCAD\Sheet\Pond Brook\W5005-029_06_DETAILS.dwg