

# MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

WESTFORD BEAVER BROOK ROAD			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	14
PROJECT FILE NO.		608830	
TITLE SHEET & INDEX			

PLAN AND PROFILE OF  
**BEAVER BROOK ROAD**  
(BRIDGE NO. W-26-014)

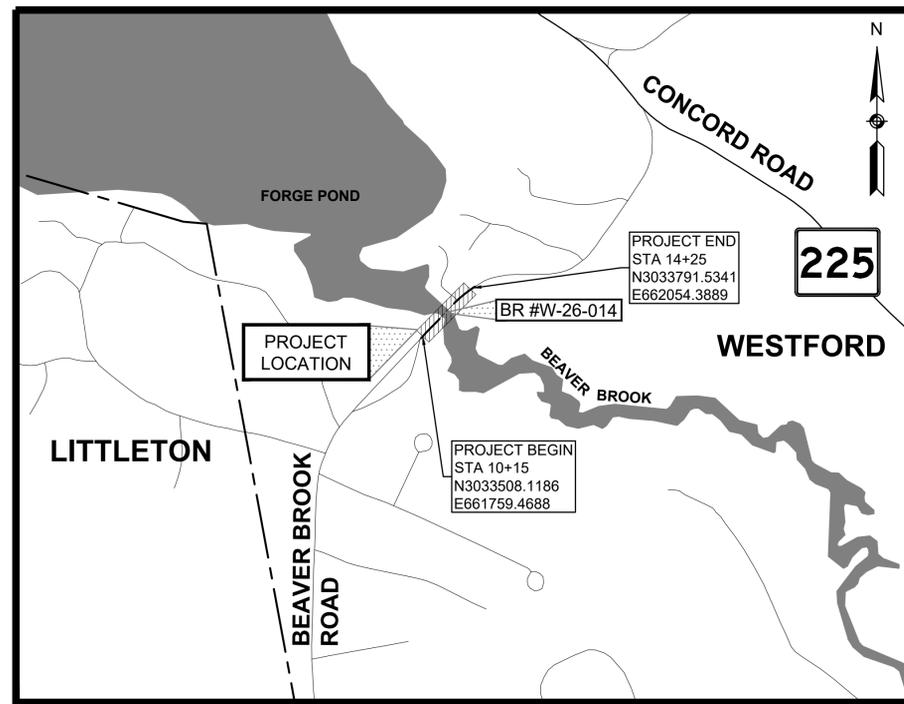
IN THE TOWN OF  
**WESTFORD**  
MIDDLESEX COUNTY

FEDERAL AID PROJECT NO.

## 25% SUBMITTAL

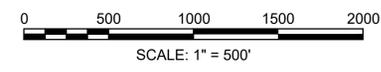
THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 1988, AS AMENDED, THE SUPPLEMENTAL SPECIFICATIONS DATED APRIL 1, 2019, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

INDEX	
SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
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10-14	CROSS SECTIONS



### DESIGN DESIGNATION (BEAVER BROOK ROAD)

DESIGN SPEED	30 MPH
ADT (2016)	3,360
ADT (2026)	3,712
K	11.1%
D	59.7% NB
T (PEAK HOUR)	3.8%
T (AVERAGE DAY)	3.3%
DHV	411
DDHV	245
FUNCTIONAL CLASSIFICATION	URBAN COLLECTOR



LENGTH OF PROJECT = 410.00 FEET = 0.078 MILES

DATE	DESCRIPTION	REV #
6/15/19	25% SUBMITTAL	-

 146 Dascomb Road Andover, MA 01810 978-794-1792	 311 Main Street 2nd Floor Worcester, MA 01608 508-868-5104	 www.TheEngineeringCorp.com	RECOMMENDED FOR APPROVAL	
			CHIEF ENGINEER	DATE
DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION APPROVED:			APPROVED	
DIVISION ADMINISTRATOR	DATE		HIGHWAY ADMINISTRATOR	DATE

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		JERSEY BARRIER
		CATCH BASIN
		CATCH BASIN CURB INLET
		FLAG POLE
		GAS PUMP
		MAIL BOX
		POST SQUARE
		POST CIRCULAR
		WELL
		ELECTRIC HANDHOLE
		FENCE GATE POST
		GAS GATE
		BORING HOLE
		MONITORING WELL
		TEST PIT
		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		WATER MANHOLE
		MASSACHUSETTS HIGHWAY BOUND
		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
		TROLLEY POLE OR GUY POLE
		TRANSMISSION POLE
		UTILITY POLE W/ FIREBOX
		UTILITY POLE WITH DOUBLE LIGHT
		UTILITY POLE W / 1 LIGHT
		UTILITY POLE
		BUSH
		TREE
		STUMP
		SWAMP / MARSH
		WATER GATE
		WATER SHUTOFF/CURB STOP
		PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		SEDIMENT CONTROL BARRIER
		TREE LINE
		EDGE OF PAVEMENT
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF MICROMILLING AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		CONTROLLER CABINET, FOUNDATION
		CONTROLLER CABINET, FOUNDATION, CONC. PAD
		MAST ARM FOUNDATION (SCALE OF BLOCK = DIAMETER IN INCHES)
		MAST ARM (LENGTH NOTED)
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		PEDESTRIAN SIGNAL HEAD
		MAST ARM OR TS POLE MOUNTED SIGN
		VIDEO DETECTION CAMERA
		EMERGENCY PRE-EMPTION RECEIVER
		EMERGENCY PRE-EMPTION CONFIRMATION STROBE
		PEDESTRIAN PUSH BUTTON
		YAGI ANTENNA
		BICYCLE WIRE LOOP DETECTOR (SIZE AS NOTED)
		WIRE LOOP DETECTOR (SIZE AND TYPE NOTED)
		TRAFFIC SIGN (1 POST)
		TRAFFIC SIGN (2 POST)
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
		LEGEND "ONLY" - WHITE
		STOP LINE - 12" WIDE
		CROSSWALK - 12" WIDE
		SOLID WHITE LINE
		SOLID YELLOW LINE
		BROKEN WHITE LINE
		BROKEN YELLOW LINE
		DOTTED WHITE LINE
		DOTTED YELLOW LINE
		DOTTED WHITE LINE EXTENSION
		DOTTED YELLOW LINE EXTENSION
		DOUBLE WHITE LINE
		DOUBLE YELLOW LINE

ABBREVIATIONS

GENERAL		ABBREVIATIONS (cont.)	
AADT	ANNUAL AVERAGE DAILY TRAFFIC	PROJ	PROJECT
ABAN	ABANDON	PROP	PROPOSED
ADJ	ADJUST	PSB	PLANTABLE SOIL BORROW
APPROX.	APPROXIMATE	PT	POINT OF TANGENCY
A.C.	ASPHALT CONCRETE	PUE	PERMANENT UTILITY EASEMENT
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE	PVC	POINT OF VERTICAL CURVATURE
BIT.	BITUMINOUS	PVI	POINT OF VERTICAL INTERSECTION
BC	BOTTOM OF CURB	PVT	POINT OF VERTICAL TANGENCY
BD.	BOUND	PVMT	PAVEMENT
BL	BASELINE	R	RADIUS OF CURVATURE
BLDG	BUILDING	R&D	REMOVE AND DISPOSE
BM	BENCHMARK	RCP	REINFORCED CONCRETE PIPE
BO	BY OTHERS	RD	ROAD
BOS	BOTTOM OF SLOPE	RDWY	ROADWAY
BR.	BRIDGE	REM	REMOVE
CB	CATCH BASIN	RET	RETAIN
CBCI	CATCH BASIN WITH CURB INLET	RET WALL	RETAINING WALL
CC	CEMENT CONCRETE	ROW	RIGHT OF WAY
CCB	CAPE COD BERM	RR	RAILROAD
CCM	CEMENT CONCRETE MASONRY	R&R	REMOVE AND RESET
CEM	CEMENT	R&S	REMOVE AND STACK
CI	CURB INLET	RT	RIGHT
CIP	CAST IRON PIPE	SB	STONE BOUND
CLF	CHAIN LINK FENCE	SHLD	SHOULDER
CL	CENTERLINE	SMH	SEWER MANHOLE
CMP	CORRUGATED METAL PIPE	ST	STREET
CSP	CORRUGATED STEEL PIPE	STA	STATION
CO.	COUNTY	SSD	STOPPING SIGHT DISTANCE
CONC	CONCRETE	SHLO	STATE HIGHWAY LAYOUT LINE
CONT	CONTINUOUS	SW	SIDEWALK
CONST	CONSTRUCTION	T	TANGENT DISTANCE OF CURVE/TRUCK %
CR GR	CROWN GRADE	TAN	TANGENT
DHV	DESIGN HOURLY VOLUME	TEMP	TEMPORARY
DI	DROP INLET	TC	TOP OF CURB
DIA	DIAMETER	TOS	TOP OF SLOPE
DIP	DUCTILE IRON PIPE	TS	TRAFFIC SIGNAL
DSCB	DEEP SUMP CATCH BASIN	TYP	TYPICAL
DW	STEADY DON'T WALK - PORTLAND ORANGE	UP	UTILITY POLE
DWY	DRIVEWAY	VAR	VARIES
ELEV (or EL.)	ELEVATION	VERT	VERTICAL
EMB	EMBANKMENT	VC	VERTICAL CURVE
EOP	EDGE OF PAVEMENT	WCR	WHEEL CHAIR RAMP
EXIST (or EX)	EXISTING	WG	WATER GATE
EXC	EXCAVATION	WIP	WROUGHT IRON PIPE
F&C	FRAME AND COVER	WM	WATER METER/WATER MAIN
F&G	FRAME AND GRATE	X-SECT	CROSS SECTION
FDN.	FOUNDATION	TRAFFIC SIGNAL ABBREVIATIONS	
FDP	FULL DEPTH PAVEMENT	CAB.	CABINET
FES	FLARED END SECTION	CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
FLDSTN	FIELDSTONE	DW	STEADY DON'T WALK
GAR	GARAGE	FDW	FLASHING DON'T WALK
GC	GRANITE CURB	FR	FLASHING CIRCULAR RED
GD	GROUND	FRL	FLASHING RED LEFT ARROW
GG	GAS GATE	FRR	FLASHING RED RIGHT ARROW
GI	GUTTER INLET	FY	FLASHING CIRCULAR YELLOW
GIP	GALVANIZED IRON PIPE	FYL	FLASHING YELLOW LEFT ARROW
GRAN	GRANITE	FYR	FLASHING YELLOW RIGHT ARROW
GRAV	GRAVEL	G	STEADY CIRCULAR GREEN
GRD	GUARD	GL	STEADY GREEN LEFT ARROW
HDW	HEADWALL	GR	STEADY GREEN RIGHT ARROW
HMA	HOT MIX ASPHALT	GSL	STEADY GREEN SLASH LEFT ARROW
HOR	HORIZONTAL	GSR	STEADY GREEN SLASH RIGHT ARROW
HYD	HYDRANT	GV	STEADY GREEN VERTICAL ARROW
INV	INVERT	OL	OVERLAP
JCT	JUNCTION	PED	PEDESTRIAN
L	LENGTH OF CURVE	PTZ	PAN, TILT, ZOOM
LB	LEACH BASIN	R	STEADY CIRCULAR RED
LOG	LIMIT OF GRADING	RL	STEADY RED LEFT ARROW
LP	LIGHT POLE	RR	STEADY RED RIGHT ARROW
L&S	LOAM & SEED	TR SIG	TRAFFIC SIGNAL
LT	LEFT	TSC	TRAFFIC SIGNAL CONDUIT
MAX	MAXIMUM	W	STEADY WALKING PERSON
MB	MAILBOX	Y	STEADY CIRCULAR YELLOW
MH	MANHOLE	YL	STEADY YELLOW LEFT ARROW
MHB	MASSACHUSETTS HIGHWAY BOUND		
MIN	MINIMUM		
NIC	NOT IN CONTRACT		
NO.	NUMBER		
OCS	OUTLET CONTROL STRUCTURE		
PC	POINT OF CURVATURE		
PCC	POINT OF COMPOUND CURVATURE		
PERM	PERMANENT		
P.G.L.	PROFILE GRADE LINE		
PI	POINT OF INTERSECTION		
POC	POINT ON CURVE		
POT	POINT ON TANGENT		
PRC	POINT OF REVERSE CURVATURE		

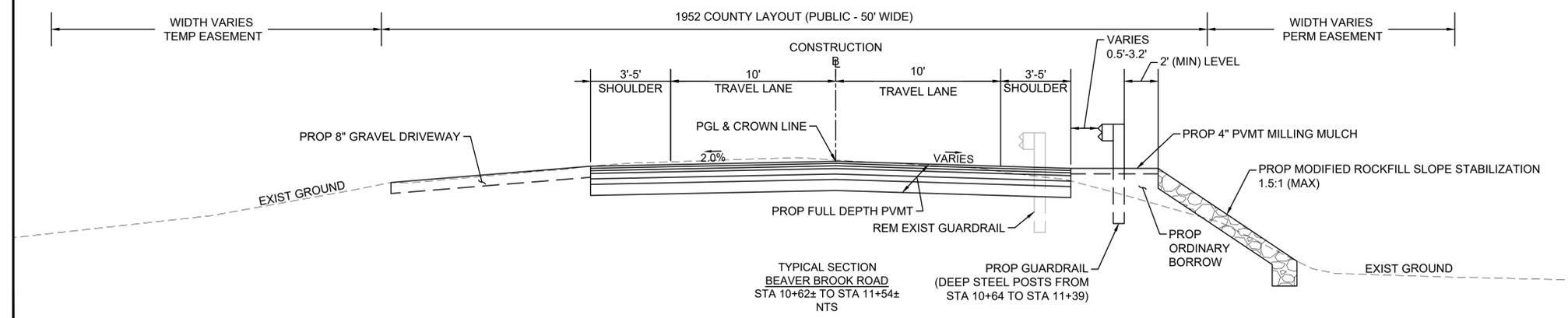
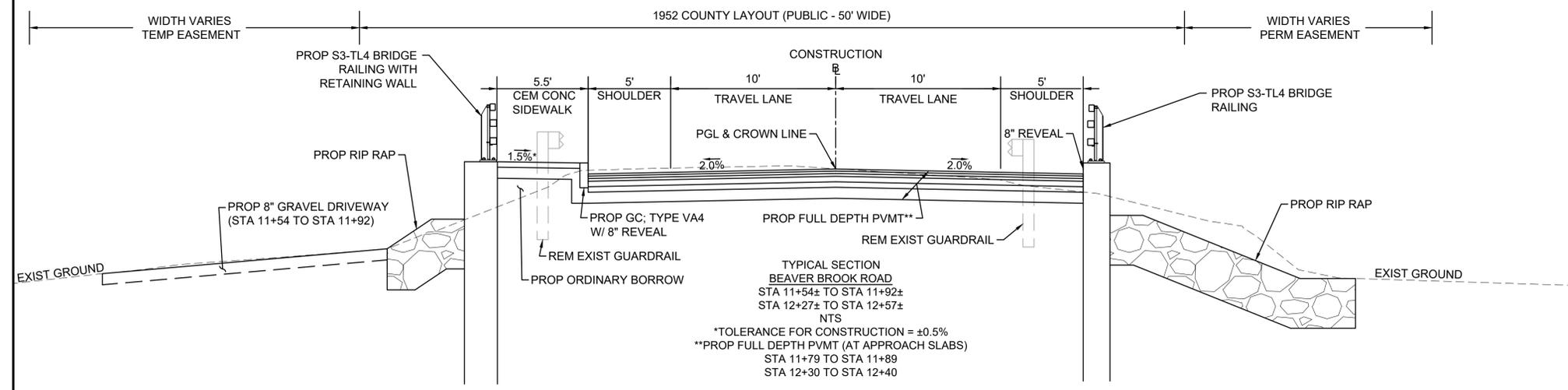
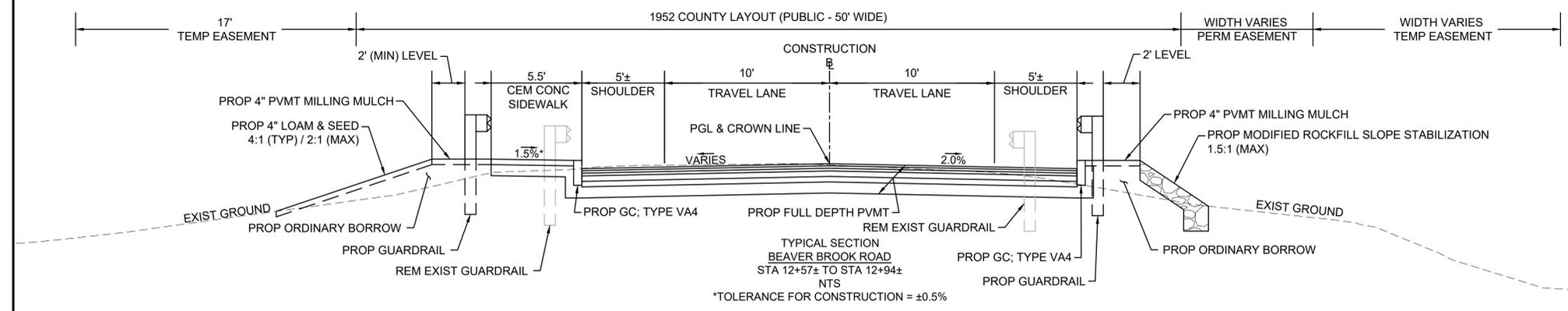
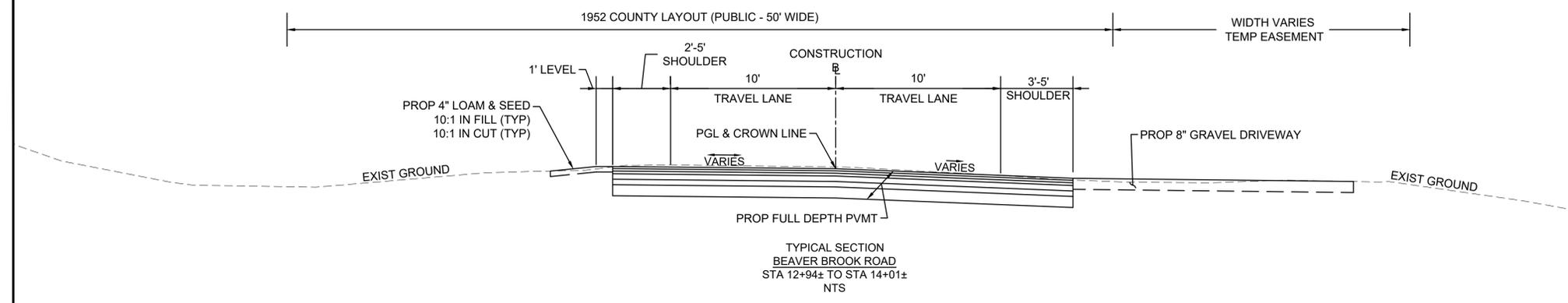
**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	14
PROJECT FILE NO.		608830	

**LEGEND & ABBREVIATIONS**

WESTFORD BEAVER BROOK ROAD			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	14
PROJECT FILE NO.		608830	

**TYPICAL SECTIONS & PAVEMENT NOTES**



- PAVEMENT NOTES**
- PROPOSED FULL DEPTH PAVEMENT**
- SURFACE: 1½" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC - B - 9.5) OVER  
1¼" SUPERPAVE BRIDGE SURFACE COURSE - 12.5 (SSC - B - 12.5) OVER  
2" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5)
- BASE: 4" SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) OVER
- SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER  
8" GRAVEL BORROW, TYPE b (COMPACTED)
- PROPOSED FULL DEPTH PAVEMENT (AT APPROACH SLABS)**
- SURFACE: 1½" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC - B - 9.5) OVER  
1¼" SUPERPAVE BRIDGE SURFACE COURSE - 12.5 (SSC - B - 12.5) OVER  
2" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5)
- BASE: 4" SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) OVER
- SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER  
VARIABLE DEPTH GRAVEL BORROW, TYPE b (COMPACTED)
- PROPOSED FULL DEPTH PAVEMENT LESS THAN 4' WIDE**
- SURFACE: 1½" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC - B - 9.5) OVER  
1¼" SUPERPAVE BRIDGE SURFACE COURSE - 12.5 (SSC - B - 12.5) OVER  
2" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5)
- BASE: 6" HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE OVER
- SUBBASE: 8" GRAVEL BORROW, TYPE b (COMPACTED)
- PROPOSED HOT MIX ASPHALT (HMA) MILL & OVERLAY**
- SURFACE: 1½" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC - B - 9.5) OVER
- BASE: 1½" PAVEMENT MICROMILLING
- PROPOSED BRIDGE PAVEMENT**
- SURFACE: 1½" SUPERPAVE BRIDGE SURFACE COURSE 9.5 (SSC-B-9.5) OVER  
1½" SUPERPAVE BRIDGE PROTECTIVE COURSE 9.5 (SPC-B-9.5)
- PROPOSED CEMENT CONCRETE SIDEWALK**
- SURFACE: 4" CEMENT CONCRETE (AIR ENTRAINED, 4000 PSI, ¾", 610.)
- BASE: 8" GRAVEL BORROW, TYPE b (COMPACTED)
- PROPOSED GRAVEL DRIVEWAY**
- SURFACE: 8" GRAVEL BORROW, TYPE b (COMPACTED)
- BASE: EXISTING MATERIAL
- PROPOSED HOT MIX ASPHALT DRIVEWAY APRON**
- SURFACE: 1½" SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5) OVER  
2" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5) OVER
- BASE: 8" GRAVEL BORROW, TYPE b

- GENERAL PAVEMENT NOTES:**
- ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED BETWEEN ALL ASPHALT SURFACES AND SAWCUT JOINTS BEFORE PAVING. HMA JOINT SEALANT 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 OF 0.05 GAL/SY, EXCEPT OVER MILLED AND CEMENT CONCRETE SURFACES, WHERE THE APPLICATION RATE SHALL BE 0.07 GAL/SY. ALL SURFACES SHALL BE CLEAN OF ALL ORGANICS, DEBRIS, AND SAND PRIOR TO PAVING.
  - ALL HMA SHALL BE IN ACCORDANCE WITH SECTION 450.
  - ASPHALT EMULSION FOR TACK COAT SHALL BE RS-1H TO RESIST TRACKING OF TACK BY HAUL VEHICLES.
  - ALL GRAVEL BORROW MEETING SPECIFICATION SHALL BE RETAINED IN PLACE, COMPACTED, AND LEVELED AS REQUIRED.

**GUARDRAIL DETAILS**

STA 10+27 RT TO STA 10+64 RT TANGENT END TREATMENT TL-2  
 STA 10+64 RT TO STA 11+39 RT GUARDRAIL TL-2 (DEEP STEEL POSTS)  
 STA 11+39 RT TO STA 11+73 RT TRANSITION TO BRIDGE RAIL  
 STA 11+39 RT TO STA 11+52 RT W-BEAM PANEL  
 STA 11+52 RT TO STA 11+58 RT THRIE BEAM TRANSITION PANEL  
 STA 11+58 RT TO STA 11+70 RT THRIE BEAM PANEL (NESTED)  
 STA 11+70 RT TO STA 11+73 RT THRIE BEAM TERMINAL CONNECTOR

STA 12+46 LT TO STA 12+67 LT TRANSITION TO BRIDGE RAIL  
 STA 12+46 LT TO STA 12+49 LT THRIE BEAM TERMINAL CONNECTOR  
 STA 12+49 LT TO STA 12+61 LT THRIE BEAM PANEL (NESTED)  
 STA 12+61 LT TO STA 12+67 LT THRIE BEAM TRANSITION PANEL  
 STA 12+67 LT TO STA 12+92 LT TANGENT END TREATMENT TL-2

STA 12+46 RT TO STA 12+80 RT TRANSITION TO BRIDGE RAIL  
 STA 12+46 RT TO STA 12+49 RT THRIE BEAM TERMINAL CONNECTOR  
 STA 12+49 RT TO STA 12+61 RT THRIE BEAM PANEL (NESTED)  
 STA 12+61 RT TO STA 12+67 RT THRIE BEAM TRANSITION PANEL  
 STA 12+67 RT TO STA 12+80 RT W-BEAM PANEL  
 STA 12+80 RT TO STA 12+89 RT TRAILING ANCHORAGE

**TRAFFIC SIGNAL CONDUIT**

BEAVER BROOK ROAD CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	10+00.00	3033497.147	661749.240		N42°59'40"E 53.57'	10+53.57	3033536.330	661785.772
C1	10+53.57	3033536.330	661785.772	R=925.00' Δ=3°05'55" L=50.02' T=25.02'		11+03.60	3033571.980	661820.857
C2	11+03.60	3033571.980	661820.857	R=925.00' Δ=3°05'55" L=50.02' T=25.02'		11+53.62	3033607.629	661855.943
L2	11+53.62	3033607.629	661855.943		N42°59'40"E 103.65'	12+57.27	3033683.437	661926.622
C3	12+57.27	3033683.437	661926.622	R=700.00' Δ=12°08'25" L=148.32' T=74.44'		14+05.59	3033780.436	662038.460
L3	14+05.59	3033780.436	662038.460		N55°08'04"E 34.41'	14+40.00	3033800.109	662066.696

**WATER SUPPLY ALTERATIONS**

NONE

**DRAINAGE DETAILS**

NONE

**PROP VA4 CURB LIMITS**

STA 11+52 RT TO STA 11+74 RT  
 STA 11+56 LT TO STA 11+90 LT  
 STA 12+29 LT TO STA 12+91 LT  
 STA 12+45 RT TO STA 13+01 RT

**LEGEND**

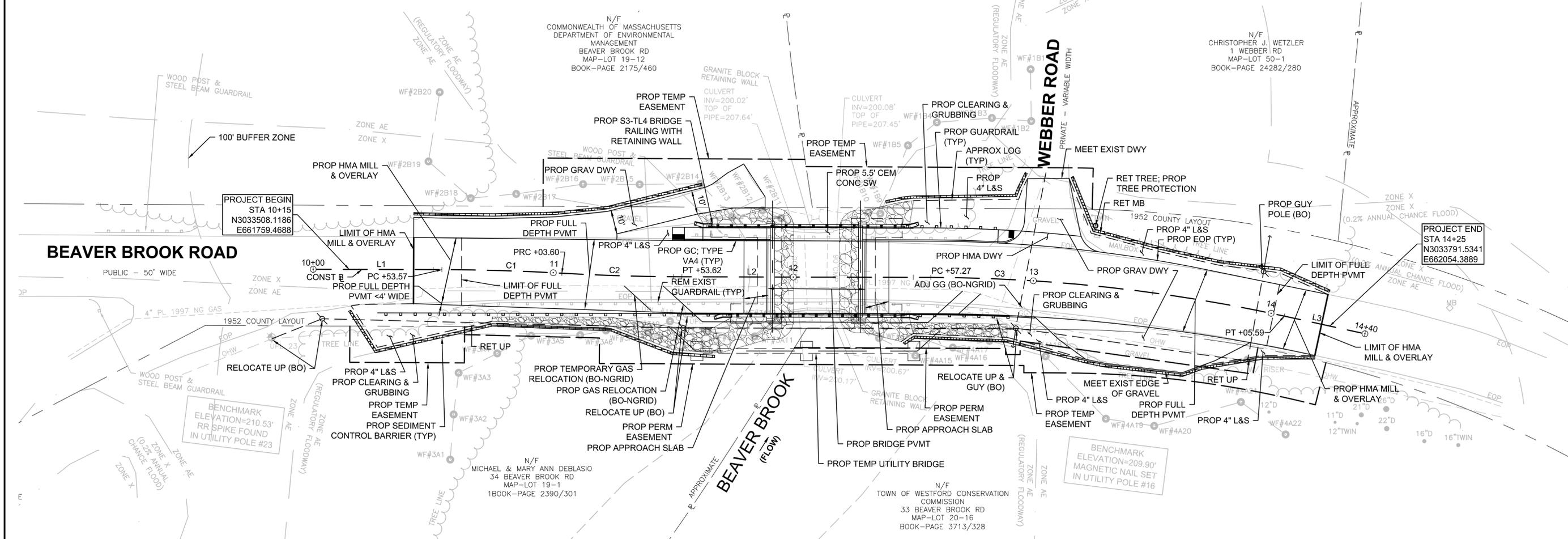
- = PROP MODIFIED ROCKFILL SLOPE STABILIZATION
- = PROP RIPRAP

**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	14

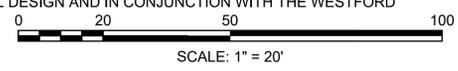
PROJECT FILE NO. 608830

**CONSTRUCTION PLAN**



**CONSTRUCTION NOTES:**

- EXISTING CONDITIONS INFORMATION COMPILED FROM SURVEY BY TEC, INC, ANDOVER, MA PERFORMED IN MARCH 2018.  
 HORIZONTAL DATUM = NAD83 (MASSACHUSETTS STATE PLANE COORDINATES)  
 VERTICAL DATUM = NAVD88
- ALL EXISTING STATE, COUNTY, AND TOWN LOCATION LINES HAVE BEEN ESTABLISHED FROM AN ACTUAL ON-THE-GROUND SURVEY. ALL PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATION ARE NOT GUARANTEED.
- THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL CONTACT DIGSAFE (1-888-DIGSAFE) A MINIMUM OF 72 HOURS PRIOR TO ANY CONSTRUCTION TO VERIFY THE LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
- WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
- ALL MUNICIPALLY OWNED UTILITY STRUCTURES (CATCH BASINS, DRAIN MANHOLES, WATER GATES, ETC.) SHALL BE ADJUSTED BY THE CONTRACTOR TO FINISHED GRADE UNLESS DIRECTED OTHERWISE. THE CONTRACTOR SHALL COORDINATE WITH THE LOWELL DEPARTMENT OF PUBLIC WORKS (LPDW) AND THE TEWKSBURY DEPARTMENT OF PUBLIC WORKS (TPDW) TO ALLOW FOR THE REPLACEMENT OF EXISTING UTILITY STRUCTURES IN POOR CONDITION.
- ALL PRIVATELY OWNED UTILITY STRUCTURES (GAS GATES, ELECTRIC /TELEPHONE MANHOLES, ETC.) SHALL BE ADJUSTED TO FINISHED GRADE BY THE PRIVATE UTILITY COMPANY, UNLESS DIRECTED OTHERWISE. THE CONTRACTOR SHALL COORDINATE WITH PRIVATE UTILITY COMPANIES FOR THE ALTERATION AND ADJUSTMENT, AS NECESSARY.
- AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
- ALL DISTURBED AREAS OUTSIDE THE CURBLINE SHALL BE STABILIZED WITH 4" LOAM AND SEED, UNLESS OTHERWISE NOTED.
- THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R), AS APPROVED BY THE ENGINEER.
- THE TERM "MEET EXIST" MEANS TO MEET BOTH THE EXISTING ALIGNMENT AND ELEVATION.
- ALL EXISTING TREES WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS. ALL PROVIDED DIMENSIONS REFER TO THE DIAMETER AT BREST HEIGHT.
- AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 3'-0" (EXCLUDING THE WIDTH OF CURB) SHALL BE MAINTAINED PAST ALL VERTICAL OBSTRUCTIONS (UTILITY POLES, LIGHT POLES, SIGNS, MAILBOXES, ETC.)
- DETECTABLE WARNING PANELS ARE REQUIRED ON ALL PROPOSED WHEELCHAIR RAMPS AND SHALL BE INSTALLED IN ACCORDANCE WITH MASSDOT CONSTRUCTIONS STANDARDS. DETECTABLE WARNING PANELS SHALL BE YELLOW IN COLOR AS APPROVED BY THE WESTFORD HIGHWAY DEPARTMENT
- TREE TRIMMING SHALL BE PERFORMED IN ADVANCE OF RELOCATED UTILITY POLES AND OVERHEAD WIRES. CONTRACTOR SHALL COORDINATE WITH NGRID FOR LOCATIONS.
- WETLAND REPLICATION AREAS WILL BE DETERMINED IN FINAL DESIGN AND IN CONJUNCTION WITH THE WESTFORD CONSERVATION COMMISSION.

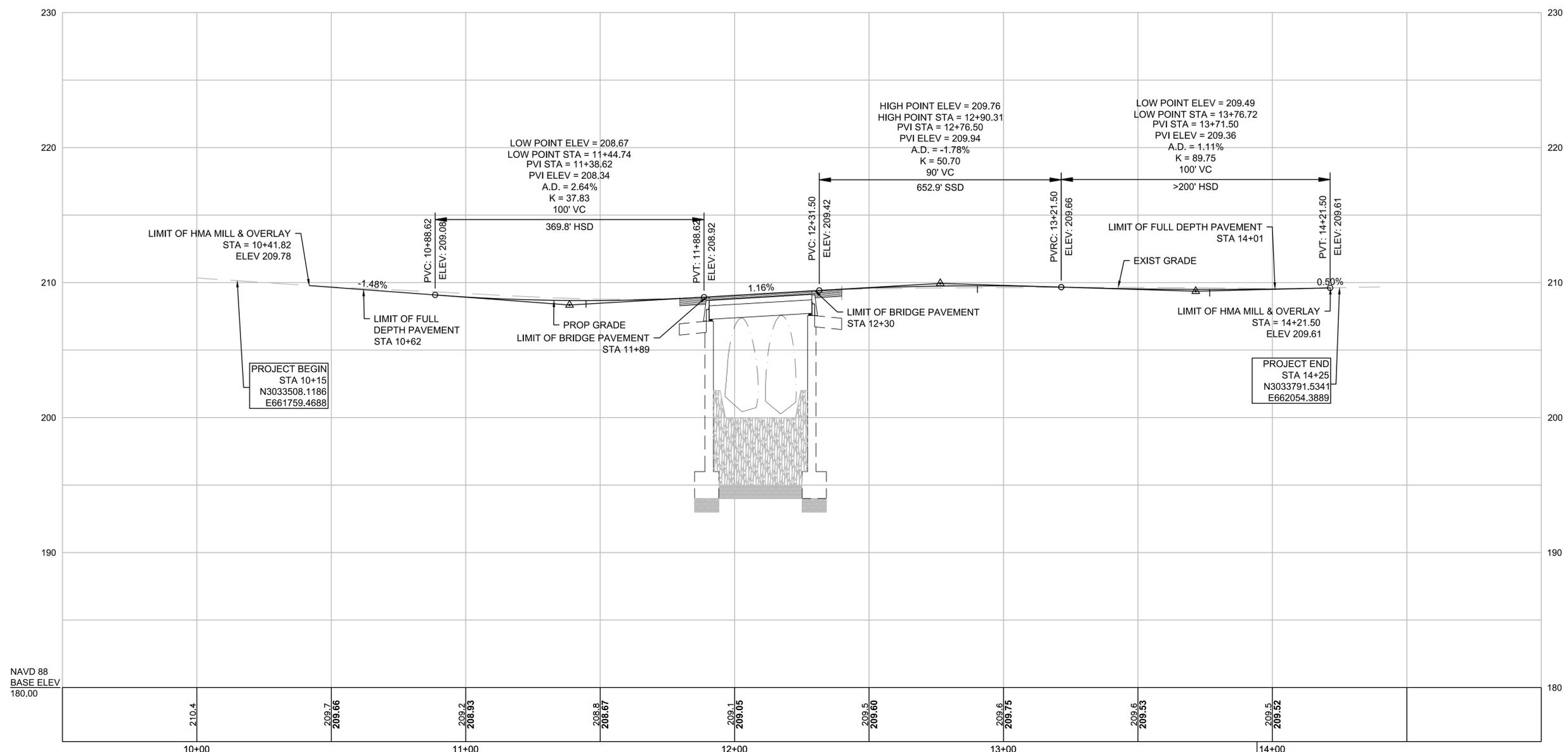


**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	14
PROJECT FILE NO.		608830	

**PROFILE**

**BEAVER BROOK ROAD**

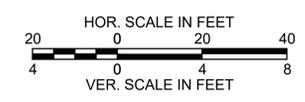


PROJECT BEGIN  
STA 10+15  
N3033508.1186  
E661759.4688

PROJECT END  
STA 14+25  
N3033791.5341  
E662054.3889

Benchmark  
Magnetic Nail Set In Utility Pole #16  
Elevation = 209.90  
Sta 13+94.31, 21.37' RT

NAVD 88  
BASE ELEV  
180.00

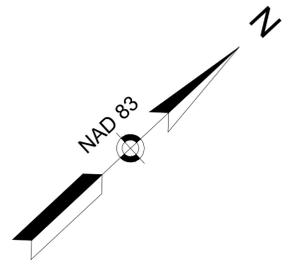


**NOTES:**

1. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. ALL PAVEMENT MARKINGS WITHIN THE LIMITS OF WORK SHALL BE THERMOPLASTIC MATERIALS.
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.
4. THE MINIMUM MOUNTING HEIGHT OF POST MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK SHALL BE 7 FEET.

WESTFORD BEAVER BROOK ROAD			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	14
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**TRAFFIC SIGN & PAVEMENT MARKING PLAN**

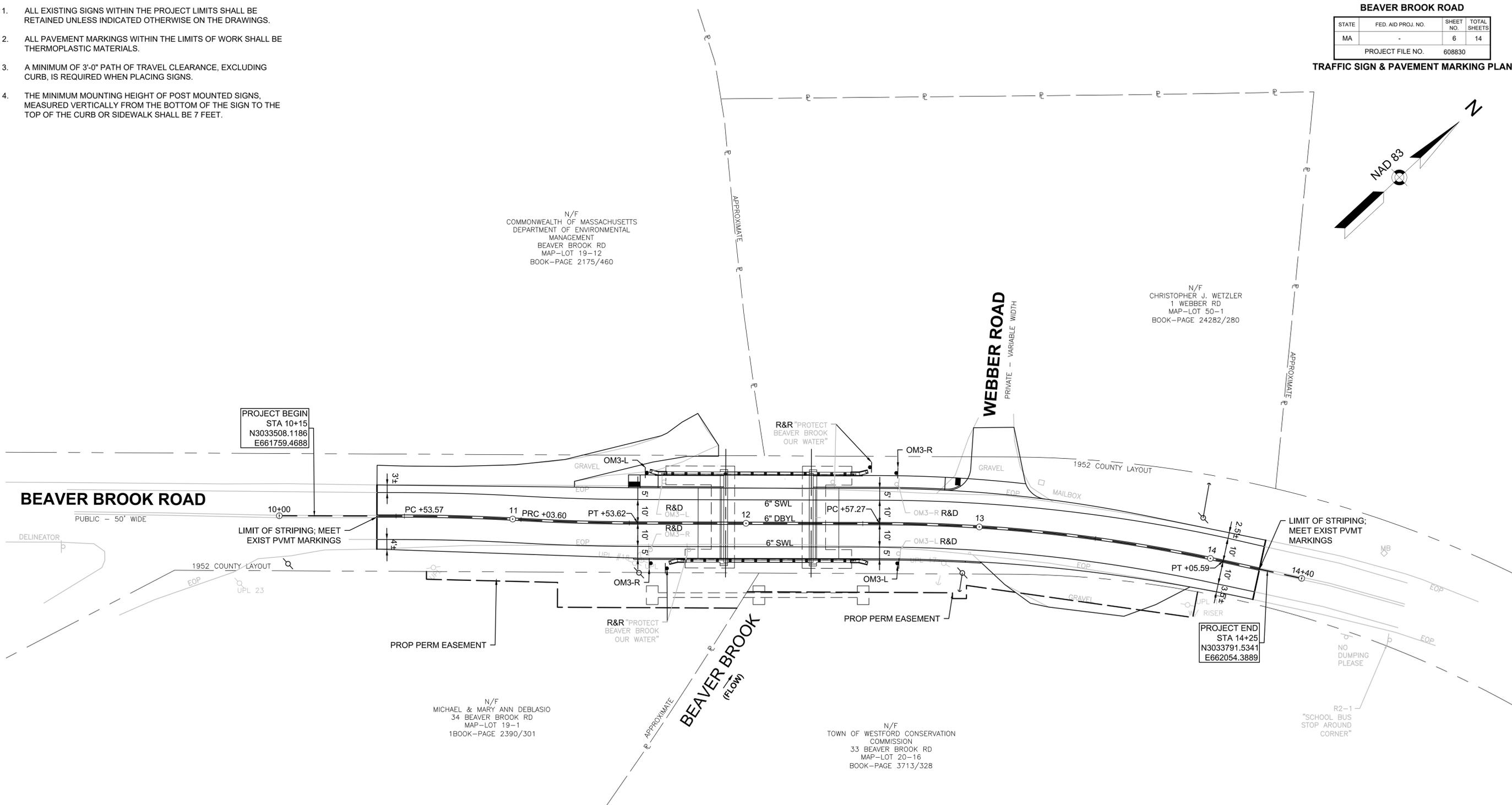


N/F  
COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF ENVIRONMENTAL  
MANAGEMENT  
BEAVER BROOK RD  
MAP-LOT 19-12  
BOOK-PAGE 2175/460

N/F  
CHRISTOPHER J. WETZLER  
1 WEBBER RD  
MAP-LOT 50-1  
BOOK-PAGE 24282/280

N/F  
MICHAEL & MARY ANN DEBLASIO  
34 BEAVER BROOK RD  
MAP-LOT 19-1  
1BOOK-PAGE 2390/301

N/F  
TOWN OF WESTFORD CONSERVATION  
COMMISSION  
33 BEAVER BROOK RD  
MAP-LOT 20-16  
BOOK-PAGE 3713/328

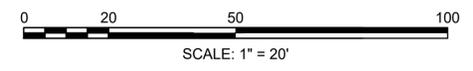


PROJECT BEGIN  
STA 10+15  
N3033508.1186  
E661759.4688

PROJECT END  
STA 14+25  
N3033791.5341  
E662054.3889

**TRAFFIC SIGN SUMMARY**

IDENTIFICATION NUMBER	SIZE OF SIGN (in)		LEGEND	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			SIZE AND NUMBER OF POSTS REQUIRED	UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR		BACK-GROUND	LEGEND	BORDER			
OM3-L	12	36		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS FOR DIMENSIONS			2	YELLOW/BLACK	N/A	N/A	2 P5	3.00	6.00
OM3-R	12	36		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS FOR DIMENSIONS			2	YELLOW/BLACK	N/A	BLACK	2 P5	3.00	6.00



**NOTES:**

1. 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.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. 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.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN THE "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL NOTIFY EACH ADJUTTER 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.
7. THE FIRST TEN PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A SEQUENTIAL FLASHING LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
13. NO WORK THAT IMPACTS THE TRAVELED WAY SHALL BE PERMITTED DURING PEAK HOUR TRAFFIC. PEAK HOUR IS DEFINED AS WEEKDAYS FROM 7-9 AM & 4-6 PM.

**LEGEND:**

- |  |                                      |                                |
|--|--------------------------------------|--------------------------------|
| ● REFLECTORIZED PLASTIC DRUM OR 36" CONE | ▨ WORK ZONE                          | 🚚 WORK VEHICLE                 |
| P/F POLICE/FLAGGER DETAIL                | ➔ DIRECTION OF TRAFFIC               | 🚚 TRUCK MOUNTED ATTENUATOR     |
| ▨ TYPE III BARRICADE                     | 🚫 IMPACT ATTENUATOR                  | 🚦 TRAFFIC OR PEDESTRIAN SIGNAL |
| 📄 CHANGEABLE MESSAGE SIGN                | ▨ MEDIAN BARRIER                     | 🚦 SIGN                         |
| ➔➔➔ ARROW BOARD                          | 🚧 MEDIAN BARRIER WITH WARNING LIGHTS |                                |

**SUGGESTED WORK ZONE WARNING SIGN SPACING**

ROAD TYPE	DISTANCE BETWEEN SIGNS (FEET)		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS	350	350	350
MOST OTHER ROADWAYS	500	500	500
FREEWAYS AND EXPRESSWAYS	1,000	1,500	2,640

**TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES**

TYPE OF TAPER	TAPER LENGTH (L)
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE-LANE, TWO-WAY TRAFFIC TAPER	50 FT MIN. 100 FT MAX.
DOWNSTREAM TAPER	50 FT MIN. 100 FT MAX. PER LANE

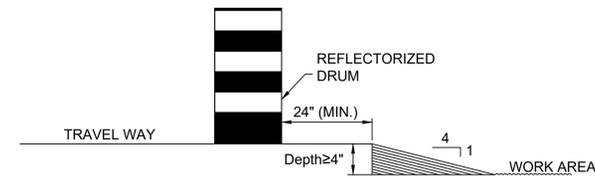
**FORMULAS FOR DETERMINING TAPER LENGTHS**

SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE: L = TAPER LENGTH IN FEET

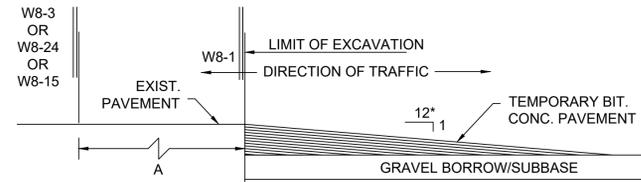
W = WIDTH OF OFFSET IN FEET

S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH



**LATERAL DROP-OFF DETAIL**

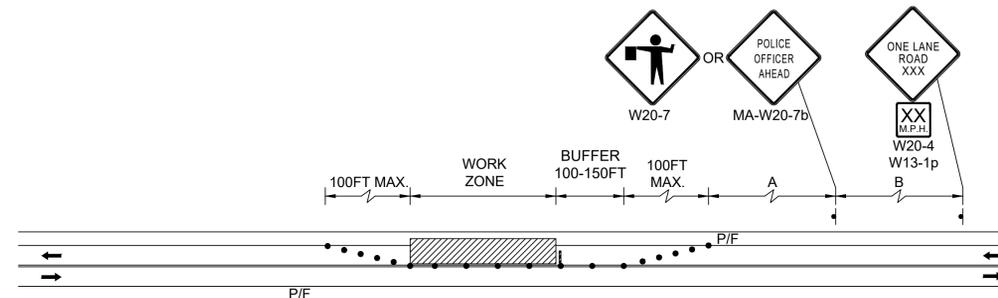
NOT TO SCALE



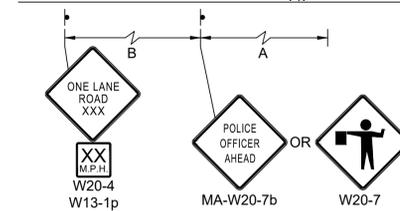
**LONGITUDINAL DROP-OFF DETAIL**

NOT TO SCALE

\* - INCREASE SLOPE RATIO FOR HIGHER SPEEDS



**TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC**



**TWO LANE ROAD SHOULDER CLOSED**

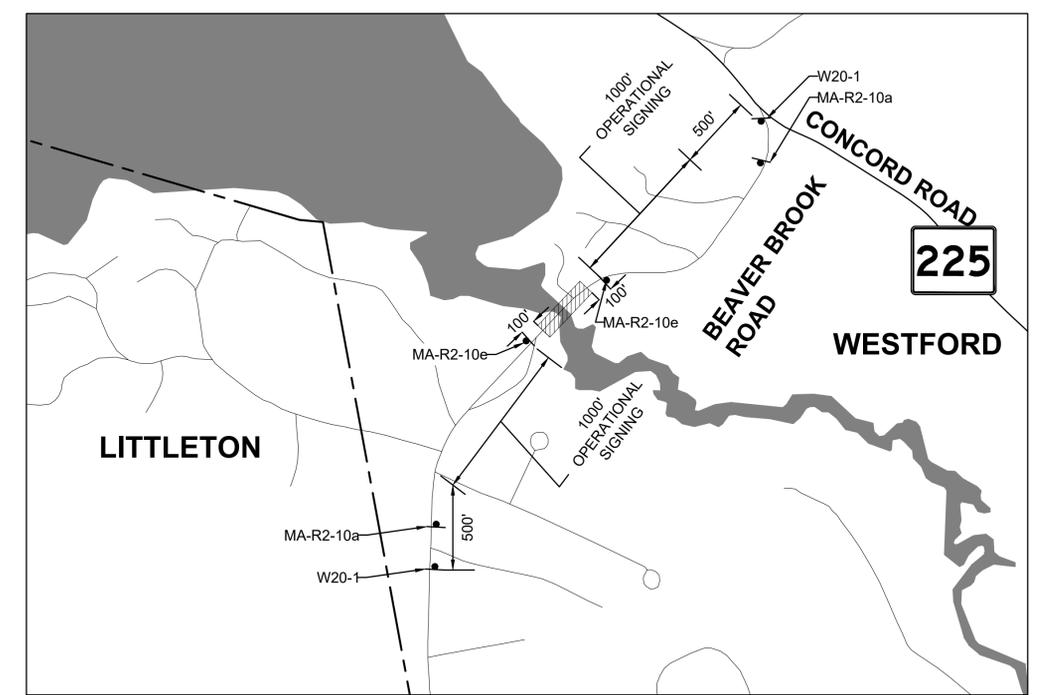
TRAFFIC SIGN SUMMARY												
IDENTIFICATION NUMBER	SIZE OF SIGN (in)		LEGEND	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR		BACK-GROUND	LEGEND	BORDER		
D3-2	66	12		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			7	FL. ORANGE	BLACK	BLACK	5.50	38.50
M4-8	24	12					14	FL. ORANGE	BLACK	BLACK	2.00	28.00
M4-8a	24	18					2	FL. ORANGE	BLACK	BLACK	3.00	6.00
M4-10L	48	18					1	FL. ORANGE/BLACK	BLACK	BLACK	6.00	6.00
M4-10R	48	18					1	FL. ORANGE/BLACK	BLACK	BLACK	6.00	6.00
M6-1L	21	15					8	FL. ORANGE	BLACK	BLACK	2.19	17.50
M6-1R	21	15					6	FL. ORANGE	BLACK	BLACK	2.19	13.13
MA-R2-10a	48	36		MASSDOT STANDARD SIGN			2	FL. ORANGE/WHITE	BLACK	BLACK	12.00	24.00
MA-R2-10e	36	48					2	FL. ORANGE/WHITE	BLACK	BLACK	12.00	24.00
R11-2a	48	30		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			2	WHITE	BLACK	BLACK	10.00	20.00
R11-3b (1 MILE)	60	30					1	WHITE	BLACK	BLACK	12.50	12.50
R11-4	60	30					2	WHITE	BLACK	BLACK	12.50	25.00
W5-1	36	36					1	FL. ORANGE	BLACK	BLACK	9.00	9.00
W8-1	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W8-3	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W13-1P	18	18					2	FL. ORANGE	BLACK	BLACK	2.25	4.50
W20-1	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W20-3	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W20-4	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00

**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	14
PROJECT FILE NO.		608830	

**TEMPORARY TRAFFIC CONTROL PLANS - 2 OF 3**

TRAFFIC SIGN SUMMARY												
IDENTIFICATION NUMBER	SIZE OF SIGN (in)		LEGEND	TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR		BACK-GROUND	LEGEND	BORDER		
W20-7	36	36		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			2	FL. ORANGE	BLACK	BLACK	9.00	18.00
MA-W20-7b	36	36		MASSDOT STANDARD SIGN			2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W21-5a	36	36		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			1	FL. ORANGE	BLACK	BLACK	9.00	9.00

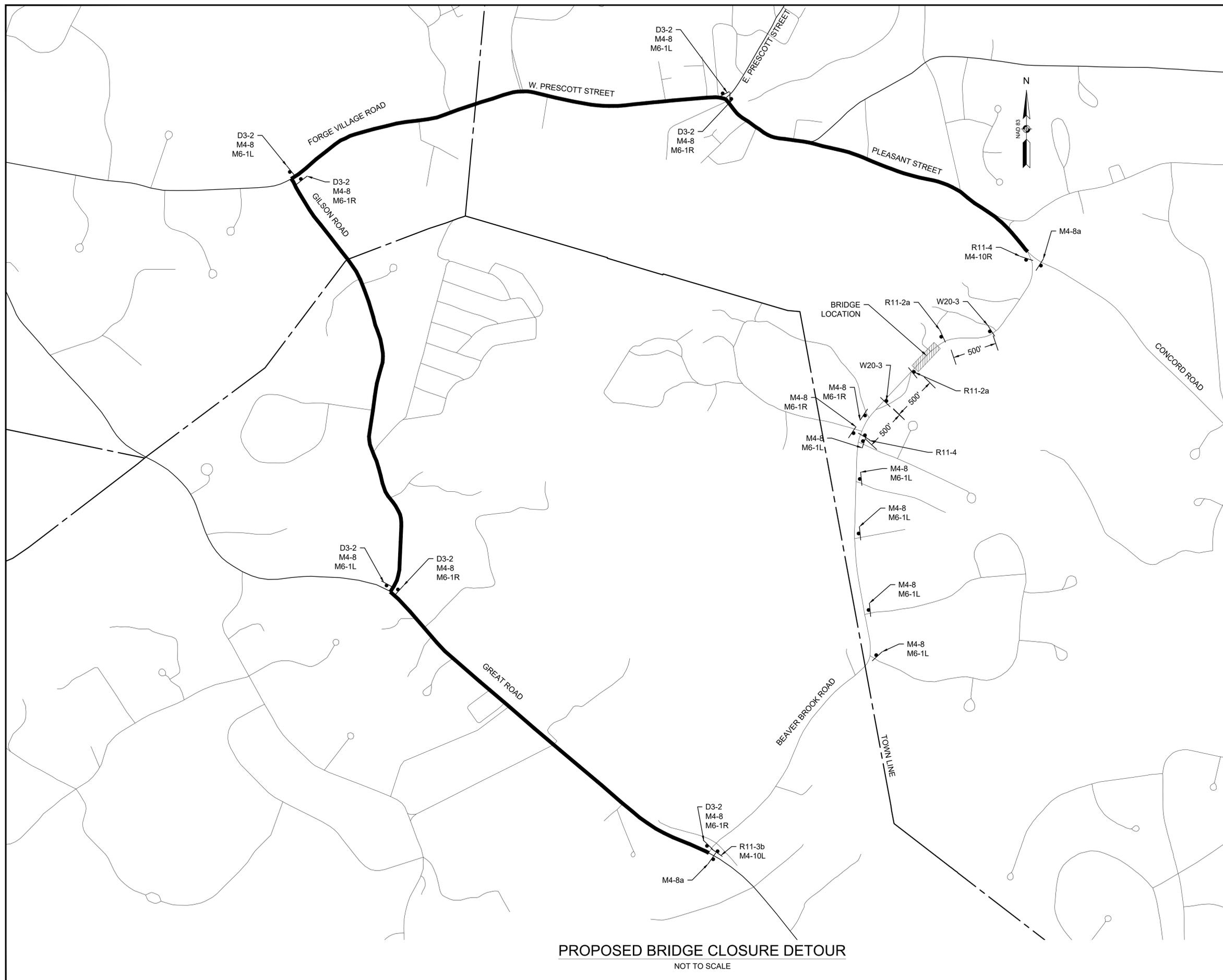


ADVANCED WARNING SCHEMATIC  
N.T.S.

**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	14
PROJECT FILE NO.		608830	

TEMPORARY TRAFFIC CONTROL PLANS - 3 OF 3

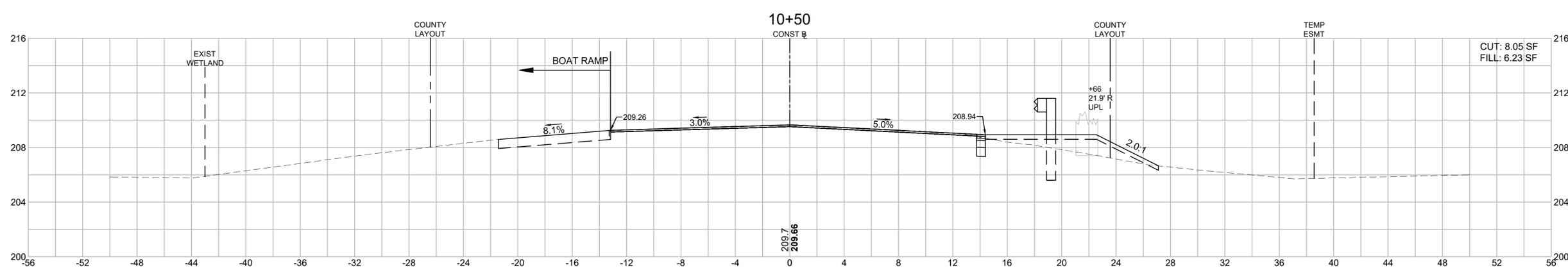
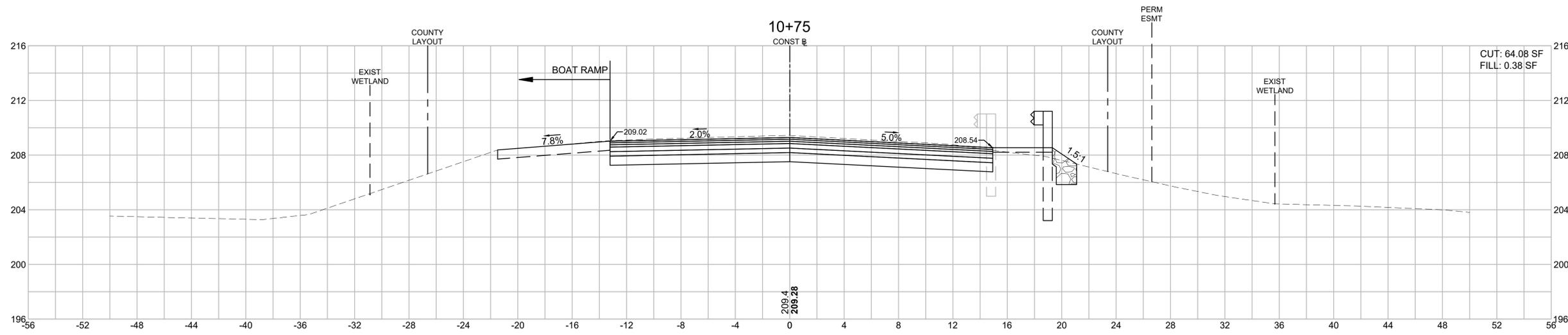
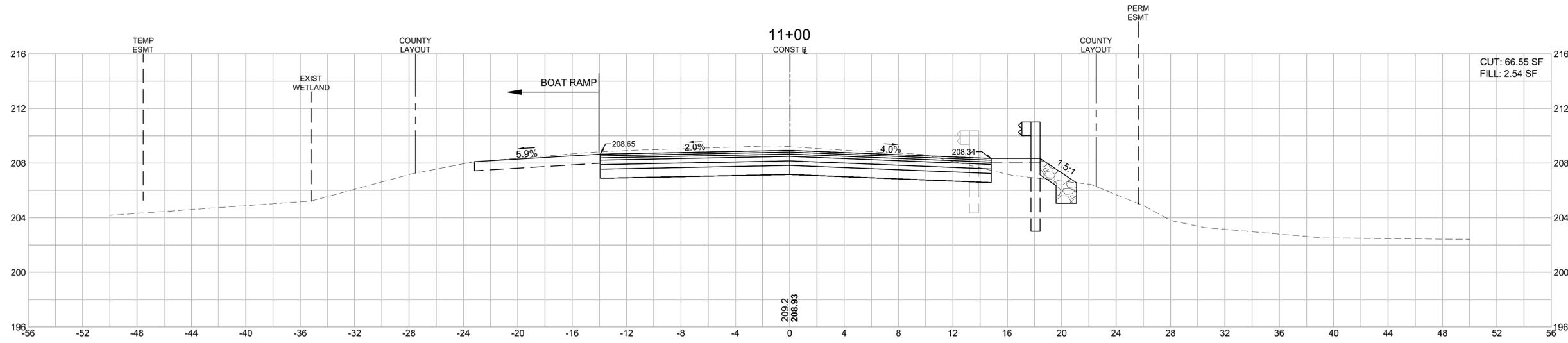


**PROPOSED BRIDGE CLOSURE DETOUR**  
NOT TO SCALE

**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	14
PROJECT FILE NO.		608830	

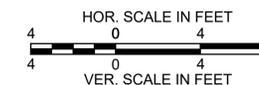
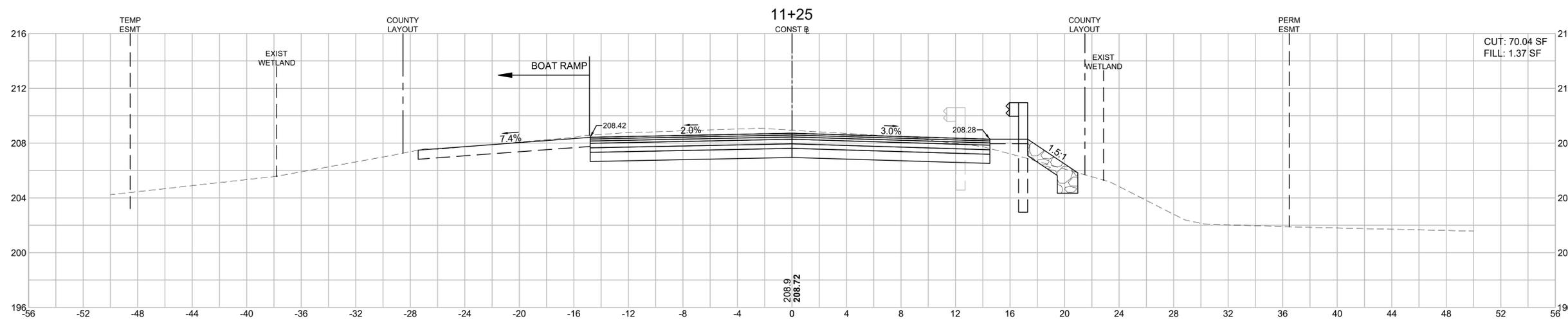
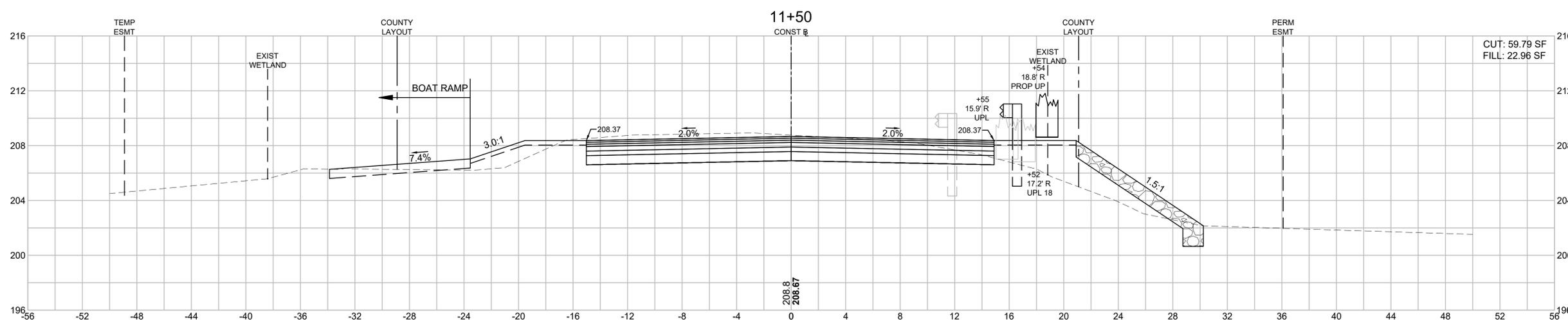
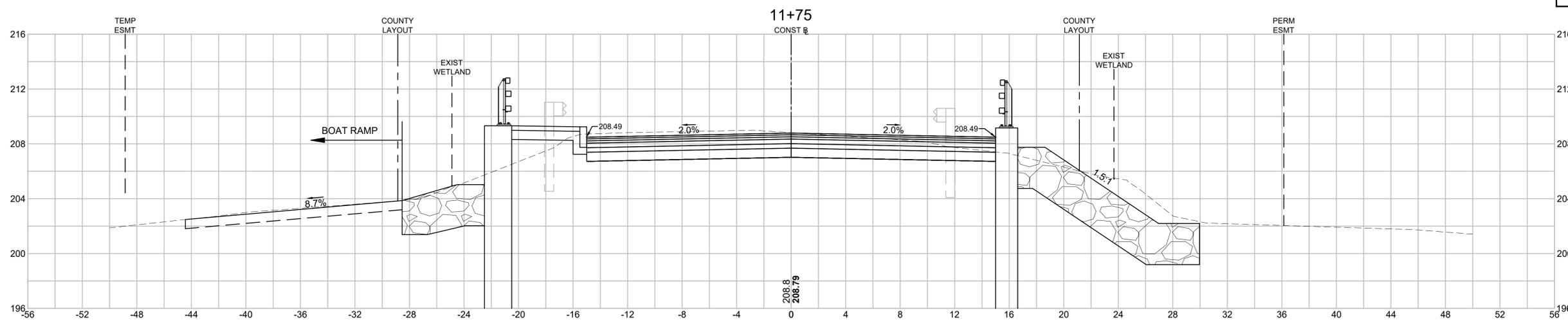
**CROSS SECTIONS - 1 OF 5**



**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	14
PROJECT FILE NO.		608830	

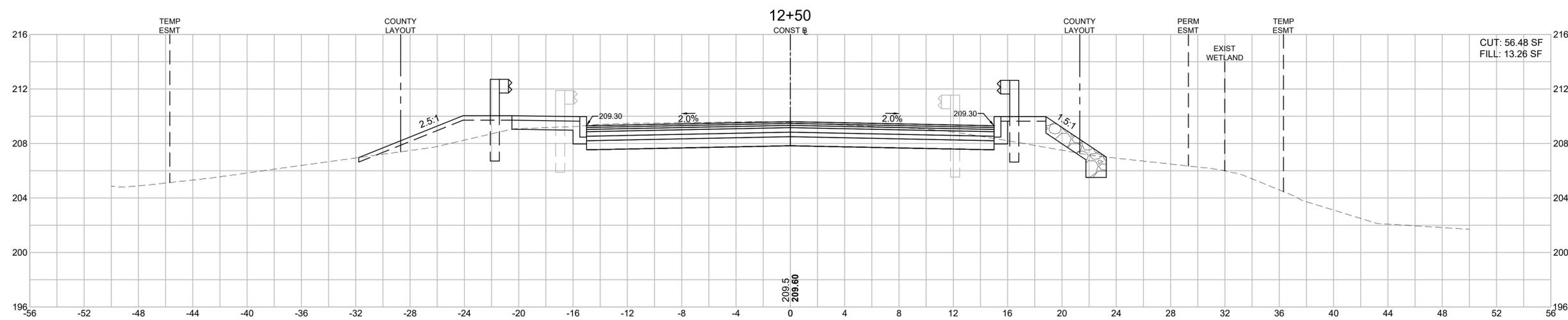
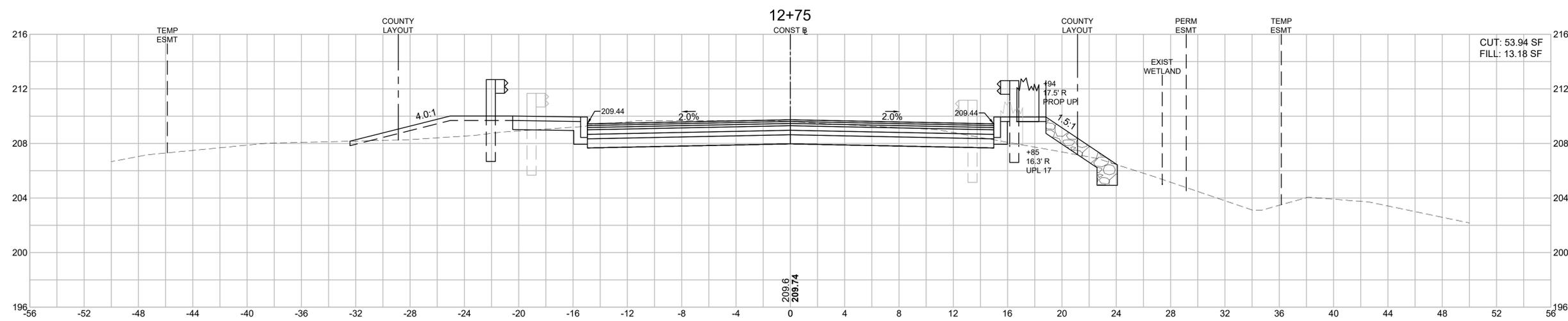
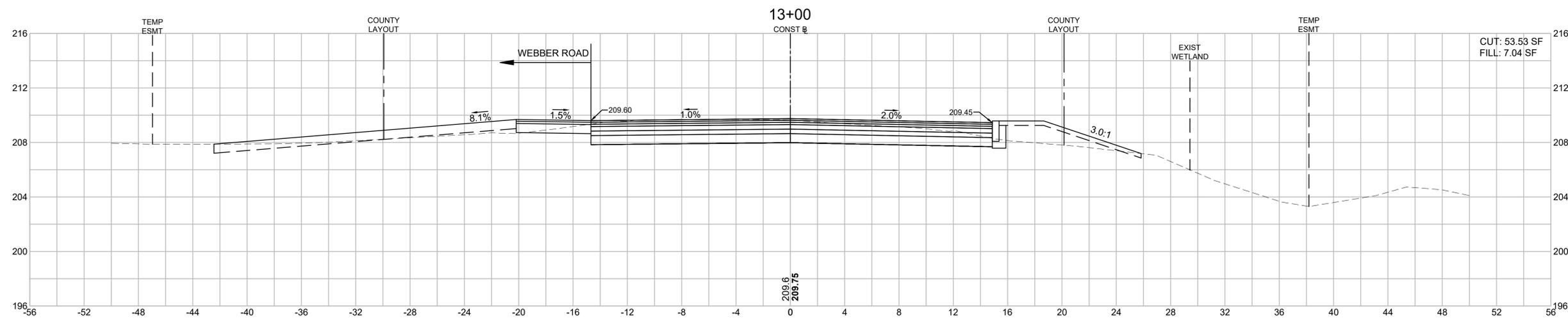
**CROSS SECTIONS - 2 OF 5**



**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	14
PROJECT FILE NO.		608830	

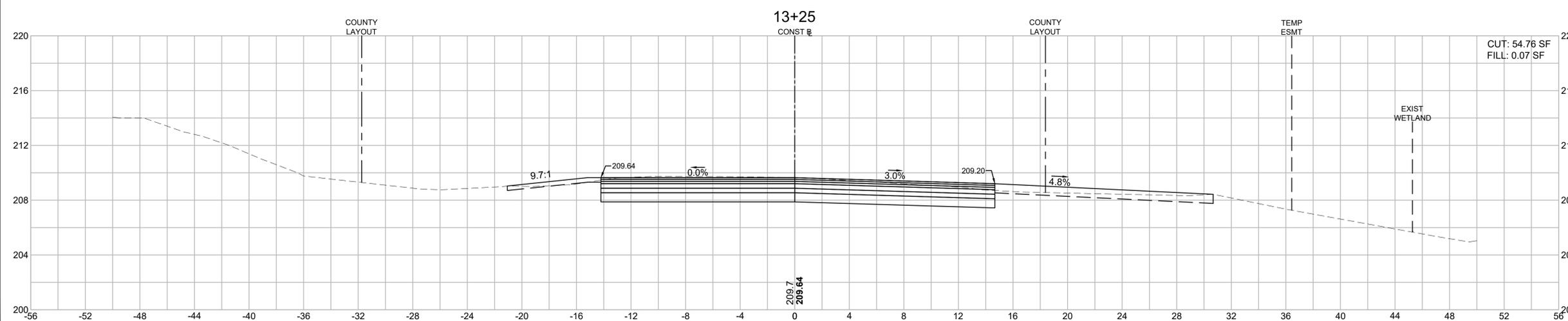
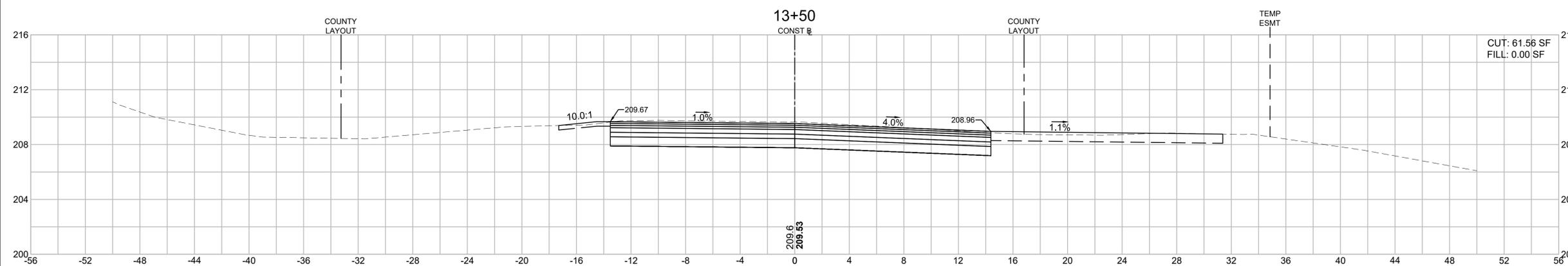
**CROSS SECTIONS - 3 OF 5**



**WESTFORD  
BEAVER BROOK ROAD**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	14
PROJECT FILE NO.		608830	

**CROSS SECTIONS - 4 OF 5**



WESTFORD  
BEAVER BROOK ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	14
PROJECT FILE NO.		608830	

CROSS SECTIONS - 5 OF 5

