MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	158
PROJECT FILE NO.	606223		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

BRUCE FREEMAN RAIL TRAIL PHASE 2B

(BRIDGE NOs. C-19-039 (BUJ), C-19-040 (BUK) & C-19-037 (BF4))

IN THE TOWNS OF

ACTON & CONCORD

MIDDLESEX COUNTY

100% SUBMISSION

THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 1988, AS AMENDED, THE SUPPLEMENTAL SPECIFICATIONS DATED JULY 1, 2015, 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.

ADDITIONAL STANDARDS:
LRFD BRIDGE MANUAL - 2013 EDITION, AASHTO GUIDE FOR THE PLANNING, DESIGN AND OPERATION OF PEDESTRIAN FACILITIES - 1ST EDITION, AND THE GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES - 2012 EDITION, WILL GOVERN.

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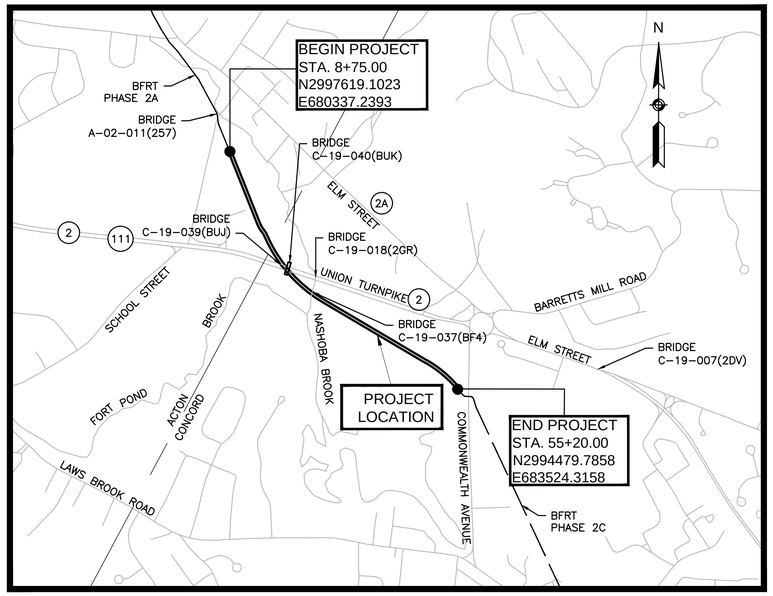

0 1000 2000 3000 4000

SCALE: 1" = 1000'

LENGTH OF PROJECT = 4645 FEET = 0.880 MILES

DESIGN DESIGNATION

DESIGN SPEED	18 MPH
MINIMUM HORIZONTAL CURVE RADIUS	60'
MINIMUM LENGTH OF CREST VERTICAL CURVE	25'
MAXIMUM GRADE FOR LEVEL TERRAIN	4.5%

FEBRUARY 2019

GPI Greenman-Pedersen, Inc.
Engineering & Construction Services
181 Ballardvale Street, Suite 202, Wilmington, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

DATE	DESCRIPTION	REV #
2/1/19	100% DESIGN SUBMISSION	2
6/28/18	75% DESIGN SUBMISSION	1
3/1/17	25% DESIGN SUBMISSION	0

massDOT Massachusetts Department of Transportation Highway Division

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER DATE

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR DATE

APPROVED

HIGHWAY ADMINISTRATOR DATE

606223_HD_(CS).DWG Plotted on 4-Feb-2019 2:55 PM

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		LEACHING CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
#	#	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
W	W	WATER MANHOLE
		SIGN AND POST
		SIGN AND POST (2 POSTS)
RRSG	RRSG	RAILROAD SIGNAL
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		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
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		COMPOST FILTER TUBES
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE 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 RIGHT OF WAY
		TOWN OR CITY BOUNDARY LINE
E		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
FND	FOUND
GAR	GARAGE

ABBREVIATIONS (cont.)

GENERAL

GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN
LP	LIGHT POLE
LT	LEFT
MAG	MAGNETIC
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY

ABBREVIATIONS (cont.)

GENERAL

PVMT	PAVEMENT
PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
R-O-W	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SHLO	STATE HIGHWAY LAYOUT LINE
SMH	SEWER MANHOLE
SSD	STOPPING SIGHT DISTANCE
SSM	STATE SURVEY MARK
ST	STREET
STA	STATION
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL

CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILE, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
WP	WOOD POLE
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

GENERAL NOTES

1. TOPOGRAPHICAL INFORMATION WAS PROVIDED BY SURVEYING AND MAPPING CONSULTANTS, JUNE 2008. VERTICAL DATUM IS BASED ON NAVD88. HORIZONTAL DATUM IS BASED ON NAD83.
2. 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 DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE EXACTLY AND TO PRESERVE ANY AND ALL UNDERGROUND UTILITIES. CALL "DIG-SAFE" 1-888-DIGSAFE (344-7233) AT LEAST 72 HOURS BEFORE COMMENCING CONSTRUCTION.
3. WHERE AN EXISTING UNDERGROUND 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.
4. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
5. 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.
6. THE TERM "PROPOSED" (PROP.) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS, OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE & RESET" (R&R).
7. ALL EXISTING STATE, COUNTY, CITY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
8. ALL JOINTS BETWEEN NEW SURFACE PAVEMENT AND EXISTING SURFACE PAVEMENT TO REMAIN SHALL BE COATED WITH A HOT MIX ASPHALT JOINT SEALANT MEETING SPECIAL PROVISION ITEM 453.
9. ALL DISTURBED AREAS NOT DESIGNATED TO BE PAVED SHALL HAVE COMPOST TOPSOIL PLACED AND SEEDED. THE COMPOST TOPSOIL SHALL HAVE A MINIMUM DEPTH OF 4 INCHES AND SHALL BE PLACED FLUSH WITH THE TOP OF THE ADJACENT CURB, EDGING, BERM OR PAVEMENT SURFACE.
10. THE LIMIT OF WORK AREA SHALL BE THE RIGHT OF WAY UNLESS SHOWN OTHERWISE.
11. PRIOR TO THE START OF ANY NEW UTILITY WORK, ALL ELEVATIONS OF EXISTING UTILITIES IN THOSE AREAS ARE TO BE VERIFIED. THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY SHOULD ANY DISCREPANCIES OCCUR.
12. ALL CASTINGS SHALL BE SET FLUSH WITH FINISHED GRADE.
13. ALL PUBLICLY OWNED GATE BOXES, SERVICE BOXES, MANHOLE FRAMES AND COVERS SHALL BE ADJUSTED TO GRADE BY THE CONTRACTOR.
14. ALL NEW SIDEWALKS AND DRIVEWAY GRADES SHALL MATCH EXISTING GRADES AT BACK OF SIDEWALK LINE UNLESS SHOWN OTHERWISE ON THE PLANS AND CROSS-SECTIONS.
15. THE CONTRACTOR SHALL TAKE EVERY PRECAUTION TO PROTECT ALL EXISTING TREES AND ROOTS THAT ARE NOT DESIGNATED FOR REMOVAL.
16. CONTRACTOR TO CONTACT ENGINEER PRIOR TO INSTALLATION OF BOUNDS FOR FINAL LOCATIONS.
17. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5 FEET SHALL BE INCLUDED IN THE COST OF THE PIPE.
18. CONTRACTOR SHALL REMOVE EXISTING ORGANIC MATERIAL THAT IS UNSUITABLE FOR REUSE AND DISPOSE OF OUTSIDE OF THE PROJECT LIMITS. IT IS ASSUMED THAT ALL OTHER EXCAVATED SUITABLE MATERIAL WILL REMAIN WITHIN THE PROJECT LIMITS. SEE SPECIAL PROVISIONS FOR DETAILS.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	158
PROJECT FILE NO.	606223		

LEGEND & ABBREVIATIONS

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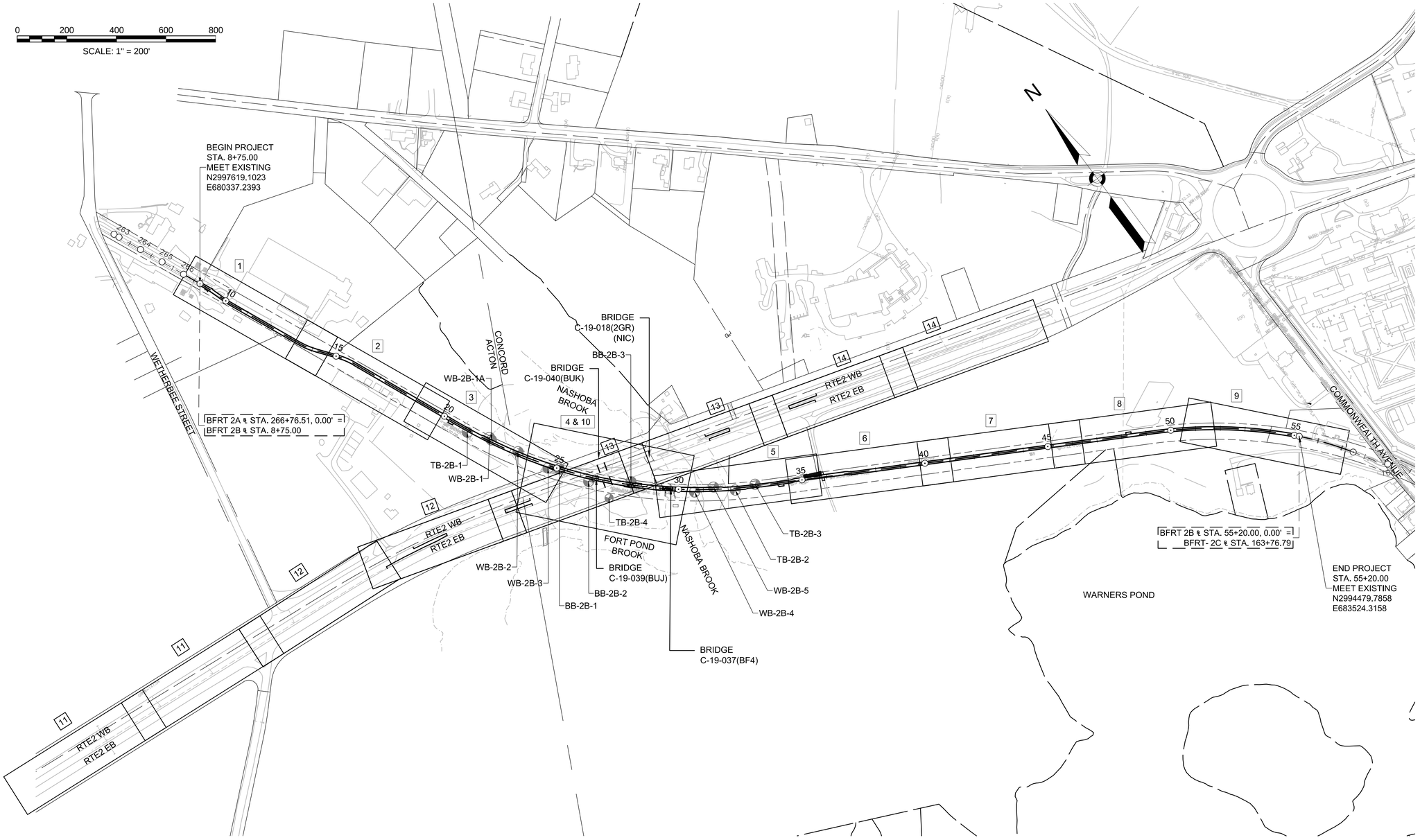
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	158
PROJECT FILE NO.	606223		

KEY PLAN & BORING LOCATIONS

SHEET REFERENCE:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Drawing Title:	Drawing Number:													
CONSTRUCTION BASELINE TIES	12	12	13	14	15	15	16	16	17			18	19	20
CONSTRUCTION PLANS & PROFILES - SHARED USE PATH	21	22	23	24	26	27	28	29	30	25				
CONSTRUCTION PLANS - ROUTE 2											31	32	33	34
CURB TIE & GRADING PLANS	35	35	36	37	38	38	39	39	40					
TRAFFIC SIGN & PAVEMENT MARKING PLANS	41	41	42	42	43	43	44	44	45		46	47	48	49
LANDSCAPING PLANS	66	67	68	69	70	71	72	73	74					

B-# = BORING LOCATION AND NUMBER



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ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	158
PROJECT FILE NO.	606223		

BORING LOGS

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Boring No. BB-2B-1

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Scale 1" = 5'

City/Town: Acton Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-12-14 2:00 pm | Total Hours: 12.5
Groundwater Depth: 9' | Date & Time: 11-13-14 7:25 am | Date & Time Completed: 11-14-14 11:00 am
Coordinates: N 2996155 E 681053 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 129.5 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2 3 5 3	14"	Dry, loose, brown, FINE TO COARSE SAND, some inorganic silt.	
S-2	5' - 7'	7 9 14 16	13"	Dry, medium dense, brown, FINE SAND, some coarse sand, trace inorganic silt.	
S-3	10' - 12'	8 13 15 16	10"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	13'6"
S-4	15' - 16'	7 9 11 11	5"	Wet, medium dense, brown-red, FINE SAND and inorganic silt.	16'
S-4A	16' - 17'		4"	Wet, medium dense, gray, FINE SAND, trace inorganic silt.	
S-5	20' - 22'	3 3 5 5	17"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.	25'
S-6	25' - 26'	2 4 4 4	8"	Wet, loose, brown, FINE SAND, some inorganic silt.	26'
S-6A	26' - 27'		8"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.	28'6"
S-7	30' - 32'	21 22 24 15	12"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
				Top of possible BEDROCK at 33'	33'
C-1	34' - 39'	4 2 2 3 2	48"	Advanced rollerbit to 34' and began coring. Hard very weathered, moderately fractured GRANITE. Percent Recovery = 80%	
C-2	39' - 44'	2 1 1 1 1	0"	No recovery, very weathered GRANITE. Rollerbit to 45', telescoped 3" casing to sample.	
S-8	45' - 45'11"	34 86/5"	9"	Moist, very dense, gray, possible weathered BEDROCK.	
S-9	50' - 50'2"	120/2"	2"	Moist, very dense, brown, FINE TO MEDIUM GRAVEL, trace inorganic silt (weathered possible bedrock) Advanced rollerbit to 55'	
				Terminated boring at 55'	55'
				Bottom of Exploration = 55'	

Remarks: * AECOM (Consultants)
Boring terminated due to not being able to advanced corebarrell down the hole.
Boring terminated without coring another 5 foot run to compensate for the no recovery obtained from C-2; enough information was obtained for the design engineer. Installed monitoring well at 20'

Protective Device - Stand: Box:
Well Depth: 20' Solid Pipe: 13'
Stick Up Pipe: 3' Screen Pipe: 10'

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 39'
Casing: NW Size: 3" Amt: 45'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

Boring No. BB-2B-2

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Scale 1" = 5'

City/Town: Acton Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-25-14 7:30 am | Total Hours: 7
Groundwater Depth: 8' | Date & Time: 11-25-14 2:15 am | Date & Time Completed: 11-25-14 2:30 pm
Coordinates: N 2996044 E 681118 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 129.7 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp. for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL 3"	
S-1	0' - 2'	2 5 6 6	10"	Dry, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-2	5' - 7'	3 3 5 7	8"	Moist, loose, dense, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-3	10' - 12'	5 7 6 7	14"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-4	15' - 17'	7 10 9 10	11"	Wet, medium dense, gray, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	19'
S-5	20' - 22'	9 11 13 16	15"	Wet, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, some inorganic silt.	23'
S-6	25' - 26'	5 6 5 5	7"	Wet, medium dense, brown, FINE SAND and inorganic silt.	26'
S-6A	26' - 27'		7"	Wet, loose, gray, FINE SAND and inorganic silt.	30'
S-7	30' - 32'	10 10 16 19	6"	Wet, medium dense, gray, COARSE TO FINE SAND and fine to medium gravel, trace inorganic silt.	32'6"
S-8	35' - 36'4"	42 55 65/4"	16"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	
S-9	40' - 41'3"	37 67 53/3"	12"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	
S-10	45' - 46'4"	28 40 80/4"	15"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	46'4"
S-11	50' - 50'2"	120/2"	0"	No Recovery	
S-12	55' - 55'8"	86 34/2"	4"	Wet, very dense, brown-white INORGANIC SILT and fine sand, some fine gravel, trace weathered bedrock.	
S-13	60' - 60'3"	120/3"	2"	Wet, very dense, brown-gray, weathered BEDROCK.	
S-14	65' - 65'4"	120/4"	3"	Wet, very dense, brown-gray weathered BEDROCK.	65'4"
				Bottom of Exploration = 65'4"	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: 2 Cones: 20
Casing: HW Size: 4" Amt: 65'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: Size:

Boring No. BB-2B-3

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Scale 1" = 5'

City/Town: Acton Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-17-14 8:00 am | Total Hours: 10.5
Groundwater Depth: 7' | Date & Time: 11-18-14 11:00 am | Date & Time Completed: 11-18-14 12:00 pm
Coordinates: N 2995941 E 681254 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 128.5 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	3 3 3 2	12"	Moist, loose, black, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	3'6"
S-2	5' - 7'	4 6 6 8	17"	Moist, medium dense, brown COARSE TO FINE SAND, trace inorganic silt.	
S-3	10' - 12'	5 6 8 8	19"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel, trace inorganic silt.	
S-4	15' - 17'	8 9 12 13	17"	Wet, medium dense, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-5	20' - 22'	12 10 9 10	10"	Wet, medium dense, gray FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-6	25' - 27'	6 8 10 12	4"	Wet, medium dense, gray-brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
S-7	30' - 32'	10 9 10 10	13"	Wet, medium dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	
				Top of weathered BEDROCK at 33'	33'
S-8	35' - 35'3"	120/3"	2"	Advanced casing and roller bit through weathered bedrock to 35'. Moist, very dense, gray FINE TO COARSE SAND and fine to coarse gravel, trace inorganic silt (weathered bedrock). Roller bit through weathered bedrock and began coring.	
C-1	38' - 43'	5 5 4 4 5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	
C-2	43' - 48'	4 5 5 4 5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	48'
				Bottom of Exploration = 48'	

Remarks: * AECOM (Consultants)
Set monitoring well at 17'

Protective Device - Stand: Box:
Well Depth: 17' Solid Pipe: 10'
Stick Up Pipe: 3' Screen Pipe: 10'

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: PW Size: 5" Amt: 34'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

5 0 5 10
HORIZONTAL
SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	158
PROJECT FILE NO.	606223		

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Boring No. TB-2B-1
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-10-14 2:30 pm | Total Hours: 7.5
Groundwater Depth: 8'4" | Date & Time: 11-11-14 2:00 pm | Date & Time Completed: 11-11-14 2:00 pm
Coordinates: N 2996495 E 680844 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 131.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2 6 8 13	12"	Dry, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	5'
S-2	5' - 7'	11 11 7 8	9"	Moist, medium dense, brown, FINE SAND, some inorganic silt.	10'
S-3	10' - 12'	3 3 4 4	15"	Wet, loose, brown, FINE SAND and inorganic silt, trace clay.	
S-4	15' - 16'	5 6 7 6	8"	Moist, medium dense, red/brown, FINE SAN D, trace inorganic silt.	16'
S-4A	16' - 17		8"	Moist, medium dense, gray, FINE SAND, trace inorganic silt.	
S-5	20' - 22'	3 4 4 3	14"	Wet, loose, gray FINE SAND, some inorganic silt, trace clay.	23'
S-6	25' - 27'	11 10 13 15	9"	Wet, medium dense, gray, FINE TO COARSE SAND, trace inorganic silt, trace fine gravel. Top of BEDROCK at 27'6"	27'6"
C-1	29' - 34'	5 5 3 4 4	60"	Advanced rollerbit to 29' through granite and began coring. Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	
C-2	34' - 36'	5 6 *	12"	Hard, severely fractured, gray GRANITE. Percent Recovery = 50%	36'
				Bottom of Exploration = 36'	

Remarks: * AECOM (Consultants)
* Had to terminate boring at 36' due to the carbide buttons from rollerbit burning out down in the hole at the diamond bit, corebarrell would not advance past 36', steel pieces in core barrell. Boring terminated with a 7' bedrock core and enough information obtained for the design engineer.

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 29'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

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Boring No. TB-2B-2
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-21-14 10:30 am | Total Hours: 5
Groundwater Depth: 7' | Date & Time: 11-21-14 3:00 pm | Date & Time Completed: 11-21-14 3:30 pm
Coordinates: N 2995663 E 681571 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 129.0 | Inspector's Name: Jun Jie Li | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 1'6"	2 2 20 100/0"	14"	TOPSOIL 4" Dry, medium dense, brown, FINE TO COARSE SAND, trace inorganic silt, trace weathered cobble. Top of BEDROCK at 1'6" Rollerbit to 9', thinking advancement was through a boulder but confirmed it was bedrock at 1'6. Began coring at 9'.	1'6"
C-1	9' - 14'	5 5 5 8 8	60"	Hard, fresh, slightly fractured, white-gray GNEISS. Percent Recovery = 100%	
C-1	14' - 19'	10 4 5 6 6	52"	Hard, slightly weathered, slightly fractured, white-gray GNEISS. Percent Recovery = 86%	19'
				Bottom of Exploration = 19'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 9'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

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Boring No. TB-2B-3
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-24-14 8:00 am | Total Hours: 5
Groundwater Depth: 6.5' | Date & Time: 11-24-14 12:00 pm | Date & Time Completed: 11-24-14 1:00 pm
Coordinates: N 2995634 E 681649 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 129.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2 3 35 25	9"	TOPSOIL 4" Dry, dense, brown, FINE TO COARSE SAND, and fine to medium gravel trace inorganic silt.	
S-2	5' - 6'4"	28 40 80/4"	12"	Dry, very dense, brown, FINE TO COARSE SAND and fine to coarse gravel, trace inorganic silt, possible weathered bedrock in tip of spoon. Top of BEDROCK at 6'10"	6'10"
C-1	9' - 14'	3 4 4 6 5	60"	Advanced rollerbit to 9' through possible granite and began coring. Hard, gray-white GRANITE Percent Recovery = 100%	
C-2	14' - 19'	4 5 5 6 5	60"	Hard, gray, white GRANITE. Percent Recovery = 100%	19'
				Bottom of Exploration = 19'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 9'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

5 0 5 10
HORIZONTAL
SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	158
PROJECT FILE NO. 606223			

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Boring No. TB-2B-4
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-14-14 12:00 pm | Total Hours: 3.5
Groundwater Depth: 6.4' | Date & Time: 11-14-14 3:15 pm | Date & Time Completed: 11-14-14 3:30 pm
Coordinates: N 2995941 E 681144 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 126.5 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description	Strata Changes
							TOPSOIL	5"
S-1	0' - 2'	2	3	4	4	18"	Moist, loose, red-brown FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	4'
S-2	5' - 7'	6	4	5	6	14"	Wet, loose, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-3	10' - 11'	4	5	14	14	8"	Wet, loose, brown, FINE SAND, trace inorganic silt.	11'
S-3A	11' - 12'					6"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel.	
S-4	15' - 17'	9	7	11	13	15"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-5	20' - 22'	8	8	8	8	13"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-6	25' - 27'	9	8	8	6	10"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-7	30' - 31'8"	7	7	30	80/2"	9"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
S-8	35' - 37'	28	47	51	54	19"	Wet, very dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	37'
							Bottom of Exploration = 37'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 35'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: Size:

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Boring No. WB-2B-1
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-07-14 11:30 am | Total Hours: 5.5
Groundwater Depth: 8' | Date & Time: 11-10-14 7:25 am | Date & Time Completed: 11-10-14 9:00 am
Coordinates: N 2996414 E 680903 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 130.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2	2	3	3	6"	Dry, loose, dark brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-2	5' - 7'	8	11	14	16	14"	Dry, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
S-3	10' - 12'	18	21	13	7	9"	Wet, dense, brown, COARSE TO FINE SAND and fine to coarse gravel, trace inorganic silt.	13'6"
S-4	15' - 17'	2	5	4	5	15"	Wet, loose, brown, FINE SAND, some inorganic silt.	
S-5	20' - 22'	3	6	7	7	14"	Wet, medium dense, brown, FINE SAND, some inorganic silt, trace clay.	23'
S-6	25' - 27'	16	27	17	14	17"	Wet, dense, brown, FINE TO COARSE SAND and fine to medium gravel, some inorganic silt (Till.) Drove casing to 28', drive shoe broke had to re-locate hole.	28'
							Boring Terminated at 28'	

Remarks: * AECOM (Consultants)
Changed location; moved boring from N2996414, E680903 to N2996412, E680903 due to drive shoe breaking in hole and started new boring WB-2B-1A.

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 25'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: Size:

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Boring No. WB-2B-1A
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-10-14 9:00 am | Total Hours: 5.5
Groundwater Depth: 8' | Date & Time: 11-10-14 2:30 pm | Date & Time Completed: 11-10-14 2:30 pm
Coordinates: N 2996412 E 680903 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 130.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description	Strata Changes
							See boring log WB-2B-1 for sample descriptions to 27'.	
							Top of BEDROCK at 28'	28'
							Rollerbit to 30' and began coring.	
C-1	30' - 35'	5	4	4	4	4	58" Hard, fresh slightly fractured, white GNEISS. Percent Recovery = 96%	
C-2	35' - 40'	4	3	5	3	4	57" Hard, white, slightly to severely fractured, white GNEISS. Percent Recovery = 95%	40'
							Bottom of Exploration at 40'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 28'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

5 0 5 10
HORIZONTAL
SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	158
PROJECT FILE NO.	606223		

BORING LOGS

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Boring No. WB-2B-2
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859

Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-06-14 10:00 am | Total Hours: 8.5

Groundwater Depth: 8.5' | Date & Time: 11-07-14 7:30 am | Date & Time Completed: 11-07-14 11:00 am

Coordinates: N 2996310 E 680961 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer

Ground Elevation: 127.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	3 6 7 7	10"	Dry, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-2	5' - 7'	9 11 14 16	6"	Moist, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-3	10' - 11'6"	15 13 14 7	10"	Wet, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	11'6"
S-3A	11'6" - 12'		5"	Wet, medium stiff, gray-brown INORGANIC SILT and fine sand.	15'
S-4	15' - 17'	2 3 3 3	17"	Wet, loose gray-brown FINE SAND, some inorganic silt.	18'6"
S-5	20' - 20'6"	21 21 22 34	5"	Wet, dense, gray-brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	20'6"
S-5A	20'6" - 22'		5"	Wet,very dense, gray-brown, FINE TO COARSE SAND, some inorganic silt, some fine to medium gravel, (Till.)	
S-6	25' - 27'	26 60 60/4"	12"	Wet, very dense, gray-brown, FINE TO COARSE SAND, some inorganic silt, some fine to medium gravel, (Till.)	
S-7	30' - 30'6"	120	6"	Wet, very dense, gray-brown, FINE TO COARSE SAND and inorganic silt, some fine to medium gravel, (Till.)	30'6"
				Top of BEDROCK at 30'6"	
				Advanced roller bit through granite to 34' and began coring.	
C-1	34' - 39'	4 4 5 5 5	60"	Hard, fresh, sound, white-gray GRANITE. Percent Recovery = 100%	
C-2	39' - 44'	6 6 7 7 7	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	44'
				Bottom of Exploration = 44'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Type of Drill Rig: CME 550X

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 30'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

massDOT Highway

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. WB-2B-3
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859

Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-12-14 7:30 am | Total Hours: 6.5

Groundwater Depth: 8.5' | Date & Time: 11-12-14 2:00 pm | Date & Time Completed: 11-12-14 2:00 pm

Coordinates: N 2996185 E 681019 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer

Ground Elevation: 131.0 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 1'	1 1 2 2	9"	Dry, very loose, brown, FINE SAND, trace inorganic silt.	1'
S-1A	1' - 2'		9"	Dry, soft, dark brown, ORGANIC SILT, trace fine sand, trace roots.	3'
S-2	5' - 7'	9 8 11 13	17"	Moist, medium dense, brown, COARSE TO FINE SAND, some fine gravel, trace inorganic silt.	
S-3	10' - 12'	9 9 11 14	6"	Wet, medium dense, brown, COARSE TO FINE SAND and fine to medium gravel, some inorganic silt.	13'6"
S-4	15' - 17'	5 5 5 6	12"	Wet, medium dense, gray FINE SAND and inorganic silt.	
S-5	20' - 22'	4 3 3 4	15"	Wet, loose, brown, FINE SAND, some inorganic silt.	
S-6	25' - 26'6"	2 2 3 6	12"	Wet, loose, gray FINE SAND, some inorganic silt.	26'6"
S-6A	26'6" - 27'		6"	Wet, loose, gray, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-7	30' - 32'	17 21 30 36	16"	Wet, very dense, gray, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt, (Till.)	
				Top of BEDROCK at 32'2"	32'2"
				Rollerbit to 34' through granite gneiss, began coring at 34'.	
C-1	34' - 39'	3 4 2 3 3	57"	Hard, slightly weathered, slightly to moderately fractured, gray-white GRANITE GNEISS. Percent Recovery = 95%	
C-2	39' - 44'	3 2 3 2 2	30"	Hard, highly weathered, extremely fractured, gray GRANITE. Percent Recovery = 50%	44'
				Bottom of Exploration = 44'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Type of Drill Rig: CME 550X

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 32'2"
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

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Derry, NH 03038

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Boring No. WB-2B-4
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859

Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-18-14 1:00 pm | Total Hours: 11.5

Groundwater Depth: 7.5' | Date & Time: 11-20-14 8:00 am | Date & Time Completed: 11-20-14 9:00 am

Coordinates: N 2995754.9 E 681434.5 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer

Ground Elevation: 129.2 | Inspector's Name: Kin Lam | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2 3 3 3	13"	TOPSOIL 4"	
				Dry, loose, brown, FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	
S-2	5' - 6'	2 2 2 2	8"	Wet, loose, brown, FINE TO COARSE SAND, some inorganic silt.	6'
S-2A	6' - 7'		10"	Moist, soft, black/dark brown ORGANIC SILT, trace fine sand, trace roots.	8'
S-3	10' - 12'	3 4 5 5	6"	Wet, loose, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
				Top of BEDROCK at 12'1"	12'1"
				Attempted to drive 4" casing when it crimped, pulled out of hole and advanced 5" casing down to 12'1", advanced rollerbit to 15' then advanced 4" casing to 15', rollerbit to 16' and began coring at 16'.	
C-1	16' - 21'	4 4 4 4 4	60"	Very hard sound, fresh, gray-pink-white QUARTZ GNEISS. Percent Recovery = 100%	
C-2	21' - 26'	5 4 4 5 4	60"	Very hard sound, fresh, gray-pink-white QUARTZ GNEISS. Percent Recovery = 100%	26'
				Bottom of Exploration = 26'	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Type of Drill Rig: CME 550X

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 12'1"
Casing: PW Size: 5" Amt: 12'1"
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

5 0 5 10

HORIZONTAL
SCALE IN FEET

massDOT Highway

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P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. WB-2B-5
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859

Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-20-14 9:30 am | Total Hours: 8.5

Groundwater Depth: 7' | Date & Time: 11-21-14 10:00 am | Date & Time Completed: 11-21-14 10:00 am

Coordinates: N 2995725 E 681508 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer

Ground Elevation: 129.8 | Inspector's Name: Jun Jie Li | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL 4"	1'
S-1	0' - 1'	1 2 120/0"	9"	Dry, very dense, brown, FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
				Encountered BOULDER at 1'	
C-1	4' - 9'	6 9 1 .5 .5	33"	Advanced rollerbit to 4' and began coring breaking through boulder at 7', continued to 9' with 5" casing.	
				BOULDER	7'
S-2	9' - 11"	9 6 4 4	10"	Continued to 9' with 5" casing. Wet, medium dense, brown, FINE SAND, some inorganic silt, some fine to medium gravel.	
				Top of BEDROCK at 12'	12'
C-2	14' - 19'	5 9 9 10 9	57"	Advanced rollerbit to 14' and began coring. Hard, fresh, sound, white GNEISS. Percent Recovery = 95%	
C-3	19' - 24'	3 3 4 4 4	40"	Hard, sligtly fractured, gray-white GNEISS. Percent Recovery = 66%	
					24'
				Bottom of Exploration = 24'	

Remarks: * AECOM (Consultants)

On core run C-3 while pulling barrell out of hole 20" of recovery was lost. Two additional attempts were made to retrieve but were unsuccessful.

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Type of Drill Rig: CME 550X

Arrow-Board: Signs: Cones:

Casing: PW Size: 5" Amt: 9'
Casing: HW Size: 4" Amt: 12'
Casing: NW Size: 3" Amt: 14'
Hammer Weight: 300 lbs. Fall: 30"

Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"

Core Barrel Type: NX Size: 2.15"

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	158
PROJECT FILE NO.	606223		

BORING LOGS

606223_HD_(BL).DWG Plotted on 4-Feb-2019 2:57 PM

5 0 5 10
HORIZONTAL
SCALE IN FEET

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	158
PROJECT FILE NO.	606223		

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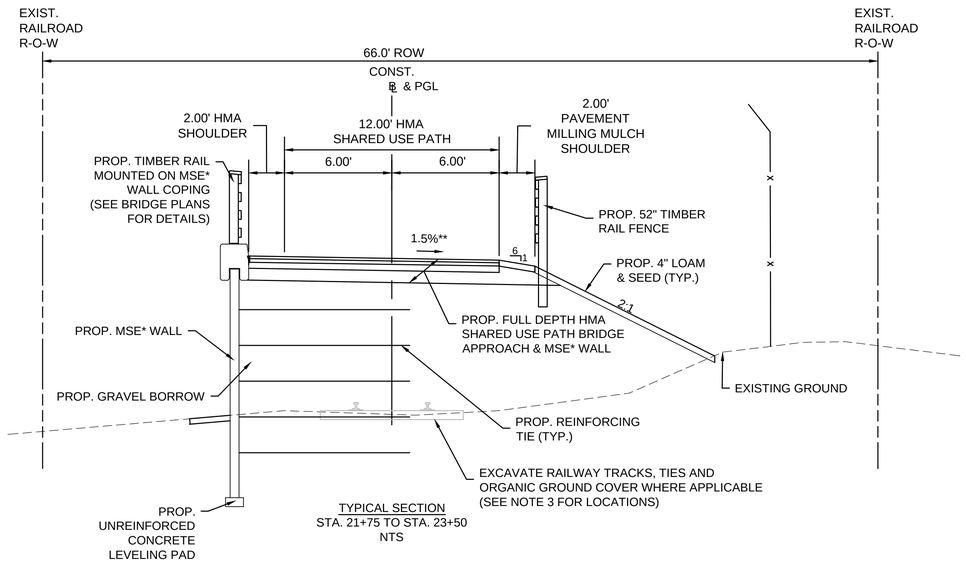
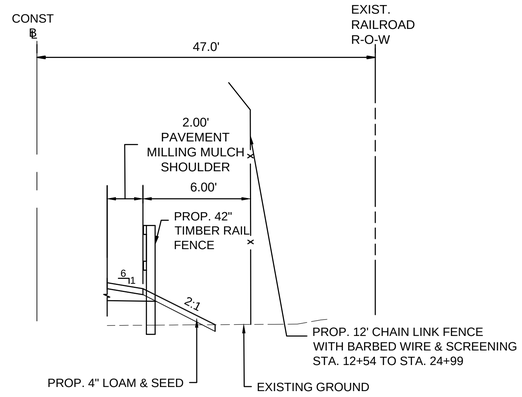
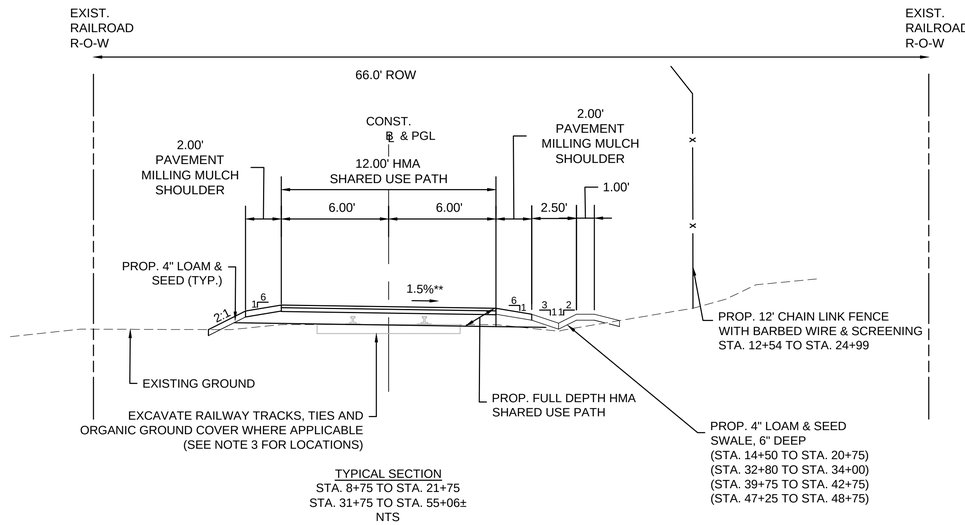
TYPICAL SECTIONS



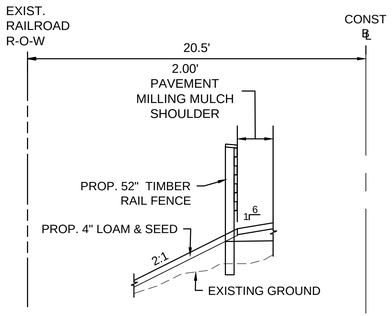
TYPICAL SECTION
STA. 21+75 TO STA. 23+50
NTS



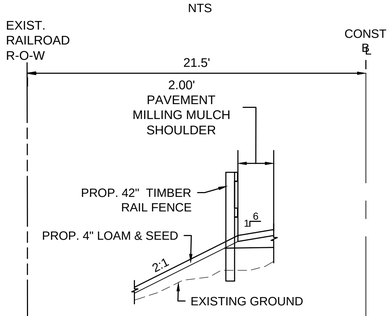
TYPICAL SECTION
LOCATIONS OF 3'-6" TIMBER RAIL FENCE - RIGHT
STA. 13+41 TO STA. 20+20
STA. 20+51 TO STA. 21+55
NTS



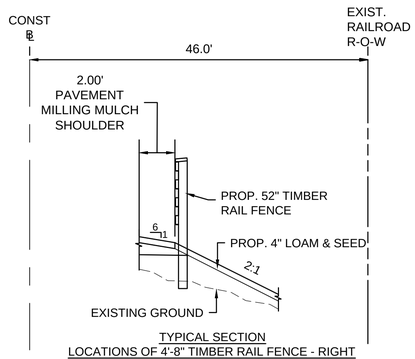
TYPICAL SECTION
STA. 8+75 TO STA. 21+75
STA. 31+75 TO STA. 55+06±
NTS



TYPICAL SECTION
LOCATIONS OF 4'-8" TIMBER RAIL FENCE - LEFT
STA. 21+55 TO STA. 21+75
STA. 31+75 TO STA. 32+25
NTS



TYPICAL SECTION
LOCATIONS OF 3'-6" TIMBER RAIL FENCE - LEFT
STA. 43+75 TO STA. 47+75
NTS



TYPICAL SECTION
LOCATIONS OF 4'-8" TIMBER RAIL FENCE - RIGHT
STA. 21+55 TO STA. 24+25
STA. 28+33 TO STA. 28+98
STA. 30+95 TO STA. 32+25
NTS

NOTES:

1. THE SECTIONS OF PROPOSED SHARED USE PATH NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFORE HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.
2. CONTRACTOR SHALL REMOVE EXISTING ORGANIC MATERIAL (ABOVE RAILROAD BALLAST) THAT IS UNSUITABLE FOR REUSE AND DISPOSE OF THIS MATERIAL OUTSIDE OF THE PROJECT LIMITS. IT IS ASSUMED THAT ALL OTHER EXCAVATED SUITABLE MATERIAL WILL REMAIN WITHIN THE PROJECT LIMITS. SEE SPECIAL PROVISIONS FOR DETAILS.
3. EXCAVATE RAILROAD TRACKS AND TIES FROM STA. 14+15 TO STA. 25+64, STA. 26+39 TO STA. 26+84, AND STA. 27+64 TO STA. 55+20.

*MSE: MECHANICALLY STABILIZED EARTH

**TOLERANCE FOR CONSTRUCTION ±0.5%

PAVEMENT NOTES

PROP. FULL DEPTH HMA SHARED USE PATH BRIDGE APPROACH & MSE WALL

SURFACE COURSE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER ASPHALT EMULSION FOR TACK COAT OVER

INTERMEDIATE COURSE: 2½" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER

FOUNDATION: 4" DENSE GRADED CRUSHED STONE FOR SUBBASE OVER 8" GRAVEL BORROW (M1.03.0 TYPE B) OVER SPECIAL BORROW COMPACTED IN LAYERS NOT TO EXCEED 8"

NOTE: IN AREAS OF FILL PLACE AN ADDITIONAL 12" OF SPECIAL BORROW, GRAVEL BORROW OR RECLAIMED PAVEMENT FOR SUBBASE TO PROVIDE FROST PROTECTION.

PROP. FULL DEPTH HMA SHARED USE PATH

SURFACE COURSE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER ASPHALT EMULSION FOR TACK COAT OVER

INTERMEDIATE COURSE: 2½" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER

SUBBASE: 8" GRAVEL BORROW (M1,03.0 TYPE B) OVER SPECIAL BORROW (TO BE USED AS DIRECTED BY ENGINEER)

PROP. FULL DEPTH HMA CONSTRUCTION

SURFACE COURSE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 POLYMER (SSC-12.5-P) OVER

INTERMEDIATE COURSE: 3" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT OVER 3" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT OVER 3" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER

SUBBASE: 8" GRAVEL BORROW (M1.03.0 TYPE B) GRAVEL BORROW (M1.03.0 TYPE B) (TO BE USED AS DIRECTED BY THE ENGINEER)

PROP. PAVEMENT MICROMILLING AND OVERLAY

SURFACE COURSE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER

SURFACE MILLING: 1¾" PAVEMENT MICROMILLING TO MATCH EXISTING CROSS SLOPE

PROP. SHARED USE PATH SHOULDER

SURFACE: 4" PAVEMENT MILLING MULCH OVER WEED CONTROL FABRIC OVER

FOUNDATION: 8" GRAVEL BORROW (M1.03.0 TYPE B)

PROP. FULL DEPTH HMA CONSTRUCTION-TEMPORARY CROSSOVER

SURFACE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER ASPHALT EMULSION FOR TACK COAT OVER

INTERMEDIATE COURSE: 2½" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER

SUBBASE: 8" GRAVEL BORROW (M1.03.0 TYPE B)

PROP. HMA FOR BRIDGE OVER NASHOBA BROOK

SURFACE COURSE: 1½" SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5) OVER

PROTECTIVE COURSE: 1½" SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 (SPC-B-9.5)

FOUNDATION: MEMBRANE WATERPROOFING OVER 8" REINFORCED CONCRETE DECK

PROP. GRAVEL DRIVEWAY

SURFACE COURSE: 12" GRAVEL BORROW (M1.03.0 TYPE B)

PROP. REST AREAS

SURFACE COURSE: 1¾" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER ASPHALT EMULSION FOR TACK COAT OVER

INTERMEDIATE COURSE: 2½" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER

SUBBASE: 8" GRAVEL BORROW (M1.03.0 TYPE B)

TACK COAT

ASPHALT EMULSION FOR TACK COAT SHALL BE APPLIED AT THE RATE OF 0.07 GAL/SY FOR MILLED SURFACES AND 0.05 GAL/SY FOR SMOOTH TIGHT PAVED SURFACES.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	158
PROJECT FILE NO.	606223		

TYPICAL SECTIONS

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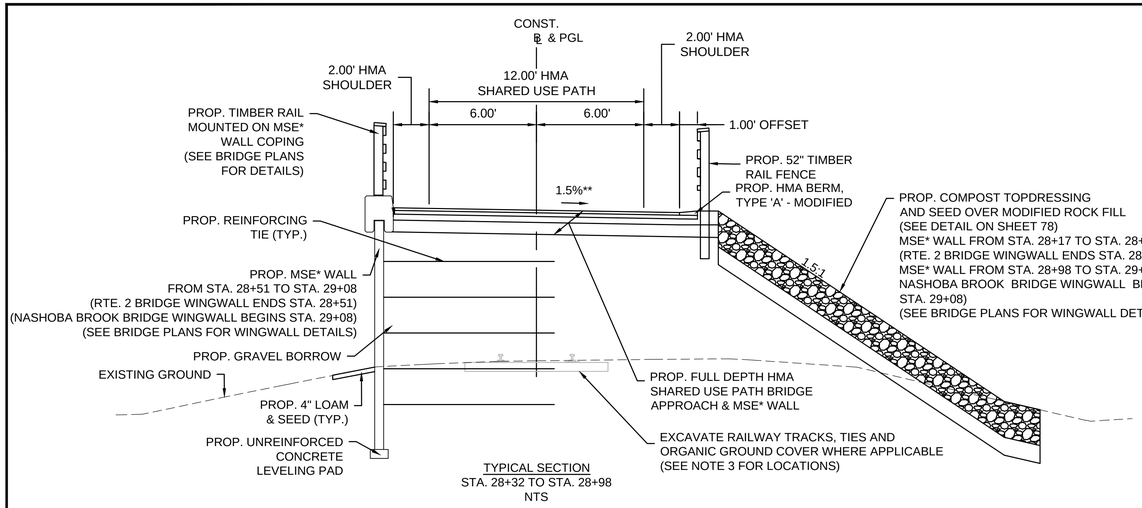
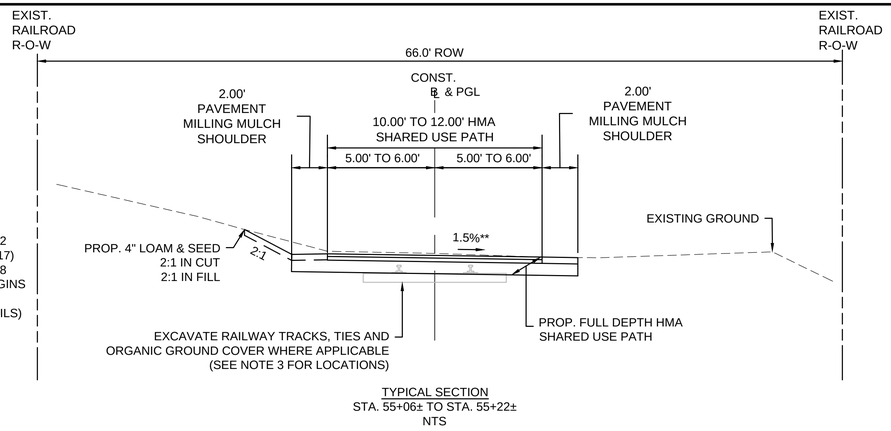
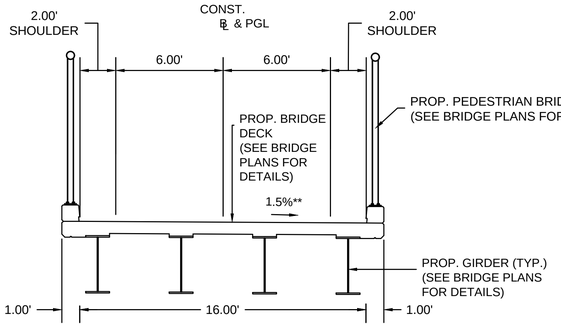


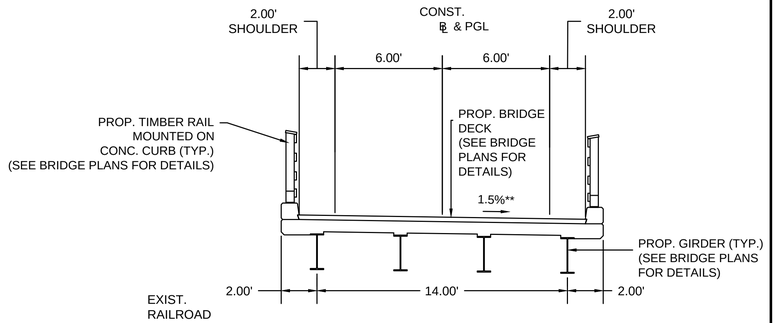
TYPICAL SECTION
STA. 28+32 TO STA. 28+98
NTS



TYPICAL SECTION
STA. 55+06± TO STA. 55+22±
NTS



TYPICAL SECTION
BRIDGE SECTION OVER RTE. 2
STA. 23+50 TO STA. 24+50
STA. 25+04 TO STA. 28+08
NTS



TYPICAL SECTION
STA. 30+95 TO STA. 31+75
NTS

TYPICAL SECTION
BRIDGE SECTION OVER NASHOBA BROOK
STA. 29+31 TO STA. 29+81
NTS

TYPICAL SECTION
STA. 24+25 TO STA. 24+73
STA. 30+05 TO STA. 30+95
NTS

NOTES:

1. THE SECTIONS OF PROPOSED SHARED USE PATH NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFORE HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.

2. CONTRACTOR SHALL REMOVE EXISTING ORGANIC MATERIAL (ABOVE RAILROAD BALLAST) THAT IS UNSUITABLE FOR REUSE AND DISPOSE OF THIS MATERIAL OUTSIDE OF THE PROJECT LIMITS. IT IS ASSUMED THAT ALL OTHER EXCAVATED SUITABLE MATERIAL WILL REMAIN WITHIN THE PROJECT LIMITS. SEE SPECIAL PROVISIONS FOR DETAILS.

3. EXCAVATE RAILROAD TRACKS AND TIES FROM STA. 14+15 TO STA. 25+64, STA. 26+39 TO STA. 26+84, AND STA. 27+64 TO STA. 55+20.

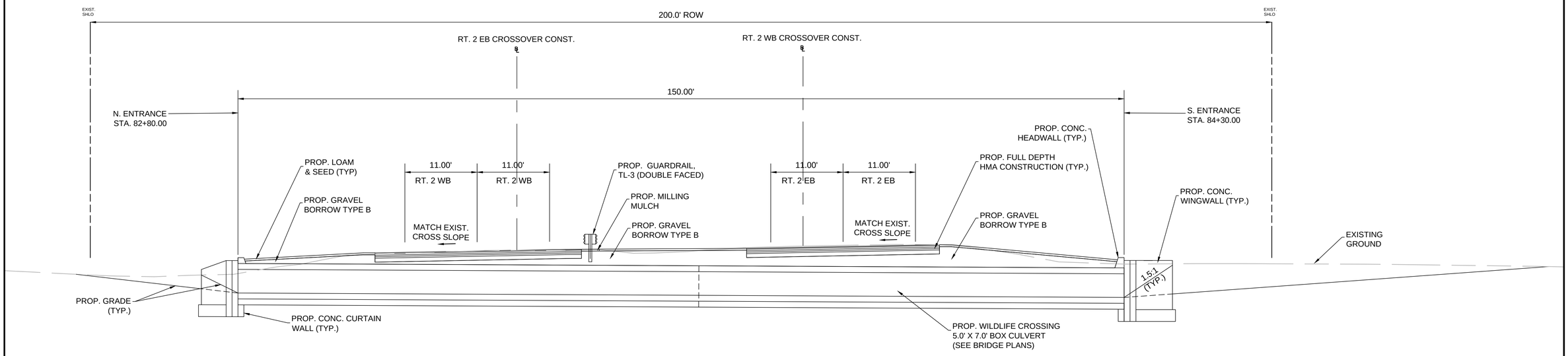
*MSE: MECHANICALLY STABILIZED EARTH

**TOLERANCE FOR CONSTRUCTION ±0.5%

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	158
PROJECT FILE NO.	606223		

TYPICAL SECTIONS



ROUTE 2 TYPICAL SECTION
OVER WILDLIFE CROSSING
NTS

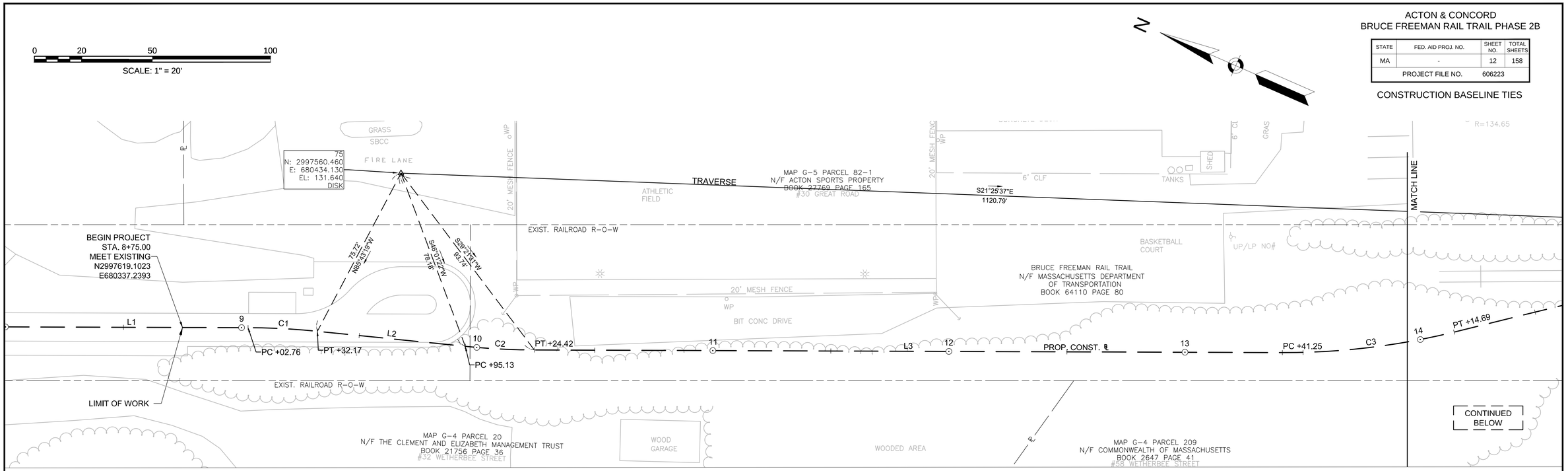
606223_HD_(TYP).DWG Plotted on 4-Feb-2019 2:57 PM

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019

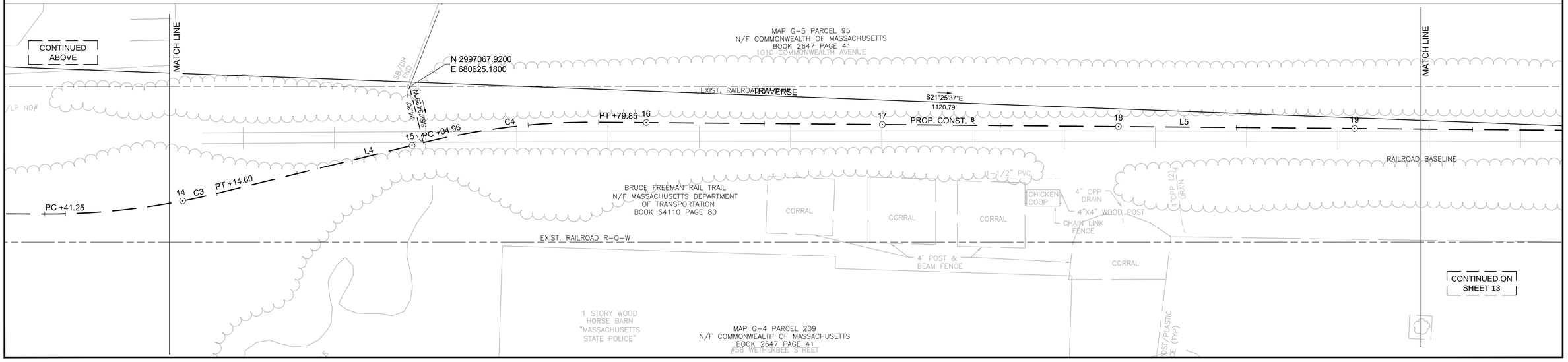


BFRT 2B CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	8+00.00	2997687.9239	680307.430		S23° 25' 09"E 102.76'	9+02.76	2997593.6328	680348.2712
C1	9+02.76	2997593.6328	680348.271	R=300.00' Δ=5°37'07" L=29.42' T=14.72'		9+32.17	2997566.1084	680358.6224
L2	9+32.17	2997566.1084	680358.622		S17° 48' 03"E 62.95'	9+95.13	2997506.1709	680377.8672
C2	9+95.13	2997506.1709	680377.867	R=300.00' Δ=5°35'44" L=29.30' T=14.66'		10+24.42	2997478.7571	680388.1705
L3	10+24.42	2997478.7571	680388.171		S23° 23' 47"E 316.82'	13+41.25	2997187.9841	680513.9767

BFRT 2B CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C3	13+41.25	2997187.9841	680513.977	R=300.00' Δ=14°01'34" L=73.44' T=36.90'		14+14.69	2997124.8046	680551.0577
L4	14+14.69	2997124.8046	680551.058		S37° 25' 21"E 90.28'	15+04.96	2997053.1103	680605.9167
C4	15+04.96	2997053.1103	680605.917	R=300.00' Δ=14°18'12" L=74.89' T=37.64'		15+79.85	2996988.5972	680643.5709
L5	15+79.85	2996988.5972	680643.571		S23° 07' 09"E 495.98'	20+75.83	2996532.4505	680838.3133

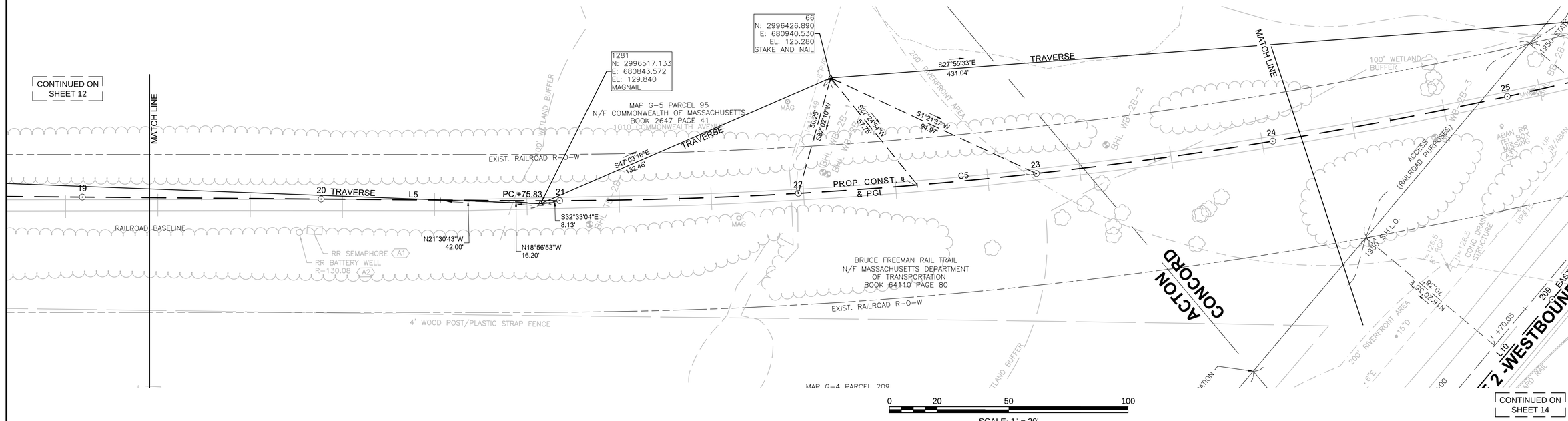


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019



0 20 50 100
SCALE: 1" = 20'

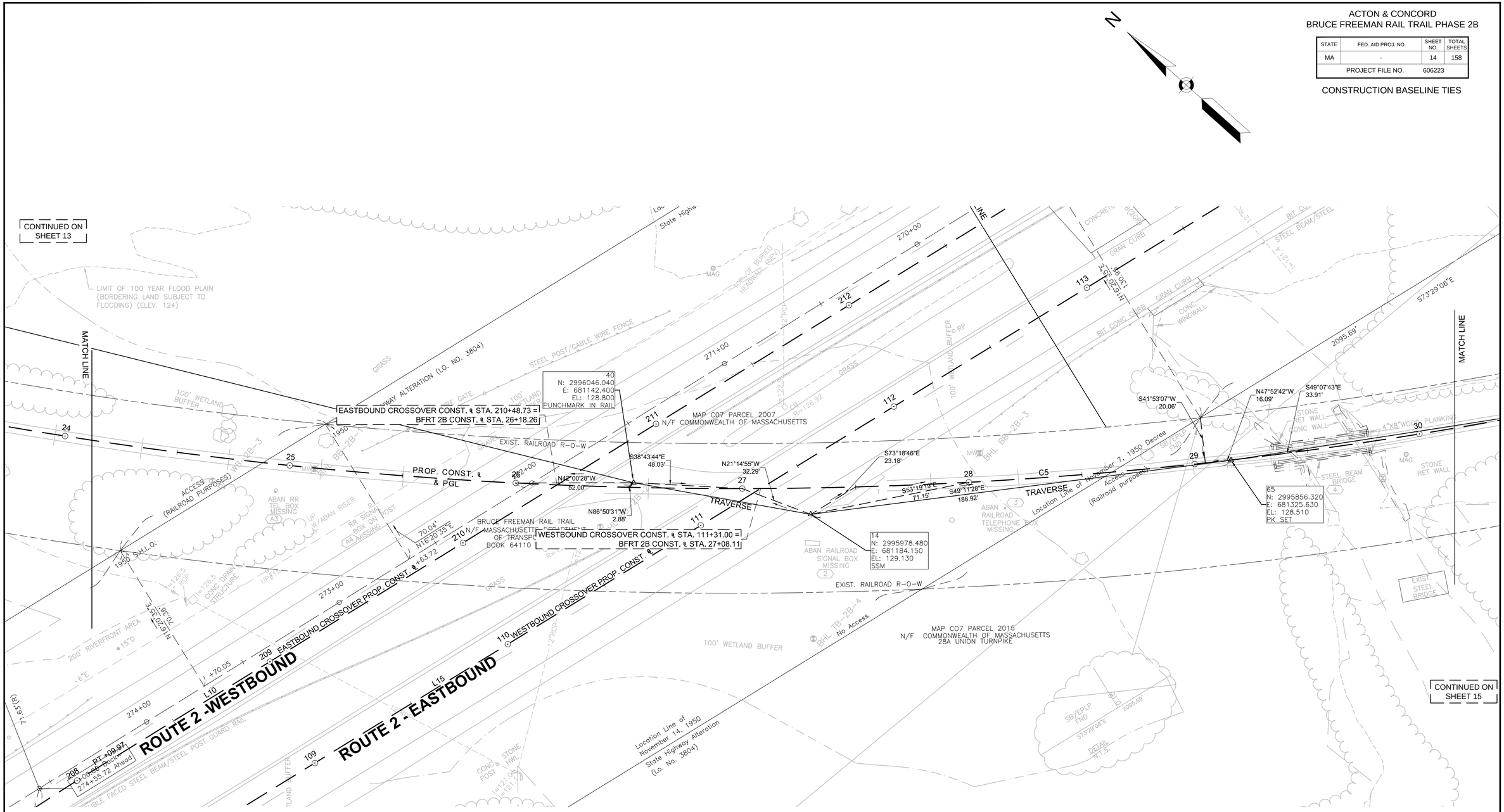
BFRT 2B CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L5	15+79.85	2996988.5972	680643.571		S23° 07' 09"E 495.98'	20+75.83	2996532.4505	680838.3133
C5	20+75.83	2996532.4505	680838.313	R=1900.00' Δ=37°56'23" L=1258.13' T=653.10'		33+33.96	2995615.7512	681666.2922

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019



BFRT 2B CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C5	20+75.83	2996532.4505	680838.313	R=1900.00' Δ=37°56'23" L=1258.13' T=653.10'		33+33.96	2995615.7512	681666.2922

NOTE:
1. FOR ROUTE 2 BASELINE TIES SEE SHEETS 18-20.

0 20 50 100
SCALE: 1" = 20'

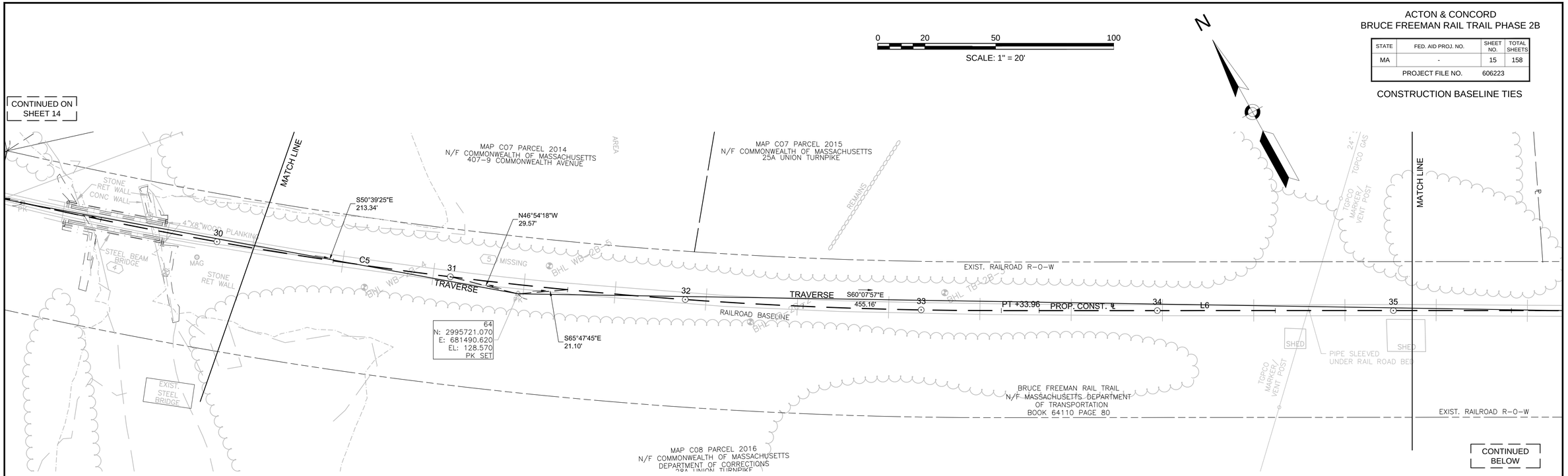
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

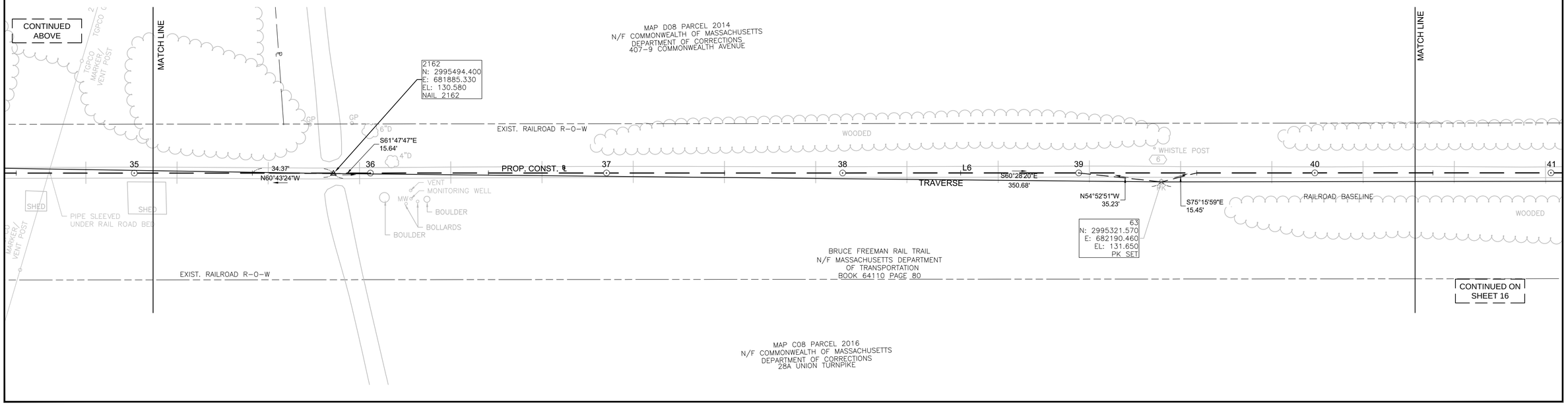
606223_HD_(BLT).DWG 4-Feb-2019

SCALE: 1" = 20'



BFRT 2B CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C5	20+75.83	2996532.4505	680838.313	R=1900.00' Δ=37°56'23" L=1258.13' T=653.10'		33+33.96	2995615.7512	681666.2922
L6	33+33.96	2995615.7512	681666.292		S61° 03' 31"E 1596.78'	49+30.74	2994843.0483	683063.6623



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

4-Feb-2019
606223_HD_(BLT).DWG

0 20 50 100
SCALE: 1" = 20'

N

MATCH LINE

CONTINUED ON SHEET 15

MAP D08 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
407-9 COMMONWEALTH AVENUE

WOODED

EXIST. RAILROAD R-O-W

40 41 L6 42 43 PROP. CONST. ℄ 44 45 46

RAILROAD BASELINE

TRAVERSE S61°07'52"E 486.28'

TRAVERSE S60°58'16"E 292.76'

N52°34'40"W 21.54'

S67°22'37"E 28.87'

BATTERY WELL

62
N: 2995086.790
E: 682616.310
EL: 134.610
PK SET

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

12"VCP UNKNOWN

DMH R=128.54

12" VCP I=125.5

I=122.4

I=121.8

UNKNOWN CONNECTION

WHISTLE POST 7

I=121.2

DMH R=128.34

I=120.8

CONTINUED BELOW

BFRT 2B CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L6	33+33.96	2995615.7512	681666.292		S61° 03' 31"E 1596.78'	49+30.74	2994843.0483	683063.6623
C6	49+30.74	2994843.0483	683063.662	R=1814.00' Δ=17°34'17" L=556.31' T=280.36'		54+87.05	2994503.9741	683501.9474

CONTINUED ABOVE

MATCH LINE

MAP D08 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
407-9 COMMONWEALTH AVENUE

TRAVERSE S79°47'24"E 252.63'

59
N: 2994899.950
E: 683120.920
EL: 146.610
STAKE AND NAIL

94.07' S65°21'52"W

80.72' S45°10'45"W

S1°41'14"E 91.67'

TRAVERSE S35°28'27"E 201.42'

CEMETERY LIMITS

DMH(R) NOT FND

EXIST. RAILROAD R-O-W

N46°36'29"W 14.52'

46 47 PROP. CONST. ℄ 48 L6 49 PC +30.74 50 C6 51

TRAVERSE S60°58'16"E 292.76'

S66°49'02"E 36.12'

58
N: 2994735.920
E: 683237.810
EL: 139.000
PK SET

60
N: 2994944.730
E: 682872.290
EL: 136.670
PK SET

WHISTLE POST 7

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

DMH(R) NOT FND

UP ABAN

UP ABAN

EXIST. RAILROAD R-O-W

I=121.2

I=120.5

CULTIVATED AREA

℄

37Y COMMONWEALTH AVENUE
MAP D08 PARCEL 2157

N/F
TOWN OF CONCORD
(SELECT BOARD)
BOOK 71342 PAGE 563

37B COMMONWEALTH AVENUE
MAP D08 PARCEL 2158

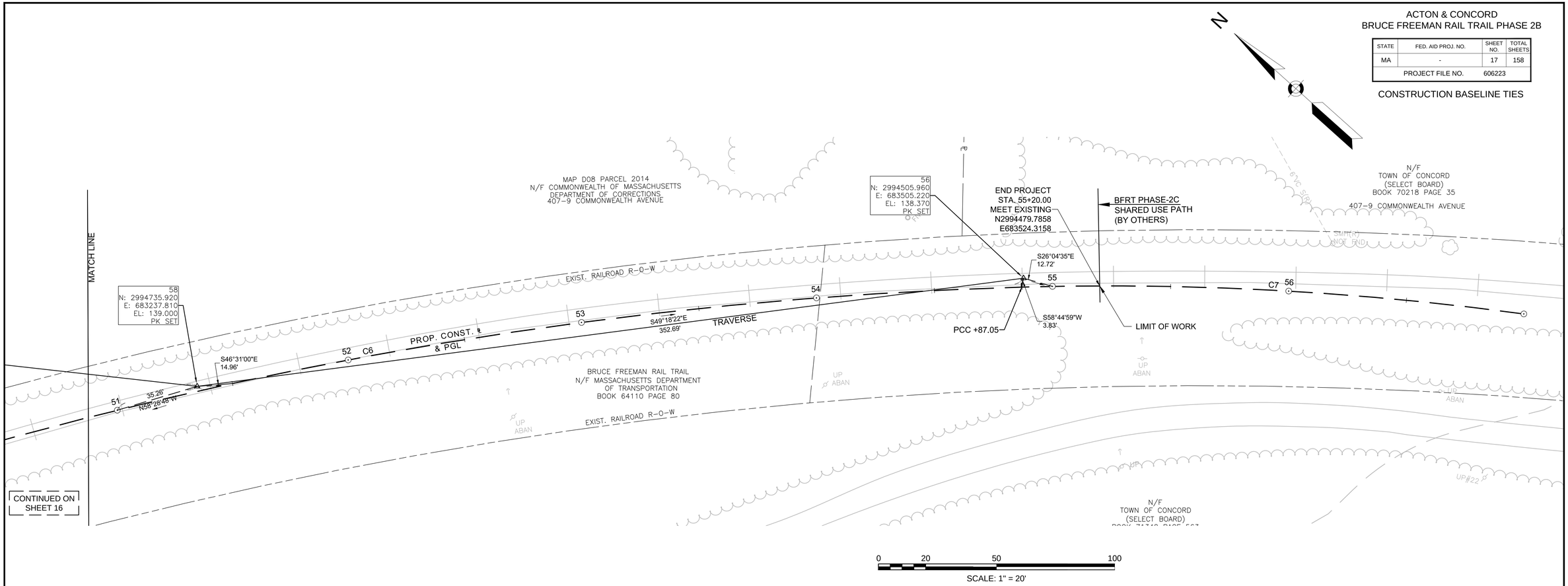
CONTINUED ON SHEET 17

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019



BFRT 2B CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C6	49+30.74	2994843.0483	683063.662	R=1814.00' Δ=17°34'17" L=556.31' T=280.36'		54+87.05	2994503.9741	683501.9474
C7	54+87.05	2994503.9741	683501.947	R=1300.00' Δ=9°23'07" L=212.95' T=106.71'		57+00.00	2994338.1901	683635.2164

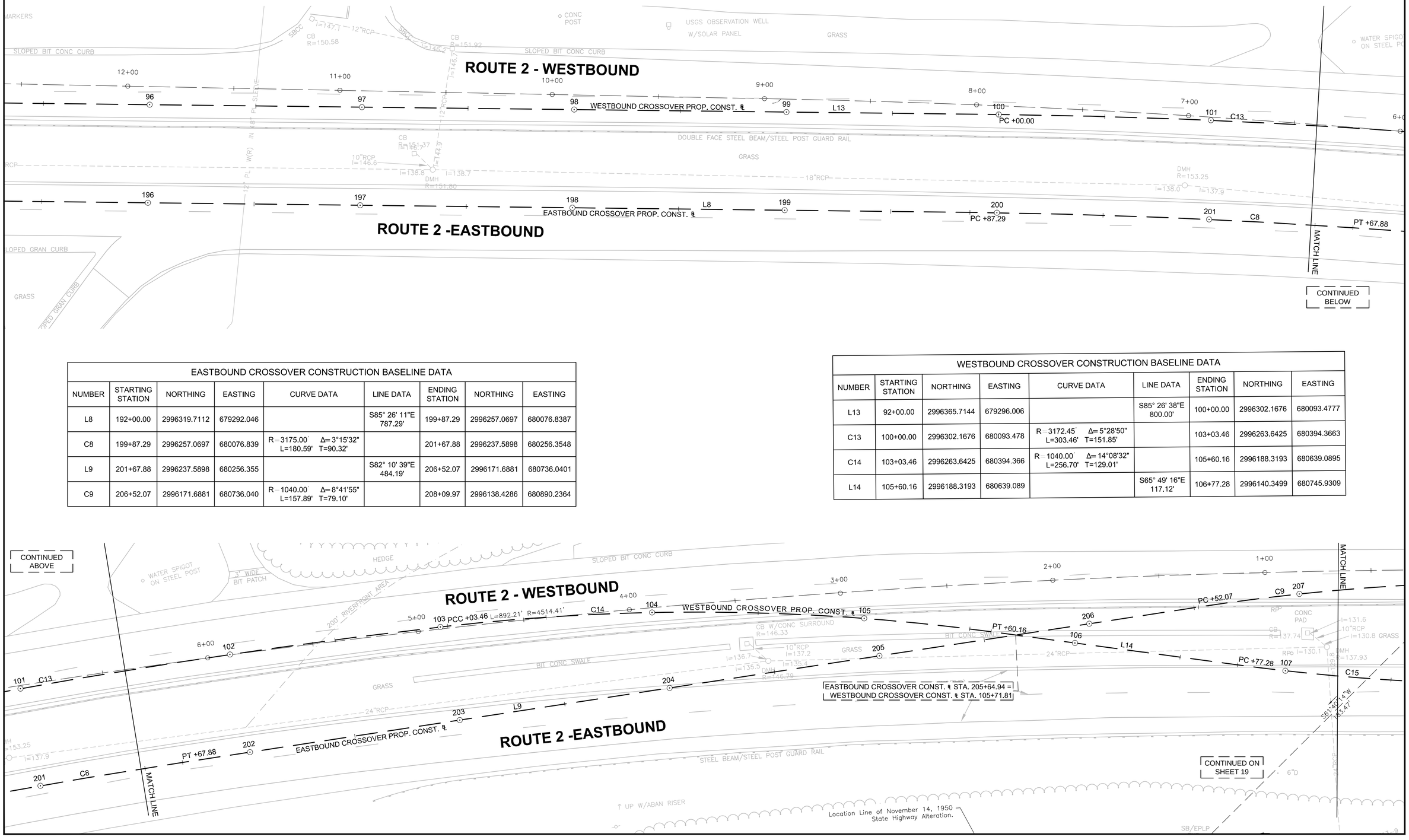
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019

0 20 50 100
SCALE: 1" = 20'



WESTBOUND CROSSOVER CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L13	92+00.00	2996365.7144	679296.006		S85° 26' 38"E 800.00'	100+00.00	2996302.1676	680093.4777
C13	100+00.00	2996302.1676	680093.478	R=3172.45' Δ=5°28'50" L=303.46' T=151.85'		103+03.46	2996263.6425	680394.3663
C14	103+03.46	2996263.6425	680394.366	R=1040.00' Δ=14°08'32" L=256.70' T=129.01'		105+60.16	2996188.3193	680639.0895
L14	105+60.16	2996188.3193	680639.089		S65° 49' 16"E 117.12'	106+77.28	2996140.3499	680745.9309

EASTBOUND CROSSOVER CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L8	192+00.00	2996319.7112	679292.046		S85° 26' 11"E 787.29'	199+87.29	2996257.0697	680076.8387
C8	199+87.29	2996257.0697	680076.839	R=3175.00' Δ=3°15'32" L=180.59' T=90.32'		201+67.88	2996237.5898	680256.3548
L9	201+67.88	2996237.5898	680256.355		S82° 10' 39"E 484.19'	206+52.07	2996171.6881	680736.0401
C9	206+52.07	2996171.6881	680736.040	R=1040.00' Δ=8°41'55" L=157.89' T=79.10'		208+09.97	2996138.4286	680890.2364

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

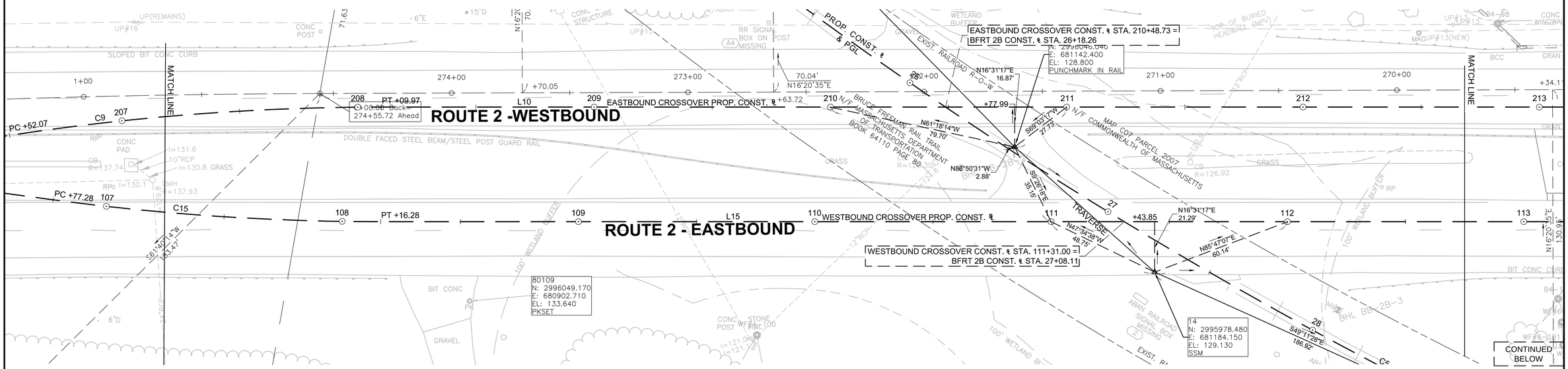
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	158
PROJECT FILE NO.	606223		

CONSTRUCTION BASELINE TIES

606223_HD_(BLT).DWG 4-Feb-2019

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET 18



EASTBOUND CROSSOVER CONSTRUCTION BASELINE DATA

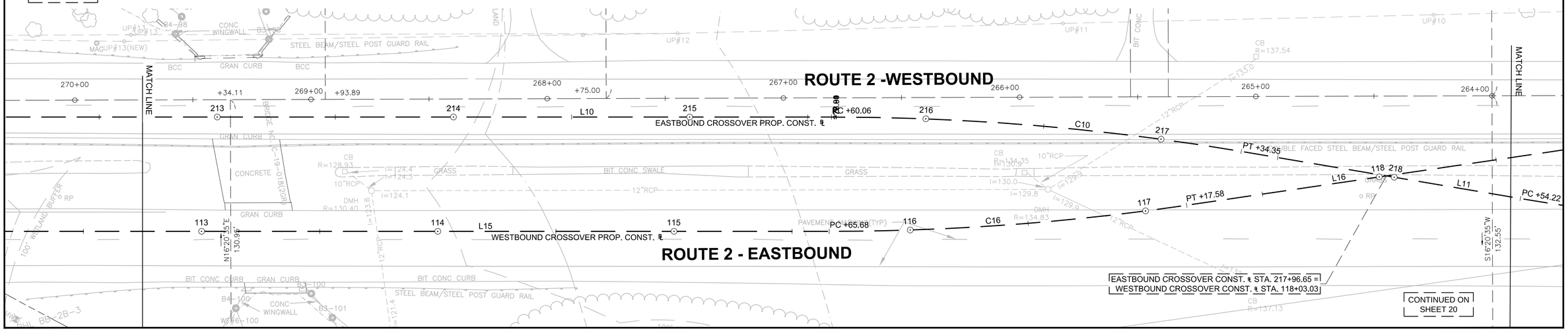
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C9	206+52.07	2996171.6881	680736.040	R=1040.00' Δ=8°41'55" L=157.89' T=79.10'		208+09.97	2996138.4286	680890.2364
L10	208+09.97	2996138.4286	680890.236		S73° 28' 43"E 750.10'	215+60.06	2995925.1221	681609.3639
C10	215+60.06	2995925.1221	681609.364	R=1040.00' Δ=9°36'06" L=174.28' T=87.35'		217+34.35	2995861.8242	681771.5289

WESTBOUND CROSSOVER CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
C15	106+77.28	2996140.3499	680745.931	R=1040.00' Δ=7°39'28" L=139.00' T=69.60'		108+16.28	2996092.0483	680876.1565
L15	108+16.28	2996092.0483	680876.157		S73° 28' 43"E 749.41'	115+65.68	2995878.9380	681594.6225
C16	115+65.68	2995878.9380	681594.622	R=1040.00' Δ=8°22'05" L=151.89' T=76.08'		117+17.58	2995846.5123	681742.8770

NOTE:
1. FOR SHARED USE PATH SEE SHEETS 12-17.

CONTINUED ABOVE



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	158
PROJECT FILE NO.	606223		

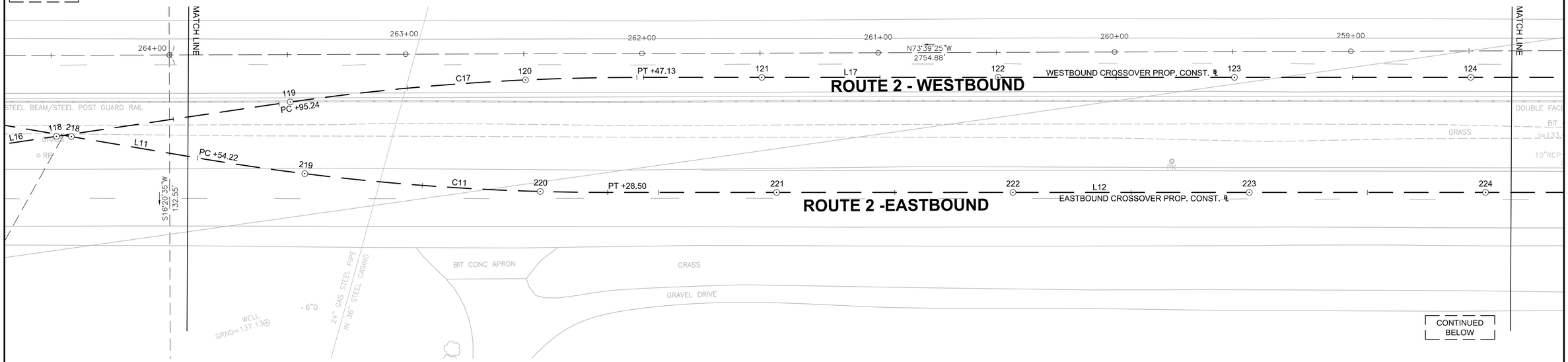
CONSTRUCTION BASELINE TIES

4-Feb-2019

606223_HD_(BLT).DWG

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET 19



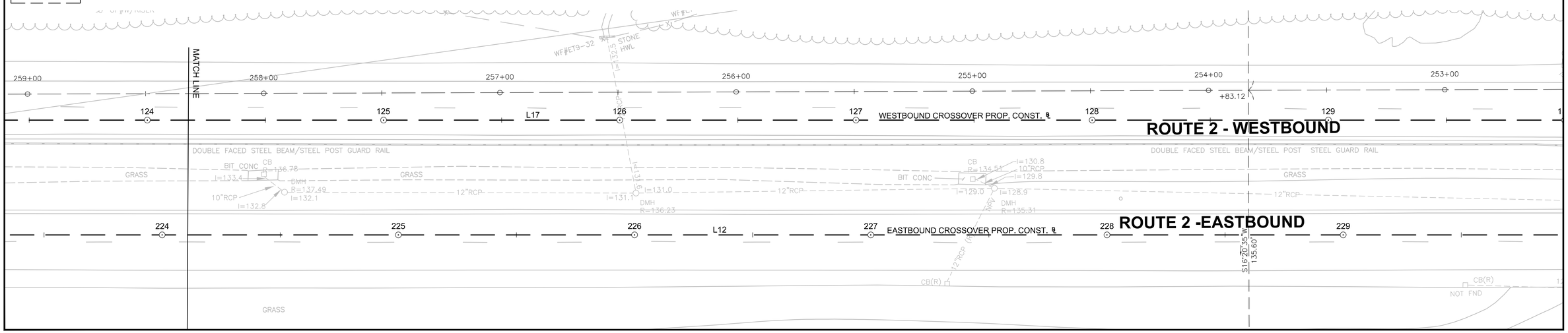
EASTBOUND CROSSOVER CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L11	217+34.35	2995861.8242	681771.529		S63° 52' 37"E 119.87'	218+54.22	2995809.0449	681879.1553
C11	218+54.22	2995809.0449	681879.155	R= 1040.00' Δ= 9°36'06" L=174.28' T=87.35'		220+28.50	2995745.7471	682041.3204
L12	220+28.50	2995745.7471	682041.320		S73° 28' 43"E 1091.55'	231+20.05	2995435.3411	683087.8023

WESTBOUND CROSSOVER CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L16	117+17.58	2995846.5123	681742.877		S81° 50' 48"E 177.66'	118+95.24	2995821.3167	681918.7391
C17	118+95.24	2995821.3167	681918.739	R= 1040.00' Δ= 8°22'05" L=151.89' T=76.08'		120+47.13	2995788.8910	682066.9936
L17	120+47.13	2995788.8910	682066.994		S73° 28' 43"E 1284.19'	133+31.32	2995423.7043	683298.1599

CONTINUED ABOVE



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHEET USE PATH

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

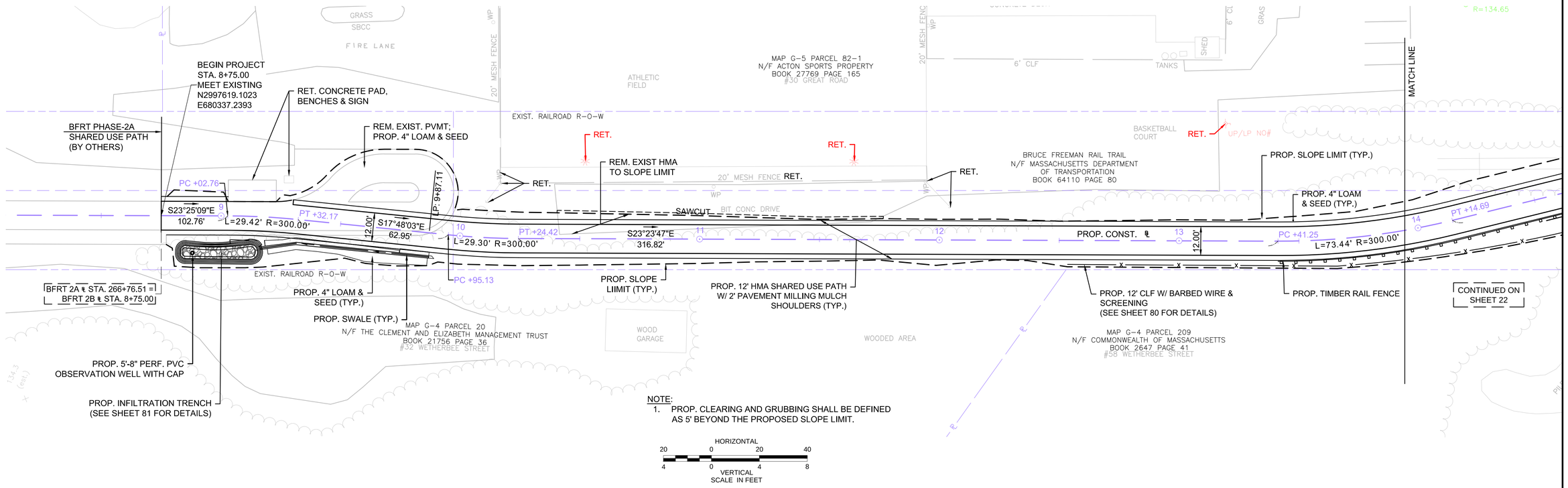
NONE

DRAINAGE DETAILS

SEE BELOW

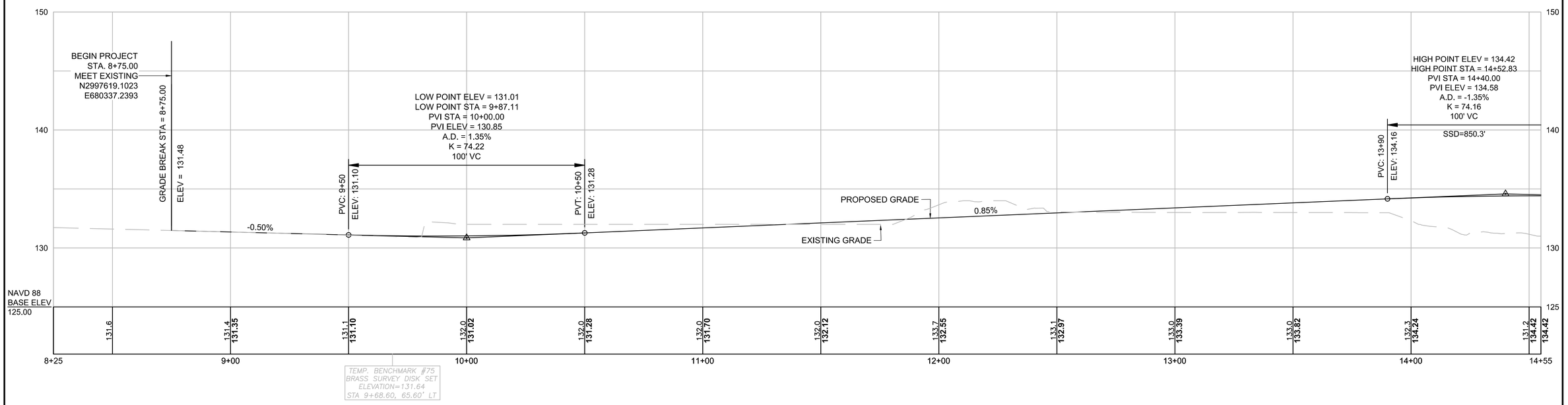
TIMBER RAIL FENCE DETAILS

STA. 13+41 RT TO STA. 20+20 RT - ITEM 655.01



NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET



TEMP. BENCHMARK #75
BRASS SURVEY DISK SET
ELEVATION=131.64
STA 9+68.60, 65.60' LT

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	22	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

4-Feb-2019

606223_HD_(CO).DWG

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

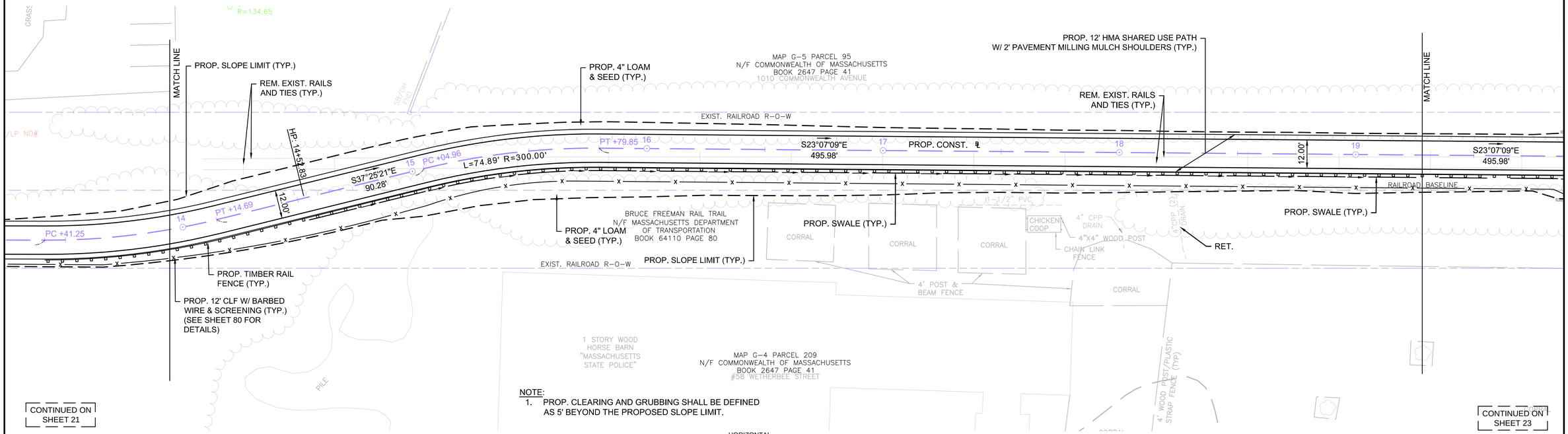
NONE

DRAINAGE DETAILS

SEE BELOW

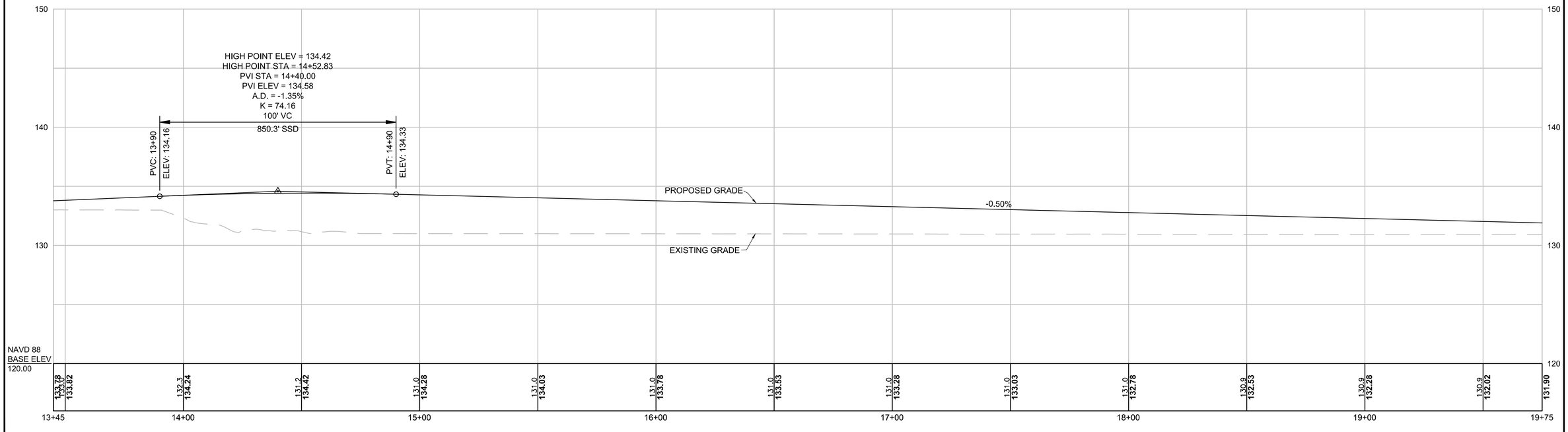
TIMBER RAIL FENCE DETAILS

STA. 13+41 RT TO STA. 20+20 RT - ITEM 655.01



NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	23	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

4-Feb-2019

606223_HD_(CO).DWG

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

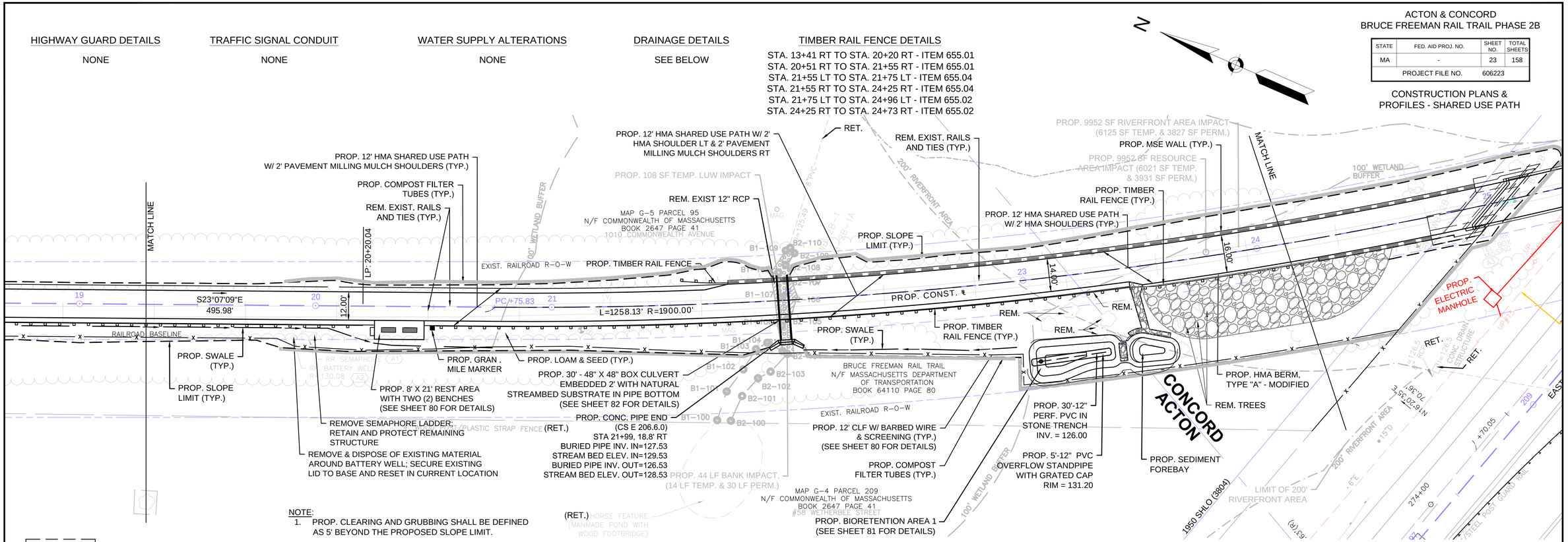
NONE

DRAINAGE DETAILS

SEE BELOW

TIMBER RAIL FENCE DETAILS

STA. 13+41 RT TO STA. 20+20 RT - ITEM 655.01
STA. 20+51 RT TO STA. 21+55 RT - ITEM 655.01
STA. 21+55 LT TO STA. 21+75 LT - ITEM 655.04
STA. 21+55 RT TO STA. 24+25 RT - ITEM 655.04
STA. 21+75 LT TO STA. 24+96 LT - ITEM 655.02
STA. 24+25 RT TO STA. 24+73 RT - ITEM 655.02

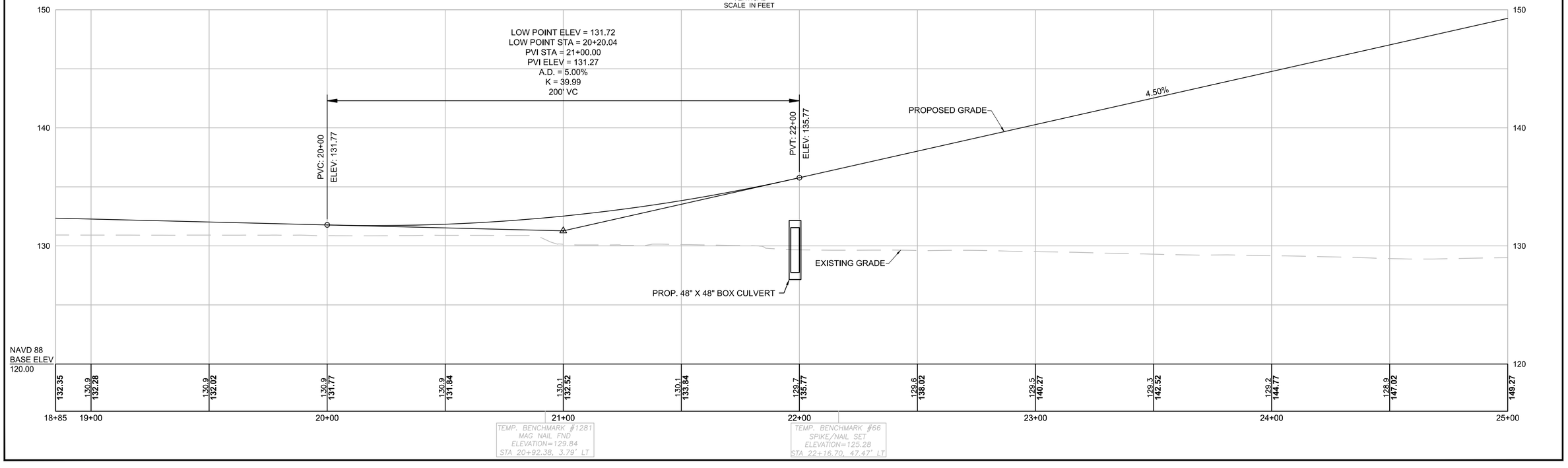


NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

CONTINUED ON SHEET 22

CONTINUED ON SHEET 24

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	24	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

SEE CONSTRUCTION PLANS - ROUTE 2

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

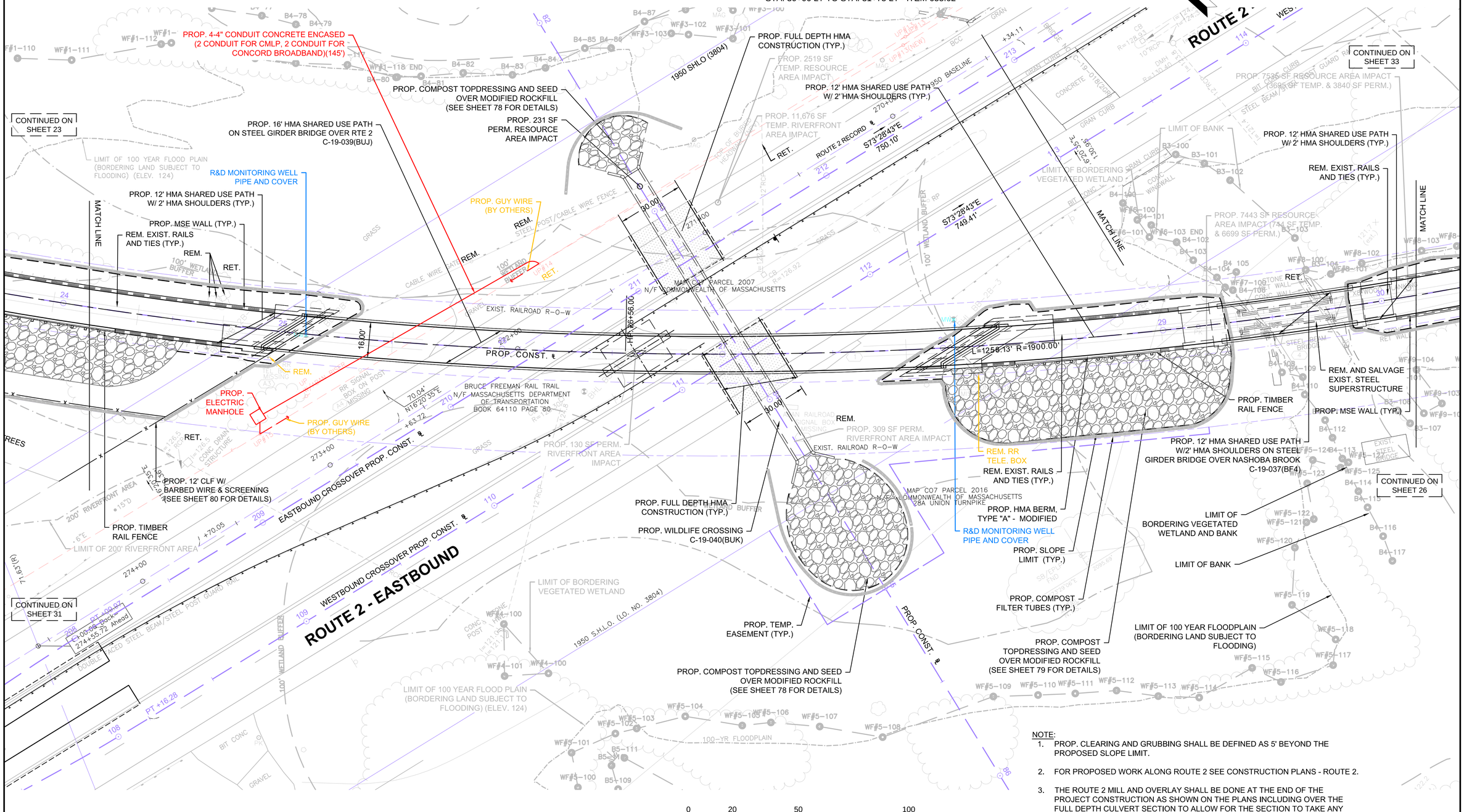
NONE

DRAINAGE DETAILS

SEE BELOW

TIMBER RAIL FENCE DETAILS

STA. 21+55 RT TO STA. 24+25 RT - ITEM 655.04
STA. 21+75 LT TO STA. 24+96 LT - ITEM 655.02
STA. 24+25 RT TO STA. 24+73 RT - ITEM 655.02
STA. 28+17 RT TO STA. 28+32 RT - ITEM 655.02
STA. 28+51 LT TO STA. 29+08 LT - ITEM 655.02
STA. 28+32 RT TO STA. 28+98 RT - ITEM 655.04
STA. 28+98 RT TO STA. 29+08 RT - ITEM 655.02
STA. 30+05 RT TO STA. 30+95 RT - ITEM 655.02
STA. 30+06 LT TO STA. 31+75 LT - ITEM 655.02



NOTE:

1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.
2. FOR PROPOSED WORK ALONG ROUTE 2 SEE CONSTRUCTION PLANS - ROUTE 2.
3. THE ROUTE 2 MILL AND OVERLAY SHALL BE DONE AT THE END OF THE PROJECT CONSTRUCTION AS SHOWN ON THE PLANS INCLUDING OVER THE FULL DEPTH CULVERT SECTION TO ALLOW FOR THE SECTION TO TAKE ANY LOADING OVER THE DURATION OF CONSTRUCTION.

FOR PROFILE: SEE SHEET NO. 25

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	25	158
PROJECT FILE NO.	606223		

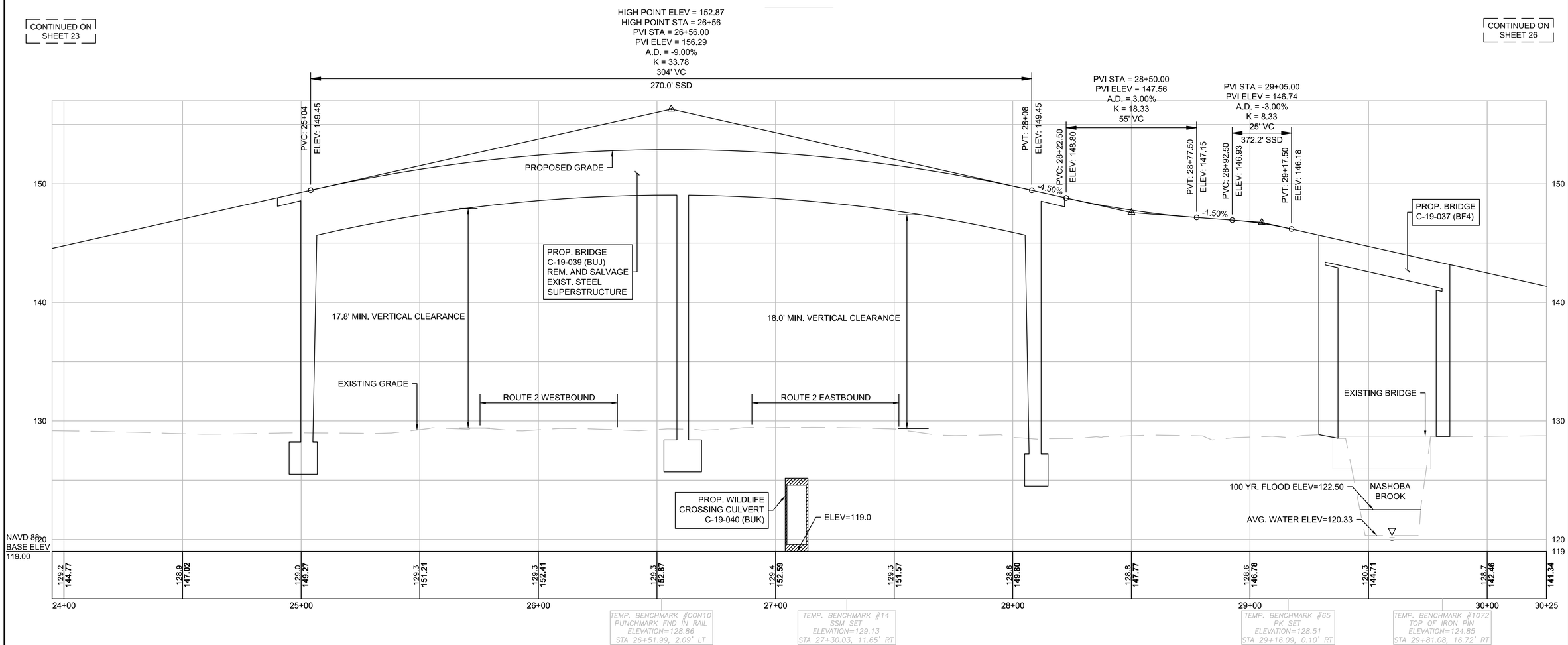
CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

606223_HD_(CO).DWG 4-Feb-2019

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET

CONTINUED ON SHEET 23

CONTINUED ON SHEET 26



FOR CONSTRUCTION PLAN: SEE SHEET NO. 24

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	26	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

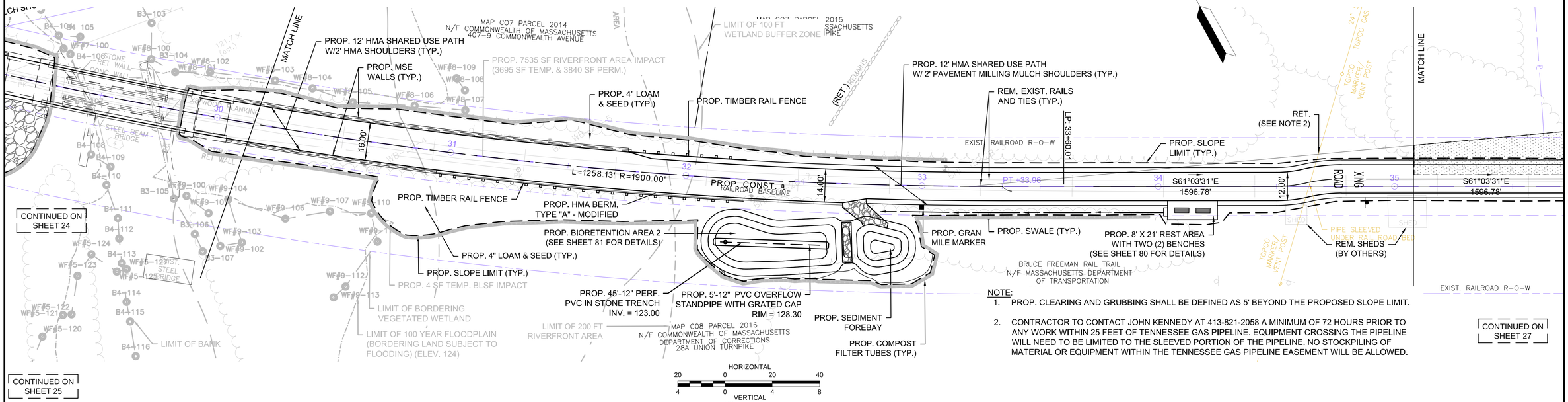
NONE

DRAINAGE DETAILS

SEE BELOW

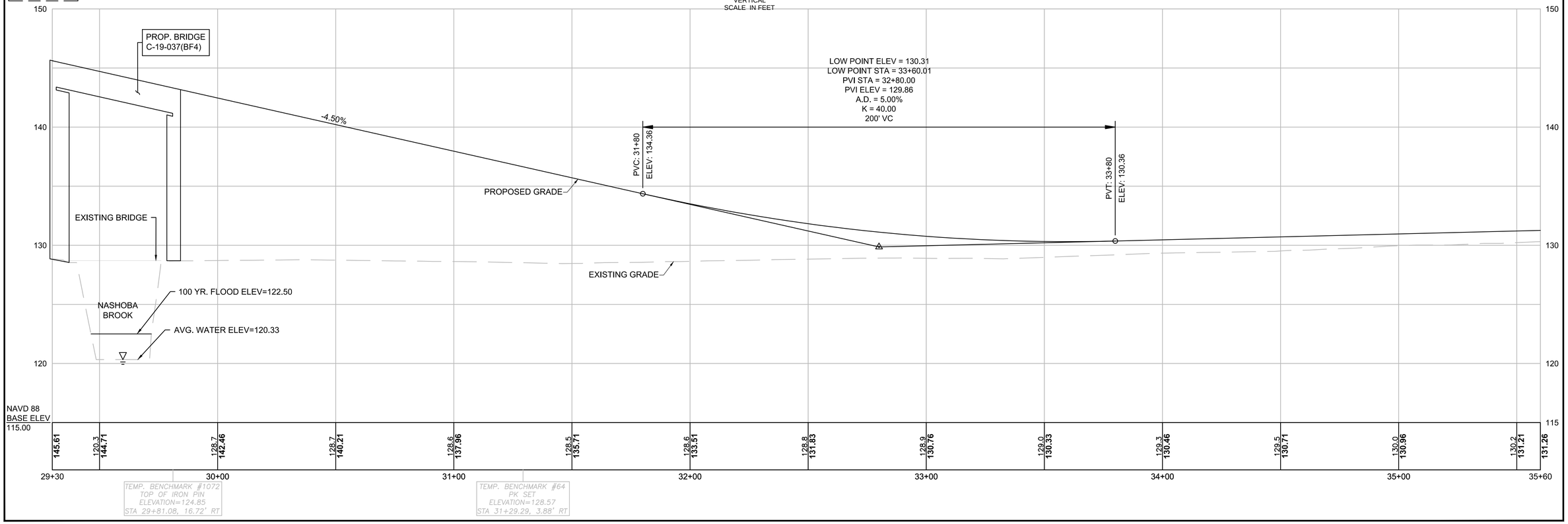
TIMBER RAIL FENCE DETAILS

STA. 30+05 RT TO STA. 30+95 RT - ITEM 655.02
STA. 30+06 LT TO STA. 31+75 LT - ITEM 655.02
STA. 30+95 RT TO STA. 32+25 RT - ITEM 655.04
STA. 31+75 LT TO STA. 32+25 LT - ITEM 655.04



NOTE:

1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.
2. CONTRACTOR TO CONTACT JOHN KENNEDY AT 413-821-2058 A MINIMUM OF 72 HOURS PRIOR TO ANY WORK WITHIN 25 FEET OF TENNESSEE GAS PIPELINE. EQUIPMENT CROSSING THE PIPELINE WILL NEED TO BE LIMITED TO THE SLEEVED PORTION OF THE PIPELINE. NO STOCKPILING OF MATERIAL OR EQUIPMENT WITHIN THE TENNESSEE GAS PIPELINE EASEMENT WILL BE ALLOWED.



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	27	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

4-Feb-2019

606223_HD_(CO).DWG

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

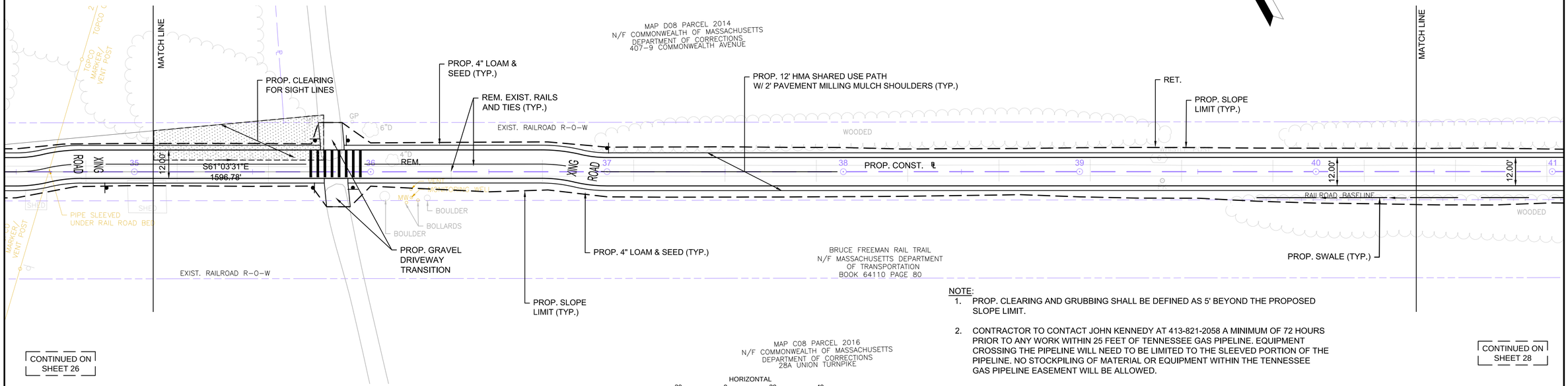
NONE

DRAINAGE DETAILS

SEE BELOW

TIMBER RAIL FENCE DETAILS

NONE



CONTINUED ON SHEET 26

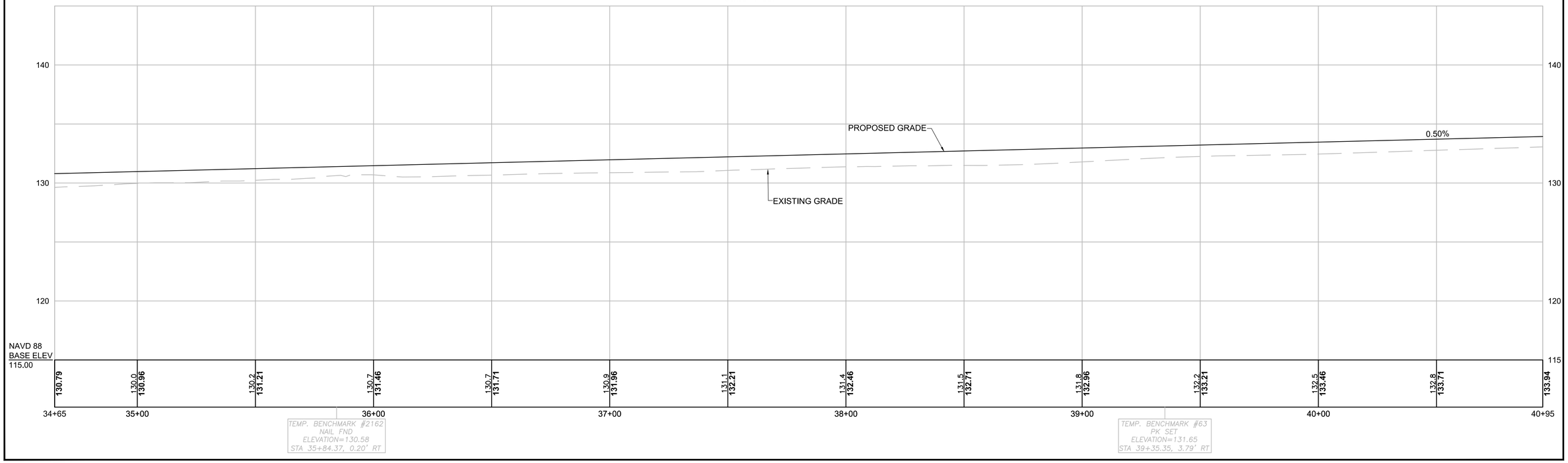
CONTINUED ON SHEET 28

MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET

NOTE:

1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.
2. CONTRACTOR TO CONTACT JOHN KENNEDY AT 413-821-2058 A MINIMUM OF 72 HOURS PRIOR TO ANY WORK WITHIN 25 FEET OF TENNESSEE GAS PIPELINE. EQUIPMENT CROSSING THE PIPELINE WILL NEED TO BE LIMITED TO THE SLEEVED PORTION OF THE PIPELINE. NO STOCKPILING OF MATERIAL OR EQUIPMENT WITHIN THE TENNESSEE GAS PIPELINE EASEMENT WILL BE ALLOWED.



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	28	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

606223_HD_(CO).DWG 4-Feb-2019

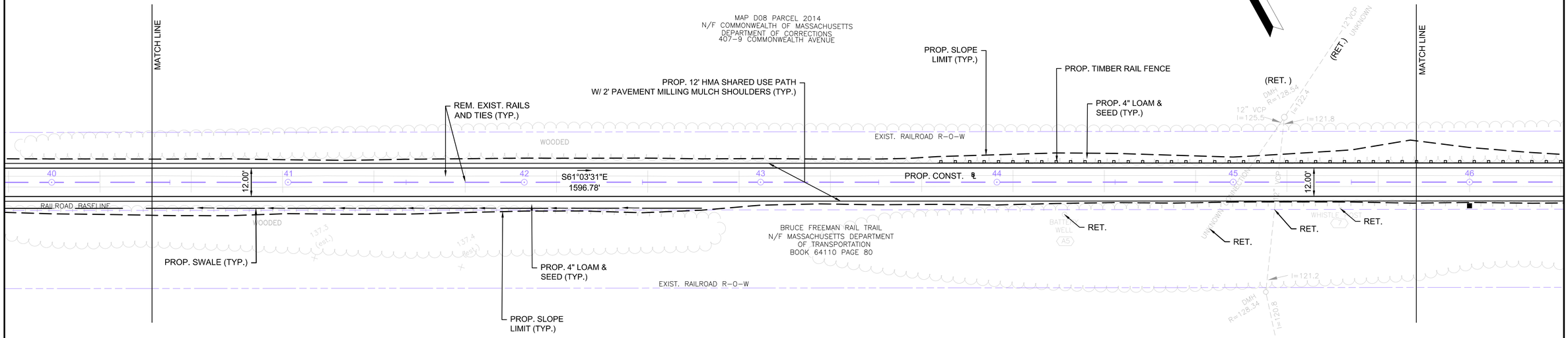
HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE BELOW

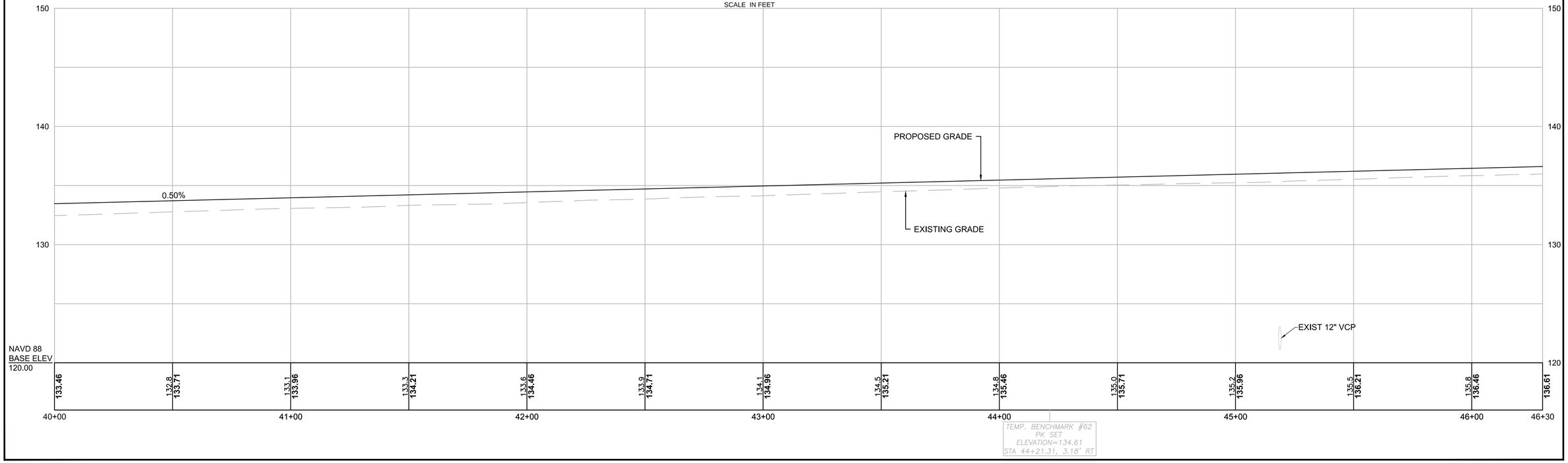
TIMBER RAIL FENCE DETAILS
STA. 43+75 LT TO STA. 47+75 LT - ITEM 655.01



NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET



TEMP. BENCHMARK #62
PK SET
ELEVATION=134.61
STA 44+21.31, 3.18' RT

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	29	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

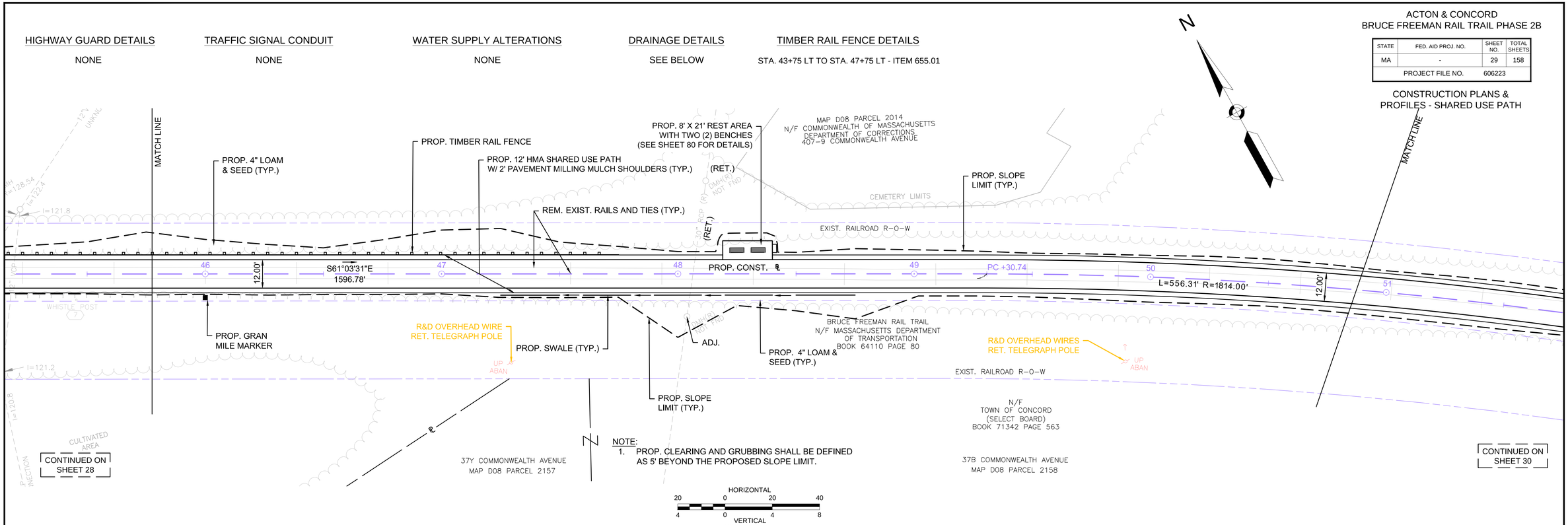
NONE

DRAINAGE DETAILS

SEE BELOW

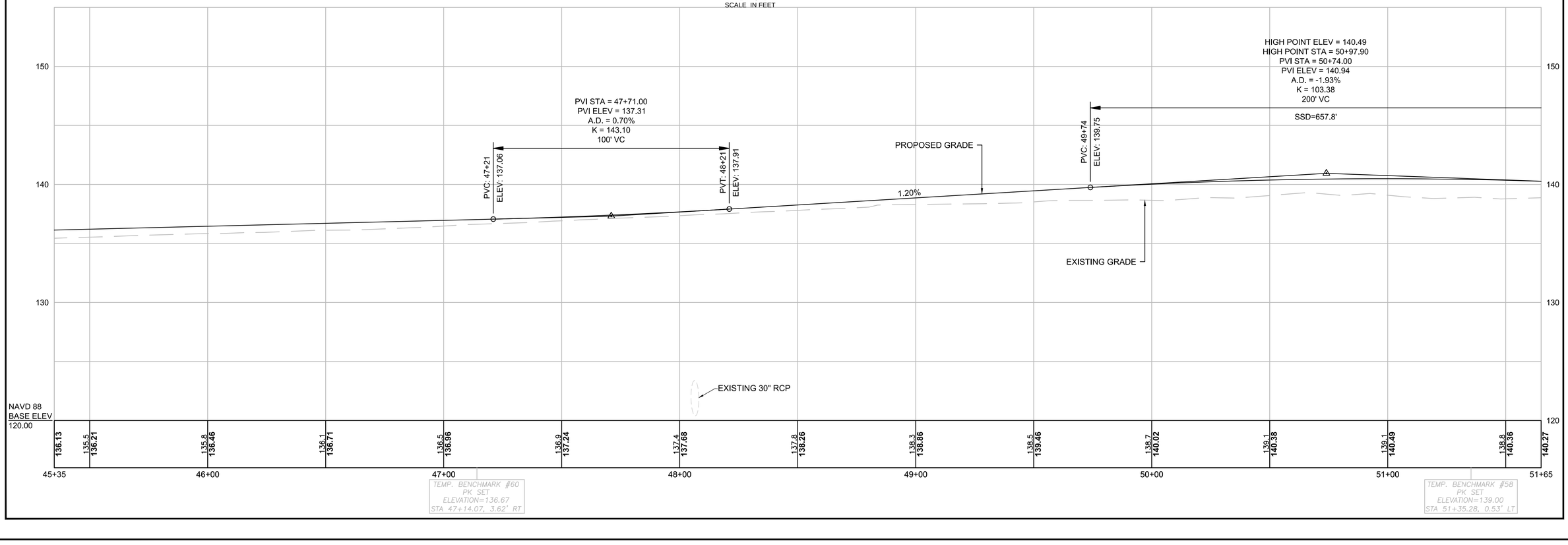
TIMBER RAIL FENCE DETAILS

STA. 43+75 LT TO STA. 47+75 LT - ITEM 655.01



NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

HORIZONTAL
20 0 20 40
4 0 4 8
VERTICAL
SCALE IN FEET



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	30	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS &
PROFILES - SHARED USE PATH

4-Feb-2019

606223_HD_(CO).DWG

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

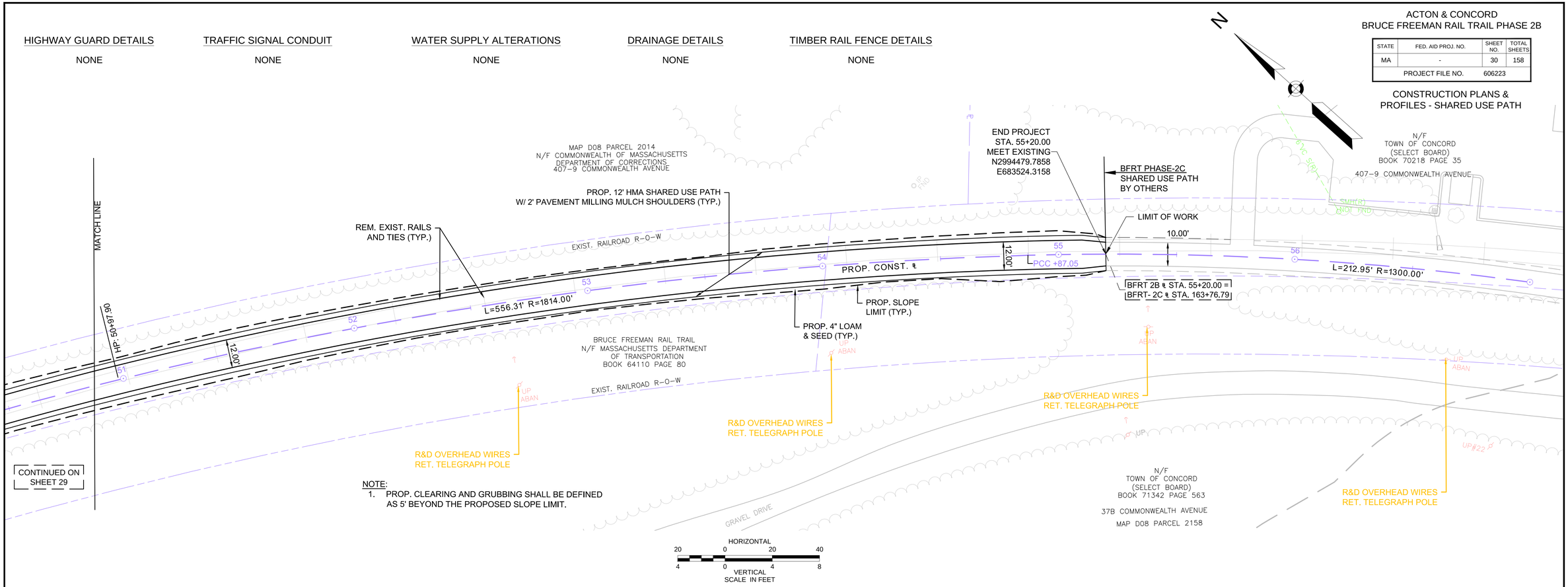
NONE

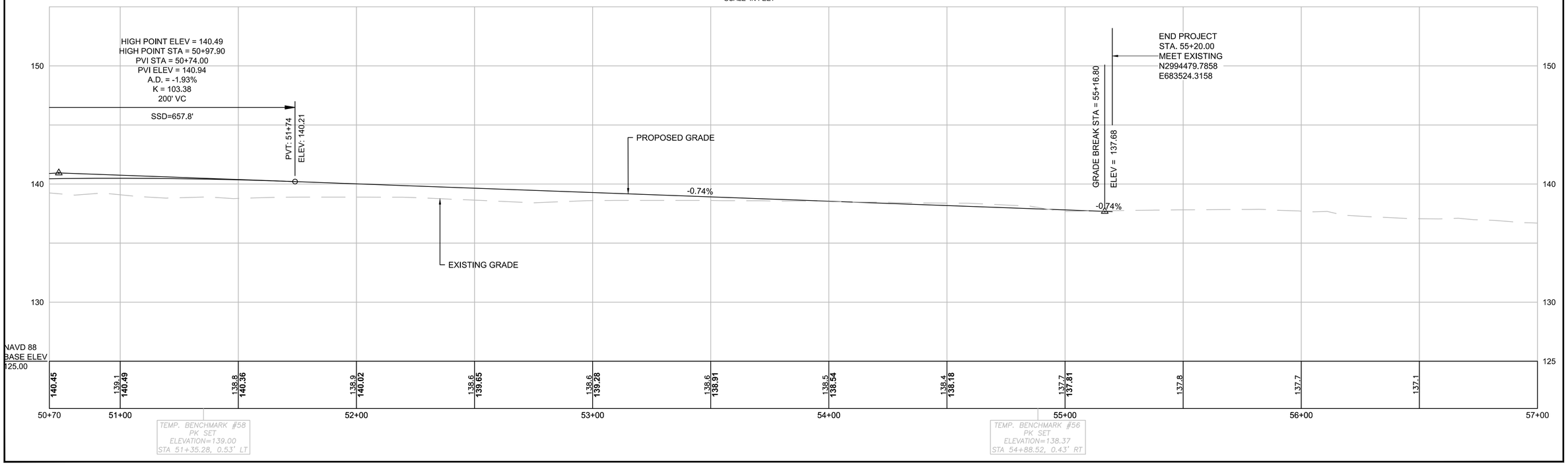
DRAINAGE DETAILS

NONE

TIMBER RAIL FENCE DETAILS

NONE





ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	31	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS - ROUTE 2

4-Feb-2019

606223_HD_(CO).DWG

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

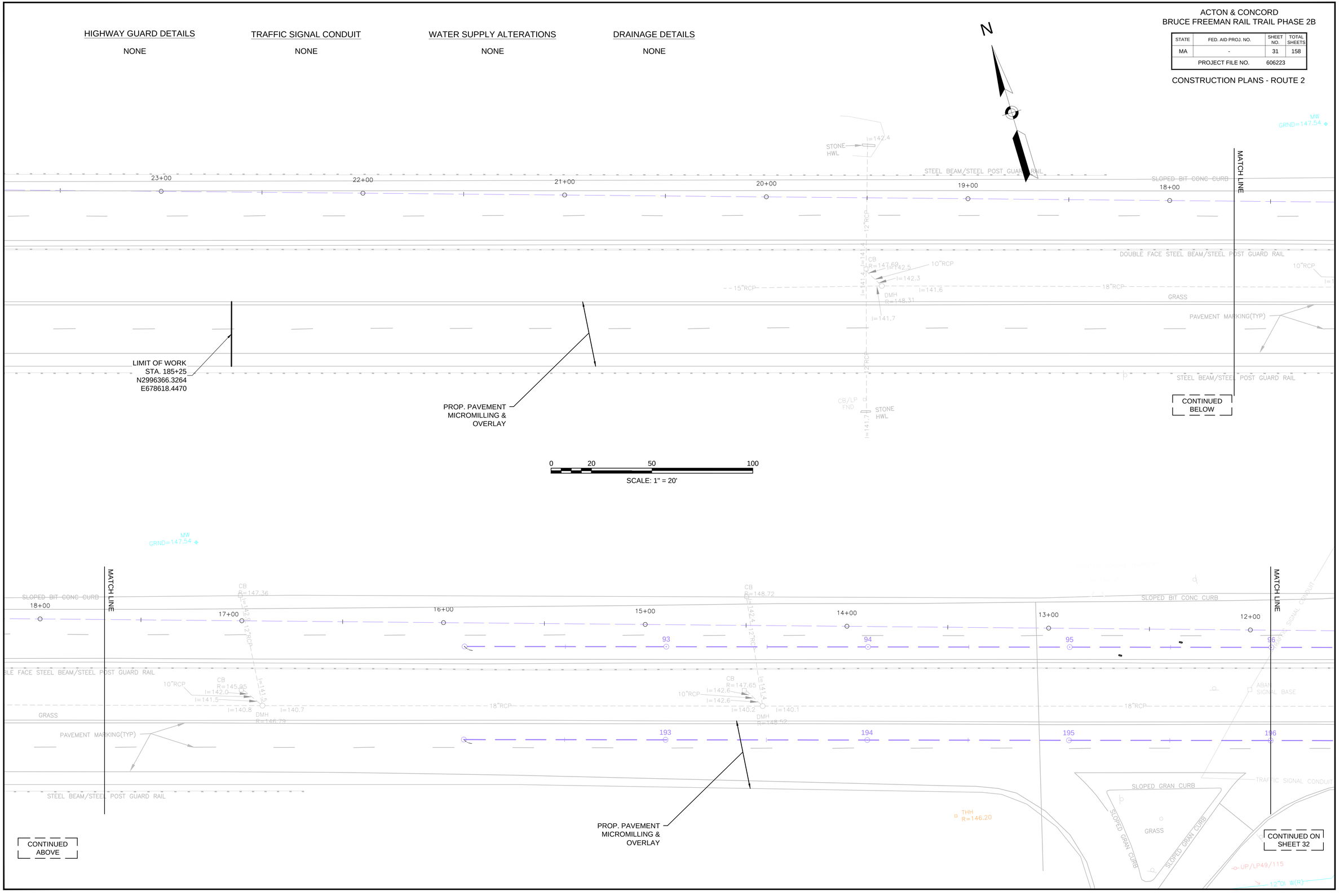
NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	32	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS - ROUTE 2

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

STA. 101+50 RT - ITEM 628.25
STA. 101+58 RT TO STA. 101+92 RT - ITEM 628.21
STA. 101+92 RT TO STA. 111+20 LT - ITEM 621.13

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

N

SCALE: 1" = 20'

ROUTE 2 - WESTBOUND

ROUTE 2 -EASTBOUND

WESTBOUND CROSSOVER PROP. CONST. ℄

EASTBOUND CROSSOVER PROP. CONST. ℄

S85°26'38"E 800.00'

S85°26'11"E 787.29'

S82°10'39"E 484.19'

LIMIT OF WORK
STA. 98+89.44
N2996310.9499
E679983.2657

PROP. PAVEMENT MICROMILLING & OVERLAY

R&D 968' OF HIGHWAY GUARD TO CONSTRUCT CROSSOVER 101+50 RT TO STA. 111+20 LT

PC +00.00
L=303.46' R=3172.45'

PC +87.29
L=180.59' R=3175.00'

PT +67.88

CONTINUED ON SHEET 31

CONTINUED BELOW

CONTINUED ABOVE

MATCH LINE

R&D 968' OF HIGHWAY GUARD TO CONSTRUCT CROSSOVER STA. 101+50 RT TO STA. 111+20 LT,

PROP. PAVEMENT MICROMILLING & OVERLAY

PROP. HIGHWAY GUARDRAIL (TL-3) (TYP.)

L=892.21' R=4514.41'

103 PCC +03.46
L=256.70' R=1040.00'

REM. HMA SWALE

EASTBOUND CROSSOVER ℄ STA. 205+64.94, 0.00' =
WESTBOUND CROSSOVER ℄ STA. 105+71.81

SAWCUT

PC +52.07
L=157.89' R=1040.00'

PT +60.16

PC +77.28
L=139.00' R=1040.00'

2.0' TYP

PROP. FULL DEPTH HMA PAVEMENT FOR TEMPORARY CROSSOVER

1950 SHLO (3804)

HIGHWAY GUARD DETAILS

STA. 101+50 RT - ITEM 628.25
STA. 101+58 RT TO STA. 101+92 RT - ITEM 628.21
STA. 101+92 RT TO STA. 111+20 RT - ITEM 621.13
STA. 210+62 RT TO STA. 222+35 RT - ITEM 621.13

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	33	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS - ROUTE 2

4-Feb-2019

606223_HD_(CO).DWG

N

ROUTE 2 - EASTBOUND

MATCH LINE
CONTINUED ON SHEET 32
CONCORD
ACTON
STEEL BEAM/STEEL POST GUARD RAIL
DOUBLE FACED STEEL BEAM/STEEL POST GUARD RAIL
PROP. PAVEMENT MICROMILLING & OVERLAY
PROP. ELECTRIC MANHOLE
PROP. GUY WIRE (BY OTHERS)
RET.
REM.
EASTBOUND CROSSOVER PROP. CONST. ℄
WESTBOUND CROSSOVER PROP. CONST. ℄
PROP. CONST. ℄
R&D 968' OF HIGHWAY GUARD TO CONSTRUCT CROSSOVER STA. 101+50 RT TO STA. 111+20 LT
PROP. HIGHWAY GUARDRAIL (TL-3) (TYP.)
PC +52.07
L=157.89' R=1040.00'
PC +77.28
L=139.00' R=1040.00'
PT +09.97
PT +16.28
1+00
274+00
273+00
272+00
271+00
270+00
1950 BASELINE
ROUTE 2 RECORD ℄
S73°28'43"E 750.10'
S73°28'43"E 749.41'
S16°20'35"W 132.55'
+70.05
+63.72
+34.11
+93.89
+34.11
70.04' N16°20'35"E
71.63' (R
N16°20'35"E 70.36'
100' WETLAND BUFFER
WETLAND BUFFER
LIMIT OF BORDERING VEGETATED WETLAND
LIMIT OF BANK
100' WETLAND BUFFER
PROP. 130 SF PERM. RIVERFRONT AREA IMPACT
PROP. 309 SF PERM. RIVERFRONT AREA IMPACT
EXIST. RAILROAD R-O-W
PROP. CONST.
PROP. FULL DEPTH CONSTRUCTION
30.00'
25.00' (TYP.)
SAWCUT
REM. EXIST. PAVEMENT PROP. LOAM AND SEED
REM. EXIST. RAILS AND TIES (TYP.)
PROP. HIGHWAY GUARDRAIL (TL-3) (TYP.)
ROUTE 2 RECORD ℄
S73°28'43"E 750.10'
1950 BASELINE
+34.1
CONTINUED BELOW
L=1256.13' R=1900.00'
1950 S.H.L.O. (LO. NO. 3804)
MARK CO. COMMONWEALTH OF MASSACHUSETTS PARCEL 2007
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION BOOK 64110 PAGE 50
BRUCE FREEMAN RAIL TRAIL
N/F COMMONWEALTH OF MASSACHUSETTS
REM. EXIST. RAILS AND TIES (TYP.)
PROP. FULL DEPTH CONSTRUCTION
PROP. 309 SF PERM. RIVERFRONT AREA IMPACT
PROP. 12' HMA SHARED USE PATH W/ 2' HMA SHOULDER LT & PAVEMENT MILLING MULCH SHOULDER RT
L=1256.13' R=1900.00'

0 20 50 100
SCALE: 1" = 20'

ROUTE 2 - WESTBOUND

CONTINUED ABOVE
MATCH LINE
STEEL BEAM/STEEL POST GUARD RAIL
PROP. PAVEMENT MICROMILLING & OVERLAY
PROP. DMH-1
STA. 216+75, 10.8' RT
RIM = 137.11
INV. (IN EXIST.) = 130.74
INV. (IN) = 131.21
INV. (OUT EXIST.) = 130.54
PROP. 245' 12" RCP
SAWCUT
EASTBOUND CROSSOVER ℄ STA. 217+96.65, 0.00' =
WESTBOUND CROSSOVER ℄ STA. 118+03.03
PROP. FULL DEPTH HMA PAVEMENT FOR TEMPORARY CROSSOVER
PROP. HIGHWAY GUARDRAIL (TL-3) (TYP.)
R&D 1,214' OF HIGHWAY GUARD TO CONSTRUCT CROSSOVER STA. 210+62 RT TO STA. 222+76 LT
PROP. PAVEMENT MICROMILLING & OVERLAY
L=174.28' R=1040.00'
L=151.89' R=1040.00'
PC +60.06
PC +65.68
PT +17.58
PT +34.39
PC +54.22
S81°50'48"E 177.66'
S63°52'37"E 119.87'
ADJ.
2.0' TYP
REM.
NOTE:
1. FOR PROPOSED WORK ALONG THE SHARED USE PATH SEE CONSTRUCTION PLANS & PROFILES - SHARED USE PATH
1950 S.H.L.O. (LO. NO. 3804)

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	34	158
PROJECT FILE NO.	606223		

CONSTRUCTION PLANS - ROUTE 2

606223_HD_(CO).DWG 4-Feb-2019

HIGHWAY GUARD DETAILS

STA. 210+62 RT TO STA. 222+35 LT - ITEM 620.13
STA. 222+35 RT TO STA. 222+69 RT - ITEM 628.21
STA. 222+69 RT TO STA. 222+76 RT - ITEM 628.25

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

N

R&D 1,214' OF HIGHWAY GUARD TO CONSTRUCT CROSSOVER STA. 210+62 RT TO STA. 222+76 LT

PROP. CB-1
STA. 219+24, 20.0' LT
RIM = 138.64
INV. (OUT) = 133.64

PROP. 245' 12" RCP

PROP. PAVEMENT MICROMILLING & OVERLAY

CONTINUED BELOW

ROUTE 2 - WESTBOUND

WESTBOUND CROSSOVER PROP. CONST. ℄

S73°28'43"E 1284.19'

PROP. HIGHWAY GUARDRAIL (TL-3) (TYP.)

SAWCUT

PT +47.13

L=151.89' R=1040.00'

S81°50'48"E 177.66'

S63°52'37"E 119.87'

PC +54.22

L=174.28' R=1040.00'

PT +28.50

SAWCUT

S73°28'43"E 1091.55'

ROUTE 2 -EASTBOUND

PROP. FULL DEPTH HMA PAVEMENT FOR TEMPORARY CROSSOVER

PROP. PAVEMENT MICROMILLING & OVERLAY

CONTINUED ON SHEET 33

MATCH LINE

S16°20'35"W 132.55'

EASTBOUND CROSSOVER ℄ STA. 217+96.65, 0.00' =
WESTBOUND CROSSOVER ℄ STA. 118+03.03

LIMIT OF WORK
STA. 223+72.32
MEET EXISTING STRIPING
N2995647.9742
E682370.9453

1950 SHLO (3804)

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

PROP. PAVEMENT MICROMILLING & OVERLAY

ROUTE 2 - WESTBOUND

WESTBOUND CROSSOVER PROP. CONST. ℄

S73°28'43"E 1284.19'

ROUTE 2 -EASTBOUND

EASTBOUND CROSSOVER PROP. CONST. ℄

S73°28'43"E 1091.55'

S16°20'35"W 135.60'

LIMIT OF WORK
STA. 128+22.00
MEET EXISTING STRIPING
N2995575.5260
E682811.9440

LIMIT OF WORK
STA. 223+72.32
MEET EXISTING STRIPING
N2995647.9742
E682370.9453

MATCH LINE

1950 SHLO (3804)

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	35	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

606223_HD_(CTG).DWG 4-Feb-2019

N

BEGIN PROJECT
STA. 8+75.00
MEET EXISTING
N2997619.1023
E680337.2393

LIMIT OF WORK

PC +02.76
131.44

PC
+22.55
6.67' LT

131.30
℄PT
+29.49
8.01' L

℄PT
+29.47
6.01' LT
131.19

131.15

PT +32.17

S 23° 25' 09" E 104.04'

S 17° 48' 03" E 62.95'

LP: 9+87.11

PC +95

131.26
131.14
131.01
130.97
130.93
131.11
131.24
131.37
131.58
131.79
132.00
132.21
132.43
132.64
132.85
133.06
133.27
133.48
133.70
133.91
134.12

PT +24.42

S 23° 23' 47" E 316.94'

PROP. SLOPE LIMIT (TYP.)

PROP. CONST. ℄ & PGL

PC +41.37

L=73.32' R=300.00'

HP: 14+52.83

PT +14.69

S 37° 25' 21" E 90.28'

L=29.42' R=300.00'

L=29.30' R=300.00'

PROP. SLOPE LIMIT (TYP.)

131.06
131.19
131.40
131.61
131.82
132.03
132.25
132.46
132.67
132.88
133.09
133.30
133.52
133.73
133.94

EXIST. RAILROAD R-O-W

20' MESH FENCE

GRASS
SBCC

ATHLETIC FIELD

MAP G-5 PARCEL 82-1
N/F ACTON SPORTS PROPERTY
BOOK 27769 PAGE 165
#30 GREAT ROAD

MAP G-4 PARCEL 20
N/F THE CLEMENT AND ELIZABETH MANAGEMENT TRUST
BOOK 21756 PAGE 36
#32 WETHERBEE STREET

WOOD GARAGE

WOODED AREA

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

BASKETBALL COURT

UP/LP NO#

MAP G-4 PARCEL 209
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
#58 WETHERBEE STREET

SHED

TANKS

6' CLF

GRAS

MATCH LINE

CONTINUED BELOW

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

MAP G-5 PARCEL 95
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
1010 COMMONWEALTH AVENUE

SEPTIC FIELD

PROP. SLOPE LIMIT (TYP.)

EXIST. RAILROAD R-O-W

HP: 14+52.83

134.51
134.44
134.37
134.25
134.12
134.00
133.87
133.75
133.62
133.50
133.37
133.25
133.12
133.00
132.87
132.75
132.62
132.50
132.37
132.24

PT +79.85

PROP. CONST. ℄ & PGL

PC +04.96

L=74.89' R=300.00'

PC +41.37

L=73.32' R=300.00'

PT +14.69

S 37° 25' 21" E 90.28'

134.33
134.42
134.15
134.24
134.33
134.26
134.19
134.07
133.94
133.82
133.69
133.57
133.44
133.32
133.19
133.07
132.94
132.82
132.69
132.57
132.44
132.32
132.19
132.06

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

CHICKEN COOP

4" CPP DRAIN

4"X4" WOOD POST

CHAIN LINK FENCE

4" CPP DRAIN

4' POST & BEAM FENCE

CORRAL

1 STORY WOOD HORSE BARN
"MASSACHUSETTS STATE POLICE"

MAP G-4 PARCEL 209
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
#58 WETHERBEE STREET

4' WOOD POST/PLASTIC STRAP FENCE (TYP)

PILE

MATCH LINE

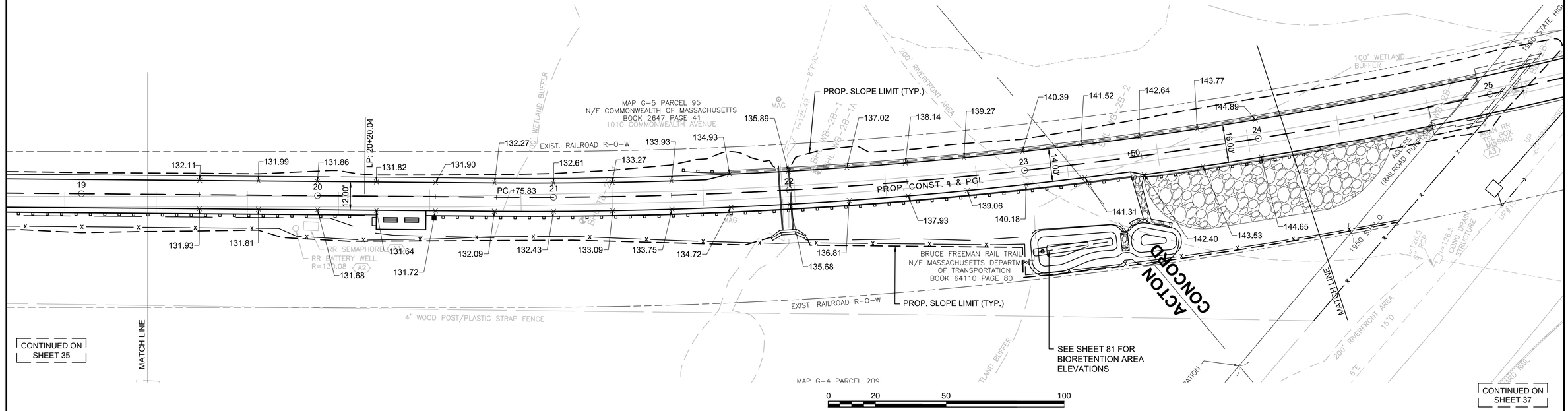
CONTINUED ON SHEET 36

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	36	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

606223_HD_(CTG).DWG 4-Feb-2019



CONTINUED ON SHEET 35

CONTINUED ON SHEET 37

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	37	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

606223_HD_(CTG).DWG 4-Feb-2019

N

CONTINUED ON SHEET 36

MATCH LINE

PROP. SLOPE LIMIT (TYP.)

PROP. CONST. ℄ & PGL

L=1258.13' R=1900.00'

HP 26+56.00

EXIST. RAILROAD R-O-W

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
BOOK 64110 PAGE 80

MAP C07 PARCEL 2007
N/F COMMONWEALTH OF MASSACHUSETTS

1950 STATE HIGHWAY ALTERATION (LO. NO. 3804)

Location Line of November 14, 1950
State Highway Alteration (Lo. No. 3804)

1950 BASELINE

1950 S.H.L.O.

LIMIT OF 100 YEAR FLOOD PLAIN (BORDERING LAND SUBJECT TO FLOODING) (ELEV. 124)

100' WETLAND BUFFER

200' RIVERFRONT AREA

100-YR FLOODPLAIN

STEEL POST/CABLE WIRE FENCE

CABLE WIRE GATE

GRASS

GRAN CURB

BIT CONC CURB

CONC WINGWALL

STEEL BEAM/STEEL POST GUARD RAIL

DOUBLE FACED STEEL BEAM/STEEL POST GUARD RAIL

12"RCP

15"D

6"E

CONC DRAIN STRUCTURE

CONC STONE HWL

BIT CONC

GRAVEL

STONE RET WALL

STEEL BEAM BRIDGE

EXIST. STEEL BRIDGE

CONCRETE DECK

BRIDGE NO. C-19-018(2CR)

MAP C07 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
128A UNION TURNPIKE

PROP. TEMP. EASEMENT (TYP.)

No Access

Access Denied as of November 7, 1950 (Railroad purposes)

Access (Railroad Purposes)

S73°29'06"E 2095.69'

CONTINUED ON SHEET 38

0 20 50 100

SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	38	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

606223_HD_(CTG).DWG 4-Feb-2019

CONTINUED ON SHEET 37

MAP C07 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
407-9 COMMONWEALTH AVENUE

MAP C07 PARCEL 2015
N/F COMMONWEALTH OF MASSACHUSETTS
25A UNION TURNPIKE

STONE RET WALL
CONC. WALL
STEEL BEAM BRIDGE
CONC. RET WALL
EXIST. STEEL BRIDGE
MATCH LINE
EXISTING PARKING AREA
REMAINS
EXIST. RAILROAD R-O-W
LP: 33+60.01
PROP. SLOPE LIMIT (TYP.)
TOPCO GAS
TOPCO MARKER/ VENT POST
24"
SHED
PIPE SLEEVED UNDER RAIL ROAD BED
BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
BOOK 64110 PAGE 80
PROP. CONST. ℄ & PGL
SEE SHEET 81 FOR ELEVATIONS OF PROP. BIORETENTION AREA
MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

CURVE TABLE				
CURVE #	DELTA	RADIUS	LENGTH	TANGENT
C1	13° 18' 07"	60.00	13.93	7.00
C2	13° 18' 40"	60.00	13.94	7.00
C3	13° 18' 07"	48.00	11.14	5.60
C4	13° 18' 40"	72.00	16.73	8.40

0 20 50 100
SCALE: 1" = 20'

CONTINUED BELOW

CONTINUED ABOVE

MAP D08 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
407-9 COMMONWEALTH AVENUE

CURVE TABLE				
CURVE #	DELTA	RADIUS	LENGTH	TANGENT
C5	13° 18' 40"	60.00	13.94	7.00
C6	13° 18' 07"	60.00	13.93	7.00
C7	13° 18' 40"	72.01	16.73	8.40
C8	13° 18' 07"	48.00	11.14	5.60

TOPCO MARKER/ VENT POST
SHED
PIPE SLEEVED UNDER RAIL ROAD BED
MW
BOULDER
BOLLARDS
WOODEN POST W/ SIGNS
WOODED
BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
BOOK 64110 PAGE 80
PROP. CONST. ℄ & PGL
PROP. SLOPE LIMIT (TYP.)
EXIST. RAILROAD R-O-W
MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

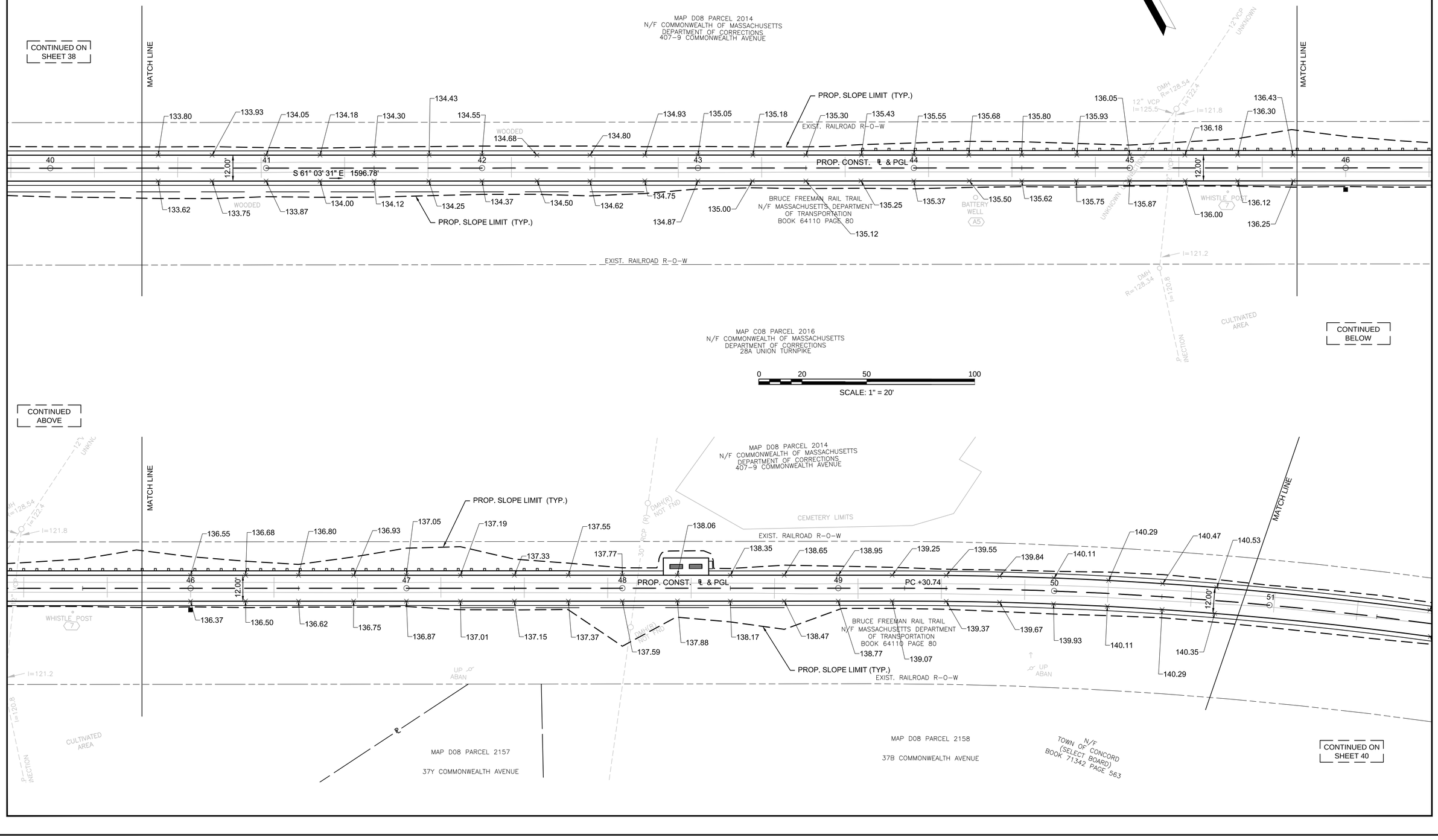
CONTINUED ON SHEET 39

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	39	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

606223_HD_(CTG).DWG 4-Feb-2019



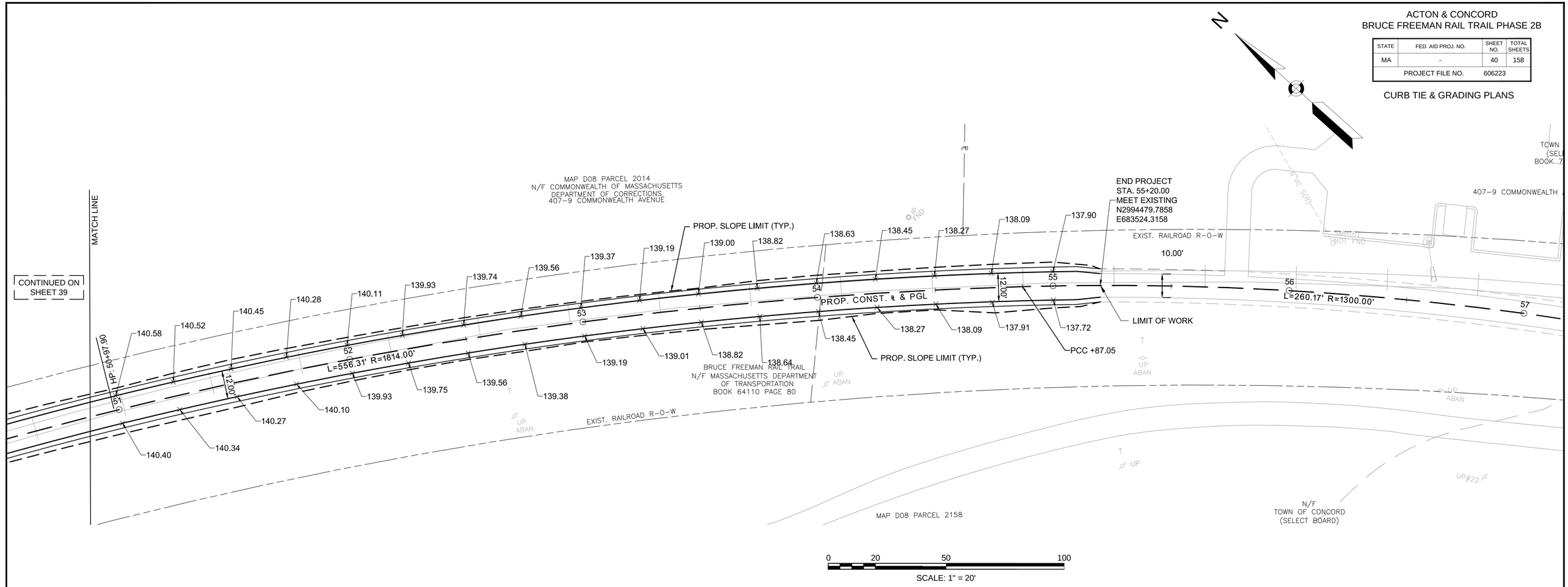
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	40	158
PROJECT FILE NO.	606223		

CURB TIE & GRADING PLANS

4-Feb-2019

606223_HD_(CTG).DWG



SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	41	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

4-Feb-2019

606223_HD_(TSPM).DWG

RET.
BIKE ROUTE
REM. BEGIN
RET.
TRAIL RULES SIGN
BRUCE FREEMAN RAIL TRAIL
BFRT PHASE-2A SHARED USE PATH (BY OTHERS)
RET. KIOSK
GRASS SBCC
FIRE LANE
20' MESH FENCE
WP
ATHLETIC FIELD
MAP G-5 PARCEL 82-1
N/F ACTON SPORTS PROPERTY
BOOK 27769 PAGE 165
#30 GREAT ROAD
6' CLF
SHED
TANKS
GRAS
R=134.65
MATCH LINE
BASKETBALL COURT
UP/LP NO#
BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
BOOK 64110 PAGE 80
BIT. CONC. DRIVE
S23°25'09"E 102.76'
9 PC +02.76
L=29.42' R=300.00'
PT +32.17
12.00'
S17°48'03"E 62.95'
PC +95.13
L=29.30' R=300.00'
PT +24.42
11
S23°23'47"E 316.82'
12
12'
PROP. CONST. ℄
13
PC +41.25
14
PT +14.69
CONTINUED BELOW
RET.
BIKE ROUTE
END REM.
RET.
134.3 (est.)
BFRT 2A ℄ STA. 266+76.51 =
BFRT 2B (2) ℄ STA. 8+75.00
BEGIN PROJECT
STA. 8+75.00
MEET EXISTING
N2997619.1023
E680337.2393
MAP G-4 PARCEL 20
N/F THE CLEMENT AND ELIZABETH MANAGEMENT TRUST
BOOK 21756 PAGE 36
#32 WETHERBEE STREET
WOOD GARAGE
WOODED AREA
MAP G-4 PARCEL 209
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
#58 WETHERBEE STREET
℄
0 20 50 100
SCALE: 1" = 20'

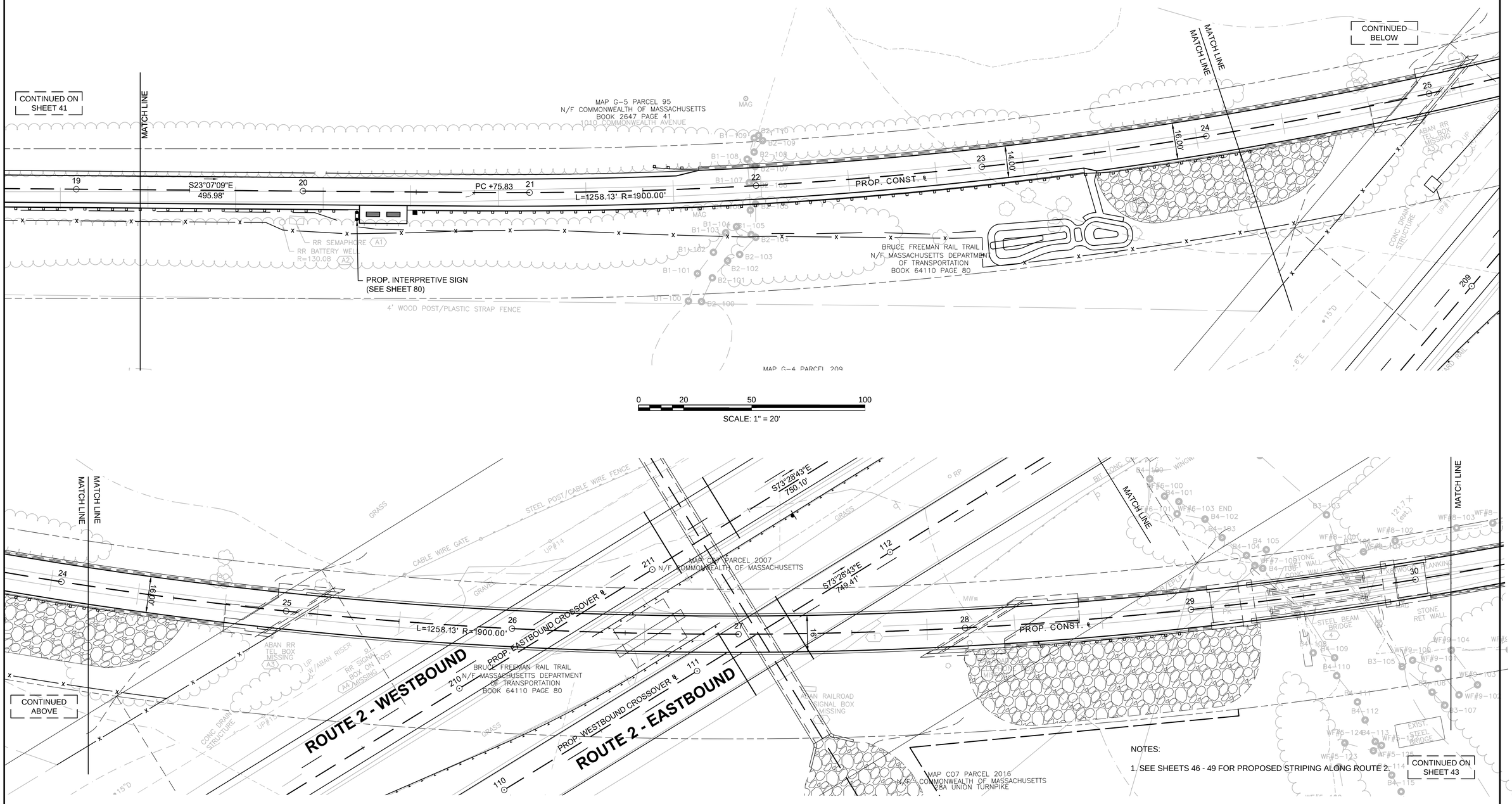
R=134.65
MATCH LINE
SB/OH FWD
MAP G-5 PARCEL 95
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
1010 COMMONWEALTH AVENUE
UP/LP NO#
PT +79.85 16
12'
17
PROP. CONST. ℄
18
19
S23°07'09"E 495.98'
S37°25'21"E 90.28'
15 PC +04.96
PT +14.69
14
PC +41.25
CONTINUED ABOVE
BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
BOOK 64110 PAGE 80
CORRAL
CHICKEN COOP
4"X4" WOOD POST
CHAIN LINK FENCE
4' POST & BEAM FENCE
1 STORY WOOD HORSE BARN "MASSACHUSETTS STATE POLICE"
MAP G-4 PARCEL 209
N/F COMMONWEALTH OF MASSACHUSETTS
BOOK 2647 PAGE 41
#58 WETHERBEE STREET
4' WOOD POST/PLASTIC STRAP FENCE (TYP)
PILE
CONTINUED ON SHEET 42

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	42	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

606223_HD_(TSPM).DWG 4-Feb-2019



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	43	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

4-Feb-2019

606223_HD_(TSPM).DWG

N

CONTINUED ON SHEET 42

MATCH LINE

MAP C07 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
407-9 COMMONWEALTH AVENUE

MAP C07 PARCEL 2015
N/F COMMONWEALTH OF MASSACHUSETTS
25A UNION TURNPIKE

121.7 (est.)

24" STEEL TOPCO GAS PIPELINE

TOPCO MARKER/ VENT POST

30

16.00'

(R&D)

31

L=1258.13' R=1900.00'

32

PROP. CONST. ℄

14.00'

33

PT +33.96

12.00'

S61°03'31"E
1596.78'

34

SYL(100')

+73

ROAD XING

+88

35

SYL(85')

12.00'

+73

PROP. "ROAD XING" PAVEMENT MARKINGS

MATCH LINE

CONTINUED BELOW

PROP. INTERPRETIVE SIGN
(SEE SHEET 80)

SHED

SHED

PIPE SLEEVED
UNDER RAIL ROAD BED

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

RET.

RET.

PROP. W2-1

MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

0 20 50 100

SCALE: 1" = 20'

CONTINUED ON SHEET 44

MATCH LINE

MAP D08 PARCEL 2014
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
407-9 COMMONWEALTH AVENUE

PROP. R1-1

(RET.)

PROP. R5-3

PROP. W2-1

ROAD XING

35

SYL(85')

12.00'

CW

36

SYL(85')

ROAD XING

37

SYL(100')

S61°03'31"E
1596.78'

38

PROP. CONST. ℄

39

40

12.00'

41

WHISTLE POST

+73

VENT

MONITORING WELL

MW-6

SHED

SHED

PIPE SLEEVED
UNDER RAIL ROAD BED

PROP. "ROAD XING"
PAVEMENT MARKINGS

PROP. R1-1

PROP. R5-3

BRUCE FREEMAN RAIL TRAIL
N/F MASSACHUSETTS DEPARTMENT
OF TRANSPORTATION
BOOK 64110 PAGE 80

CONTINUED ABOVE

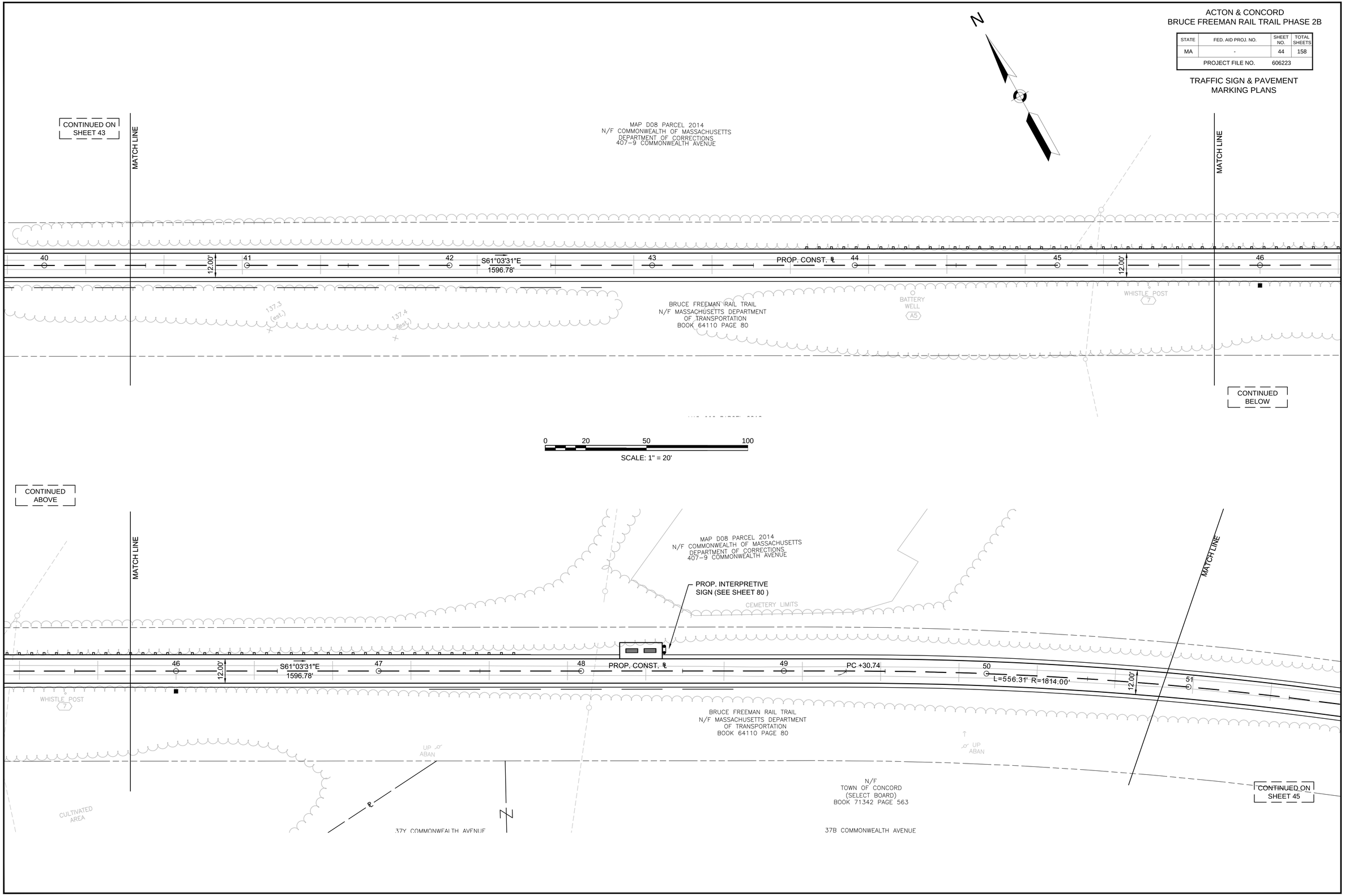
MAP C08 PARCEL 2016
N/F COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF CORRECTIONS
28A UNION TURNPIKE

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	44	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

606223_HD_(TSPM).DWG 4-Feb-2019

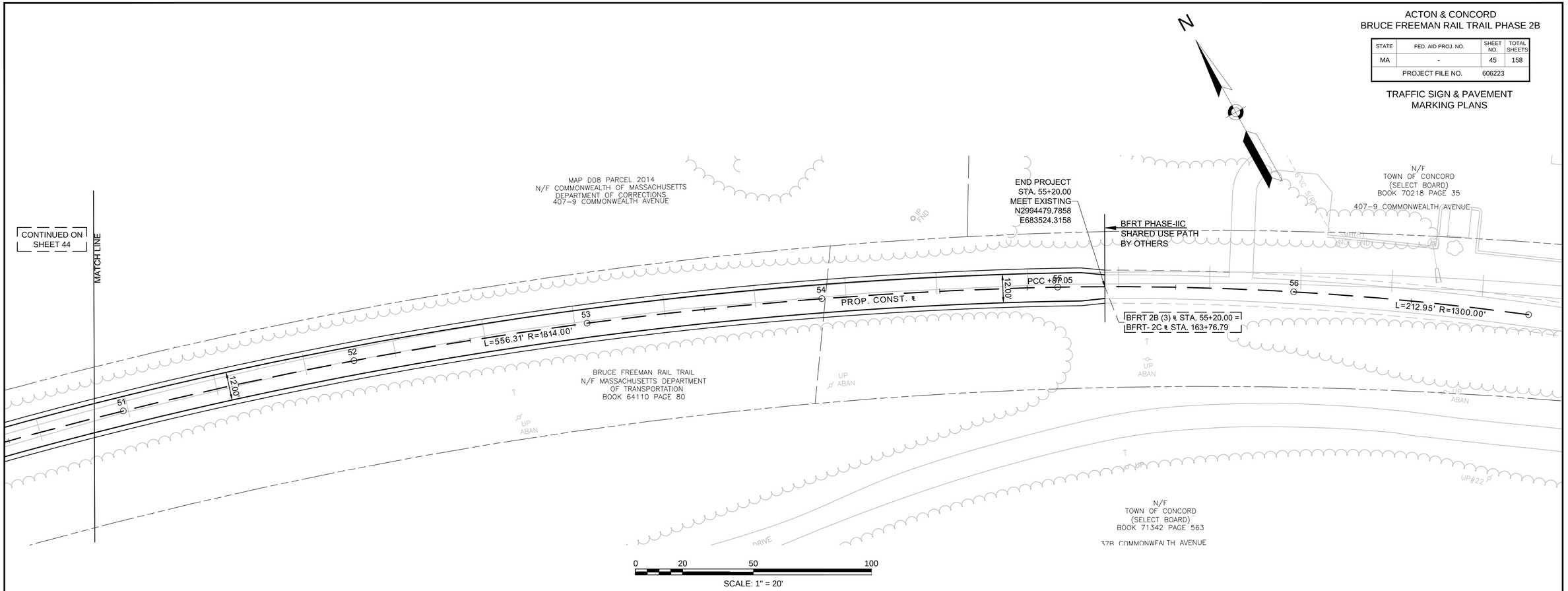


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	45	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

606223_HD_(TSPM).DWG 4-Feb-2019



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

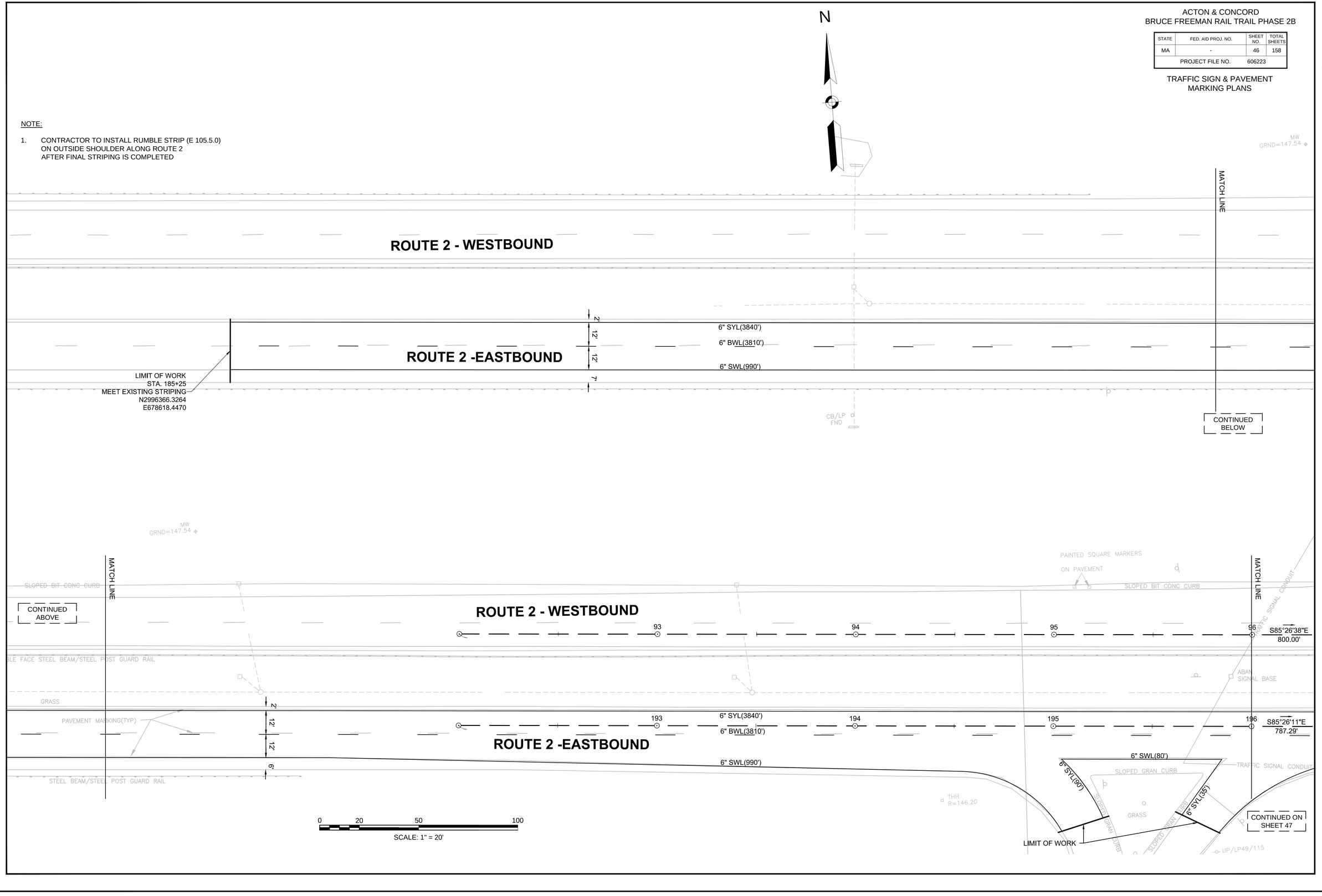
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	46	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

606223_HD_(TSPM).DWG 4-Feb-2019

NOTE:

1. CONTRACTOR TO INSTALL RUMBLE STRIP (E 105.5.0) ON OUTSIDE SHOULDER ALONG ROUTE 2 AFTER FINAL STRIPING IS COMPLETED



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	47	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

606223_HD_(TSPM).DWG 4-Feb-2019

NOTE:

1. CONTRACTOR TO INSTALL RUMBLE STRIP (E 105.5.0) ON OUTSIDE SHOULDER ALONG ROUTE 2 AFTER FINAL STRIPING IS COMPLETED

CONTINUED ON SHEET 46

N

ROUTE 2 - WESTBOUND

ROUTE 2 -EASTBOUND

MATCH LINE

TRAFFIC SIGNAL CONDUIT

ABAN SIGNAL BASE

UP/LP# 57/18 W/SIGNAL RISER

USGS OBSERVATION WELL W/SOLAR PANEL

WATER SPIGOT ON STEEL POST

MARKERS

1" PL W(R) IN 18" PL SLEEVE

96 S85°26'38"E 800.00' 97 PROP. WESTBOUND CROSSOVER ℄ 98 99 100 PCC +00.00 101 L=303.46' R=3172.45'

196 S85°26'11"E 787.29' 197 PROP. EASTBOUND CROSSOVER ℄ 198 199 200 PC +87.29 201 L=180.59' R=3175.00' PT +67.88

6" SWL(2935')
6" BWL(2930')
6" SYL(2930')
6" SYL(3840')
6" BWL(3810')
6" SWL(2790')
6" SWL(80')
6" SYL(35')

7' 12' 12' 3' 2' 12' 12' 8'

LIMIT OF WORK
STA. 98+89.44
MEET EXISTING STRIPING
N2996310.9499
E679983.2657

UP/LP49/115

CONTINUED BELOW

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

N

ROUTE 2 - WESTBOUND

ROUTE 2 -EASTBOUND

MATCH LINE

STEEL BEAM/STEEL POST GUARD RAIL

SLOPED BIT CONC CURB

BIT CONC SWALE

HEDGE

3' WIDE BIT PATCH

GRASS

UP#17 W/2 ABAN TEL RISERS

UP(REMAINS) UP#16

10"D 6"D 8"D

101 L=303.46' R=3172.45' 102 103 PCC +03.46 104 105 L=256.70' R=1040.00' PT +60.16 106 PROP. WESTBOUND CROSSOVER ℄ PC +77.28 107 L=139.00' R=1040.00'

201 L=180.59' R=3175.00' PT +67.88 202 S82°10'39"E 484.19' 203 204 PROP. EASTBOUND CROSSOVER ℄ 205 206 PC +52.07 207 L=157.89' R=1040.00'

6" SWL(2935')
6" BWL(2930')
6" SYL(2930')
6" SYL(3840')
6" BWL(3810')
6" SWL(2790')

6' 12' 12' 4' 12' 12' 7'

CONC PAD

CONTINUED ON SHEET 48

SB/EPLP FND

STONE

UP W/ABAN RISER

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	48	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

4-Feb-2019

606223_HD_(TSPM).DWG

NOTE:

1. CONTRACTOR TO INSTALL RUMBLE STRIP (E 105.5.0) ON OUTSIDE SHOULDER ALONG ROUTE 2 AFTER FINAL STRIPING IS COMPLETED

N

CONTINUED ON SHEET 47

MATCH LINE

ROUTE 2 - WESTBOUND

6" SWL(2935')
6" BWL(2930')
6" SYL(2930')

5'
12'
12'
4'

207 PC +52.07 L=157.89' R=1040.00' 208 PT +09.97 209 210 PROP. EASTBOUND CROSSOVER ℄ 211 S73°28'43"E 750.10' 212 213

L=1258.13' R=1900.00'

26

N/F COMMONWEALTH OF MASSACHUSETTS

BRUCE FREEMAN RAIL TRAIL N/F MASSACHUSETTS DEPARTMENT OF TRANSPORTATION BOOK 64110 PAGE 80

PARCEL 2007

107 PC +77.28 L=139.00' R=1040.00' 108 PT +16.28 109 110 PROP. WESTBOUND CROSSOVER ℄ 111 S73°28'43"E 749.41' 112 113

6" SYL(3840')
6" BWL(3810')
6" SWL(2790')

1'
12'
12'
7'

ROUTE 2 - EASTBOUND

25

24

28

CONTINUED BELOW

MATCH LINE

PROP. CONST. ℄

DOUBLE FACED STEEL BEAM/STEEL POST GUARD RAIL

CONC PAD

GRASS

BIT CONC

GRAVEL

CONC POST

STONE HWL

WF#ET13-9

WF#4-101

WF#4-100

SB/EPLP END

RR SIGNAL BOX ON POST MISSING

CONC DRAIN STRUCTURE

UP W/ABAN RISER

WIRE FENCE

MAG

UP#16

UP#15

UP#14

UP#13

UP#12

UP#11

UP#10

B4-98

B3-98

MAG UP#13(NEW)

CONC WINGWA

BCC

GRND

BIT CONC CUR

B4

WF#6

0 20 50 100

SCALE: 1" = 20'

CONTINUED ABOVE

ROUTE 2 - WESTBOUND

6" SWL(2935')
6" BWL(2930')
6" SYL(2930')

5'
12'
12'
4'

213 PROP. EASTBOUND CROSSOVER ℄ 214 S73°28'43"E 750.10' 215 PC +60.06 216 217 L=174.28' R=1040.00' PT +34.35 118 218 S81°50'48"E 177.66' S63°52'37"E 119.87' PC +54.22

117 PT +17.58

113 PROP. WESTBOUND CROSSOVER ℄ 114 S73°28'43"E 749.41' 115 PC +65.68 116 L=151.89' R=1040.00'

6" SYL(3840')
6" BWL(3810')
6" SWL(2790')

1'
12'
12'
7'

ROUTE 2 -EASTBOUND

MATCH LINE

CONTINUED ON SHEET 49

MATCH LINE

PROP. CONST. ℄

EASTBOUND CROSSOVER CONST. ℄ STA. 217+96.65 =
WESTBOUND CROSSOVER CONST. ℄ STA. 118+03.03

B3-100
B4-100
WF#6-100
B4-101
WF#6-101
WF#6-103 END
B4-102
B4-103
B4-104
B4-105
B3-101
B3-102
B3-103

SB/EPLP

GRND

NOTE:

1. CONTRACTOR TO INSTALL RUMBLE STRIP (E 105.5.0) ON OUTSIDE SHOULDER ALONG ROUTE 2 AFTER FINAL STRIPING IS COMPLETED

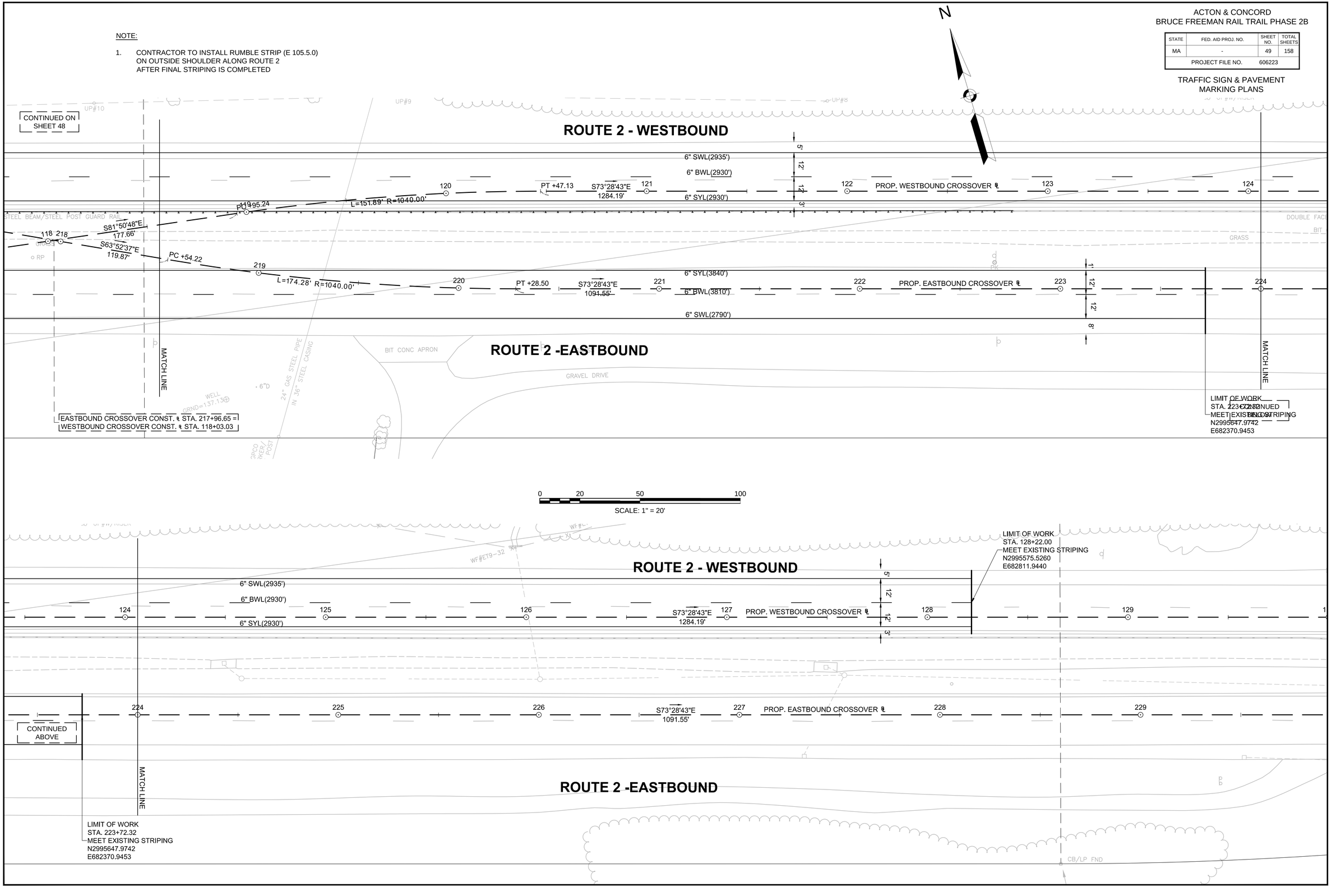
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	49	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN & PAVEMENT MARKING PLANS

4-Feb-2019

606223_HD_(TSPM).DWG



IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)		NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA IN SQUARE FEET	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING		BACK-GROUND	LEGEND	BORDER			
R1-1	30"	30"		MUTCD STANDARD		2	RED	WHITE	WHITE	P5 (2 REQ'D)	6.25	12.50
R5-3	24"	24"		MUTCD STANDARDS		2	WHITE	BLACK	BLACK	P5 (2 REQ'D)	4.00	8.00
W2-1	18"	18"		MUTCD STANDARDS		2	YELLOW	BLACK	BLACK	P5 (2 REQ'D)	2.25	4.50

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	50	158
PROJECT FILE NO.	606223		

TRAFFIC SIGN SUMMARY SHEET

606223_HD_(SS).DWG Plotted on 4-Feb-2019 3:30 PM

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	51	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 1

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:31 PM

TRAFFIC MANAGEMENT LEGEND

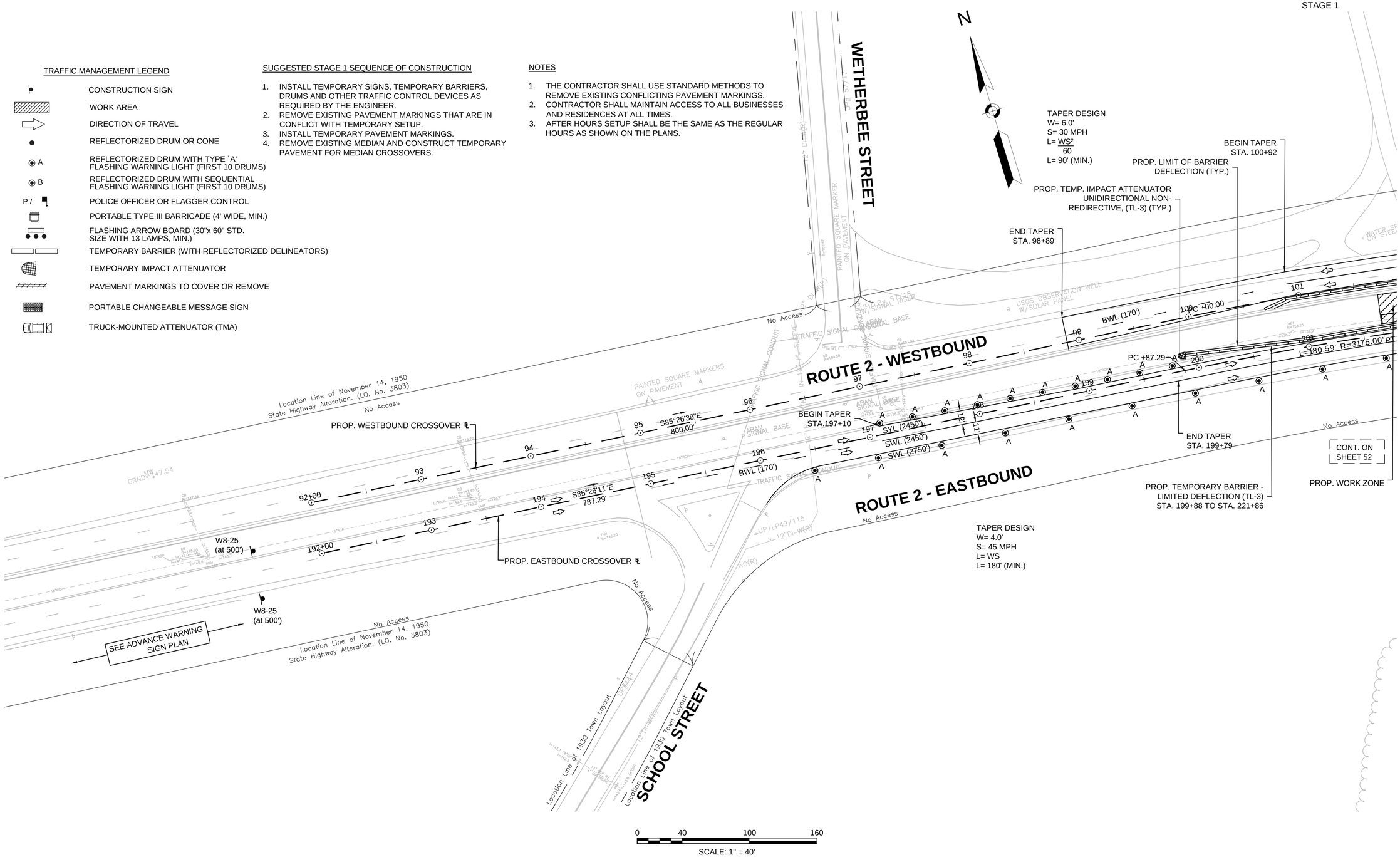
- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 1 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. REMOVE EXISTING MEDIAN AND CONSTRUCT TEMPORARY PAVEMENT FOR MEDIAN CROSSOVERS.

NOTES

1. THE CONTRACTOR SHALL USE STANDARD METHODS TO REMOVE EXISTING CONFLICTING PAVEMENT MARKINGS.
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.



0 40 100 160

SCALE: 1" = 40'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	52	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 1

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:32 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGNS
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCT-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 1 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. REMOVE EXISTING MEDIAN AND CONSTRUCT TEMPORARY PAVEMENT FOR MEDIAN CROSSOVERS.

NOTES

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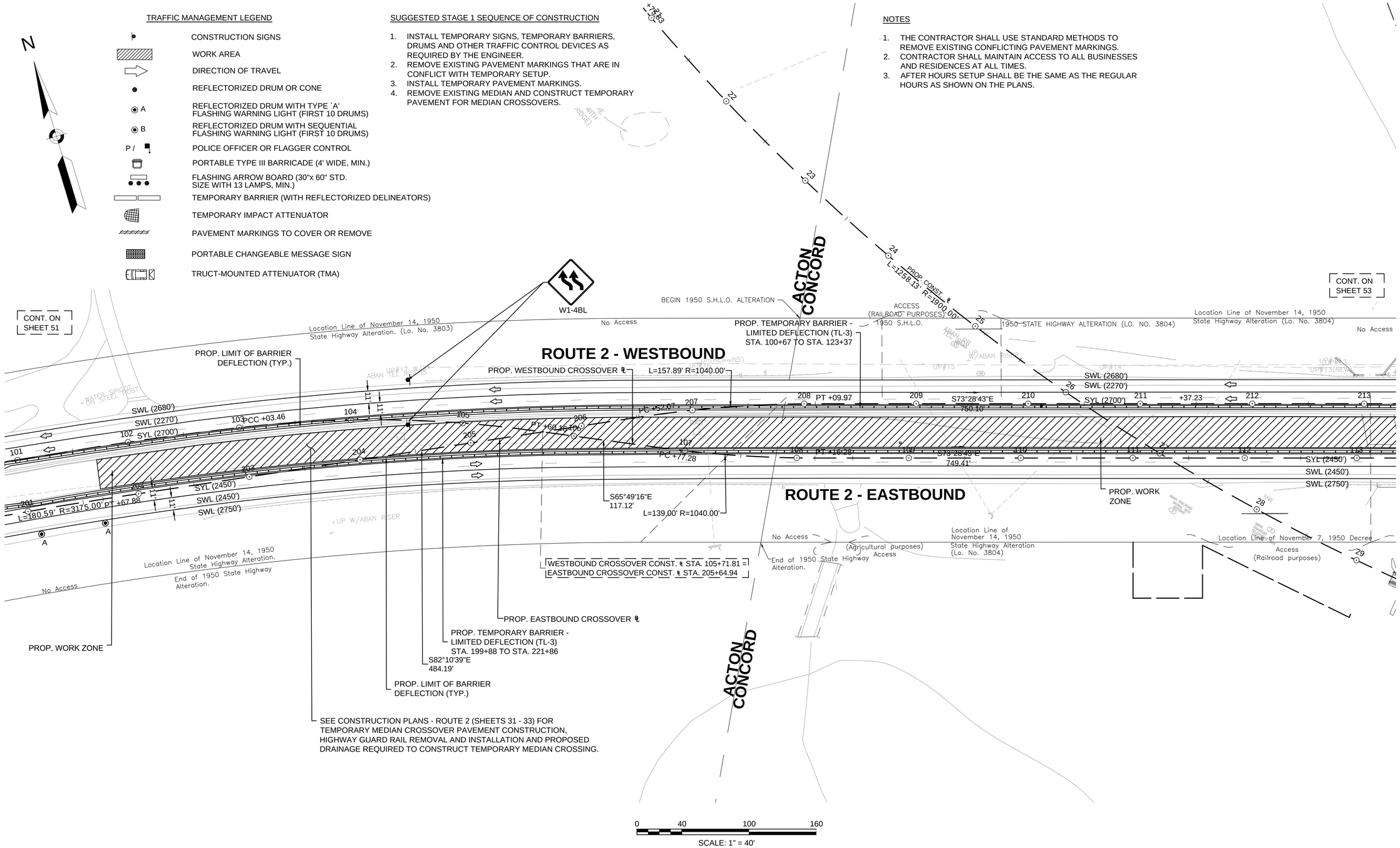
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	53	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 1

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:32 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 1 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
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NOTES

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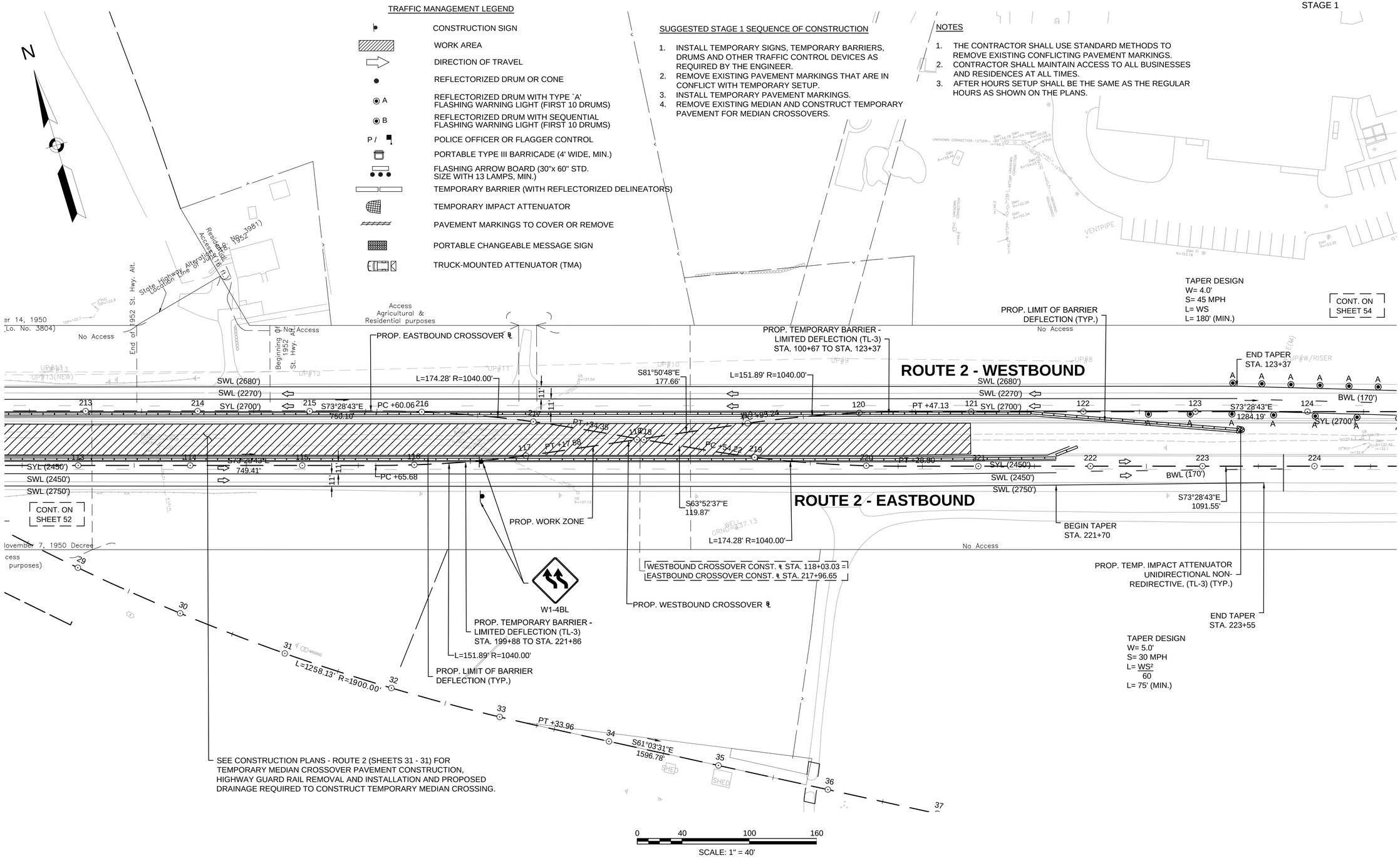
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	54	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 1

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:32 PM

SUGGESTED STAGE 1 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
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NOTES

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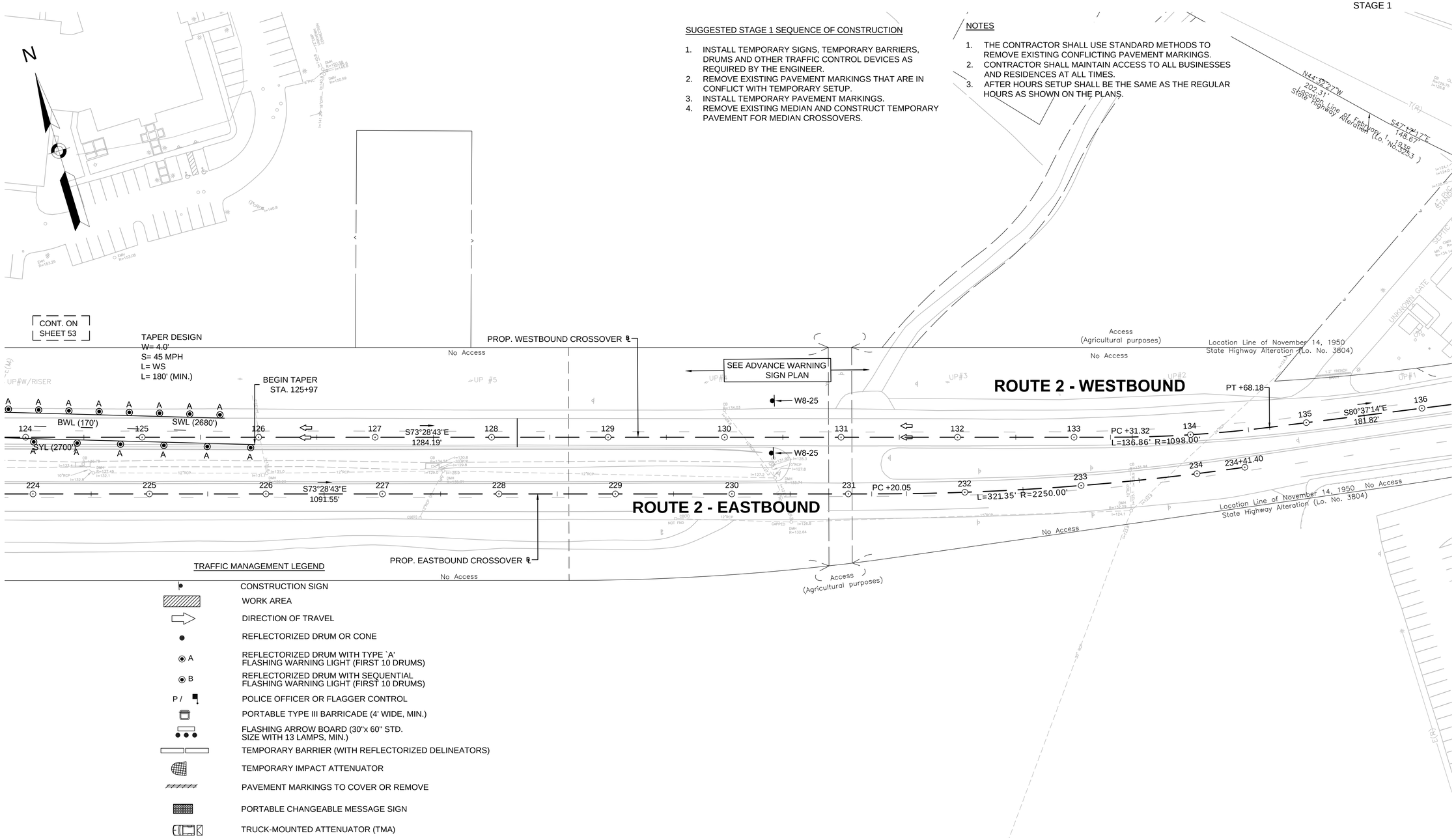


TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

0 40 100 160
SCALE: 1" = 40'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	55	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 2

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:33 PM

TRAFFIC MANAGEMENT LEGEND

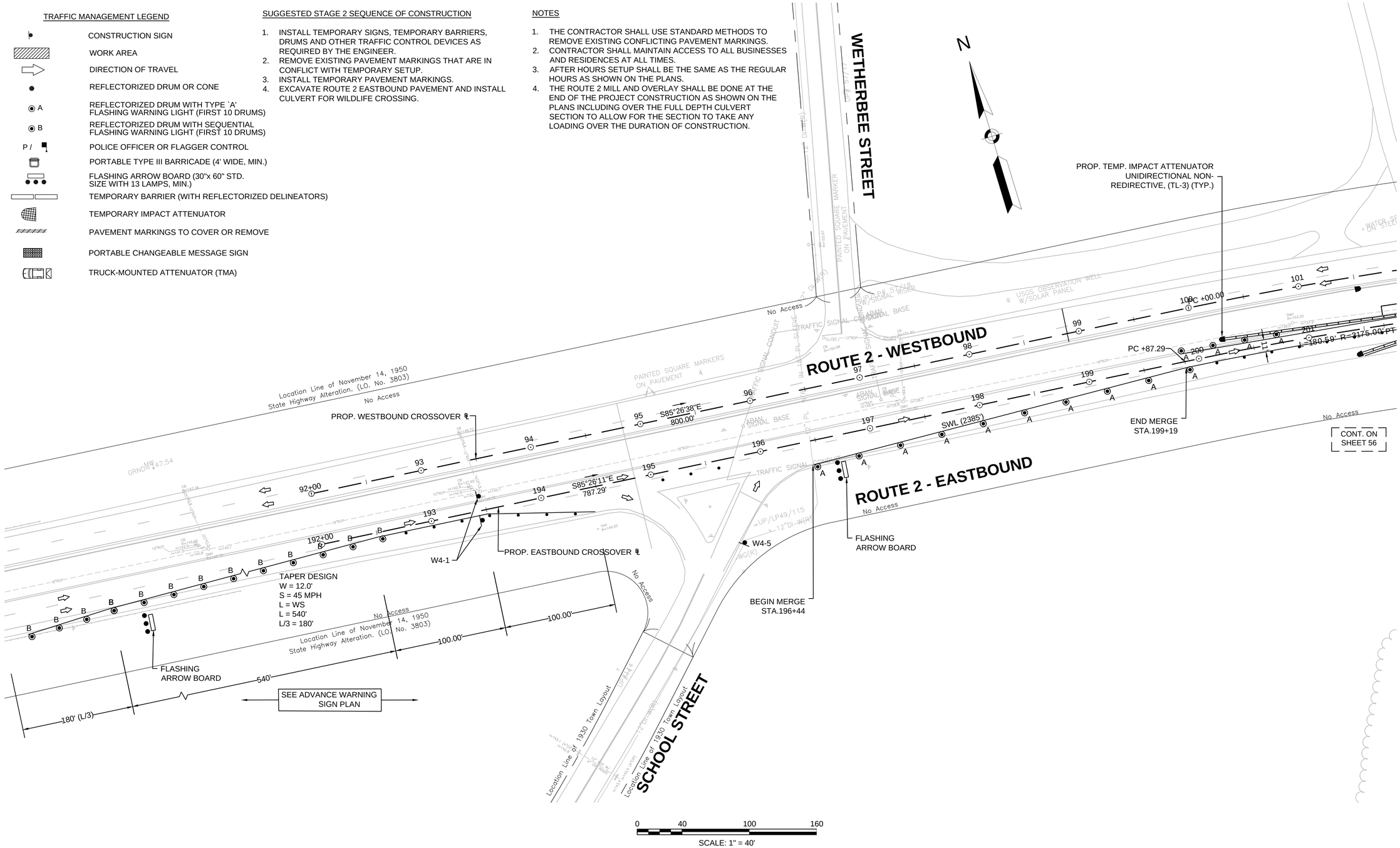
- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 2 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. EXCAVATE ROUTE 2 EASTBOUND PAVEMENT AND INSTALL CULVERT FOR WILDLIFE CROSSING.

NOTES

1. THE CONTRACTOR SHALL USE STANDARD METHODS TO REMOVE EXISTING CONFLICTING PAVEMENT MARKINGS.
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.
4. THE ROUTE 2 MILL AND OVERLAY SHALL BE DONE AT THE END OF THE PROJECT CONSTRUCTION AS SHOWN ON THE PLANS INCLUDING OVER THE FULL DEPTH CULVERT SECTION TO ALLOW FOR THE SECTION TO TAKE ANY LOADING OVER THE DURATION OF CONSTRUCTION.



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	56	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 2

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:33 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
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- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 2 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
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NOTES

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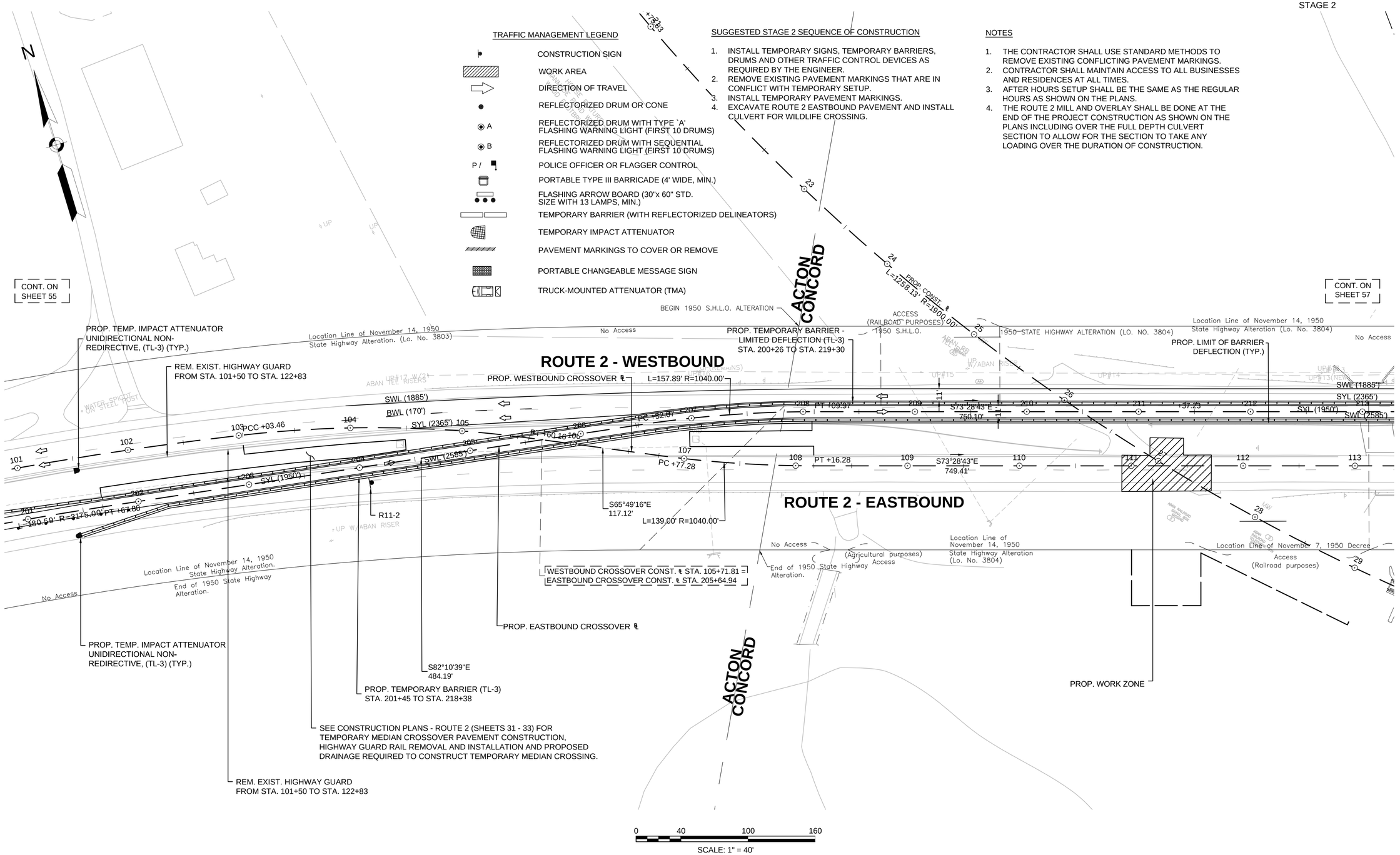

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	57	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 2

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:33 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
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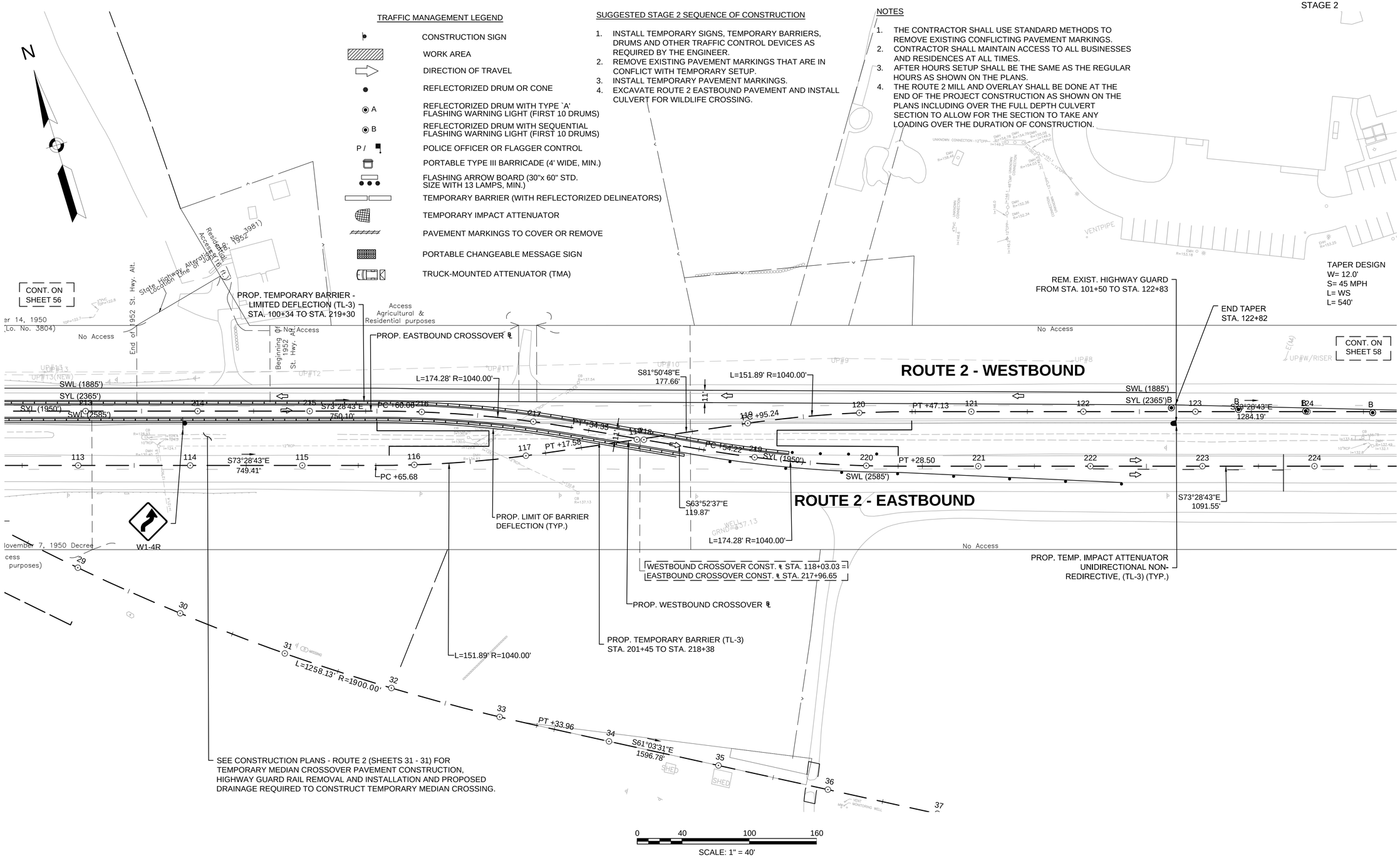
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 2 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. EXCAVATE ROUTE 2 EASTBOUND PAVEMENT AND INSTALL CULVERT FOR WILDLIFE CROSSING.

NOTES

1. THE CONTRACTOR SHALL USE STANDARD METHODS TO REMOVE EXISTING CONFLICTING PAVEMENT MARKINGS.
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.
4. THE ROUTE 2 MILL AND OVERLAY SHALL BE DONE AT THE END OF THE PROJECT CONSTRUCTION AS SHOWN ON THE PLANS INCLUDING OVER THE FULL DEPTH CULVERT SECTION TO ALLOW FOR THE SECTION TO TAKE ANY LOADING OVER THE DURATION OF CONSTRUCTION.

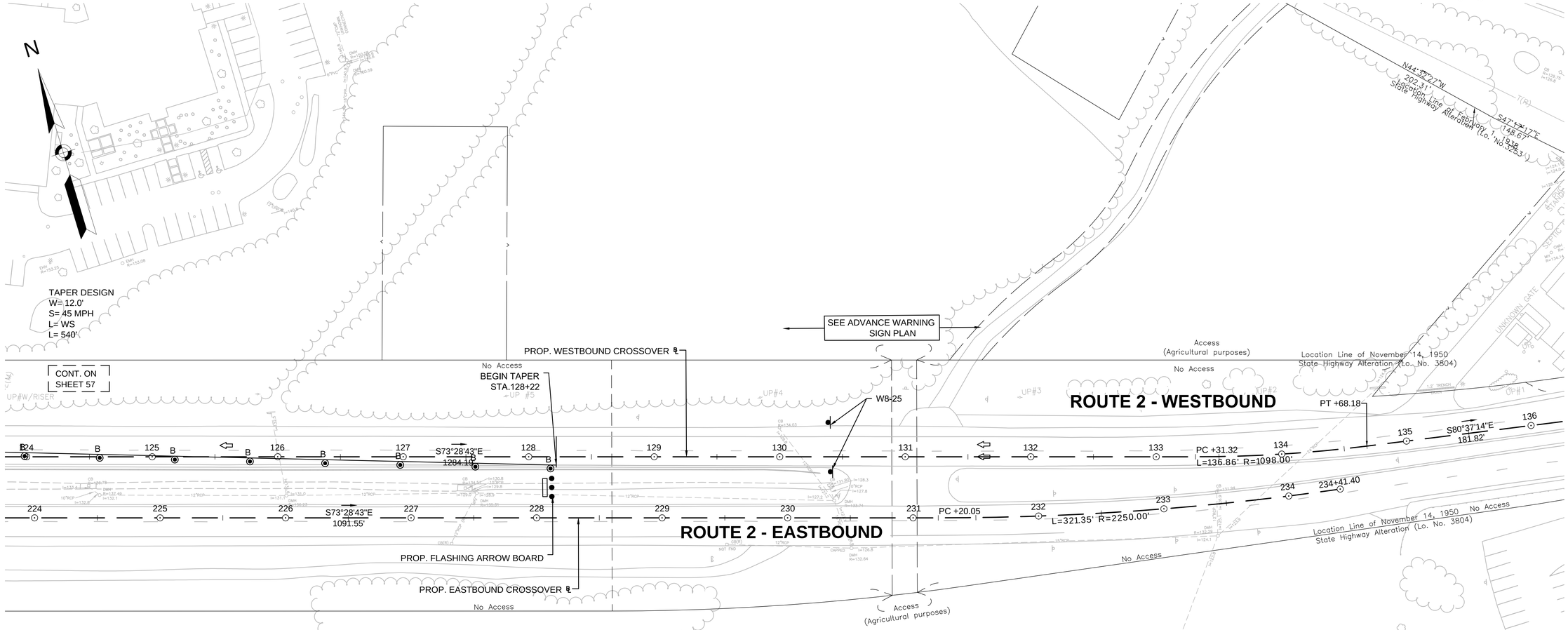


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	58	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 2

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:33 PM



TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE 'A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 2 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. EXCAVATE ROUTE 2 EASTBOUND PAVEMENT AND INSTALL CULVERT FOR WILDLIFE CROSSING.

NOTES

1. THE CONTRACTOR SHALL USE STANDARD METHODS TO REMOVE EXISTING CONFLICTING PAVEMENT MARKINGS.
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.
4. THE ROUTE 2 MILL AND OVERLAY SHALL BE DONE AT THE END OF THE PROJECT CONSTRUCTION AS SHOWN ON THE PLANS INCLUDING OVER THE FULL DEPTH CULVERT SECTION TO ALLOW FOR THE SECTION TO TAKE ANY LOADING OVER THE DURATION OF CONSTRUCTION.

0 40 100 160
SCALE: 1" = 40'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	59	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 3

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:34 PM

TRAFFIC MANAGEMENT LEGEND

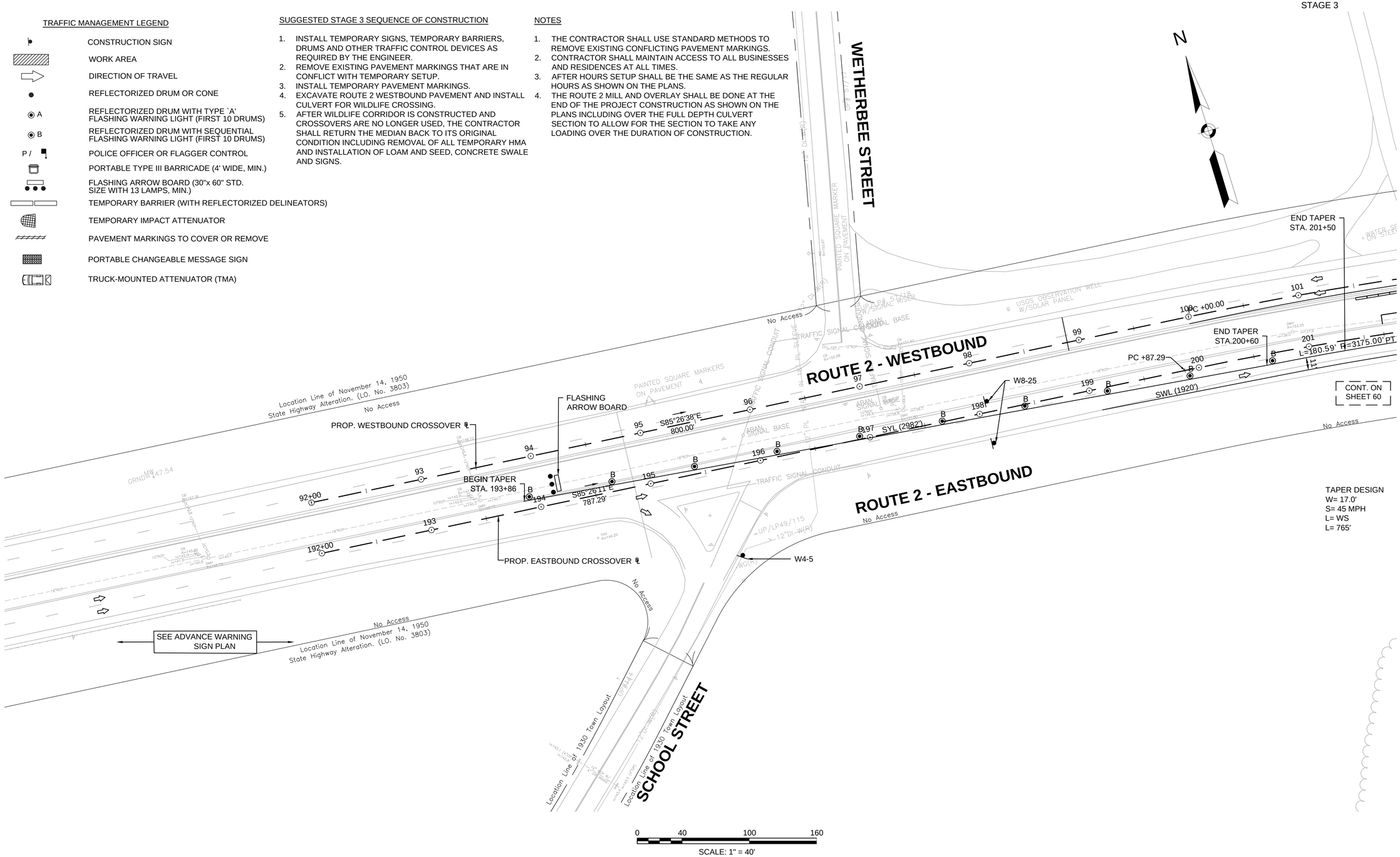
- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE `A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRUCK-MOUNTED ATTENUATOR (TMA)

SUGGESTED STAGE 3 SEQUENCE OF CONSTRUCTION

1. INSTALL TEMPORARY SIGNS, TEMPORARY BARRIERS, DRUMS AND OTHER TRAFFIC CONTROL DEVICES AS REQUIRED BY THE ENGINEER.
2. REMOVE EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY SETUP.
3. INSTALL TEMPORARY PAVEMENT MARKINGS.
4. EXCAVATE ROUTE 2 WESTBOUND PAVEMENT AND INSTALL CULVERT FOR WILDLIFE CROSSING.
5. AFTER WILDLIFE CORRIDOR IS CONSTRUCTED AND CROSSOVERS ARE NO LONGER USED, THE CONTRACTOR SHALL RETURN THE MEDIAN BACK TO ITS ORIGINAL CONDITION INCLUDING REMOVAL OF ALL TEMPORARY HMA AND INSTALLATION OF LOAM AND SEED, CONCRETE SWALE AND SIGNS.

NOTES

1. THE CONTRACTOR SHALL USE STANDARD METHODS TO REMOVE EXISTING CONFLICTING PAVEMENT MARKINGS.
2. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
3. AFTER HOURS SETUP SHALL BE THE SAME AS THE REGULAR HOURS AS SHOWN ON THE PLANS.
4. THE ROUTE 2 MILL AND OVERLAY SHALL BE DONE AT THE END OF THE PROJECT CONSTRUCTION AS SHOWN ON THE PLANS INCLUDING OVER THE FULL DEPTH CULVERT SECTION TO ALLOW FOR THE SECTION TO TAKE ANY LOADING OVER THE DURATION OF CONSTRUCTION.



TAPER DESIGN
W= 17.0'
S= 45 MPH
L= WS
L= 765'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	60	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 3

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:34 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
- A — REFLECTORIZED DRUM WITH TYPE 'A' FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- B — REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHT (FIRST 10 DRUMS)
- P / — POLICE OFFICER OR FLAGGER CONTROL
- PORTABLE TYPE III BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- TEMPORARY BARRIER (WITH REFLECTORIZED DELINEATORS)
- TEMPORARY IMPACT ATTENUATOR
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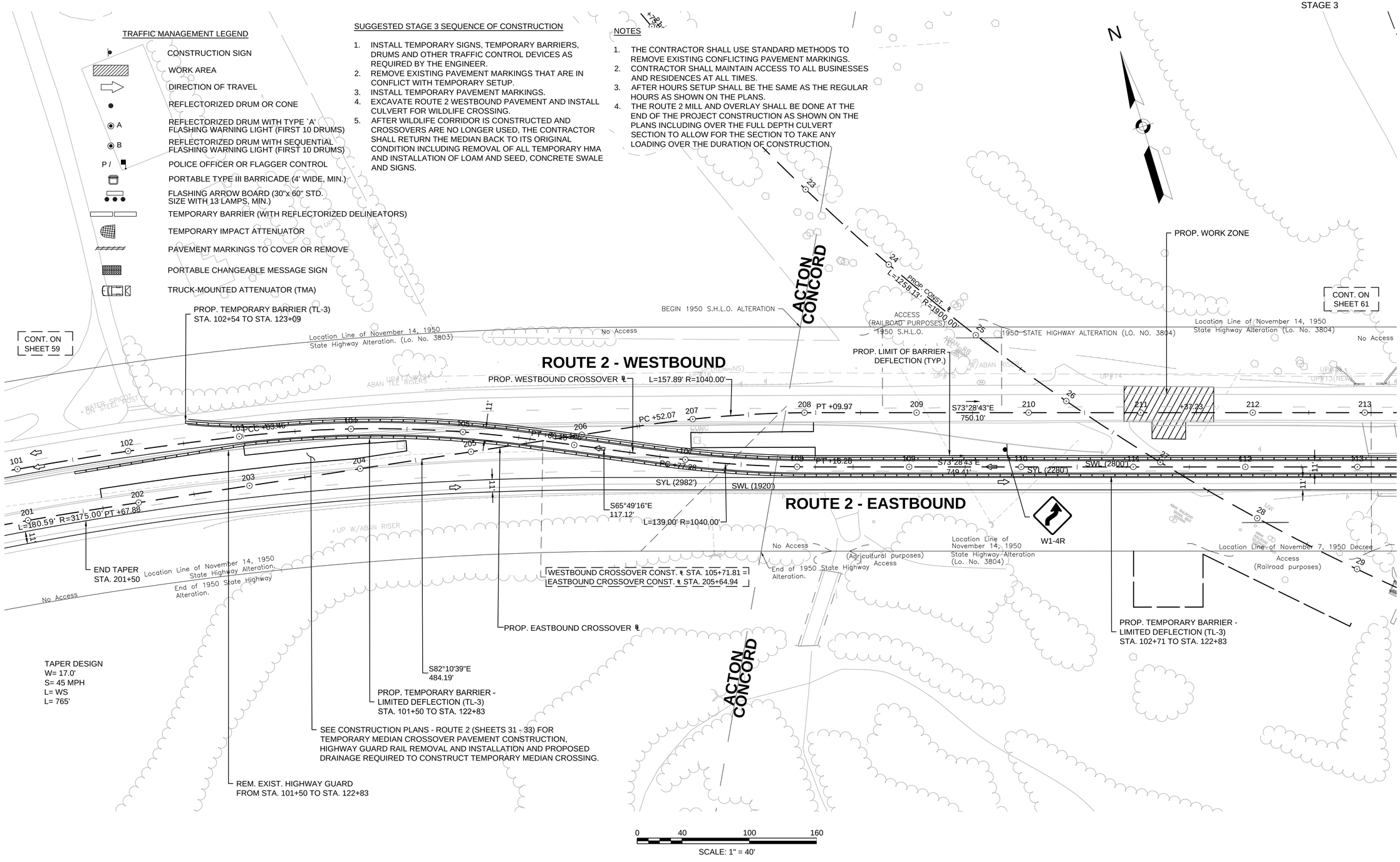

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	61	158
PROJECT FILE NO.	606223		

CONSTRUCTION STAGING PLANS
STAGE 3

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:34 PM

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM OR CONE
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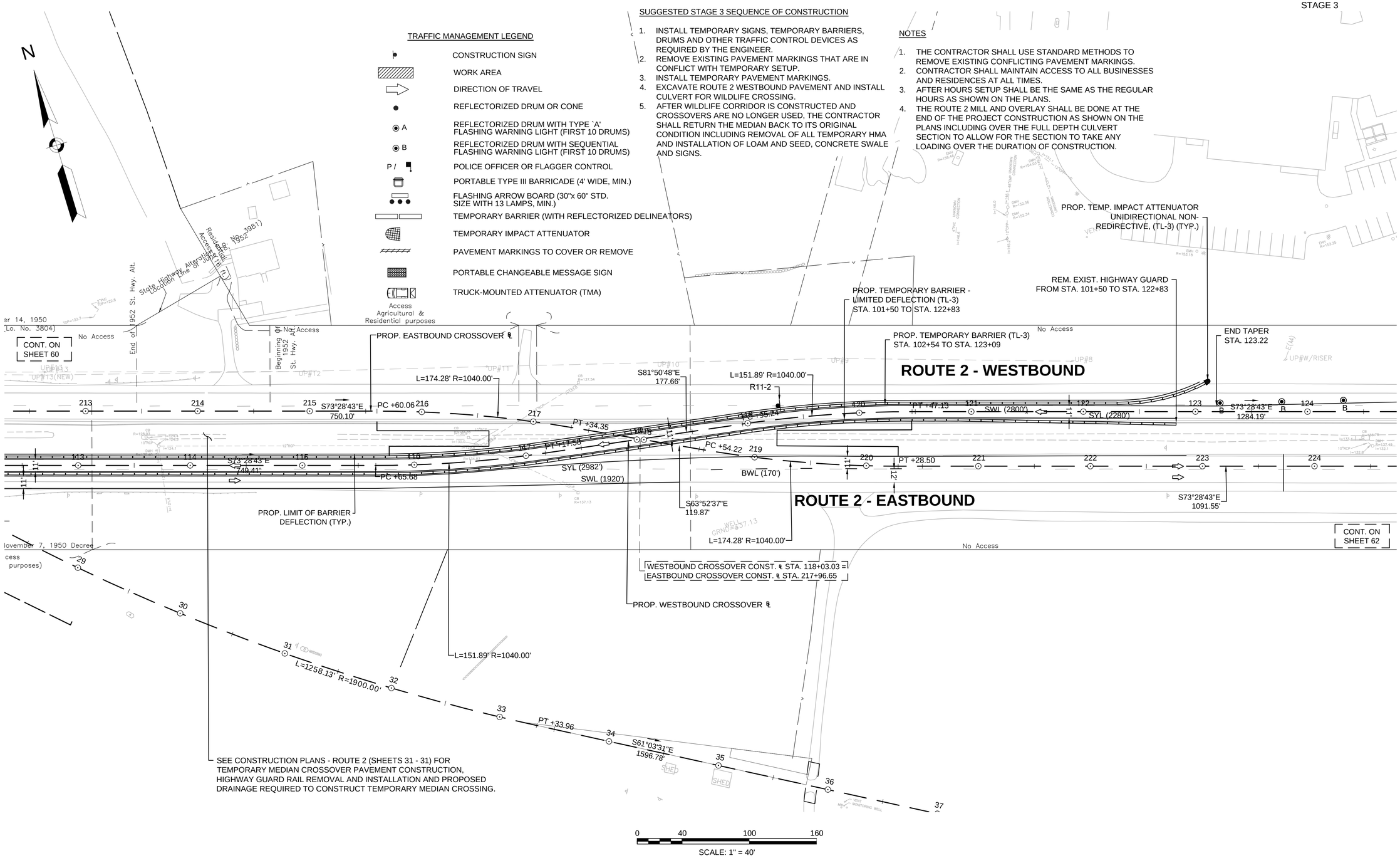
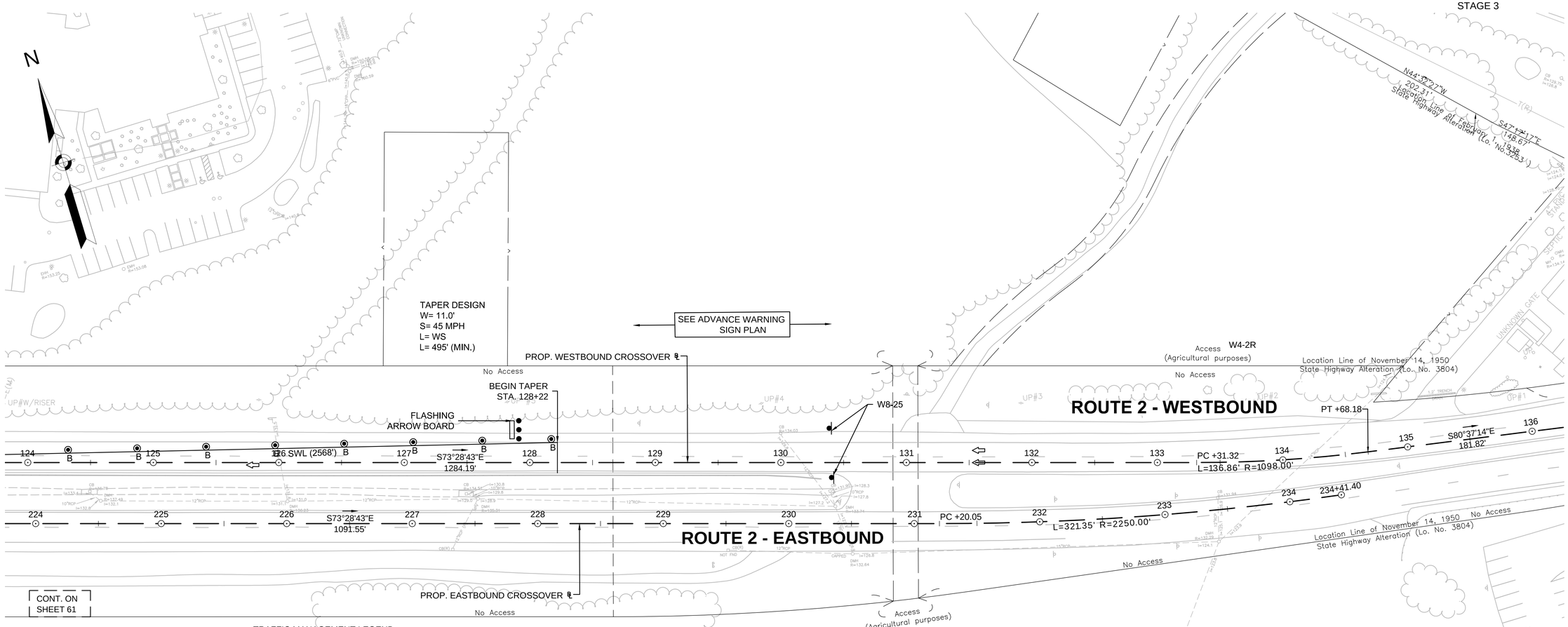


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	62	158
PROJECT FILE NO.		606223	

CONSTRUCTION STAGING PLANS
STAGE 3

606223_HD_(STAGING).DWG Plotted on 4-Feb-2019 3:34 PM



TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
- WORK AREA
- DIRECTION OF TRAVEL
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0 40 100 160
SCALE: 1" = 40'

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	63	158
PROJECT FILE NO.	606223		

TEMPORARY TRAFFIC CONTROL PLANS

IDENTIFICATION NUMBER	SIZE OF SIGN WIDTH	SIZE OF SIGN HEIGHT	TEXT	TEXT DIMENSIONS (INCHES) LETTER HEIGHT	TEXT DIMENSIONS (INCHES) VERTICAL SPACING	NUMBER OF SIGNS REQUIRED	COLOR BACKGROUND	COLOR LEGEND	COLOR BORDER	UNIT AREA IN SQUARE FEET	AREA IN SQUARE FEET
MA-R2-10a	48"	36"	WORK ZONE / SPEEDING FINES DOUBLED	MASSDOT STANDARD		6	ORANGE / WHITE	BLACK	BLACK	12.00	72.00
MA-R2-10e	36"	48"	END ROAD WORK / DOUBLE FINES END	MASSDOT STANDARD		4	ORANGE / WHITE	BLACK	BLACK	12.00	48.00
R11-2	48"	30"	ROAD CLOSED	MUTCD STANDARD		1	WHITE	BLACK	BLACK	10.00	10.00
W1-4BL	48"	48"		MUTCD STANDARD		2	ORANGE	BLACK	BLACK	16.00	32.00
W1-4R	48"	48"		MUTCD STANDARD		2	ORANGE	BLACK	BLACK	16.00	32.00
W1-4BR	48"	48"		MUTCD STANDARD		4	ORANGE	BLACK	BLACK	16.00	64.00
W1-6L	60"	30"		MUTCD STANDARD		1	ORANGE	BLACK	BLACK	12.50	12.50
W4-2L	36"	36"		MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W4-2R	36"	36"		MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W4-5R	36"	36"		MUTCD STANDARD		1	ORANGE	BLACK	BLACK	9.00	9.00
W8-1	36"	36"	BUMP	MUTCD STANDARD		5	ORANGE	BLACK	BLACK	9.00	45.00
W8-3	36"	36"	PAVEMENT ENDS	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W8-8	36"	36"	ROUGH ROAD	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W8-15	36"	36"	GROOVED PAVEMENT	MUTCD STANDARD		4	ORANGE	BLACK	BLACK	9.00	36.00
W8-25	48"	48"	SHOULDER ENDS	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	16.00	32.00
W13-1P	18"	18"	XX MPH	MUTCD STANDARD		4	ORANGE	BLACK	BLACK	2.25	9.00
W20-1	36"	36"	ROAD WORK AHEAD	MUTCD STANDARD		4	ORANGE	BLACK	BLACK	9.00	36.00
W20-1M	36"	36"	ROAD WORK 1 MILE	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W20-5L	48"	48"	LEFT LANE CLOSED AHEAD	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	16.00	32.00
W20-5R	36"	36"	RIGHT LANE CLOSED AHEAD	MUTCD STANDARD		2	ORANGE	BLACK	BLACK	9.00	18.00
W21-5a	36"	36"	RIGHT SHOULDER CLOSED	MUTCD STANDARD		1	ORANGE	BLACK	BLACK	9.00	9.00
W21-5b	36"	36"	RIGHT SHOULDER CLOSED AHEAD	MUTCD STANDARD		1	ORANGE	BLACK	BLACK	9.00	9.00
W21-10	48"	48"	MEDIAN CROSSOVER 1 MILE	5"D	4"	2	ORANGE	BLACK	BLACK	16.00	32.00
W21-11a	48"	48"	LANE SHIFT 2500 FT	5" D	4"	2	ORANGE	BLACK	BLACK	16.00	32.00
W21-11b	48"	48"	LANE SHIFT 1000 FT	5" D	4"	2	ORANGE	BLACK	BLACK	16.00	32.00

TRAFFIC MANAGEMENT NOTES

GENERAL

1. ALL TRAFFIC MANAGEMENT AND WORK ZONE TRAFFIC CONTROL MEASURES SHALL CONFORM TO THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.), MASSDOT - HIGHWAY DIVISION'S "STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TRAFFIC MANAGEMENT PLANS", THE STANDARD SPECIFICATIONS, AND THE FOLLOWING NOTES.

2. THE TEMPORARY TRAFFIC CONTROL PLANS CONTAINED HEREIN ARE GIVEN AS A GUIDE FOR TYPICAL WORK ZONE TRAFFIC CONTROL APPLICATIONS FOR THE TYPES OF WORK ANTICIPATED FOR THIS PROJECT. THEY ARE NOT INTENDED TO COVER ALL POSSIBLE CONSTRUCTION OPERATIONS WHICH THE CONTRACTOR MAY CHOOSE TO EMPLOY. WORK ZONE TRAFFIC CONTROL FOR OTHER CONSTRUCTION OPERATIONS OR OTHER TRAFFIC SITUATIONS IF APPLICABLE SHALL BE IN ACCORDANCE WITH THE REFERENCES LISTED IN NOTE NO. 1 AND AS APPROVED OR DIRECTED BY THE ENGINEER.

3. WITH THE EXCEPTION OF THE PERMANENT LANE CLOSURES REQUIRED FOR STAGED CONSTRUCTION, LANE RESTRICTIONS MAY NOT REMAIN OVERNIGHT OR DURING NON-WORKING HOURS. AFTER EACH WORKING DAY, TRAFFIC CONTROL DEVICES THAT ARE NOT REQUIRED SHALL BE MOVED OFF THE ROADWAY OR FULL DEPTH CONSTRUCTION AREA AND PLACED SO AS NOT TO IMPEDE PEDESTRIAN AREAS, ABUTTER ACCESS OR CAUSE CONFUSION TO MOTORISTS. IN CERTAIN CIRCUMSTANCES, AND ONLY WITH THE APPROVAL OF MASSDOT AND THE ENGINEER, LANE RESTRICTIONS MAY REMAIN OVERNIGHT.

4. CONTRACTOR SHALL PROVIDE A SAFE TEMPORARY PEDESTRIAN ACCESS WHERE EXISTING SIDEWALKS OR OTHER PEDESTRIAN AREAS ARE AFFECTED BY CONSTRUCTION WORK. CONTRACTOR SHALL 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.

5. PLACE ALL CONSTRUCTION SIGNING, TRAFFIC CONTROL DEVICES AND TEMPORARY PAVEMENT MARKINGS FOR EACH PHASE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

6. ONE (1) THRU TRAVEL LANE HAVING A MINIMUM WIDTH OF 11'-0" MUST BE PROVIDED FOR BOTH DIRECTIONS DURING ALL PHASES OF CONSTRUCTION AS SHOWN ON THE TEMPORARY TRAFFIC CONTROL PLANS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. MINIMUM LANE WIDTH IS MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.

7. WHEN WORK INFRINGES UPON THE TRAVELED WAY, WORK SHALL BE RESTRICTED TO OFF-PEAK HOURS ONLY (NORMALLY 9:00am TO 4:00pm, MONDAY TO FRIDAY). THE CONTRACTOR SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF ROAD CLOSURE.

8. TAPER LENGTH FORMULAE FOR CHANNELIZATION DEVICES: ENGLISH UNITS:
   L = WxS FOR SPEED EQUAL TO OR GREATER THAN 45 M.P.H.
   L = WS²/60 FOR SPEED EQUAL TO OR LESS THAN 40 M.P.H.
   WHERE: L = MIN. LENGTH OF TAPER, S = POSTED SPEED, W = OFFSET WIDTH.

9. ADVISORY SPEED LIMIT, IF USED, SHALL BE SET IN THE FIELD BY THE ENGINEER. W13-1P PLATES SHALL BE USED WHERE APPROPRIATE.

10. FLASHING ARROW PANEL SHALL BE SET IN "ARROW MODE" WHEN USED FOR ACTUAL LANE CLOSURES ONLY. FOR SHOULDER CLOSURES, BULBS TO BE ILLUMINATED IN A NON-DIRECTIONAL CAUTION CONFIGURATION TO AVOID UNNECESSARY LANE SHIFTS.

11. DISTANCES SHOWN ON THE TEMPORARY TRAFFIC CONTROL PLANS ARE A GUIDE ONLY, AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.

GRADE DIFFERENCES

1. WHERE THERE IS A LONGITUDINAL DIFFERENCE IN ELEVATION BETWEEN EXISTING PAVEMENT AND ADJACENT TRAVEL SURFACE (UNDER REPAIR OR RECONSTRUCTION), THE CONTRACTOR SHALL PATCH A TEMPORARY HMA WEDGE WITH A 12:1 (OR FLATTER) SLOPE FOR SMOOTH TRANSITION. SEE DETAIL, THIS SHEET.

2. CROSS-SECTIONAL GRADE DIFFERENCES IN EXCESS OF 2" DURING NON-WORKING HOURS WILL REQUIRE DELINEATION BY USE OF REFLECTORIZED DRUMS.

3. CROSS-SECTIONAL GRADE DIFFERENCES IN EXCESS OF 4" DURING NON-WORKING HOURS SHALL BE PROTECTED BY BACKFILLING WITH A WEDGE OF EARTHWORK TO BE COMPACTED AT 4:1 SLOPE AND WILL ALSO REQUIRE DELINEATION BY USE OF DRUMS.

4. A MINIMUM SLOPE OF 4:1 MUST BE MAINTAINED AFTER WORKING HOURS DURING SUBBASE AND BASE COURSE INSTALLATION ALONG EDGE OF THE TRAVELWAY (SEE DETAIL, THIS SHEET). A MAXIMUM SLOPE OF 8:1 MUST BE MAINTAINED ON ALL ABUTTER ACCESS DRIVES AND A MAXIMUM SLOPE OF 12:1 MUST BE MAINTAINED ON ALL SIDEWALKS.

CONSTRUCTION SIGNING

5. ALL CONSTRUCTION SIGNS SHALL BE BLACK LEGEND ON A REFLECTORIZED ORANGE BACKGROUND UNLESS OTHERWISE NOTED.

6. CONSTRUCTION SIGNING SHOWN ON THE ADVANCE SIGNING PLAN SHALL REMAIN IN PLACE FOR THE ENTIRE PROJECT DURATION, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

7. STANDARD ORANGE OR FLUORESCENT RED-ORANGE FLAGS (16"x16" MIN.) MAY BE ATTACHED TWO (2) EACH ON ALL ADVANCE WARNING SIGNS. FLAGS SHALL NOT INTERFERE WITH A CLEAR VIEW OF THE SIGN FACE. IF USED, THE COST FOR THE FLAGS SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE SIGNS WITH NO ADDITIONAL PAYMENT.

8. EXISTING GUIDE SIGNS SHALL BE TEMPORARILY RESET AS DIRECTED BY THE ENGINEER.

9. ALL SIGNS, INCLUDING EXISTING BARRICADES AND OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES THAT ARE NOT REPRESENTATIVE OF ACTUAL WORK CONDITIONS SHALL BE EITHER COVERED OR REMOVED WHEN NOT APPLICABLE.

10. IF USED, ALL W20-4 AND W20-5 SIGNS SHALL BE TAKEN DOWN OR COVERED AT THE CLOSE OF EACH DAY UNLESS LANE RESTRICTIONS ARE PERMITTED TO REMAIN OVERNIGHT IN ACCORDANCE WITH NOTE NO. 3 ABOVE.

11. USE W20-7b OR W20-7a SIGNS ONLY WHILE POLICE OR FLAGGERS ARE DIRECTING TRAFFIC. THEY SHALL BE TAKEN DOWN OR COVERED AT THE CLOSE OF EACH DAY OR WHEN NOT IN USE.

606223_HD_(TTCP).DWG Plotted on 4-Feb-2019 4:30 PM

TRAFFIC MANAGEMENT NOTES CONTINUED

PAVEMENT MARKINGS

12. PAVEMENT MARKINGS WHICH ARE NO LONGER APPLICABLE SHALL BE REMOVED. APPLY TEMPORARY MARKINGS WHERE SHOWN ON THE TEMPORARY TRAFFIC CONTROL PLANS.

13. ON PROJECTS WHERE PAVEMENT OVERLAY IS NOT DESIGNATED, EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH TEMPORARY TRAFFIC CONTROLS SHOULD BE COVERED TEMPORARILY WITH BLACKOUT TAPE, AS DIRECTED BY THE ENGINEER, FOR THE FULL DURATION OF THE PHASE IN PROGRESS. TEMPORARY PAINTED OR REMOVABLE TAPE MARKINGS SHALL BE USED AS NECESSARY FOR ALL PHASES OF CONSTRUCTION.

CHANNNELIZATION

25. THE MAXIMUM SPACING BETWEEN CHANNELIZATION DEVICES (DRUMS OR CONES) SHALL BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT. THE MINIMUM SPACING SHALL BE 25' O.C.

26. REFLECTORIZED CONES SHALL BE 36" HIGH.

27. PLASTIC DRUMS MUST PASS THE CRITERIA SET FORTH IN NCHRP 350 "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES." IF THEY DO NOT MEET THESE CRITERIA, THEY MUST BE REMOVED FROM THE PROJECT.

28. TEMPORARY IMPACT ATTENUATORS MUST MEET THE PERFORMANCE STANDARDS OF MASH.

29. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY MUST PASS THE CRITERIA SET FORTH IN NCHRP 350 "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES." IF THEY DO NOT MEET THIS CRITERIA, THEY MUST BE REMOVED FROM THE PROJECT.

30. THE FIRST TEN (10) PLASTIC DRUMS OF A TAPER ALONG THE SOLID YELLOW EDGE LINE SHALL BE MOUNTED WITH SEQUENTIAL FLASHING WARNING LIGHTS UNLESS OTHERWISE NOTED AS TYPE "A" LIGHTS ON THE STAGING PLANS.

31. 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.

TRAFFIC MANAGEMENT LEGEND

- CONSTRUCTION SIGN
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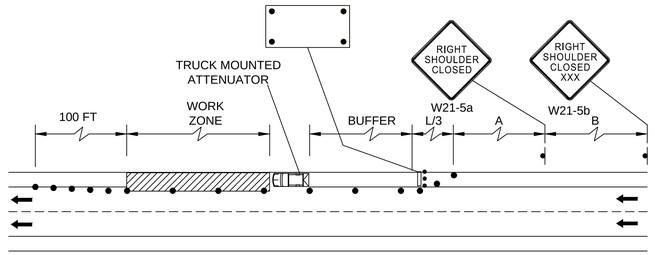
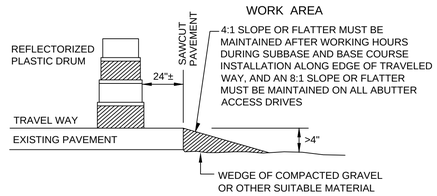


DIVIDED HIGHWAY
SHOULDER CLOSED
NOT TO SCALE



AFTER WORK HOURS TREATMENT
FOR LATERAL SLOPING

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	64	158
PROJECT FILE NO.	606223		

TEMPORARY TRAFFIC CONTROL PLANS

ALL PCMS (3 TOTAL)
ALL STAGES
THE SUGGESTED MESSAGE TWO WEEKS IN ADVANCE OF CONSTRUCTION SHOULD READ AS FOLLOWS:

(MESSAGE 1)

ROAD
WORK
STARTS

(MESSAGE 2)

XX/XX/XX
USE
CAUTION

PCMS-1
STAGE 1
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 1 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

ROAD
WORK
1 MILE

STAGE 2
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 2 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

HOSMER
STREET
OPEN

(MESSAGE 2)

DURING
CONST.

STAGE 3
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 3 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

ROAD
WORK
1 MILE

PCMS-2
STAGE 1
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 1 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

ROAD
WORK
1/2 MILE

STAGE 2
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 2 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

ROAD
WORK
1/2 MILE

STAGE 3
THE SUGGESTED MESSAGE ON ROUTE 2 (EASTBOUND) DURING STAGE 3 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

SCHOOL
STREET
OPEN

(MESSAGE 2)

DURING
CONST.

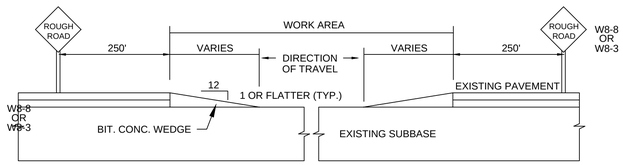
PCMS-3
ALL STAGES
THE SUGGESTED MESSAGE ON ROUTE 2 (WESTBOUND) DURING STAGE 1 SHOULD READ AS FOLLOWS:

(MESSAGE 1)

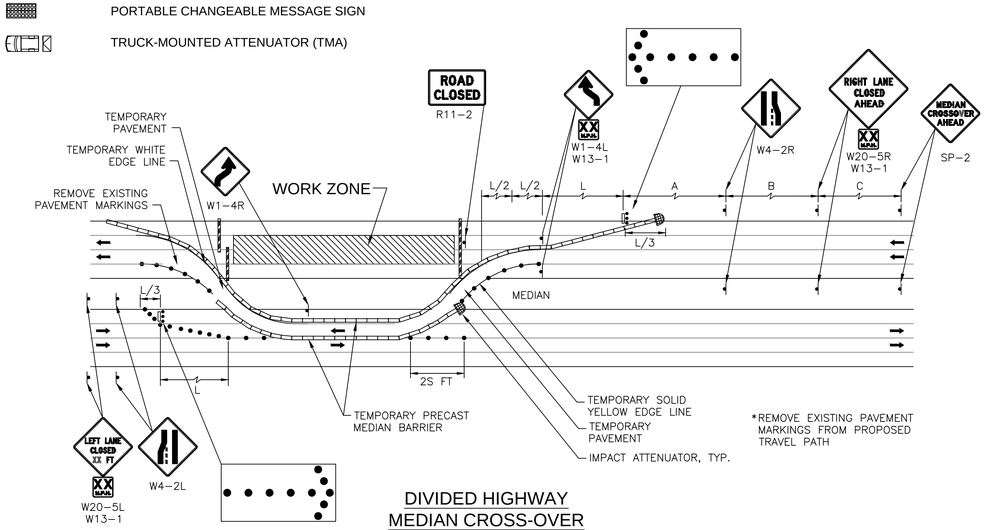
ROAD
WORK
3/4 MILE

PORTABLE CHANGEABLE MESSAGE SIGNS

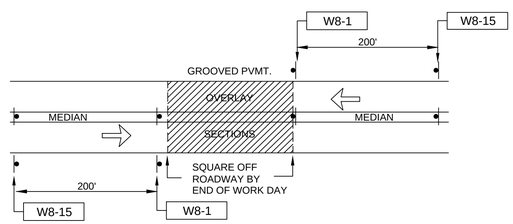
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL CONFORM TO THE 2009 MUTCD AS AMENDED AND SHOULD BE PLACED ON THE SHOULDER OF THE ROADWAY OR IF PRACTICAL SET WELL AWAY FROM TRAVEL LANE, MESSAGE SIGNS SHOULD BE PROTECTED WITH RETROREFLECTIVE TEMPORARY TRAFFIC CONTROL DEVICES WHEN PLACED WITHIN THE AVAILABLE CLEAR ZONE OR SHIELDED WITH A BARRIER OR CRASH CUSHION. THE LOCATION AND USE OF THE PCMS SHALL BE DETERMINED DURING THE PRE-CONSTRUCITON MEETING. ALTERNATE MESSAGES MAY BE DETERMINED BY THE ENGINEER IN THE FIELD.



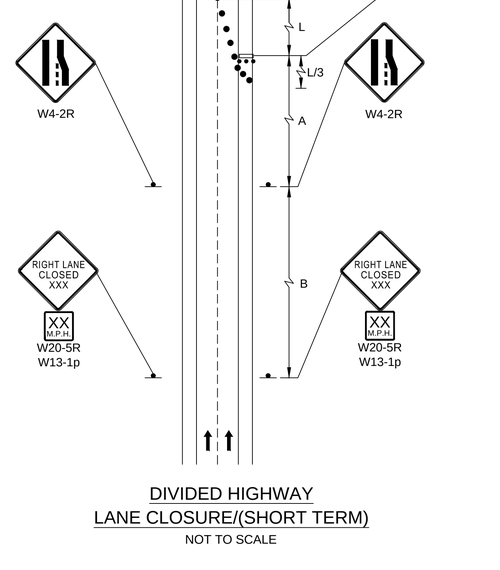
TEMPORARY RAMP



DIVIDED HIGHWAY
MEDIAN CROSS-OVER



AFTER WORK HOURS TREATMENT
FOR AREAS RECEIVING OVERLAY



DIVIDED HIGHWAY
LANE CLOSURE/(SHORT TERM)
NOT TO SCALE

606223_HD_(TTCP).DWG Plotted on 4-Feb-2019 4:30 PM

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	65	158
PROJECT FILE NO.	606223		

TEMPORARY TRAFFIC CONTROL PLANS

606223_HD_(TTCP).DWG Plotted on 4-Feb-2019 3:35 PM

N

MAIN ST
CONCORD RD
MINOT AVE
POPE RD
ACTON
CONCORD
TAYLOR RD
HOSMER ST
ALCOTT ST
WETHERBEE ST
BARRETT'S MILL RD
GREAT RD
PIPER RD
BRUCEWOOD RD
ROBINWOOD RD
SCHOOL ST
LAWS BROOK RD
ACTON
CONCORD
CONCORD ROTARY
COMMONWEALTH AVE
ELM ST
ROUTE 2 / CONCORD TURNPIKE

PCMS-1
W20-1a
MA-R2-10a

STAGE 1	STAGE 2	STAGE 3
(NONE)	W21-10	W20-5L W13-1p

2640'
1500'
1000'

PCMS-2

STAGE 1	STAGE 2	STAGE 3
W21-11a	W20-5R W13-1p	W4-2L

W20-1
MA-R2-10a

STAGE 1	STAGE 2	STAGE 3
W14-1R W13-1p	W4-2R	W8-25

MA-R2-10e
WORK ZONE
WESTBOUND
WORK ZONE
WORK ZONE
ROUTE 2 / UNION TURNPIKE
EASTBOUND
1000'
500'
W20-1
MA-R2-10a
W20-1a
MA-R2-10e

STAGE 1	STAGE 2	STAGE 3
W1-4R W13-1p	W4-2L	W4-2R

STAGE 1	STAGE 2	STAGE 3
W21-11 (1500)	W20-5L W13-1p	W20-5R W13-1p

MA-R2-10a
MA-R2-10e
W20-1
PCMS-3

NOTE:

TWO (2) OF EACH ADVANCE WARNING SIGNS ALONG ROUTE 2 EASTBOUND AND WESTBOUND ARE REQUIRED (ONE IN THE SHOULDER, ONE IN THE MEDIAN).

ADVANCE WARNING SIGN PLAN

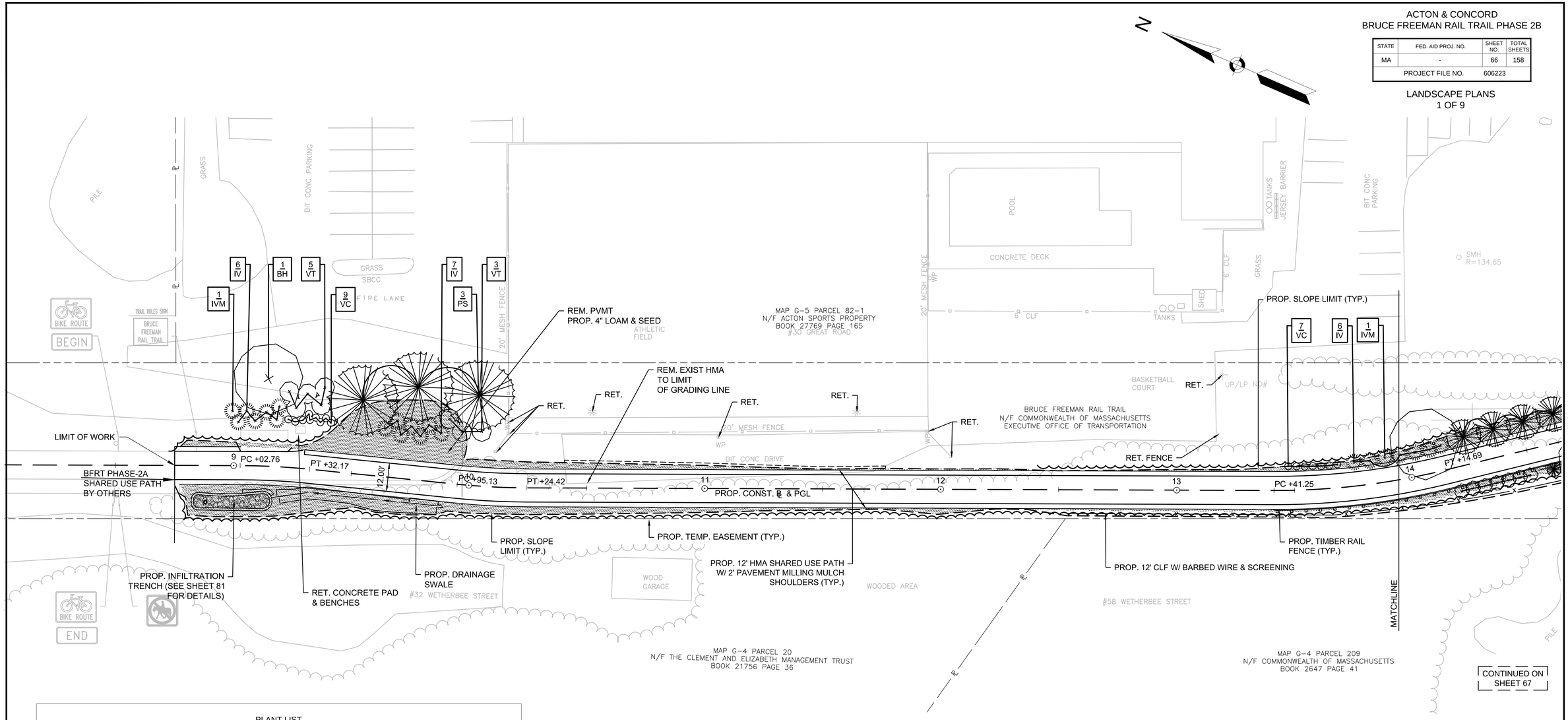
0 600 1200 1800 2400
SCALE: 1" = 600'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	66	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
1 OF 9

4-Feb-2019
606223_HD_(LSD).DWG



PLANT LIST					
QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
TREES					
1	BH	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	8-10 FT. CLUMP	B&B
3	PS	PINUS STROBUS	WHITE PINE	5-6 FT.	B&B
SHRUBS					
19	IV	ILEX VERTICILLATA	WINTERBERRY	24-30 IN.	
2	IVM	ILEX VERTICILLATA	WINTERBERRY (MALE)	24-30 IN.	
16	VC	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	6-9 IN.	
8	VT	VIBURNUM TRILOBUM	AMERICAN CRANBERRY VIBURNUM	3-4 FT.	

LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
- PROP. CLEARING LIMIT (TYP.)
- PROP. NATIVE SEED
- PROP. WETLAND SEED
- PROP. NATIVE TALL SEED
- PROP. AGED PINE BARK MULCH

NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

PLANTING NOTES

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
3. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, & SIZE.
4. UPON APPROVAL OF PLANTING, TAGS SHALL BE IMMEDIATELY REMOVED.
5. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
6. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
7. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

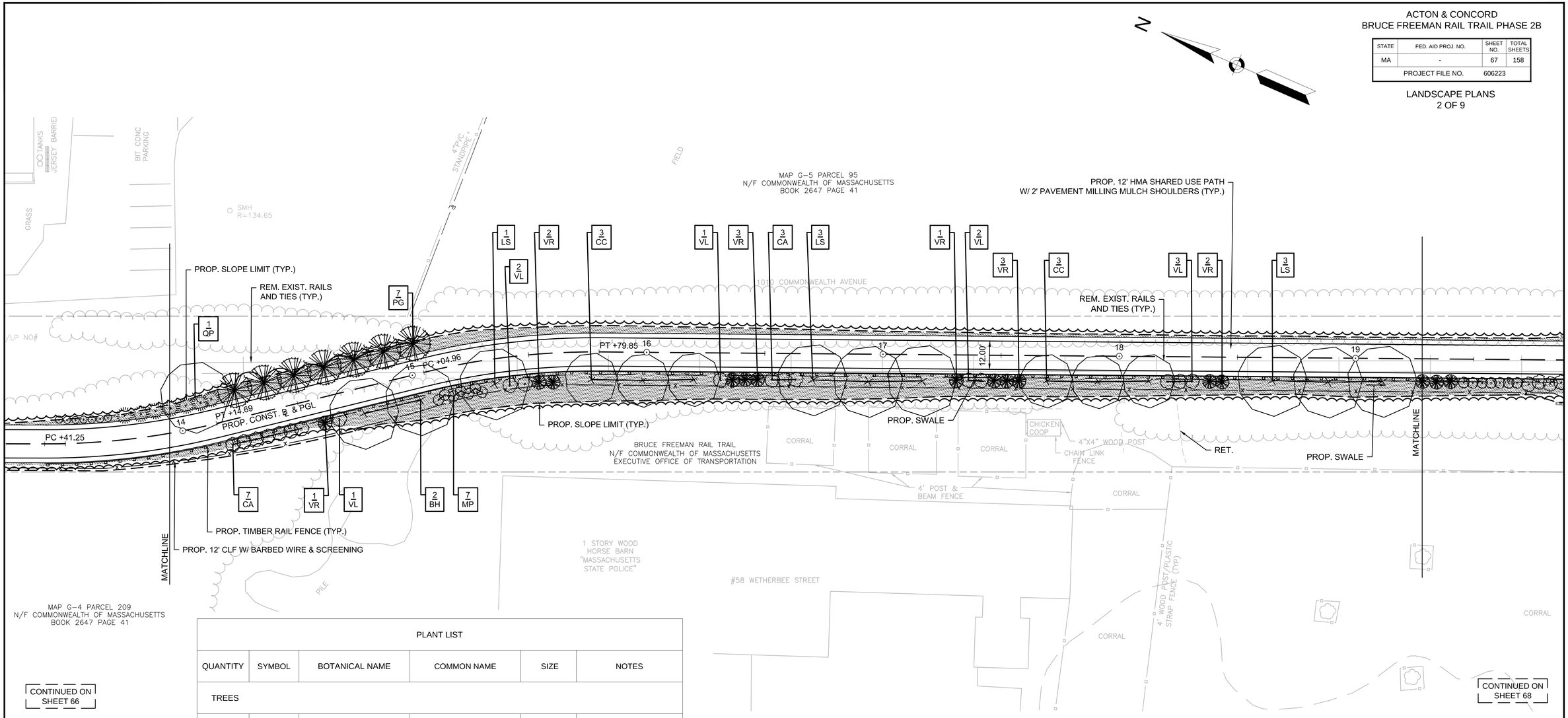
0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	67	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
2 OF 9

606223_HD_(LSD).DWG 4-Feb-2019



PLANT LIST					
QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
TREES					
2	BH	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	8-10 FT. CLUMP	B&B
6	CC	CARPINUS CAROLINIANA	HORN BEAM	8-10 FT.	B&B
7	LS	LIQUIDAMBAR STYRACIFLUA	SWEET GUM	2-2.5 IN. CAL.	B&B
7	PG	PICEA GLAUCA	WHITE SPRUCE	5-6 FT.	B&B
1	QP	QUERCUS PALUSTRIS	PIN OAK	2-2.5 IN. CAL.	B&B
SHRUBS					
10	CA	CLETHRA ALNIFOLIA	SUMMER SWEET	18-24 IN.	B&B
7	MP	MYRICA PENSYLVANICA	BAYBERRY	2-3 FT.	B&B
9	VL	VIBURNUM LENTAGO	NANNYBERRY	24-30 IN.	B&B
12	VR	VIBURNUM RHYTIDOPHYLLUM	LEATHERLEAF VIBURNUM	24-30 IN.	

LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
- PROP. CLEARING LIMIT (TYP.)
- PROP. NATIVE SEED
- PROP. WETLAND SEED
- PROP. NATIVE TALL SEED
- PROP. AGED PINE BARK MULCH

NOTE:
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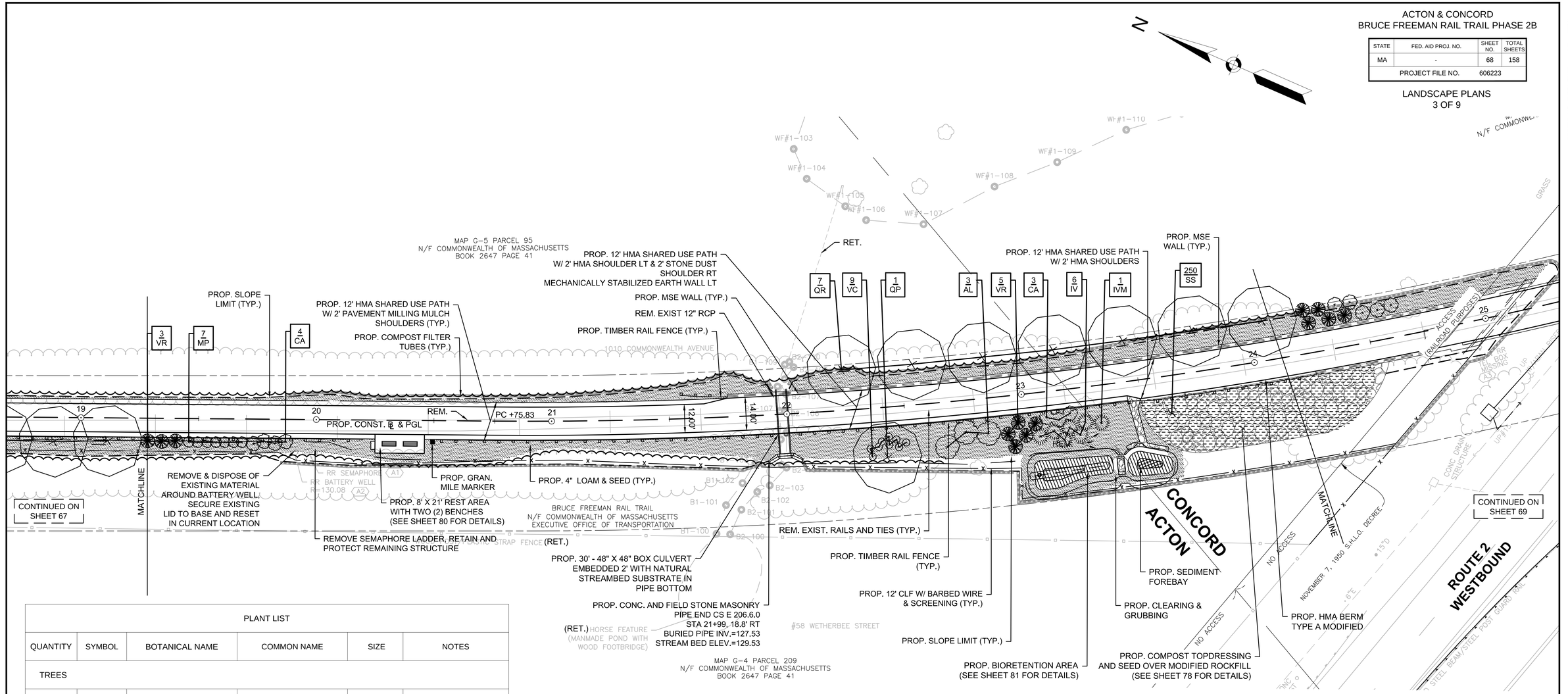
0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	68	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
3 OF 9

606223_HD_(LSD).DWG 4-Feb-2019



PLANT LIST					
QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
TREES					
3	AL	AMELANCHIER LAEVIS	ALLEGHENY SERVICEBERRY	4-5 FT. CLUMP	B&B
1	QP	QUERCUS PALUSTRIS	PIN OAK	2-2.5 IN. CAL.	B&B
7	QR	QUERCUS RUBRA	RED OAK	2-2.5 IN. CAL.	
SHRUBS					
7	CA	CLETHRA ALNIFOLIA	SUMMERSWEET	18-24 IN.	
6	IV	ILEX VERTICILLATA	WINTERBERRY	24-30 IN.	
1	IVM	ILEX VERTICILLATA	WINTERBERRY (MALE)	24-30 IN.	
7	MP	MYRICA PENSYLVANICA	BAYBERRY	2-3 FT.	
9	VC	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	6-9 IN.	
8	VR	VIBURNUM RHYTIDOPHYLLUM	LEATHERLEAF VIBURNUM	24-30 IN.	
GRASS					
250	SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUE STEM	2.5' plugs	3' O.C.

LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
- PROP. CLEARING LIMIT (TYP.)
- PROP. NATIVE SEED
- PROP. WETLAND SEED
- PROP. NATIVE TALL SEED
- PROP. AGED PINE BARK MULCH

NOTE:
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PLANTING NOTES

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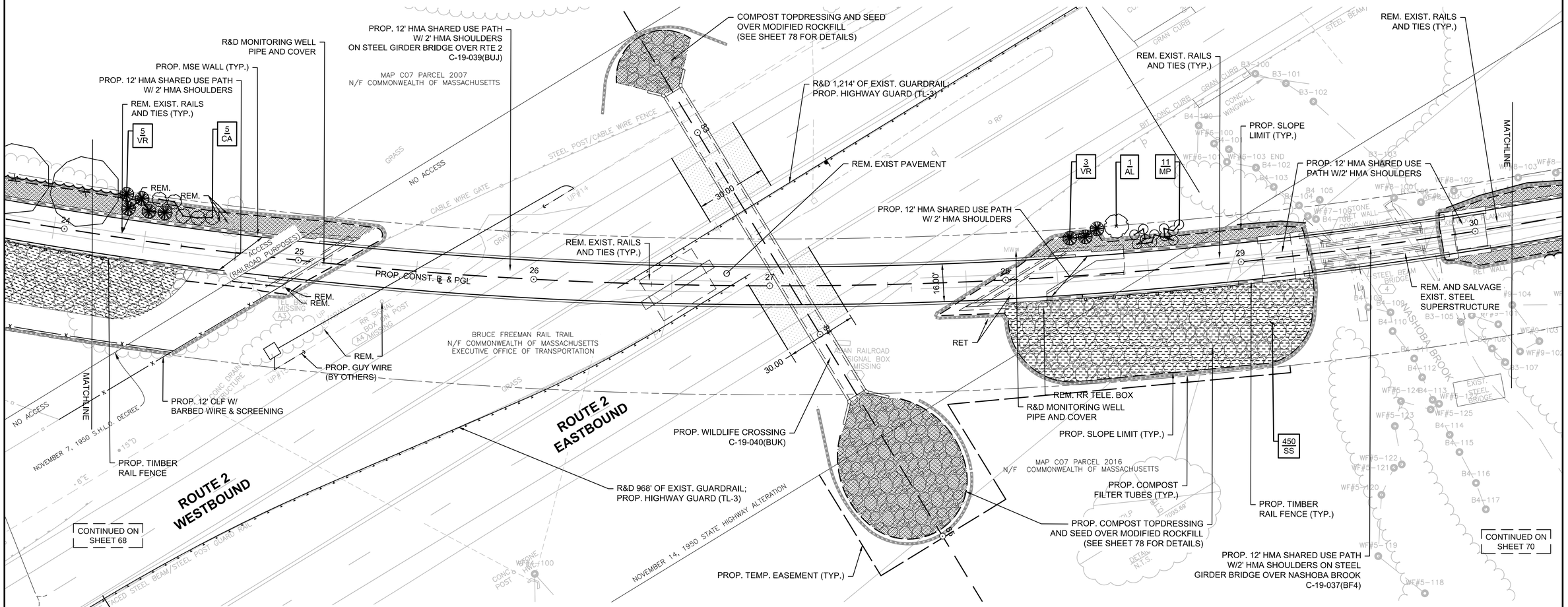
0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	69	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
4 OF 9

606223_HD_(LSD).DWG 4-Feb-2019


PROP. 12' HMA SHARED USE PATH W/ 2' HMA SHOULDERS ON STEEL GIRDER BRIDGE OVER RTE 2 C-19-039(BUJ)
MAP C07 PARCEL 2007 N/F COMMONWEALTH OF MASSACHUSETTS
R&D MONITORING WELL PIPE AND COVER
PROP. MSE WALL (TYP.)
PROP. 12' HMA SHARED USE PATH W/ 2' HMA SHOULDERS
REM. EXIST. RAILS AND TIES (TYP.)
5 VR
5 CA
COMPOST TOPDRESSING AND SEED OVER MODIFIED ROCKFILL (SEE SHEET 78 FOR DETAILS)
R&D 1,214' OF EXIST. GUARDRAIL; PROP. HIGHWAY GUARD (TL-3)
REM. EXIST PAVEMENT
30.00
REM. EXIST. RAILS AND TIES (TYP.)
PROP. 12' HMA SHARED USE PATH W/ 2' HMA SHOULDERS
3 VR
1 AL
11 MP
PROP. SLOPE LIMIT (TYP.)
MATCHLINE
REM. EXIST. RAILS AND TIES (TYP.)
PROP. 12' HMA SHARED USE PATH W/2' HMA SHOULDERS
REM.
ACCESS (RAILROAD PURPOSES)
PROP. CONST. ℄ & PGL
REM. AND SALVAGE EXIST. STEEL SUPERSTRUCTURE
BRUCE FREEMAN RAIL TRAIL
N/F COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF TRANSPORTATION
16.00'
RET
REM. RR TELE. BOX
R&D MONITORING WELL PIPE AND COVER
PROP. GUY WIRE (BY OTHERS)
PROP. 12' CLF W/ BARBED WIRE & SCREENING
PROP. SLOPE LIMIT (TYP.)
450 SS
MAP C07 PARCEL 2016 N/F COMMONWEALTH OF MASSACHUSETTS
PROP. COMPOST FILTER TUBES (TYP.)
PROP. TIMBER RAIL FENCE (TYP.)
PROP. TIMBER RAIL FENCE
ROUTE 2 EASTBOUND
ROUTE 2 WESTBOUND
PROP. WILDLIFE CROSSING C-19-040(BUK)
R&D 968' OF EXIST. GUARDRAIL; PROP. HIGHWAY GUARD (TL-3)
NOVEMBER 14, 1950 STATE HIGHWAY ALTERATION
NOVEMBER 7, 1950 S.H.L.O. DECREE
PROP. TEMP. EASEMENT (TYP.)
PROP. COMPOST TOPDRESSING AND SEED OVER MODIFIED ROCKFILL (SEE SHEET 78 FOR DETAILS)
PROP. 12' HMA SHARED USE PATH W/2' HMA SHOULDERS ON STEEL GIRDER BRIDGE OVER NASHOBA BROOK C-19-037(BF4)
CONTINUED ON SHEET 68
CONTINUED ON SHEET 70
WASHOBA BROOK
EXIST. STEEL BRIDGE
STEEL BEAM BRIDGE
RET WALL
STONE WALL
CONC WALL
CONC WINGWALL
BIT CONC CURB
GRAN CURB
STEEL BEAM
GRASS
NO ACCESS
CABLE WIRE GATE
STEEL POST/CABLE WIRE FENCE
CONC DRAIN STRUCTURE
UP#14
UP#15
UP#16
UP#17
MBTA RAILROAD SIGNAL BOX MISSING
RR SIGNAL BOX ON A4 MISSING POST
TELE BOX MISSING
A3
A4
A5
MW#1
MW#2
MW#3
MW#4
MW#5
MW#6
MW#7
MW#8
MW#9
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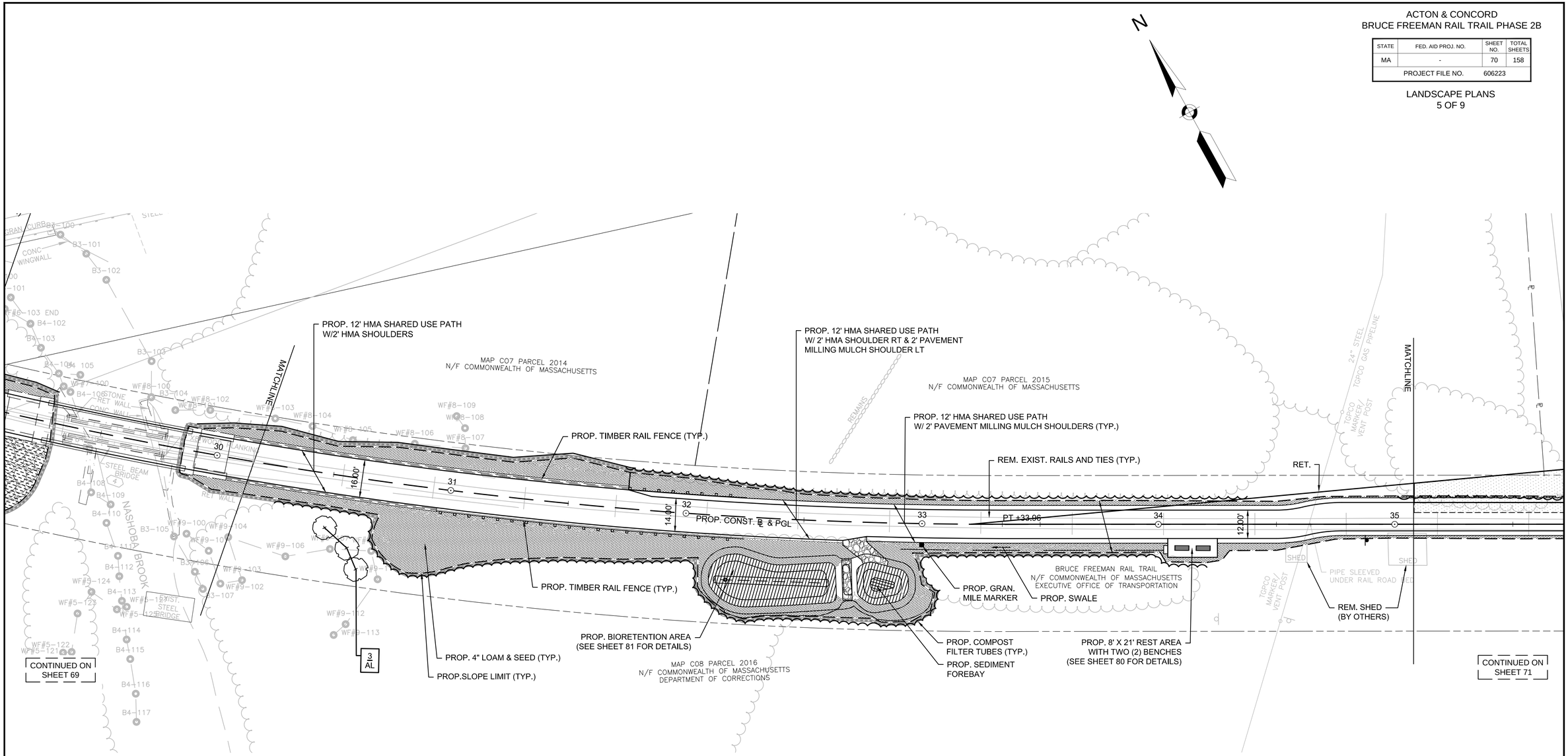
MW#35
MW#36
MW#37
MW#38
MW#39
MW#40

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	70	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
5 OF 9

606223_HD_(LSD).DWG 4-Feb-2019



PLANT LIST					
QUANTITY	SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
TREES					
3	AL	AMELANCHIER LAEVIS	ALLEGHENY SERVICEBERRY	4-5 FT. CLUMP	B&B

LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
- PROP. CLEARING LIMIT (TYP.)
- PROP. NATIVE SEED
- PROP. WETLAND SEED
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- PROP. AGED PINE BARK MULCH

NOTE:
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0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	71	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
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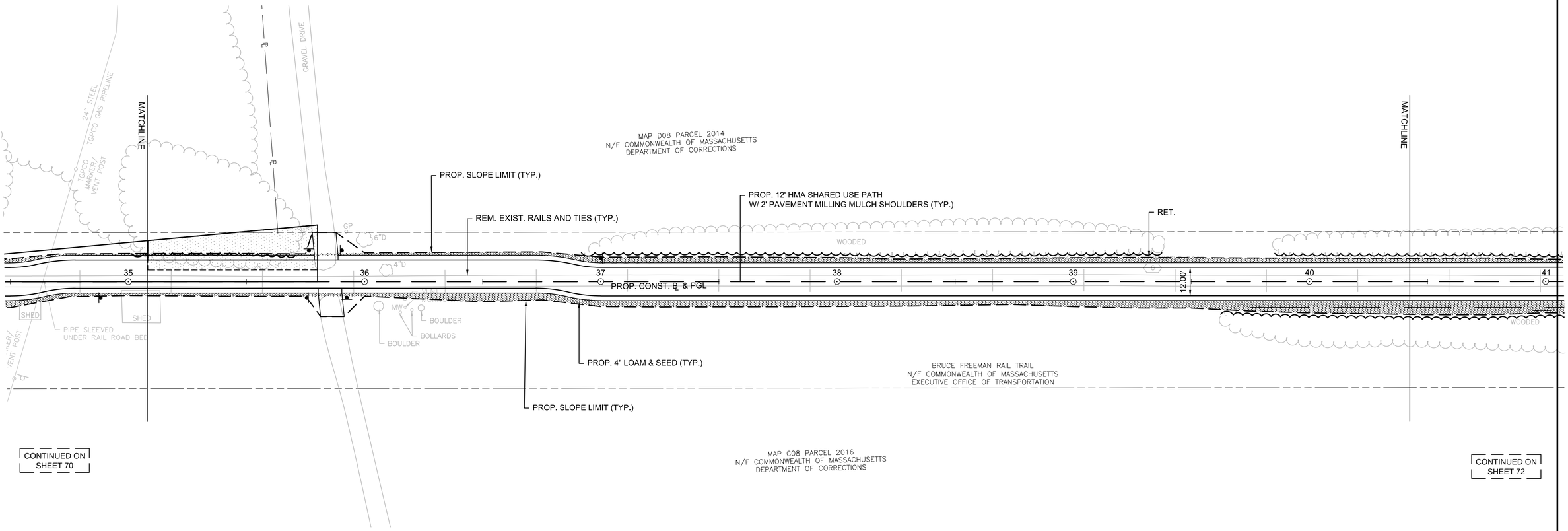
4-Feb-2019

606223_HD_(LSD).DWG



CONTINUED ON SHEET 70

CONTINUED ON SHEET 72

LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
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0 20 50 100

SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	72	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
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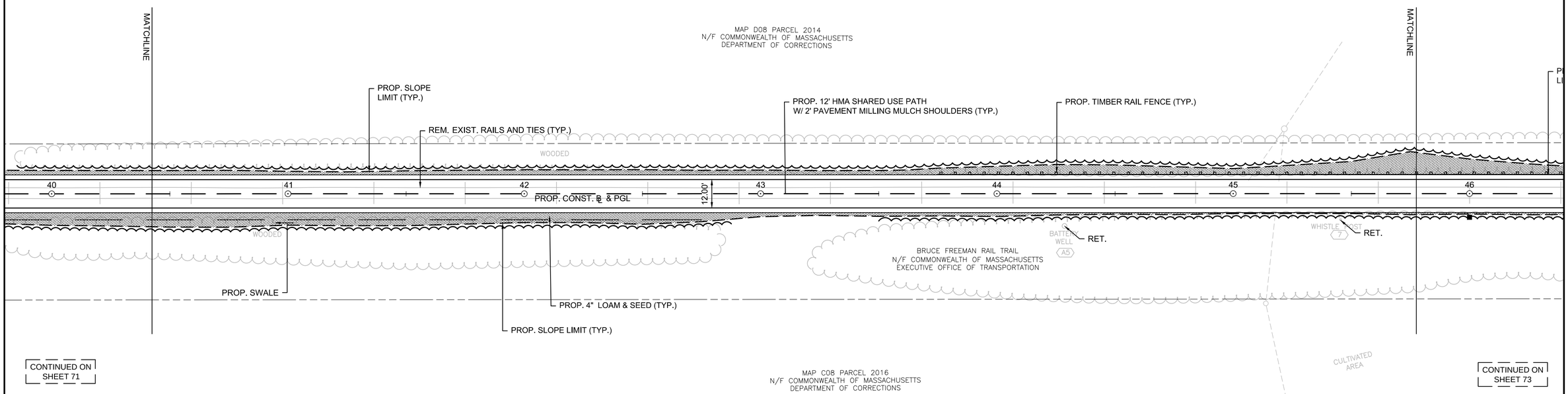
4-Feb-2019
606223_HD_(LSD).DWG



LEGEND

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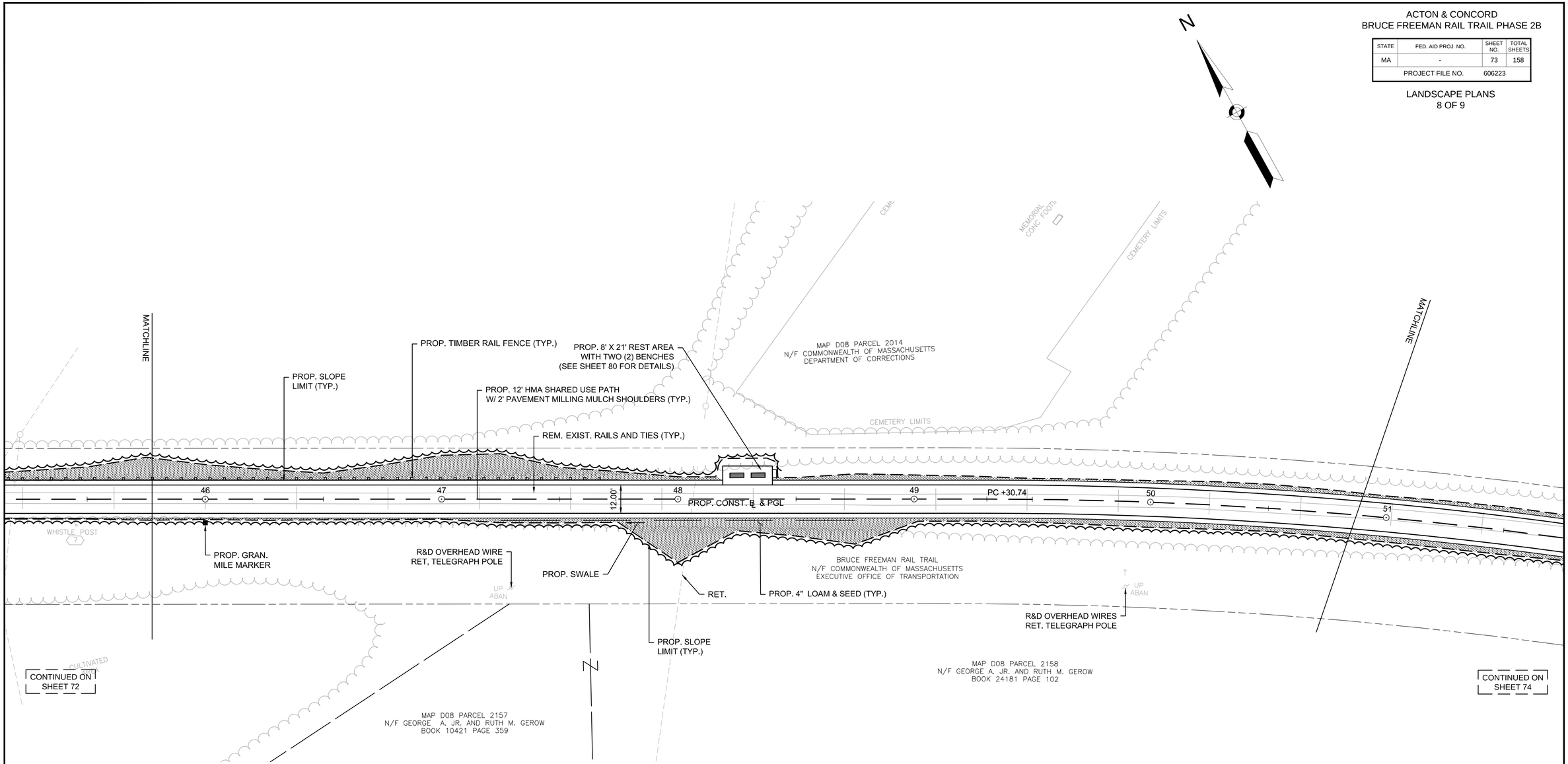
0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	73	158
PROJECT FILE NO.	606223		

LANDSCAPE PLANS
8 OF 9

4-Feb-2019
606223_HD_(LSD).DWG



LEGEND

- PROP. EVERGREEN TREE (TYP.)
- PROP. EVERGREEN SHRUB (TYP.)
- PROP. DECIDUOUS TREE (TYP.)
- PROP. DECIDUOUS SHRUB (TYP.)
- PROP. CLEARING LIMIT (TYP.)
- PROP. NATIVE SEED
- PROP. WETLAND SEED
- PROP. NATIVE TALL SEED
- PROP. AGED PINE BARK MULCH

NOTE:
1. PROP. CLEARING AND GRUBBING SHALL BE DEFINED AS 5' BEYOND THE PROPOSED SLOPE LIMIT.

PLANTING NOTES

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
3. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, & SIZE.
4. UPON APPROVAL OF PLANTING, TAGS SHALL BE IMMEDIATELY REMOVED.
5. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
6. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
7. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

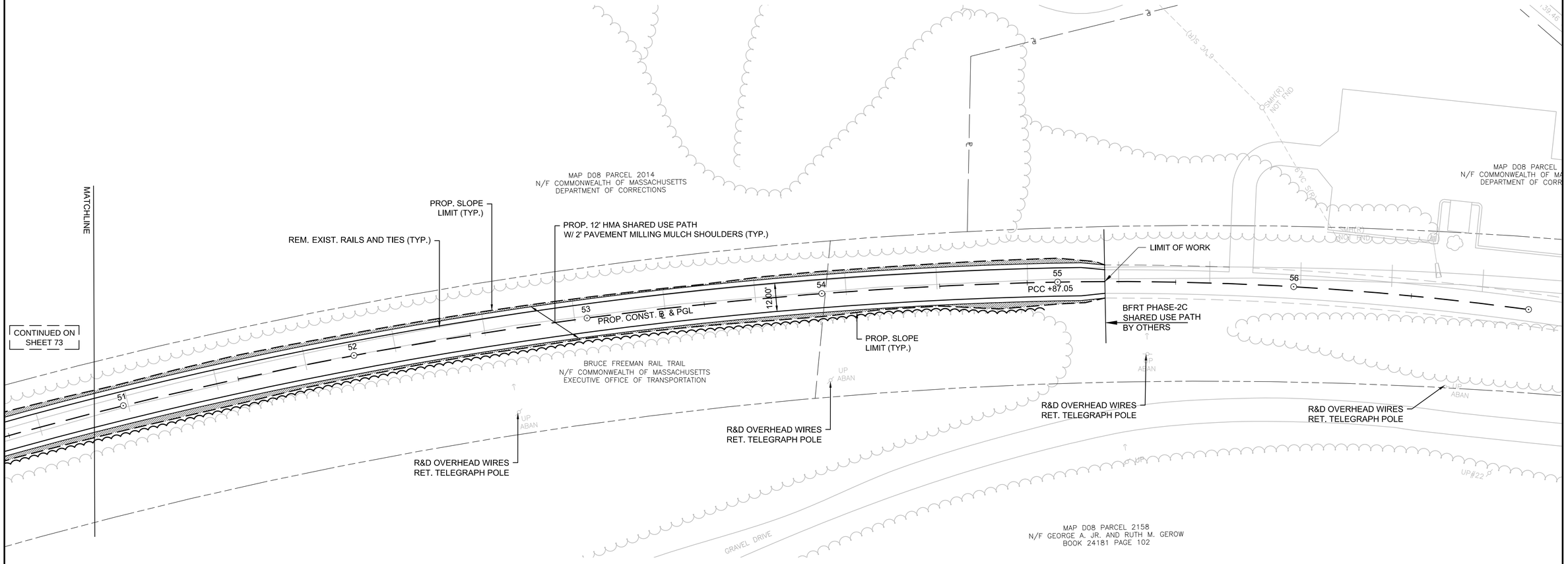
0 20 50 100
SCALE: 1" = 20'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	74	158
PROJECT FILE NO.	606223		

LANDSCPE PLANS
9 OF 9

4-Feb-2019
606223_HD_(LSD).DWG



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0 20 50 100
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ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	75	158
PROJECT FILE NO.	606223		

INVASIVE PLANT MANAGEMENT PLAN

4-Feb-2019

INVASIVES_LOCATION.DWG

INVASIVES IDENTIFIED

*CELASTRUS ORBICULATUS (BITTERSWEET)

*LONICERA spp. (HONEYSUCKLE)

*RHAMNUS FRAGULA (GLOSSY BUCKTHORN)

ACER PLATANOIDES (NORWAY MAPLE)

EUONYMUS ALATUS (BURNING BUSH)

POLYGONUM CUSPIDATUM (JAPANESE KNOTWEED)

ROSA MULTIFLORA

* DOMINANT INVASIVE SPECIES

N

CONCORD
ACTON

A STA. 8+75 TO STA 25+00

B STA. 28+00 TO STA 29+35

*LONICERA spp. (HONEYSUCKLE) HEAVY CONCENTRATION ALONG SW EDGE OF THE FIELD

POLYGONUM CUSPIDATUM (JAPANESE KNOTWEED) LOCATED

EUONYMUS ALATUS (BURNING BUSH) LOCATED

ROSA MULTIFLORA LOCATED

PROP. WILDLIFE CROSSING

PROP. BRIDGE ABUTMENT

ROUTE 2 (WESTBOUND)

ROUTE 2 (EASTBOUND)

PROP. BRIDGE ABUTMENT

PROP. BRIDGE WALLS

PROP. BRIDGE WALL

SPRING FED POOL

PROP. BRIDGE WALL

*HEAVY CONCENTRATION CELASTRUS ORBICULATUS (BITTERSWEET)

POLYGONUM CUSPIDATUM (JAPANESE KNOTWEED)

CONTINUED BELOW

0 100 200 300 400

SCALE: 1" = 100'

ROUTE 2 (WESTBOUND)

ROUTE 2 (EASTBOUND)

PROP. BRIDGE ABUTMENT

PROP. BRIDGE WALL

PROP. BRIDGE WALL

B STA. 28+00 TO STA 29+35

C STA. 29+80 TO STA 35+70

D STA. 37+00 TO STA 47+00

E STA. 47+00 TO STA 55+00

CEMETERY

COMMONWEALTH AVENUE

POLYGONUM CUSPIDATUM (JAPANESE KNOTWEED) LOCATED

WARNER'S POND

CONTINUED ABOVE

LEGEND

A ID TAG

PROP. AREAS TO BE CLEARED AND GRUBBED FOR TRAIL CONSTRUCTION

PROP. AREAS TO BE SELECTIVELY CLEARED OF INVASIVE PLANT SPECIES

NOTE:
1. INVASIVE PLANT CONTROL AREAS SHOWN ARE CONSIDERED TO BE PRIORITY AND ARE APPROXIMATE ONLY. ACTUAL AREAS WILL BE DETERMINED IN THE FIELD DURING THE REQUIRED SITE WALK FOR INVASIVE CONTROL PRIOR TO THE START OF CONSTRUCTION. ACTUAL LOCATIONS AND AREAS REQUIRED FOR TREATMENT MAY VARY FROM THOSE SHOWN ON THE PLANS. FINAL QUANTITIES WILL BE VERIFIED IN THE FIELD, APPROVED IN WRITING PRIOR TO THE START OF INVASIVE CONTROL, AND ADJUSTED ACCORDINGLY.

0 100 200 300 400

SCALE: 1" = 100'

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	76	158
PROJECT FILE NO.	606223		

LANDSCAPE DETAILS

606223_HD_(LSD).DWG 4-Feb-2019

LANDSCAPE NOTES:

1. ALL DIMENSION LINES ARE EITHER PARALLEL OR PERPENDICULAR TO LINES FROM WHICH THEY ARE DRAWN UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

2. BEFORE CONSTRUCTION BEGINS, SUBMITTALS MUST BE APPROVED, ALL LOCATIONS SHALL BE STAKED IN THE FIELD, MOCKUPS CONSTRUCTED AND VERIFIED BY THE CONTRACTOR AND REVIEWED BY THE ENGINEER. ADJUSTMENTS SHALL BE MADE AT NO ADDITIONAL COST TO THE DEPARTMENT.

3. REFER TO SPECIFICATIONS FOR MATERIALS AND INSTALLATION.

PLANTING NOTES:

1. ALL PLANT MATERIAL SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE 'AMERICAN STANDARD FOR NURSERY STOCK' PUBLISHED BY AMERICAN ASSOCIATION OF NURSERYMEN, LATEST EDITION, OR AS INDICATED IN THE PLANT LIST, WHICH SHALL GOVERN.

2. ALL PLANT MATERIAL SHALL BE FIELD SELECTED IN NURSERIES BY THE ENGINEER AFTER PRELIMINARY TAGGING BY CONTRACTOR. ALL STOCK SHALL BE NURSERY GROWN.

3. ENGINEER SHALL REVIEW PLACEMENT OF PLANTS IN FIELD BEFORE INSTALLATION AFTER STAKING IN FIELD BY CONTRACTOR ACCORDING TO PLANTING PLANS AND SITE DETAILS. THE CONTRACTOR SHALL INFORM THE ENGINEER IMMEDIATELY OF ANY CONFLICTS BETWEEN PROPOSED PLANT LOCATIONS AND BELOW GRADE UTILITIES, STRUCTURES, DRAINAGE PROBLEMS, OR ANY OTHER PLANTING CONFLICT ENCOUNTERED OR ANTICIPATED AND REVIEWED WITH THE ENGINEER BEFORE CONSTRUCTION COMMENCES.

4. THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN SIZES AND QUANTITIES SUFFICIENT TO COMPLETE THE PLANTING SHOWN ON THE DRAWINGS. THE NUMBERS OF PLANTS GIVEN IN MASSINGS AND ON THE PLANT LIST IS APPROXIMATE AND CONTRACTOR SHALL PLANT SHRUBS AND TREES AT INDICATED SPACING AS INDICATED ON THE PLANS. THE ENGINEER HAS THE RIGHT TO REJECT INJURED, DISEASED, DESICCATED, OR INCORRECT SPECIES AT ANY TIME.

5. ALL PLANTS THAT ARE DELIVERED TO THE SITE AND NOT PLANTED IMMEDIATELY SHALL BE STORED AND WATERED PROPERLY, ACCORDING TO THE SPECIFICATIONS, IN SECURE LOCATIONS REVIEWED BY THE ENGINEER. PLANTS SHALL BE PLANTED WITHIN 5 DAYS OF DELIVERY TO SITE AS SPECIFIED IN THE STANDARD SPECIFICATIONS. ALL PLANTS SHALL HAVE ONE YEAR GUARANTEE.

6. ALL NEW AND EXISTING PLANT MATERIAL WITHIN THE LANDSCAPE LIMIT OF WORK LINE SHALL BE PRUNED AFTER PLANTING TO REMOVE ALL DEAD OR DAMAGED BRANCHES. TREE WOUND DRESSING SHALL NOT BE USED ON ANY PLANTINGS. ALL NEW PLANTINGS SHALL BE WATERED FROM DELIVERY UNTIL THE END OF THE GUARANTEE PERIOD.

7. ALL PLANTS SHALL BEAR THE SAME RELATION TO FINISHED GRADE AS TO ORIGINAL GRADE BEFORE DIGGING, UNLESS OTHERWISE DETAILED, AND SHALL HAVE A MULCHED SAUCER ACCORDING TO THE DETAILS. PLANT PITS SHALL DRAIN, OR REMEDIAL UNDER-DRAINAGE SHALL BE INSTALLED TO DRAIN OUTLETS.

8. ALL PAPER OR PLASTIC CONTAINERS, WIRE BASKETS, TWINE, AND PLASTIC OR IRON FASTENERS AND ROPE SHALL BE REMOVED FROM PLANTS BEFORE SETTING IN PLANT PIT. TURN DOWN BURLAP TWO-THIRDS.

9. EXISTING TOPSOILS SHALL BE UTILIZED FOR LOAM, OR PLANTING SOIL MIXTURES, ONLY IF TESTING INDICATES TOTAL CONFORMITY TO SPECIFICATIONS FOR LOAM BORROW. ALL GRASS, SOD, ROOTS, AND STONES OVER TWO-INCH DIAMETER SHALL BE REMOVED AND LEGALLY DISPOSED OF.

10. SHRUBS SHALL BE INSTALLED AND MAINTAINED 10' CLEAR FROM ALL HYDRANTS AND STANDPIPES TO ENSURE THEIR VISIBILITY AT ALL TIMES.

11. PLANT SPACING SHALL BE AS INDICATED ON THE DRAWINGS OR IN THE PLANT LIST. MULCH WITH 2-3" AGED PINE BARK MULCH TO LIMITS.

12. TREE PROTECTION FENCING SHALL BE INSTALLED BEFORE CONSTRUCTION VEHICLES ACCESS OR CONSTRUCTION OCCURS WITHIN 25' OF ANY EXISTING TREE TO REMAIN. FENCING SHALL BE INSTALLED AT TREE DRIPLINE OR EDGE OF ADJACENT PAVING AND IN ACCORDING TO CIVIL PLANS AND WITH REVIEW OF ENGINEER. REMOVAL SHALL BE AT COMPLETION OF CONSTRUCTION IN THE VICINITY.

LOAM & GRADING NOTES:

1. ANY DISCREPANCIES OR CONFLICTS ARISING BETWEEN EXISTING CONDITIONS AND THE GRADING PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING.

2. GRADE STAKES SHOWING DEPTH OF LOAM SHALL BE REVIEWED BY ENGINEER IN FIELD BEFORE FINAL GRADING CAN COMMENCE.

3. ALL NEW ON-GRADE PLANTINGS SHALL HAVE MODIFIED LOAM (PLANTING SOIL), INSTALLED AT A DEPTH AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS. ALL SEEDED AREAS SHALL HAVE FOUR INCH DEPTH MODIFIED LOAM. LOAM BORROW SHALL BE REQUIRED TO BE TESTED FOR CONFORMANCE WITH SPECIFICATIONS BEFORE DELIVERY OF PRODUCT FOR SPREADING. SOIL MAY NOT BE WORKED IN A WET OR FROZEN STATE OR LOAM BORROW MAY BE REJECTED BY THE ENGINEER.

4. AREAS WHERE PLANTING OR SEEDING OCCURS ON EXISTING GRADES AREAS SHALL BE CLEARED, DISCED AND/OR FILLED AND SOIL AMENDED TO MEET THE RANGES AND MINIMUM REQUIREMENTS FOR MODIFIED LOAM BORROW. IF EXISTING SOIL CANNOT BE AMENDED TO MEET SPECIFICATIONS, IT SHALL BE EXCAVATED AND REPLACED WITH APPROVED LOAM BORROW.

5. ALL EXISTING OR PROPOSED INLET COVERS, GRATES, ETC. SHALL BE SET AND ADJUSTED BY THE CONTRACTOR TO BE FLUSH WITH THE FINISHED GRADE AT NO EXTRA COST TO THE DEPARTMENT.

6. THE CONTRACTOR'S WORK SHALL BE SCHEDULED TO ALLOW THE FINISHED SUBGRADE ELEVATIONS TO DRAIN PROPERLY WITHOUT PUDDLING. PROVIDE TEMPORARY POSITIVE DRAINAGE AS REQUIRED.

7. THE PROPOSED SITE PAVEMENTS, SURFACINGS, AND PLANTED AREAS SHALL BE PITCHED IN THE DIRECTIONS SHOWN ON THE DRAWINGS. IF NOT OTHERWISE SHOWN, PROPOSED PAVEMENT AREAS SHALL BE PITCHED A MINIMUM OF ONE PERCENT IN THE DIRECTION SHOWN ON THE DRAWINGS, AND PROPOSED SEEDED AND PLANTED AREAS SHALL BE PITCHED IN A MINIMUM OF ONE PERCENT TOWARD A DRAIN INLET OR BASIN.

8. CONTRACTOR SHALL MEET EXISTING GRADES IN A SMOOTH MANNER, WITHOUT DISTURBING DRAINAGE CONDITIONS, AND SHALL PROTECT EXISTING VEGETATION AND PROTECTIVE FENCING. THE CONTRACTOR SHALL REQUEST THAT THE ENGINEER REVIEW THE FINISHED GRADES BEFORE PLANTING AND SEEDING BEGIN.

PLANT SCHEDULE

SH 1	SH 2	SH 3	SH 4	SH 5	TOTAL QTY.	KEY	BOTANICAL NAME	COMMON NAME	INSTALL SIZE	COMMENTS
TREES										
-	-	3	1	3	7	AL	AMELANCHIER LAEVIS	ALLEGHENY SERVICEBERRY	4-5 FT. CLUMP	B&B
1	2	-	-	-	3	BH	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	8-10 FT. CLUMP	B&B
-	6	-	-	-	6	CC	CARPINUS CAROLINIANA	HORNBEAM	8-10 FT	B&B
-	7	-	-	-	7	LS	LIQUIDAMBAR STYRACIFLUA	SWEETGUM	2.-2.5 IN. CAL.	B&B
-	7	-	-	-	7	PG	PICEA GLAUCA	WHITE SPRUCE	5-6 FT.	B&B
3	-	-	-	-	3	PS	PINUS STROBUS	WHITE PINE	5-6 FT.	B&B
-	1	1	-	-	2	QP	QUERCUS PALUSTRIS	PIN OAK	2-2.5 IN. CAL.	B&B
-	-	7	-	-	7	QR	QUERCUS RUBRA	RED OAK	2-2.5 IN. CAL.	B&B
SHRUBS										
-	10	7	5	-	22	CA	CLETHRA ALNIFOLIA	SUMMERSWEET	18-24 IN.	
19	-	6	-	-	25	IV	ILEX VERTICILLATA	WINTERBERRY	24-30 IN.	
2	-	1	-	-	3	IVM	ILEX VERTICILLATA	WINTERBERRY (MALE)	18-24 IN.	
-	7	7	11	-	25	MP	MYRICA PENSYLVANICA	BAYBERRY	2-3 FT.	
16	-	9	-	-	25	VC	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	6-9 IN.	
8	-	-	-	-	8	VT	VIBURNUM TRILOBUM	AMERICAN CRANBERRY VIBURNUM	3-4 FT..	
-	9	-	-	-	9	VL	VIBURNUM LENTAGO	NANNYBERRY	24-30 IN.	B&B
-	12	8	8		28	VR	VIBURNUM RHYTIDOPHYLLUM	LEATHERLEAF VIBURNUM	24-30 IN.	
GRASS										
		250	450		700	SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUE STEM	2.5' plugs	3' O.C.

SEEDING SCHEDULE

LEGEND	TYPE	SUB TYPE	ITEM	NOTES
NATIVE - SUN/PART SHADE UPLAND				
	NATIVE SEED MIX	TRAILSIDE - MID HEIGHT UPLAND MIX - PART SHADE	765.421	FOR TRAILSIDE USE WHERE NO MOWING / INFREQUENT MOWING EXPECTED. SEED OVER 1" COMPOST TOPDRESSING OVER 4" LOAM.
WETLAND				
	WETLAND SEED MIX	FACW - SEASONALLY FLOODED - CUSTOM MIX	765.554	FOR USE IN WETLAND MITIGATION AND BIORETENTION AREAS. SEED OVER 1" COMPOST TOP-DRESSING OVER 4" LOAM.
NATIVE FULL SUN				
	NATIVE TALL SEED MIX	UPLAND TALL MIX - FULL SUN	765.431	FOR USE ON SOUTH FACING BRIDGE SIDE SLOPES WHERE NO MOWING. SEED OVER 1" COMPOST TOP-DRESSING OVER 4" LOAM OVER MODIFIED ROCK.

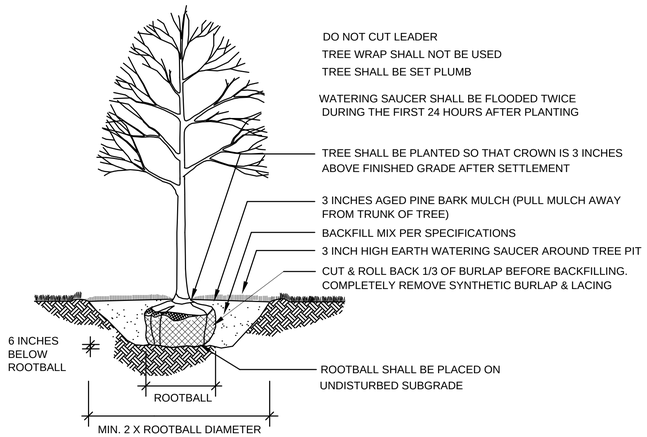
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	77	158
PROJECT FILE NO.	606223		

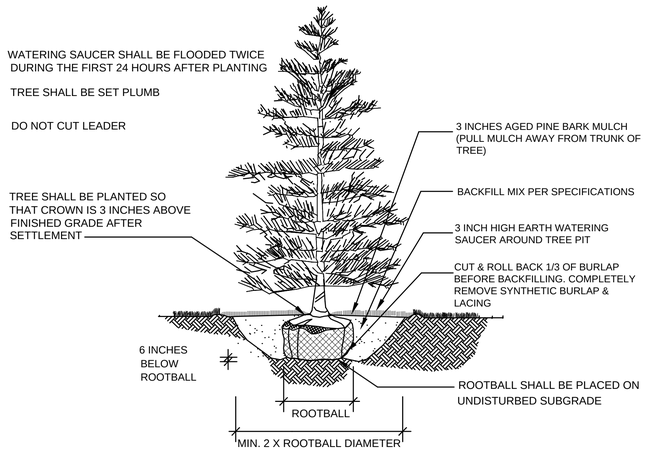
LANDSCAPE DETAILS

4-Feb-2019

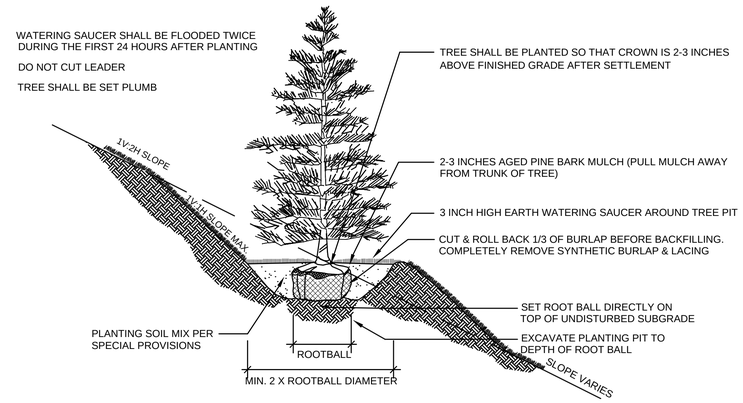
606223_HD_(LSD).DWG



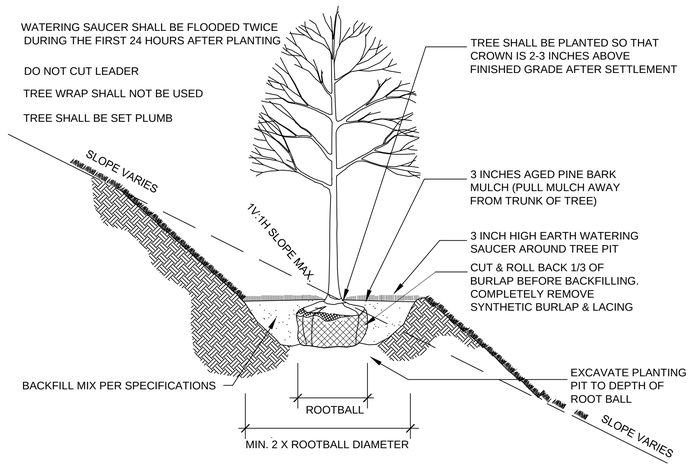
1 DECIDUOUS TREE PLANTING
NOT TO SCALE



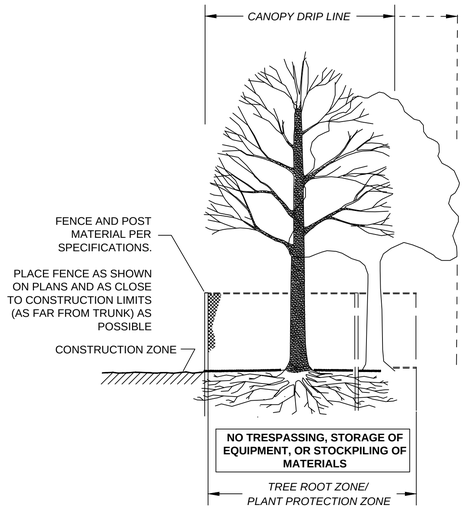
2 EVERGREEN TREE PLANTING
NOT TO SCALE



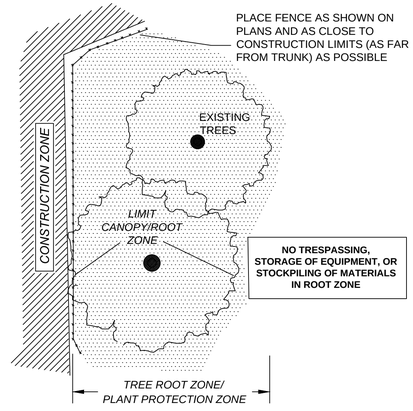
3 EVERGREEN TREE PLANTING (SLOPE)
NOT TO SCALE



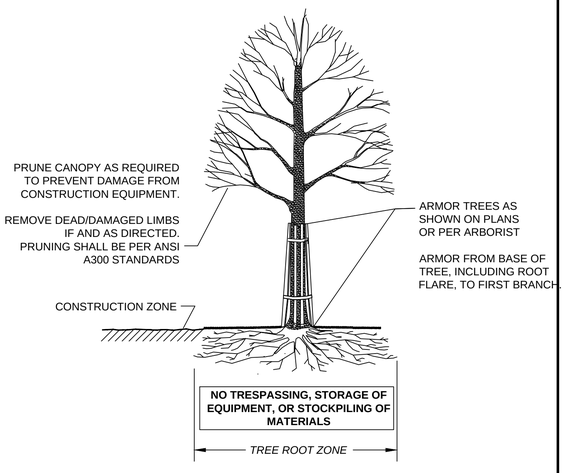
4 DECIDUOUS TREE PLANTING (SLOPE)
NOT TO SCALE



SECTION - FENCE PROTECTION OF ROOT ZONE



PLAN VIEW - FENCE PROTECTION OF ROOT ZONE



SECTION - TRUNK ARMORING & PRUNING

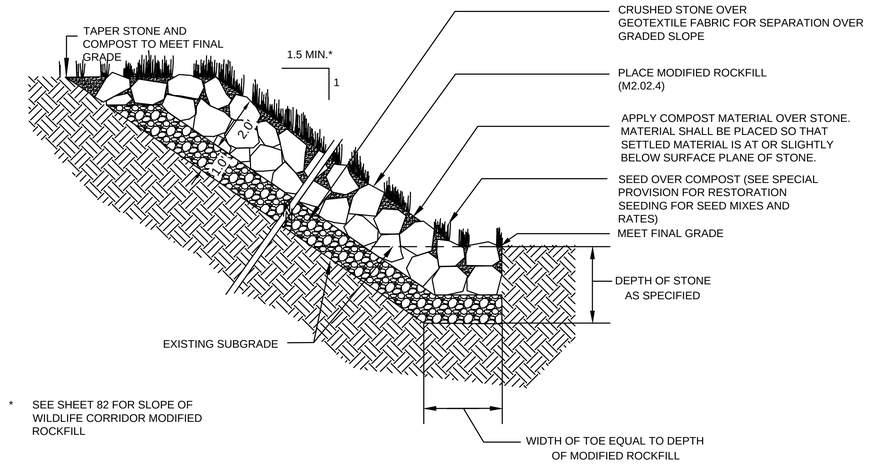
5 TREE PROTECTION DETAILS
NOT TO SCALE

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	78	158
PROJECT FILE NO.	606223		

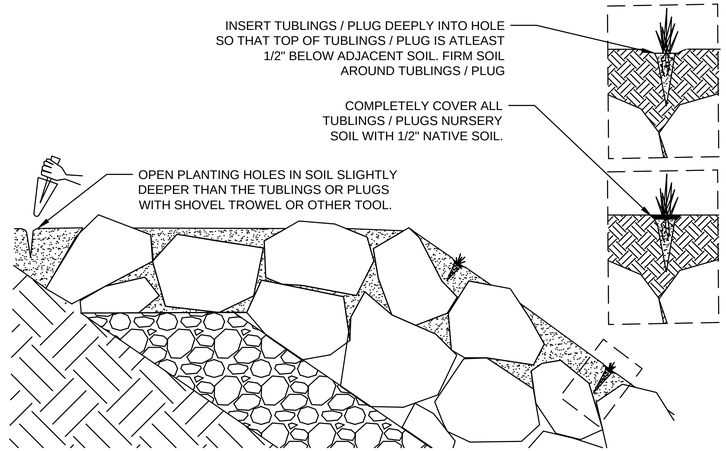
LANDSCAPE DETAILS

606223_HD_(LSD).DWG 4-Feb-2019

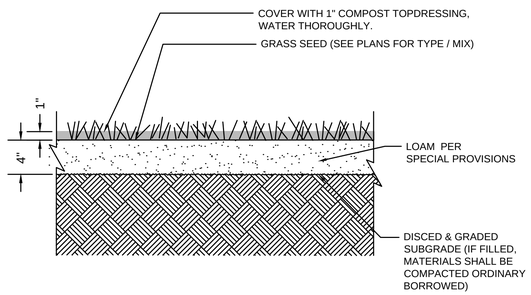


* SEE SHEET 82 FOR SLOPE OF WILDLIFE CORRIDOR MODIFIED ROCKFILL

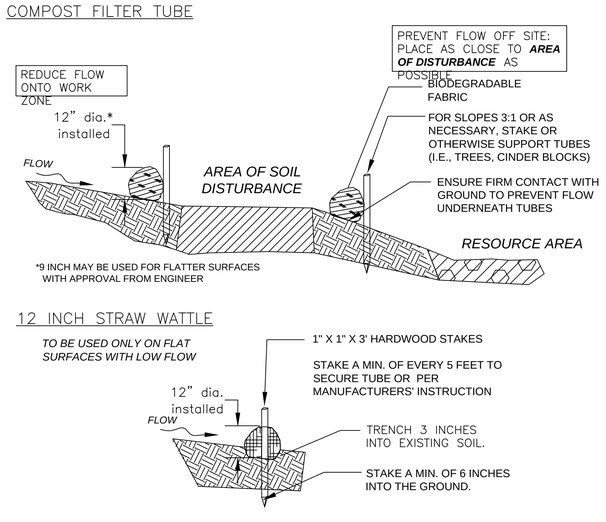
6 COMPOST TOPDRESSING AND SEED OVER MODIFIED ROCKFILL
NOT TO SCALE 20111021_MassDOT



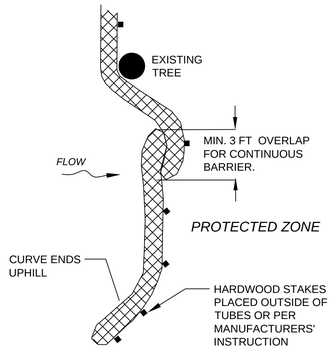
7 TUBELINGS / PLUGS IN MODIFIED ROCK FILL
NOT TO SCALE



8 LOAM, SEED, & COMPOST TOPDRESSING
NOT TO SCALE



SECTION



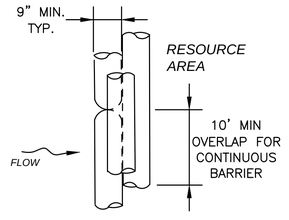
PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

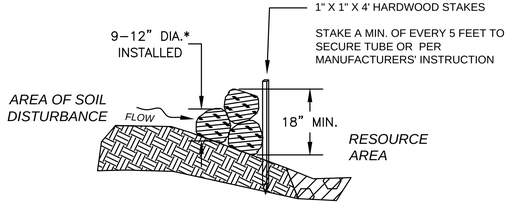
PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

9 SEDIMENT BARRIERS - COMPOST FILTER TUBES & STRAW WATTLES
NOT TO SCALE 20181210_MassDOT

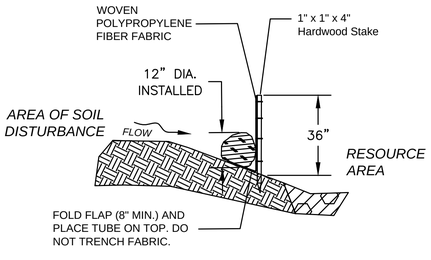


PLAN VIEW



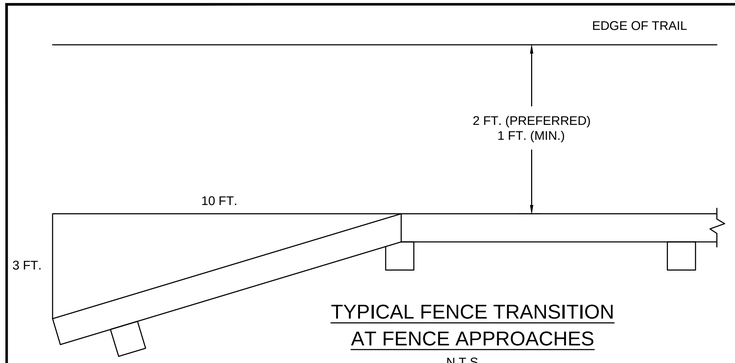
SECTION

10 COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)
NOT TO SCALE



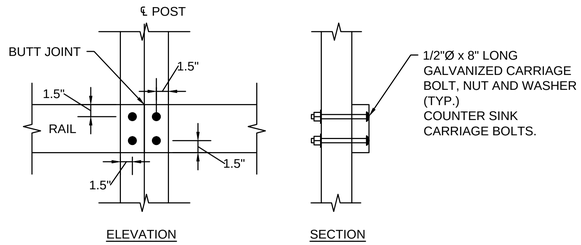
SECTION

11 COMPOST FILTER TUBE & SILT FENCE
NOT TO SCALE



TYPICAL FENCE TRANSITION AT FENCE APPROACHES

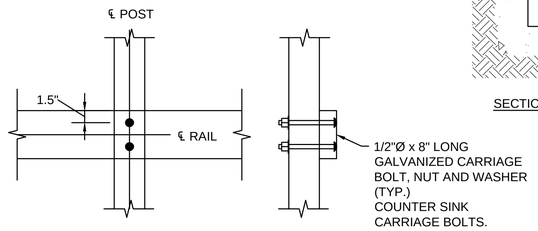
N.T.S.



ELEVATION SECTION

BUTT JOINT CONNECTION

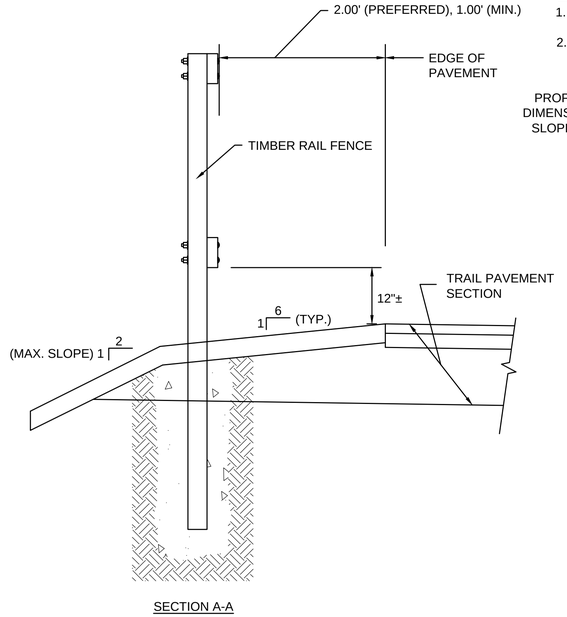
N.T.S.



ELEVATION SECTION

INTERMEDIATE CONNECTION

N.T.S.



SECTION A-A

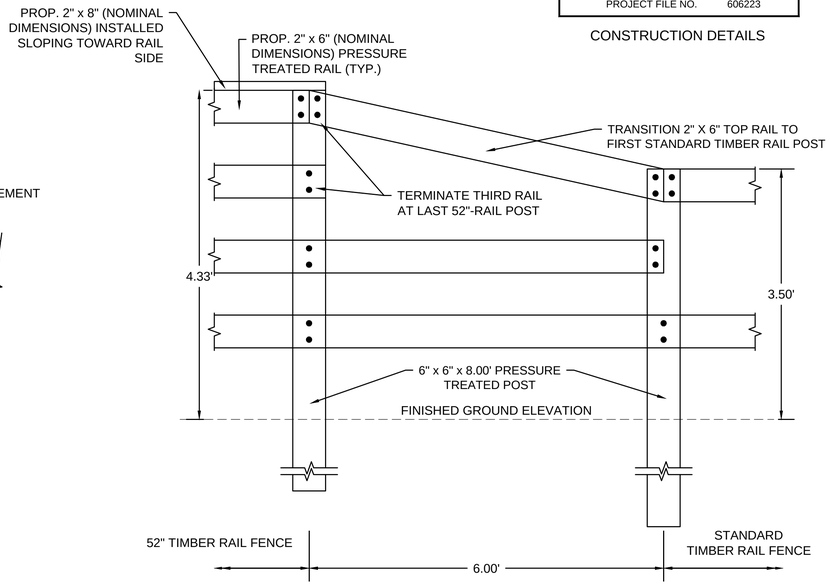
NOTES:

1. TIMBER PRESERVATIVES SHALL BE USED ON ALL WOOD TIMBER.
2. ALL CUT ENDS SHALL BE PAINTED WITH PRESERVATIVE IN THE FIELD PER MANUFACTURERS DIRECTION.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	79	158
PROJECT FILE NO.	606223		

CONSTRUCTION DETAILS

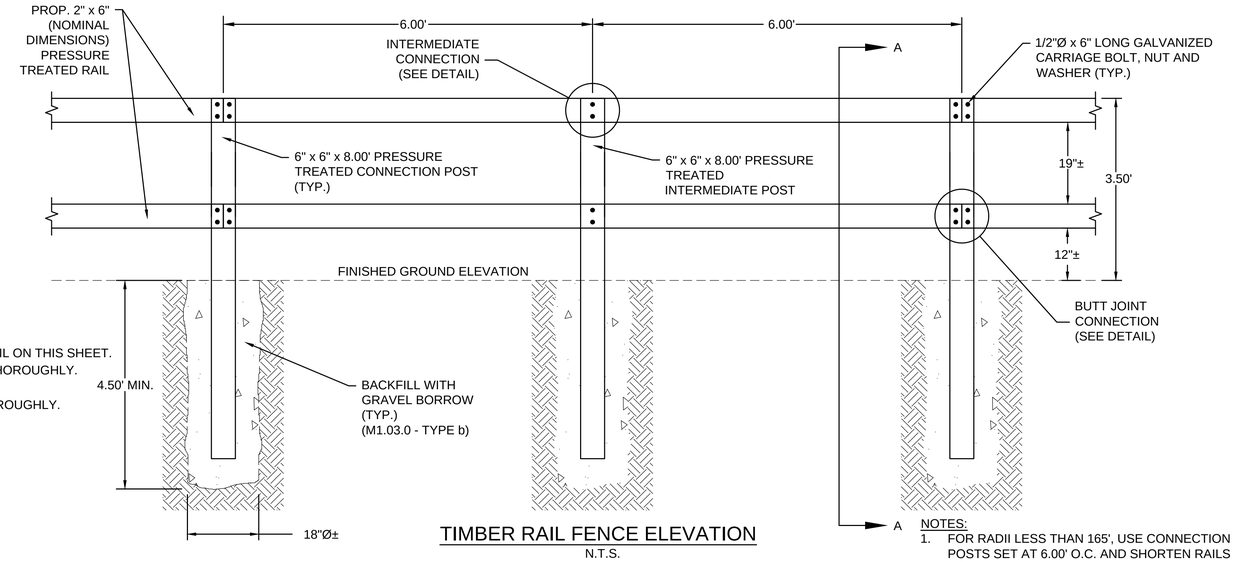


52" TIMBER RAIL FENCE TRANSITION TO STANDARD TIMBER RAIL FENCE

N.T.S.

SUGGESTED TIMBER RAIL FENCE CONSTRUCTION SEQUENCE

1. AUGER OR DIG POST HOLE TO REQUIRED DIMENSIONS.
2. IF GROUND IS SATURATED, USE TUBE STEEL SLEEVE. SEE DETAIL ON THIS SHEET.
3. BACKFILL BOTTOM 6"± OF HOLE WITH GRAVEL AND COMPACT THOROUGHLY.
4. SET POST AND HOLD PLUMB DURING BACKFILLING.
5. BACKFILL WITH GRAVEL IN 12" LIFTS. COMPACT EACH LIFT THOROUGHLY.
6. CLAMP RAILS TO POSTS AND FIELD DRILL BOLT HOLES.
7. SET BOLTS, WASHERS AND NUTS.



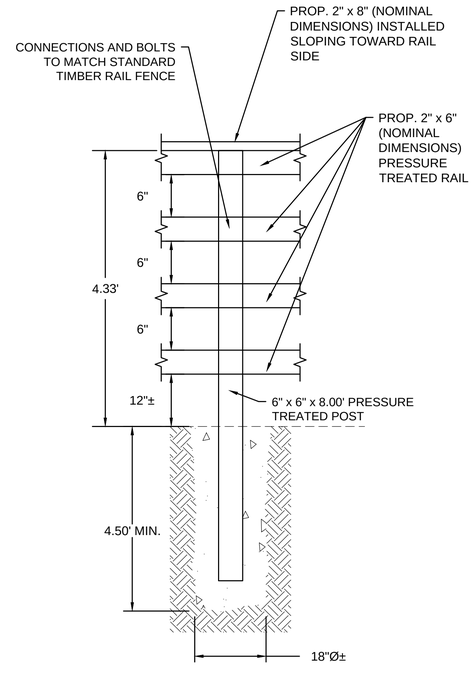
TIMBER RAIL FENCE ELEVATION

N.T.S.

SEE PLANS FOR LOCATIONS

NOTES:

1. FOR RADII LESS THAN 165', USE CONNECTION POSTS SET AT 6.00' O.C. AND SHORTEN RAILS ACCORDINGLY.



52" TIMBER RAIL FENCE

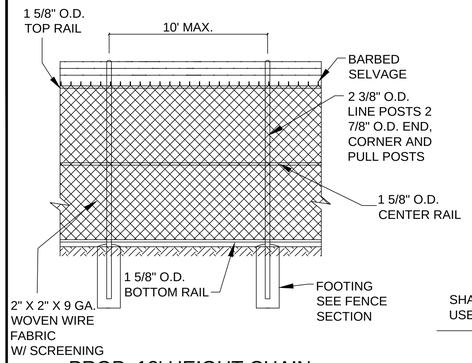
N.T.S.

606223_HD_(CD).DWG Plotted on 4-Feb-2019 3:41 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	80	158
PROJECT FILE NO.	606223		

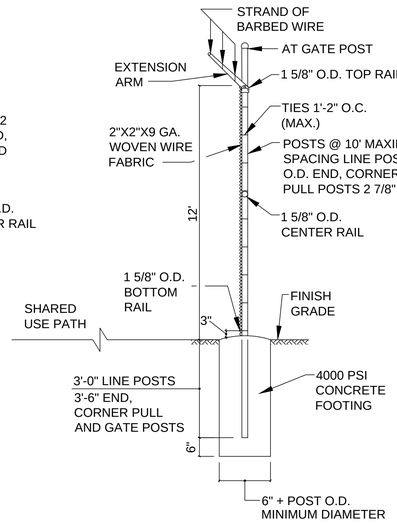
CONSTRUCTION DETAILS

606223_HD_(CD).DWG Plotted on 4-Feb-2019 3:41 PM



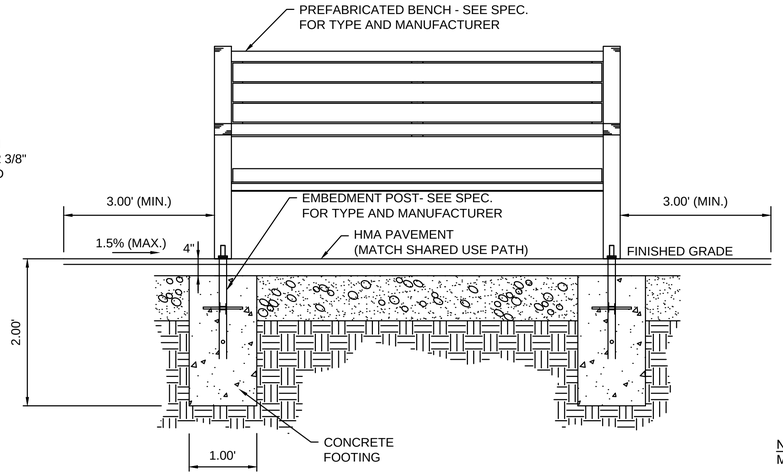
PROP. 12' HEIGHT CHAIN LINK FENCE

N.T.S.



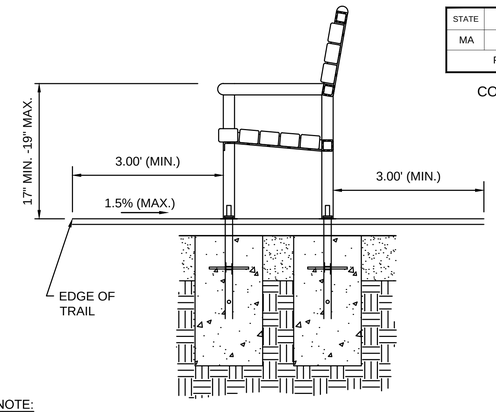
PROP. 12' HEIGHT CHAIN LINK FENCE SECTION

N.T.S.

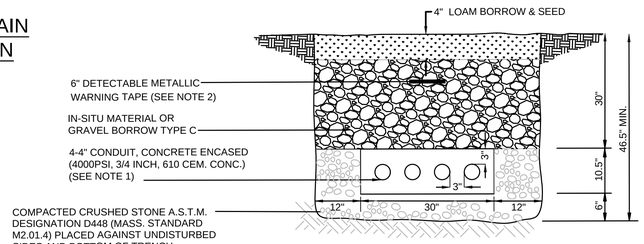


PROP. BENCH

N.T.S.



NOTE:
MINIMUM SETBACK OF 3.00' FROM TRAIL SURFACE

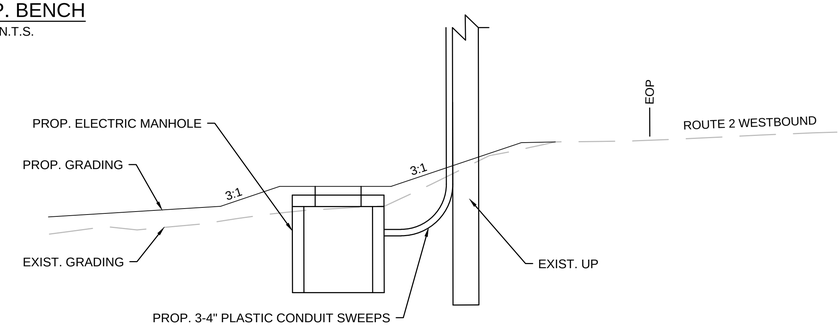


ELECTRICAL CONDUIT TRENCH DETAIL

N.T.S.

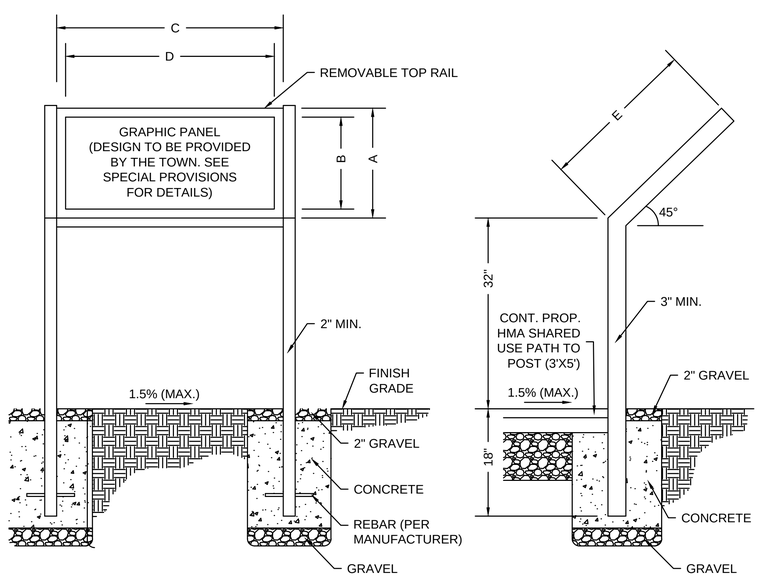
NOTES:

1. ELECTRICAL CONDUIT SHALL BE SCHEDULE 80 TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY MASSDOT.
2. WARNING TAPE COLOR SHALL BE PER APWA STANDARDS.



ELECTRICAL MANHOLE/UTILITY POLE DETAIL

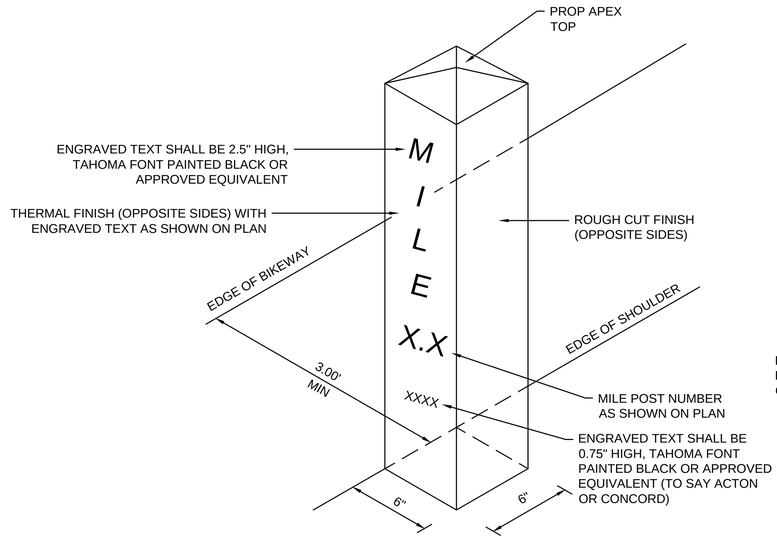
N.T.S.



PROP. INTERPRETIVE SIGN

N.T.S.

DIMENSION TABLE					
SIGN TYPE	HEIGHT		WIDTH		DEPTH
	A	B	C	D	E
26" x 38"	26"	23"	38"	35"	26.5"



PROP. GRANITE MILE MARKER

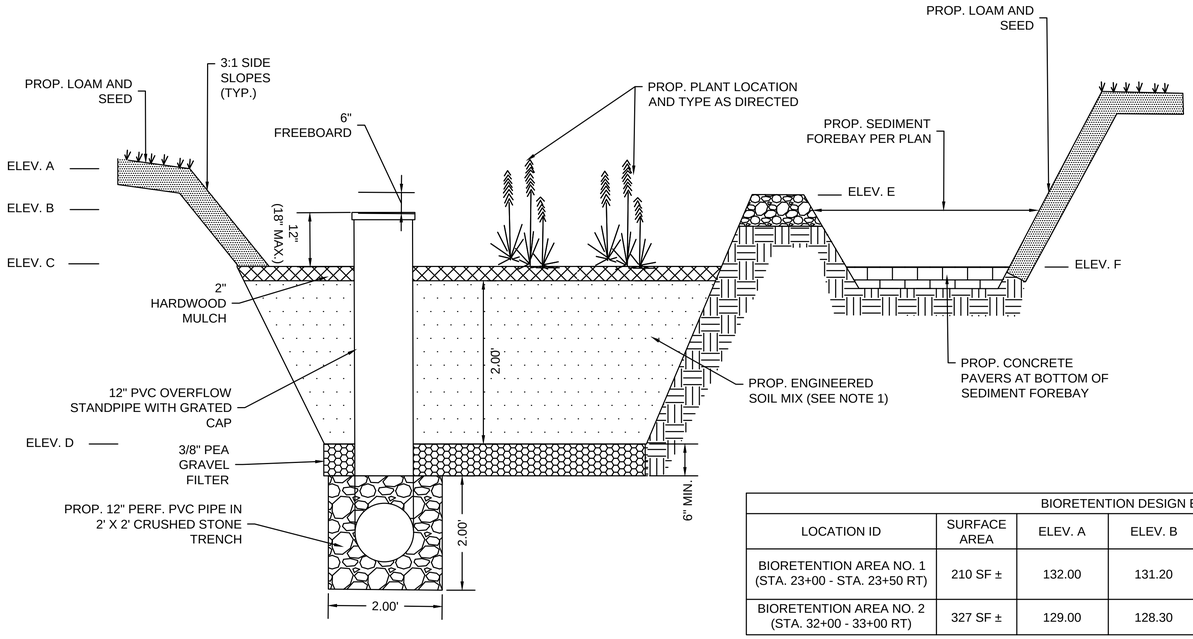
N.T.S.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	81	158
PROJECT FILE NO.	606223		

CONSTRUCTION DETAILS

606223_HD_(CD).DWG Plotted on 4-Feb-2019 3:41 PM

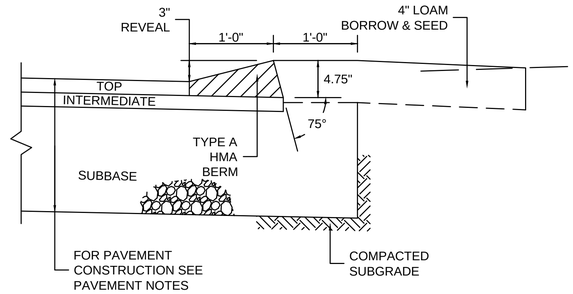


PROP. BIORETENTION AREA DETAIL
N.T.S.

NOTES:

1. THE SOIL MIX FOR BIORETENTION AREAS SHOULD BE A MIX OF SAND, SILT, CLAY AND ORGANICS TO MEET THE FOLLOWING SPECIFICATIONS:
   - 5% MAX. VERY COARSE SAND/GRAVEL
   - 60%-85% SAND
   - 20% MAXIMUM SILT
   - 5% MAXIMUM CLAY
   - 3% - 8% ORGANIC MATTER
   - PEAT IS NOT PERMITTED IN SOIL MIX
2. CONSTRUCT BIORETENTION AREAS IN ACCORDANCE WITH THE MASSACHUSETTS STORMWATER HANDBOOK (VOL. 2, 2008).
3. SNOW SHOULD NEVER BE STORED IN BIORETENTION AREAS.

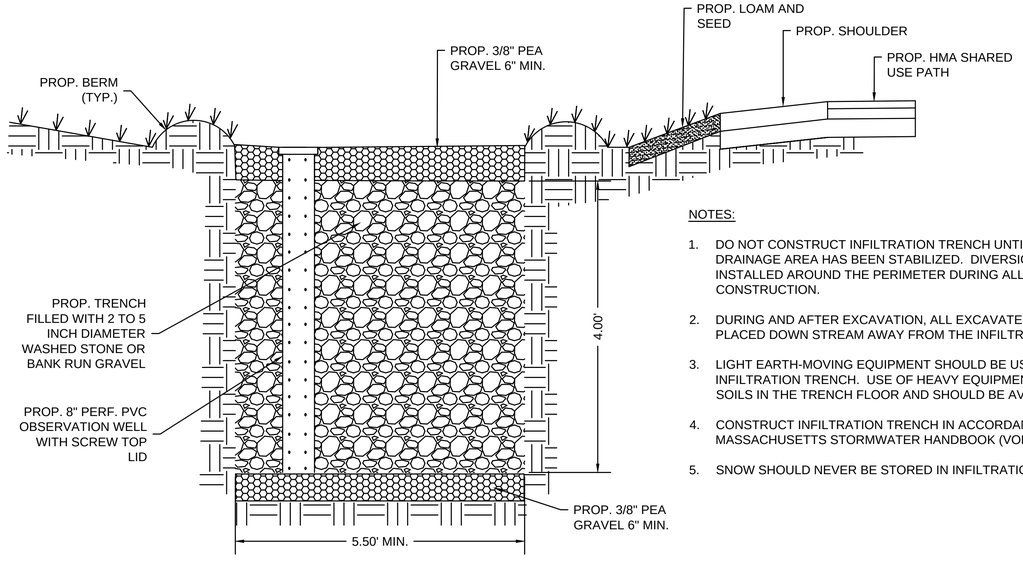
BIORETENTION DESIGN ELEVATIONS							
LOCATION ID	SURFACE AREA	ELEV. A	ELEV. B	ELEV. C	ELEV. D	ELEV. E	ELEV. F
BIORETENTION AREA NO. 1 (STA. 23+00 - STA. 23+50 RT)	210 SF ±	132.00	131.20	130.20	128.00	131.70	129.80
BIORETENTION AREA NO. 2 (STA. 32+00 - 33+00 RT)	327 SF ±	129.00	128.30	127.30	125.10	128.80	126.00



NOTES:

1. HMA BELOW THE BERM SHALL BE PAID FOR UNDER ITEM 450.32 SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0)

HOT MIX ASPHALT BERM, TYPE 'A'-MODIFIED DETAIL
N.T.S.



NOTES:

1. DO NOT CONSTRUCT INFILTRATION TRENCH UNTIL THE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED. DIVERSION BERMS SHOULD BE INSTALLED AROUND THE PERIMETER DURING ALL PHASES OF CONSTRUCTION.
2. DURING AND AFTER EXCAVATION, ALL EXCAVATED MATERIALS SHOULD BE PLACED DOWN STREAM AWAY FROM THE INFILTRATION TRENCH.
3. LIGHT EARTH-MOVING EQUIPMENT SHOULD BE USED TO EXCAVATE THE INFILTRATION TRENCH. USE OF HEAVY EQUIPMENT CAUSES COMPACTION OF SOILS IN THE TRENCH FLOOR AND SHOULD BE AVOIDED.
4. CONSTRUCT INFILTRATION TRENCH IN ACCORDANCE WITH THE MASSACHUSETTS STORMWATER HANDBOOK (VOL. 2, 2008).
5. SNOW SHOULD NEVER BE STORED IN INFILTRATION AREA.

PROP. STORMWATER INFILTRATION TRENCH
(STA. 8+80± TO STA. 9+20±)
N.T.S.

HISTORIC MARKER INVENTORY	
REFERENCE	DESCRIPTION
A1	SEMAPHORE
A2	BATTERY WELL
A3	TELEPHONE POLE (MISSING)
A4	SIGNAL BOX ON POST (MISSING)
2	RAILROAD SIGNAL BOX (MISSING)
3	RAILROAD TELEPHONE BOX (MISSING)
4	NASHOBA BROOK BRIDGE
5	FLANGER SIGN (MISSING)
6	WHISTLE POST
A5	BATTERY WELL
7	WHISTLE POST

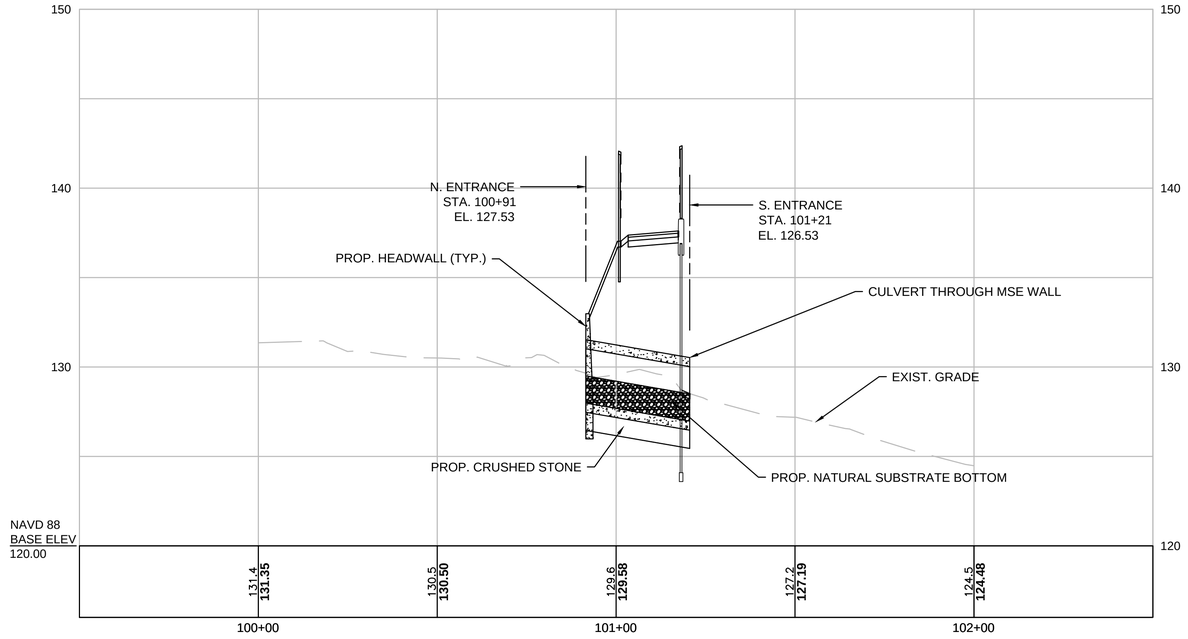
X = REFERENCE NUMBER (SEE SHEETS 21 - 30 FOR LOCATIONS)

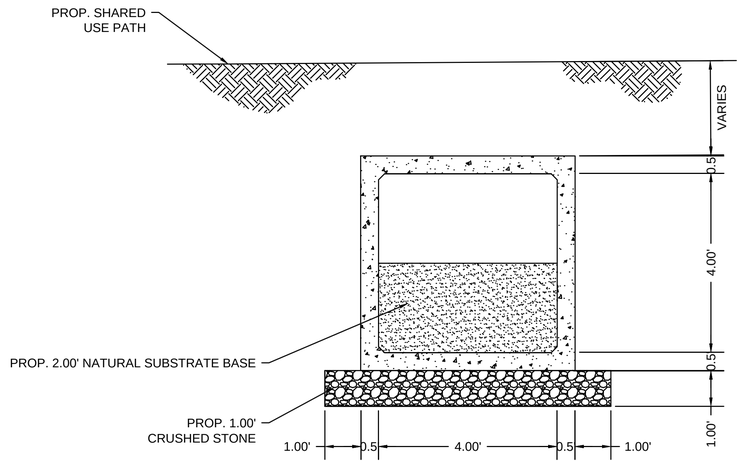
NOTE: REFERENCE NO.'S WITH AN "A" DESIGNATION ARE HISTORICAL MARKERS ASSOCIATED WITH BFRT 2B PROJECT. NUMERICAL DESIGNATIONS REFERENCE THE "PAL" TECHNICAL MEMORANDUM PREVIOUSLY SUBMITTED IN JANUARY, 2008.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	82	158
PROJECT FILE NO.	606223		

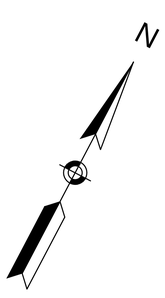
CULVERT DETAILS

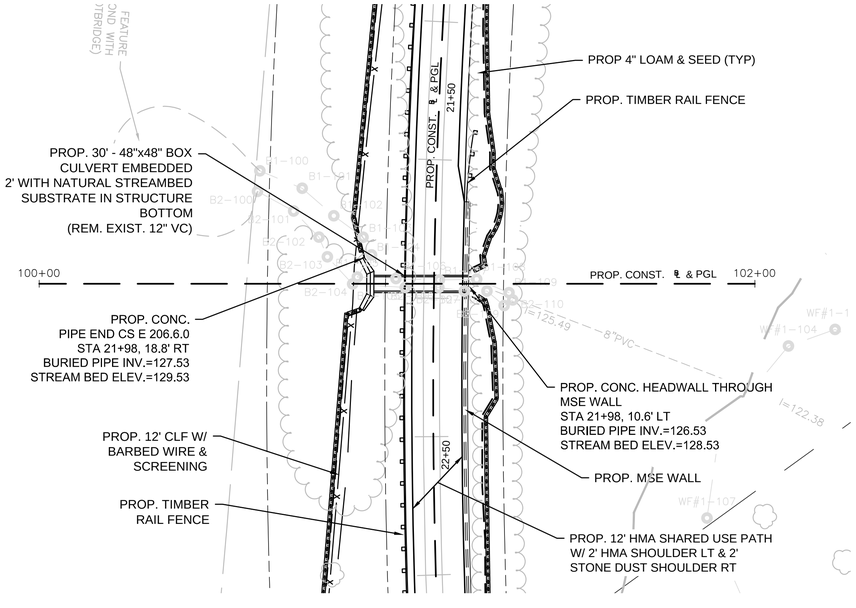




SECTION
NTS

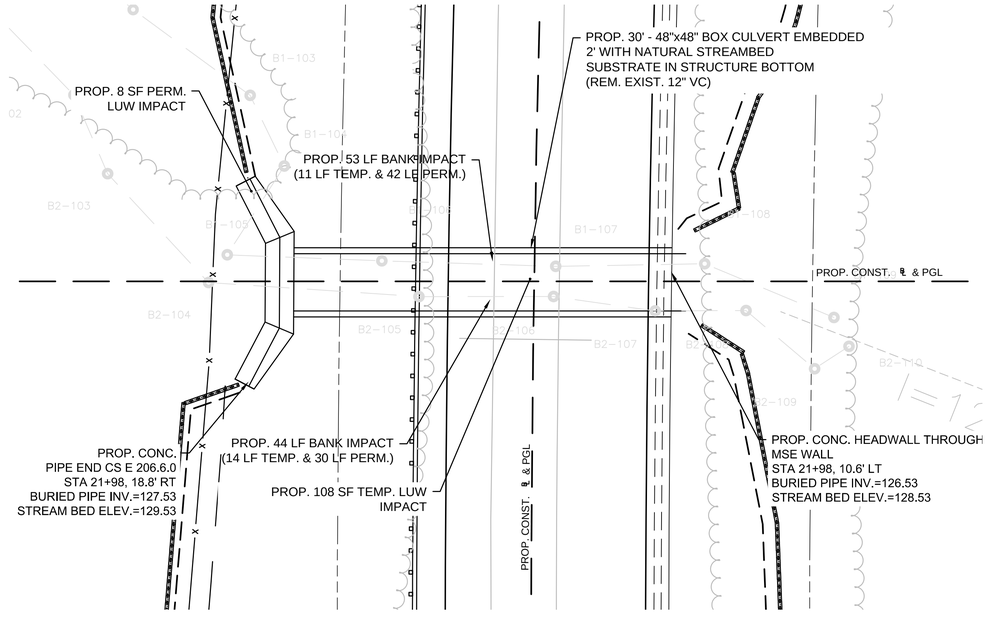
HOR. SCALE IN FEET
20 0 20 40
VER. SCALE IN FEET
4 0 4 8





PLAN
SCALE: 1" = 20'

0 20 50 100
SCALE: 1" = 20'



RESOURCE AREA LEGEND	
LINE TYPE/HATCH	DESCRIPTION
B#-100 / WF#-100	LIMIT OF BANK & BORDERING VEGETATED WETLAND(BVW)
	LIMIT OF TEMPORARY BANK IMPACT
	LIMIT OF PERMANENT BANK IMPACT
	TEMPORARY LAND UNDER WATER (LUW) IMPACT
	PERMANENT LAND UNDER WATER (LUW) IMPACT

RESOURCE AREA IMPACTS
SCALE: 1" = 5'

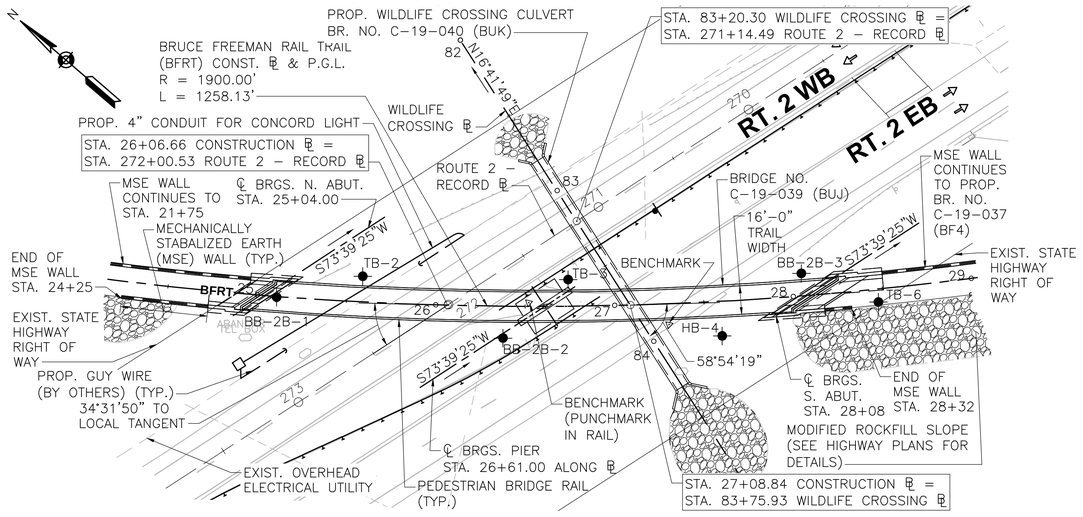
NOTE:
1. SEE BRIDGE PLANS FOR ADDITIONAL DETAIL OF THE CULVERT THROUGH THE MSA WALL.

606223_HD_(CULV).DWG Plotted on 4-Feb-2019 3:42 PM

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

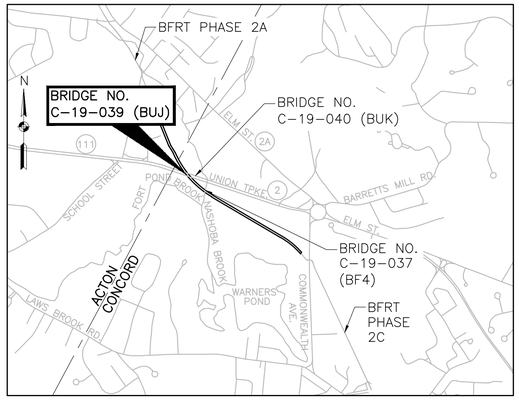
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	83	158
PROJECT FILE NO. 606223			

KEY PLAN, LOCUS MAP, PROFILES AND QUANTITIES



KEY PLAN

SCALES: 1" = 40'



LOCUS

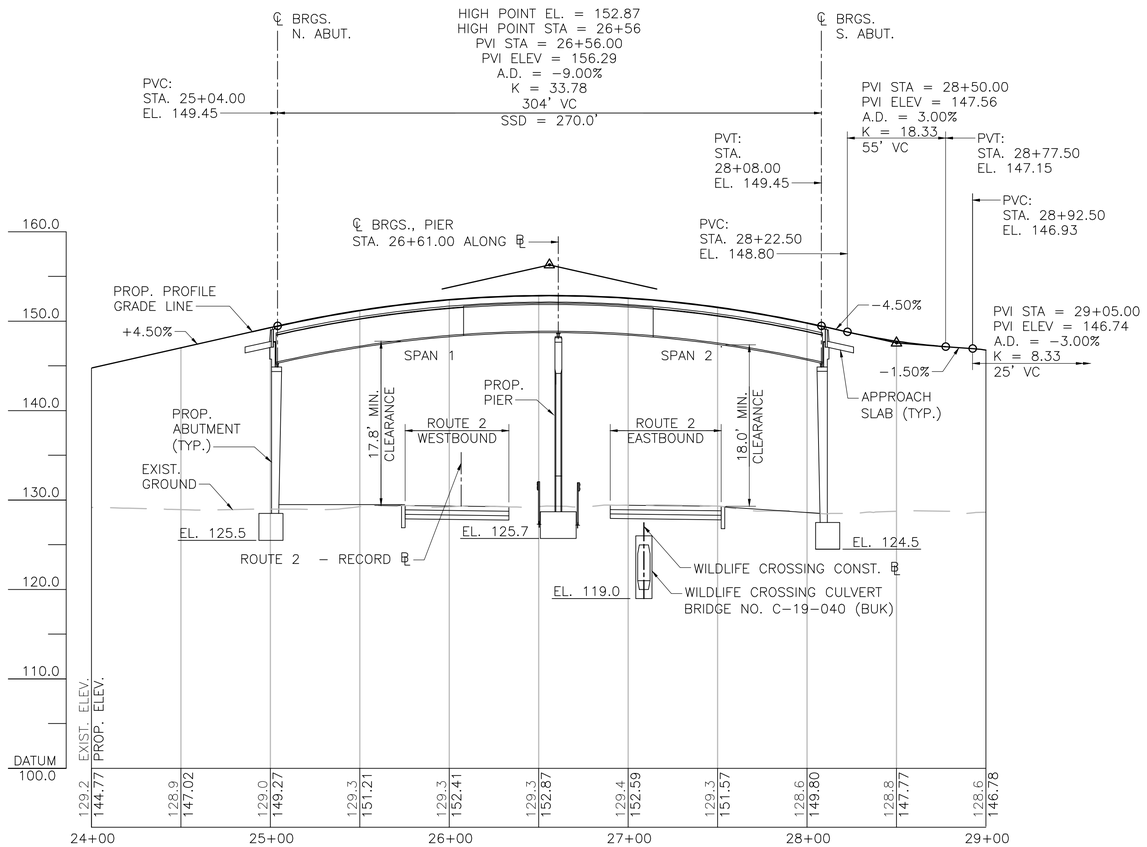
SCALES: 1" = 1500'

INDEX OF BRIDGE SHEETS:

1. KEY PLAN, LOCUS MAP, PROFILES AND QUANTITIES
2. GENERAL NOTES AND ESTIMATED QUANTITIES
3. BORING LOGS (1 OF 3)
4. BORING LOGS (2 OF 3)
5. BORING LOGS (3 OF 3)
6. PLAN AND ELEVATION
7. NORTH ABUTMENT PLAN, ELEVATION, AND SECTION
8. SOUTH ABUTMENT PLAN, ELEVATION, AND SECTION
9. END OF DECK, WINGWALLS, AND FOUNDATION DETAILS
10. CURTAIN WALL PLANS AND DETAILS (1 OF 2)
11. CURTAIN WALL PLANS AND DETAILS (2 OF 2)
12. MSE WALL SECTIONS
13. MSE WALL PLAN AND ELEVATION
14. STRIP SEAL JOINT DETAILS
15. ACUTE CORNER & APPROACH SLAB PLANS AND DETAILS
16. END DIAPHRAGM PLAN, ELEVATION, AND SECTION
17. PIER PLAN, ELEVATION, AND DETAILS
18. FRAMING PLAN AND BEAM ELEVATIONS
19. STRUCTURAL STEEL DETAILS
20. TOF ELEVATIONS AND CAMBER TABLE
21. DECK SECTION AND DETAILS
22. BEARING DETAILS
23. RAILING AND PROTECTIVE SCREEN DETAILS
24. TIMBER RAIL TRANSTION

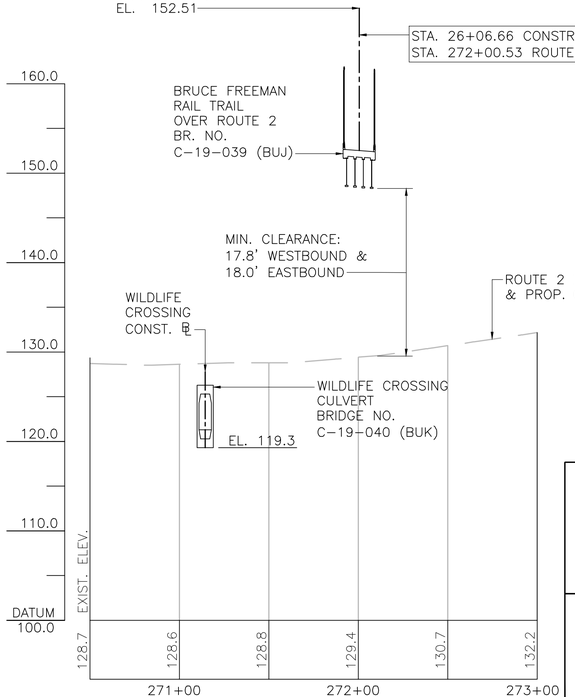
CURVE DATA – BRUCE FREEMAN RAIL TRAIL (BFRT) CONST. ℄ & P.G.L.

CURVE NO.	BEGIN STATION	END STATION	RADIUS	DELTA	LENGTH	TANGENT
C5	20+75.83	33+33.96	1900.00'	37°56'23"	1258.13'	653.10'



PROFILE – BRUCE FREEMAN RAIL TRAIL CONST. ℄ & P.G.L.

SCALES: HORIZ: 1" = 40'
VERT: 1" = 8'



PROFILE – ROUTE 2 RECORD ℄

SCALES: HORIZ: 1" = 40'
VERT: 1" = 8'

	MONTH DD, YYYY: ISSUED FOR CONSTRUCTION

MassDOT Massachusetts Department of Transportation Highway Division

PROPOSED BRIDGE

CONCORD

BRUCE FREEMAN RAIL TRAIL OVER MA 2 (UNION TURNPIKE)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Greenman-Pedersen, Inc.
GPI
181 Ballardvale Street, Suite 202
Wilmington, MA 01887

TITLE: _____ CHIEF ENGINEER _____

SHEET 1 OF 24 SHEETS BRIDGE NO. C-19-039 (BUJ)

606223_BRIC19039)_01.DWG Plotted on 1-Feb-2019 9:36 AM

Second Structural Submittal (S2) 25-January-2019

V:\MAX-2007\ENGR-BRT-JB\606223\DWG\BRIDGE\606223_BRIC19039_01.dwg 2/1/2019 9:55:52 AM JWO To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	84	158
PROJECT FILE NO. 606223			

GENERAL NOTES AND
ESTIMATED QUANTITIES

GENERAL NOTES:

DESIGN:
IN ACCORDANCE WITH THE 2014 SPECIFICATIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016, FOR H10 LOADING. DESIGN ALSO IN ACCORDANCE WITH AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR PEDESTRIAN LOADING.

BENCH MARK:
STA. # CON10 (SMC #40)
PUNCHMARK IN RAIL
N 2996046.040 E 681142.400
BFRT 2B ℄ STA. 26+51.99
2.086' LT ELEV. 128.80

STA. #14 SSM SET
N 2995978.480 E 681184.150
BFRT 2B ℄ STA. 27+30.02
11.647' RT ELEV. 129.13

ELEVATIONS:
ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

MASSDOT SURVEY NOTEBOOKS:
COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM MASSACHUSETTS DEPARTMENT OF TRANSPORTATION – HIGHWAY DESIGN

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

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

UNSUITABLE MATERIAL:
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:
DESIGN RETURN PERIOD: 1000 YEARS
DESIGN SPECTRA:
As = 0.128
Sds = 0.256
Sd1 = 0.096
SITE CLASS = D
SEISMIC DESIGN CATEGORY (SDC) = A

ANCHOR BOLTS:
ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

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

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	21"	26"	31"
2. 12" OF CONCRETE BELOW BAR	29"	36"	43"
3. COATED BARS, COVER < 3DB, OR CLEAR SPACING < 6DB	31"	39"	46"
4. COATED BARS, ALL OTHER CASES	25"	31"	37"
5. CONDITION 2. AND 3.	35"	44"	53"
6. CONDITION 2. AND 4.	34"	43"	51"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES

(1)	(2)	(3)	TO BE USED IN CONSTRUCTION OF:
4000	1½	565	ABUTMENTS, FOOTINGS, APPROACH SLABS, WINGWALLS, CURTAIN WALLS
4000	¾	610	ABUTMENT BACKWALLS, KEEPER BLOCKS
4000	¾	585 HP	DECK, END DIAPHRAGMS, PIER CAP, PIER COLUMN, SAFETY CURBS, WINGWALL CAPS

(1) 28 DAY COMPRESSIVE STRENGTH (PSI)
(2) MAXIMUM AGGREGATE SIZE (IN.)
(3) CEMENTITOUS CONTENT (POUND/C.Y.)

UTILITIES:
THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

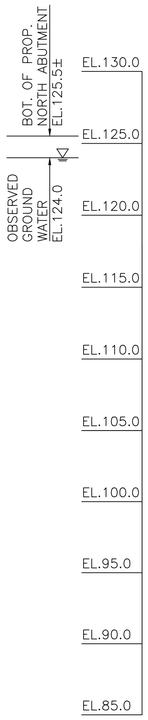
ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
BRIDGE EXCAVATION	1445	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	1000	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES & PIPES	520	CY
CRUSHED STONE FOR BRIDGE FOUNDATIONS	30	TON
BRIDGE STRUCTURE, BRIDGE NO. C–19–039 (BUJ)	1	LS
MECHANICALLY STABILIZED EARTH WALL	750	SY
MSE WALL MANUFACTURER'S REPRESENTATIVE	9	DAY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_02.DWG Plotted on 1-Feb-2019 9:36 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-2307524\B-BRT-3\606223\DWG\BR\606223_BR(C19039)_02.dwg, 2/1/2019 9:36:23 AM, DWG To PDF.pc3

BORING LOGS (1 OF 3)



massDOT Highway

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-2
Scale 1" = 5'

City/Town: Concord | Trail Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-01-09 1:00PM | Total Hours: 4.75
Groundwater Depth: 4' | Date & Time: 10-02-09 9:45AM | Date & Time Completed: 10-02-09 9:45AM
Coordinates: N 2996126.0 E 681093.2 | Driller's Name: Peter Labossiere | Helper's Name: Shawn Burto
Ground Elevation: 128.0' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	3 3 5 14	12"	Dry, loose, brown, COARSE SAND, some fine sand, trace organic silt.	
S-2	4' - 6'	9 10 13 11	12"	Wet, medium dense, brown, COARSE SAND, trace fine sand.	
S-3	9' - 11'	5 6 7 10	10"	Wet, medium dense, brown, COARSE SAND, trace fine sand.	
S-4	14' - 16'	32 21 17 16	6"	Wet, dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-5	19' - 21'	9 6 12 17	12"	Wet, medium dense, brown, COARSE SAND, some fine sand and gravel, trace inorganic silt.	23'
S-6	24' - 26'	8 5 6 5	12"	Wet, medium dense, gray, FINE SAND, trace inorganic silt.	
S-7	29' - 31'	25 8 8 13	6"	Wet, medium dense, gray, FINE SAND, some fine gravel, weathered bedrock in wash.	
				Top of Possible BEDROCK at 32'	32'
				Rollerbit to 34'.	
	34' - 35'	13 4		Retrieved 1'6" boulder, advanced to 36' to sample.	
S-8	36' - 36'8"	41 8/2"	8"	Wet, very dense, gray, FINE SAND, some coarse sand and fine gravel, (till).	36'8"
				Bottom of Exploration = 36'8"	

Notes: Sample by cathead

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

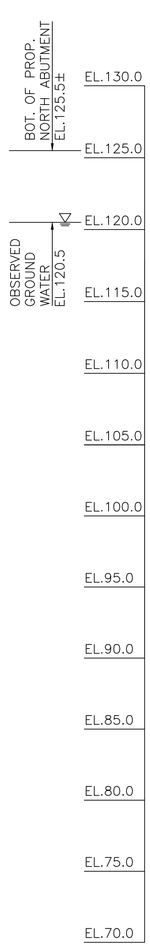
Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Mobile B-47
Casing Type:HW Size: 4" Hammer Weight:300Lbs. Fall:30" Signs: Cones:
Depth: 33' Arrow-Board:
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: Size:

BORING TB–2



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P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. BB-2B-1
Scale 1" = 5'

City/Town: Acton Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-12-14 2:00 pm | Total Hours: 12.5
Groundwater Depth: 9' | Date & Time: 11-13-14 7:25 am | Date & Time Completed: 11-14-14 11:00 am
Coordinates: N 2996155 E 681053 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 129.5 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	2 3 5 3	14"	Dry, loose, brown, FINE TO COARSE SAND, some inorganic silt.	
S-2	5' - 7'	7 9 14 16	13"	Dry, medium dense, brown, FINE SAND, some coarse sand, trace inorganic silt.	
S-3	10' - 12'	8 13 15 16	10"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	13'6"
S-4	15' - 16'	7 9 11 11	5"	Wet, medium dense, brown-red, FINE SAND and inorganic silt.	16'
S-4A	16' - 17'		4"	Wet, medium dense, gray, FINE SAND, trace inorganic silt.	
S-5	20' - 22'	3 3 5 5	17"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.	25'
S-6	25' - 26'	2 4 4 4	8"	Wet, loose, brown, FINE SAND, some inorganic silt.	26'
S-6A	26' - 27'		8"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.	28'6"
S-7	30' - 32'	21 22 24 15	12"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
				Top of possible BEDROCK at 33'	33'
C-1	34' - 39'	4 2 2 3 2	48"	Advanced rollerbit to 34' and began coring. Hard very weathered, moderately fractured GRANITE. Percent Recovery = 80%	
C-2	39' - 44'	2 1 1 1 1	0"	No recovery, very weathered GRANITE. Rollerbit to 45', telescoped 3" casing to sample.	
S-8	45' - 45'11"	34 86/5"	9"	Moist, very dense, gray, possible weathered BEDROCK.	
S-9	50' - 50'2"	120/2"	2"	Moist, very dense, brown, FINE TO MEDIUM GRAVEL, trace inorganic silt (weathered possible bedrock) Advanced rollerbit to 55'	
				Terminated boring at 55'	55'
				Bottom of Exploration = 55'	

Remarks: * AECOM (Consultants)
Boring terminated due to not being able to advanced corebarrell down the hole.
Boring terminated without coring another 5 foot run to compensate for the no recovery obtained from C-2; enough information was obtained for the design engineer. Installed monitoring well at 20'

Protective Device - Stand: Box:
Well Depth: 20' Solid Pipe: 13'
Stick Up Pipe: 3' Screen Pipe: 10'

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 39'
Casing: NW Size: 3" Amt: 45'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING BB–2B–1

BORING NOTES:

TB–2

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: ⊕
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
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 A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2014.
7. BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

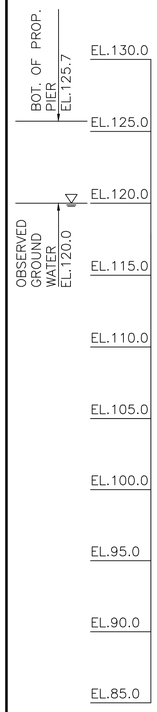
NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_03-05.DWG Plotted on 1-Feb-2019 9:36 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAX-2007\245\D-BR_2B\606223\DWG\BR\606223_BRC19039_01-05-dwg 2/1/2019 9:9:29 AM, DWG To PDF.pc3

BORING LOGS (2 OF 3)



massDOT Highway

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-3
Scale 1" = 5'

City/Town: Concord | Trail Borings | Project File No: 602091 | Contract No: 58183

Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-09-09 7:00AM | Total Hours: 7

Groundwater Depth: 9' | Date & Time: 10-09-09 2:00PM | Date & Time Completed: 10-09-09 2:00PM

Coordinates: N 2996037.7 E 681166.5 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre

Ground Elevation: 129.0' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	3 4 3 5	16"	Dry, loose, brown, COARSE SAND ANDFINE SAND, trace organic silt.	
S-2	4' - 6'	14 9 7 7	12"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-3	9' - 11'	7 5 6 6	8"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic, silt.	13'
S-4	14' - 16'	7 7 12 13	12"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	
S-5	19' - 21'	13 19 8 11	6"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	
S-6	24' - 26'	16 13 12 6	7"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-7	29' - 31'	4 3 3 5	12"	Wet, loose, gray, FINE SAND, some inorganic silt.	33'
S-8	34' - 36'	14 13 15 15	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-9	39' - 40'	70 67	10"	Wet, very dense, gray, FINE SAND AND COARSE SAND, some inorganic silt, (till).	37'
S-10	44' - 44'6"	120/6"	6"	Wet, very dense, gray, FINE SAND, some inorganic silt, trace coarse sand, (till).	49'
S-11	49' - 49'8"	51 70/2"	8"	Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt, trace bedrock pieces in tip of spoon. Top of BEDROCK at 50'	50'
C-1	50' - 55'	3 4 4 3 4	39"	Began coring at 50'. Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Pecent Recovery = 78%	
C-2	55' - 60'	3 3 2 3 3	29"	Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 48%	60'
				Bottom of Exploration = 60'	

Notes: Sample by cathead

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

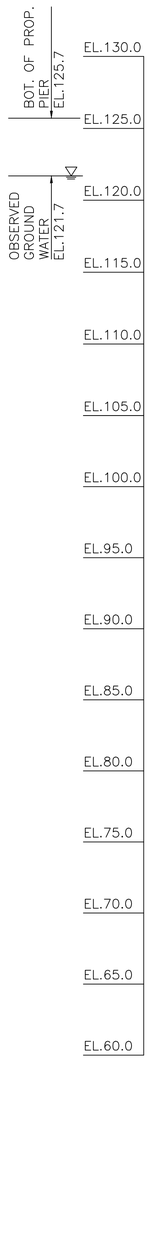
Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Mobile B-47
Casing Type: HW Size: 4" Signs:
Hammer Weight: 300Lbs. Cones: 6
Fall: 30" Arrow-Board:
Depth: 45'
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING TB–3



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NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. BB-2B-2
Scale 1" = 5'

City/Town: Acton Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859

Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-25-14 7:30 am | Total Hours: 7

Groundwater Depth: 8' | Date & Time: 11-25-14 2:15 am | Date & Time Completed: 11-25-14 2:30 pm

Coordinates: N 2996044 E 681118 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer

Ground Elevation: 129.7 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp. for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL 3"	
S-1	0' - 2'	2 5 6 6	10"	Dry, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-2	5' - 7'	3 3 5 7	8"	Moist, loose, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-3	10' - 12'	5 7 6 7	14"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-4	15' - 17'	7 10 9 10	11"	Wet, medium dense, gray, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	19'
S-5	20' - 22'	9 11 13 16	15"	Wet, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, some inorganic silt.	23'
S-6	25' - 26'	5 6 5 5	7"	Wet, medium dense, brown, FINE SAND and inorganic silt.	26'
S-6A	26' - 27'		7"	Wet, loose, gray, FINE SAND and inorganic silt.	30'
S-7	30' - 32'	10 10 16 19	6"	Wet, medium dense, gray, COARSE TO FINE SAND and fine to medium gravel, trace inorganic silt.	32'6"
S-8	35' - 36'4"	42 55 65/4"	16"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	
S-9	40' - 41'3"	37 67 53/3"	12"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	
S-10	45' - 46'4"	28 40 80/4"	15"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	46'4"
S-11	50' - 50'2"	120/2"	0"	No Recovery	
S-12	55' - 55'8"	86 34/2"	4"	Wet, very dense, brown-white INORGANIC SILT and fine sand, some fine gravel, trace weathered bedrock.	
S-13	60' - 60'3"	120/3"	2"	Wet, very dense, brown-gray, weathered BEDROCK.	
S-14	65' - 65'4"	120/4"	3"	Wet, very dense, brown-gray weathered BEDROCK.	65'4"
				Bottom of Exploration = 65'4"	

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: 2 Cones: 20
Casing: HW Size: 4" Amt: 65'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: Size:

BORING BB–2B–2

NOTES:

1. FOR LOCATION OF BORINGS, SEE SHEET 1.
2. FOR BORING NOTES, SEE SHEET 3.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

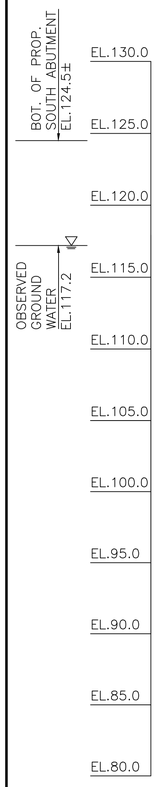
606223_BR(C19039)_03-05.DWG Plotted on 1-Feb-2019 9:36 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-2007\0145-BRT-3R\606223\DWG\BR\606221_BR(C19039)_03-05.dwg 2/1/2019 9:59:11 AM DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	87	158

PROJECT FILE NO. 606223

BORING LOGS (3 OF 3)



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NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring # HB-4
Scale 1" = 5'

City/Town: Concord	Highway Borings	Project File No: 602091	Contract No: 58183
Project: Route 2 Construction at the Concord Rotary		Date & Time Started: 10-02-09 1:15PM	Total Hours: 5.25
Groundwater Depth: 11'	Date & Time: 10-05-09 10:30AM	Date & Time Completed: 10-05-09 10:30AM	
Coordinates: N 2995951.8	E 681198.7	Driller's Name: Roger Burne	Helper's Name: Patrick Schofield
Ground Elevation: 128.2'	Inspector's Name: Christopher Cheu	Inspector's Company: Lamson Engineering, Inc. for AECOM	

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL * 2"	
S-1	0' - 2'	4 3 4 5	5"	Dry, loose, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-2	4' - 6'	5 5 9 9	12"	Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt.	
S-3	9' - 11'	5 5 5 5	18"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	14'
S-4	14' - 16'	7 9 10 11	15"	Wet, medium dense, grey, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.	
S-5	19' - 21'	9 11 13 12	18"	Wet, medium dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	24'
S-6	24' - 26'	19 15 9 10	15"	Wet, medium dense, grey, FINE SAND, some inorganic silt, trace clay lenses.	28'6"
S-7	29' - 31'	29 22 23 27	12"	Wet, dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-8	34' - 34'9"	44 120/3"	9"	Wet, very dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	34'9"
				Encountered BOULDER 34'9" to 35'. * 35'	
				Advanced Rollerbit to 38'.	
				Top of BEDROCK at 38'.	38'
C-1	38' - 43'	4 5 3 4 5	27"	Began coring. Severely fractured, white/ black, GRANITE, trace quartz lenses. Percent Recovery= 45%	43'
				Bottom of Exploration= 43'	

Notes: Stopped coring at 5' per order of on-site engineer due to having obtained sufficient information. Well installed at 15'. 4 bags sand/ 1 cement. Sample by cathead.

Protective Device - Stand: Box:
Well Depth: 15' Solid Pipe: 8'
Stick Up Pipe: 3' Screen Pipe: 10'

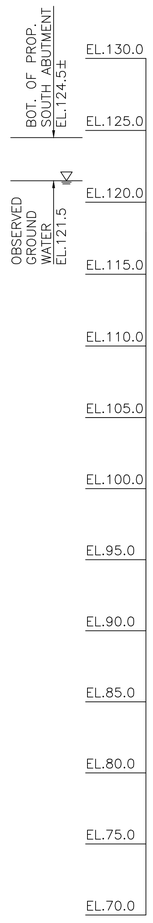
Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Diedrich- 50
Casing Type: HW Size: 4" Signs:
Hammer Weight: 300Lbs. Cones: 7
Fall: 30"
Depth: 34' Arrow-Board:
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING HB–4



massDOT Highway

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. BB-2B-3
Scale 1" = 5'

City/Town: Acton Concord	Bridge: Bruce Freeman Rail Trail (Phase II-B)	Project File No: 606223	Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B)		Date & Time Started: 11-17-14 8:00 am	Total Hours: 10.5
Groundwater Depth: 7'	Date & Time: 11-18-14 11:00 am	Date & Time Completed: 11-18-14 12:00 pm	
Coordinates: N 2995941	E 681254	Driller's Name: Manlea Thompson	Helper's Name: Donald Palmer
Ground Elevation: 128.5	Inspector's Name: Weijie Dong	Inspector's Company: Lamson Engineering, Corp., for *	

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	3 3 3 2	12"	Moist, loose, black, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	3'6"
S-2	5' - 7'	4 6 6 8	17"	Moist, medium dense, brown COARSE TO FINE SAND, trace inorganic silt.	
S-3	10' - 12'	5 6 8 8	19"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel, trace inorganic silt.	
S-4	15' - 17'	8 9 12 13	17"	Wet, medium dense, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-5	20' - 22'	12 10 9 10	10"	Wet, medium dense, gray FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-6	25' - 27'	6 8 10 12	4"	Wet, medium dense, gray-brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
S-7	30' - 32'	10 9 10 10	13"	Wet, medium dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	
				Top of weathered BEDROCK at 33'	33'
				Advanced casing and roller bit through weathered bedrock to 35'.	
S-8	35' - 35'3"	120/3"	2"	Moist, very dense, gray FINE TO COARSE SAND and fine to coarse gravel, trace inorganic silt (weathered bedrock). Roller bit through weathered bedrock and began coring.	
C-1	38' - 43'	5 5 4 4 5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	
C-2	43' - 48'	4 5 5 4 5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%	48'
				Bottom of Exploration = 48'	

Remarks: * AECOM (Consultants)
Set monitoring well at 17'

Protective Device - Stand: Box:
Well Depth: 17' Solid Pipe: 10'
Stick Up Pipe: 3' Screen Pipe: 10'

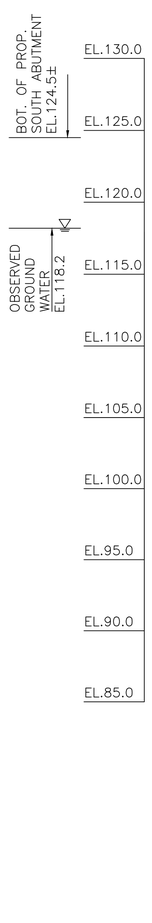
Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: PW Size: 5" Amt: 34'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING BB–2B–3



massDOT Highway

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038

Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-6
Scale 1" = 5'

City/Town: Concord	Trail Borings	Project File No: 602091	Contract No: 58183
Project: Route 2 Construction at the Concord Rotary		Date & Time Started: 10-05-09 11:25AM	Total Hours: 4
Groundwater Depth: 10'	Date & Time: 10-06-09 7:00AM	Date & Time Completed: 10-06-09 7:30AM	
Coordinates: N 2995897.9	E 681269.9	Driller's Name: Peter Labossiere	Helper's Name: Jack Lefebvre
Ground Elevation: 128.2'	Inspector's Name: Derek Lee	Inspector's Company: Lamson Engineering, Inc. for AECOM	

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	4 6 7 7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.	4'
S-2	4' - 6'	4 2 2 4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.	9'
S-3	9' - 11'	12 12 11 9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-4	14' - 16'	13 9 9 11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-5	19' - 21'	7 13 8 13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	24'
S-6	24' - 26'	17 11 7 5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.	
S-7	29' - 31'	18 8 21 100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.	
				Top of BEDROCK at 32'.	32'
				Began coring.	
C-1	32' - 37'	4 5 14 5 6	54"	Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%	37'
				Bottom of Exploration = 37'	

Notes: Sample by cathead

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Mobile B-47
Casing Type: HW Size: 4" Signs:
Hammer Weight: 300Lbs. Cones:
Fall: 30"
Depth: 30' Arrow-Board:
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING TB–6

NOTES:

1. FOR LOCATION OF BORINGS, SEE SHEET 1.
2. FOR BORING NOTES, SEE SHEET 3.

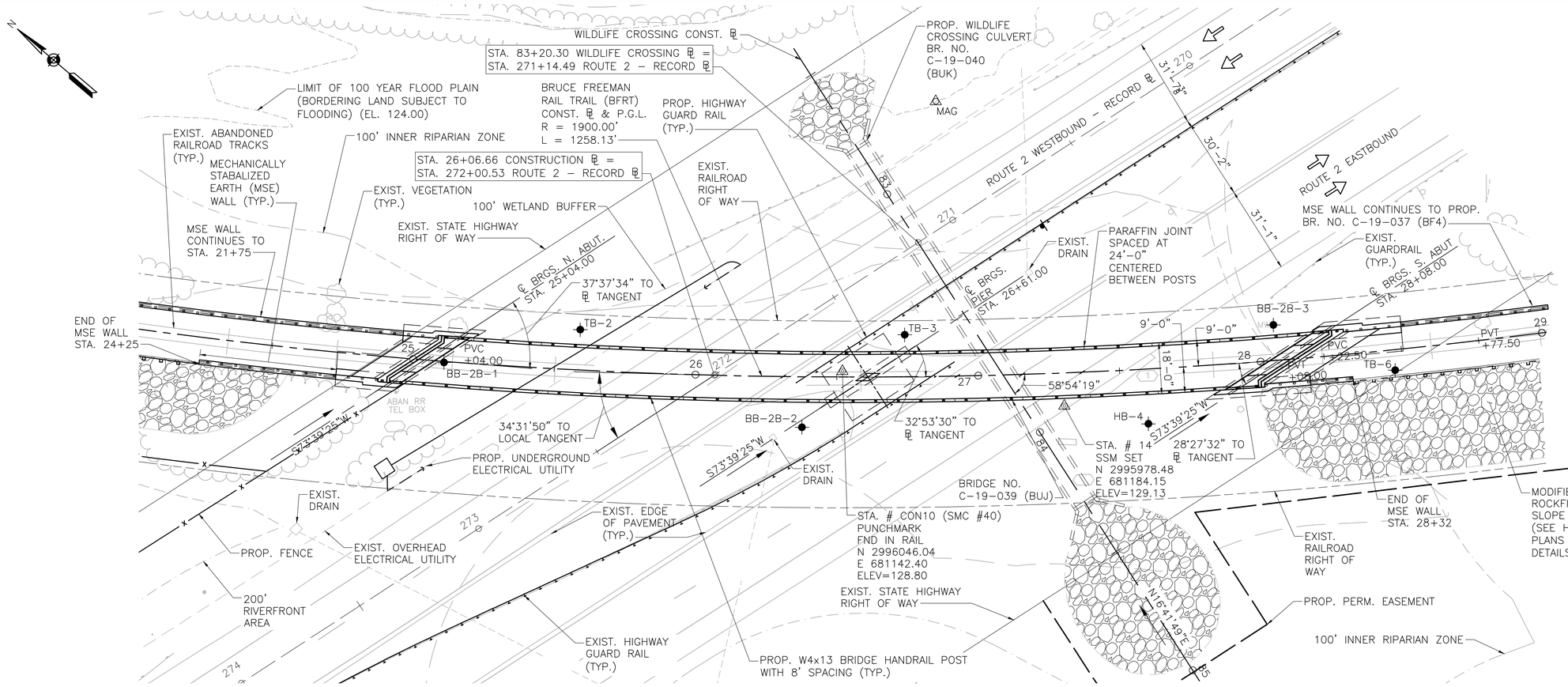
DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
	USE ONLY PRINTS OF LATEST DATE

606223_BR(C19039)_03-05.DWG Plotted on 1-Feb-2019 9:36 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-102704\04-BRF-3\606223\DWG\BR\606223_BRC19039_03-05.dwg, 1/1/2019 9:51:2 AM, DWG To PDF.pc3

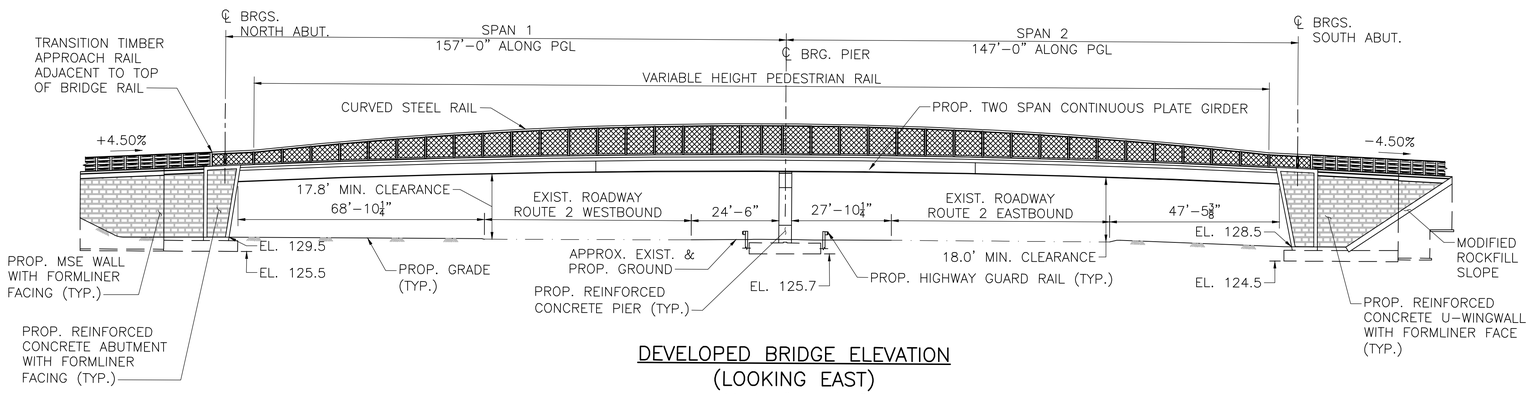
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	88	158
PROJECT FILE NO. 606223			

PLAN AND ELEVATION



PLAN
SCALES: 1" = 20'



DEVELOPED BRIDGE ELEVATION
(LOOKING EAST)
SCALE: 1" = 20'–0"

BRIDGE SKEWS ALONG ℄

LOCATION:	SKEW ANGLE:
NORTH ABUTMENT	52°22'26"
PIER	57°6'30"
SOUTH ABUTMENT	61°32'28"

NOTE:
FOR BRIDGE RAIL END POST SPACING, SEE BRIDGE SHEET 24 OF 24.

NOTE:
ALL ROADWAY DIMENSIONAL INFORMATION IS BASED ON SURVEY FOR ROUTE 2, ALL DIMENSIONS SHALL BE CONFIRMED BY CONTRACTOR IN THE FIELD.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BRC(19039)_06.DWG Plotted on 1-Feb-2019 9:37 AM
Second Structural Submittal (S2) 25-January-2019
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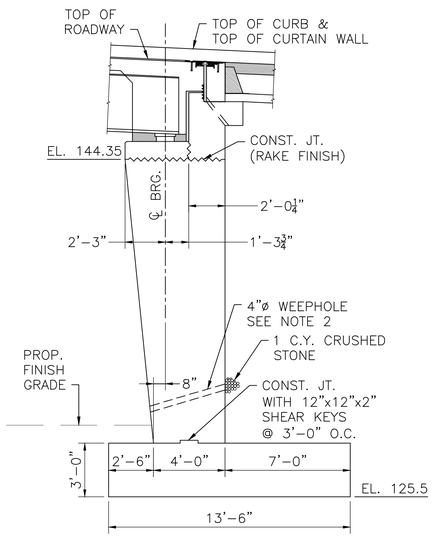
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

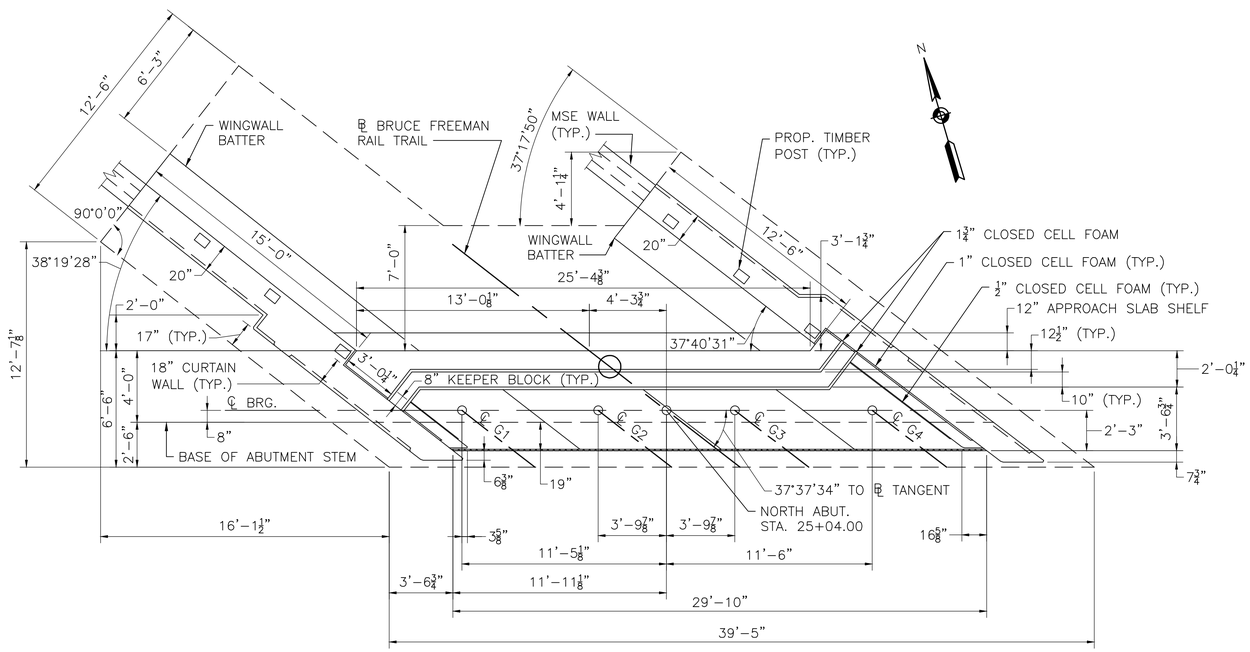
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	89	158
PROJECT FILE NO. 606223			

NORTH ABUTMENT PLAN, ELEVATION, AND SECTION



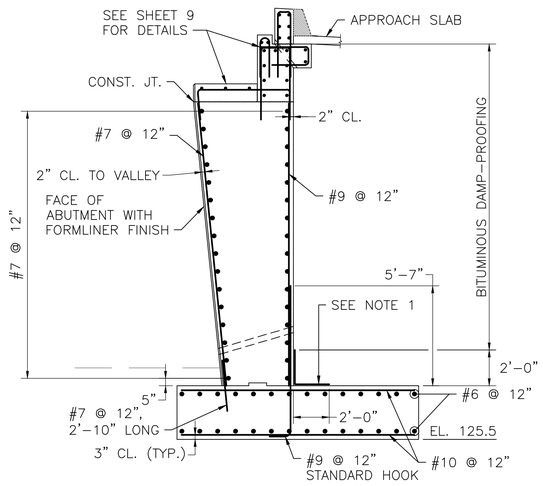
NORTH ABUTMENT TYPICAL SECTION

SCALE: ¼" = 1'–0"



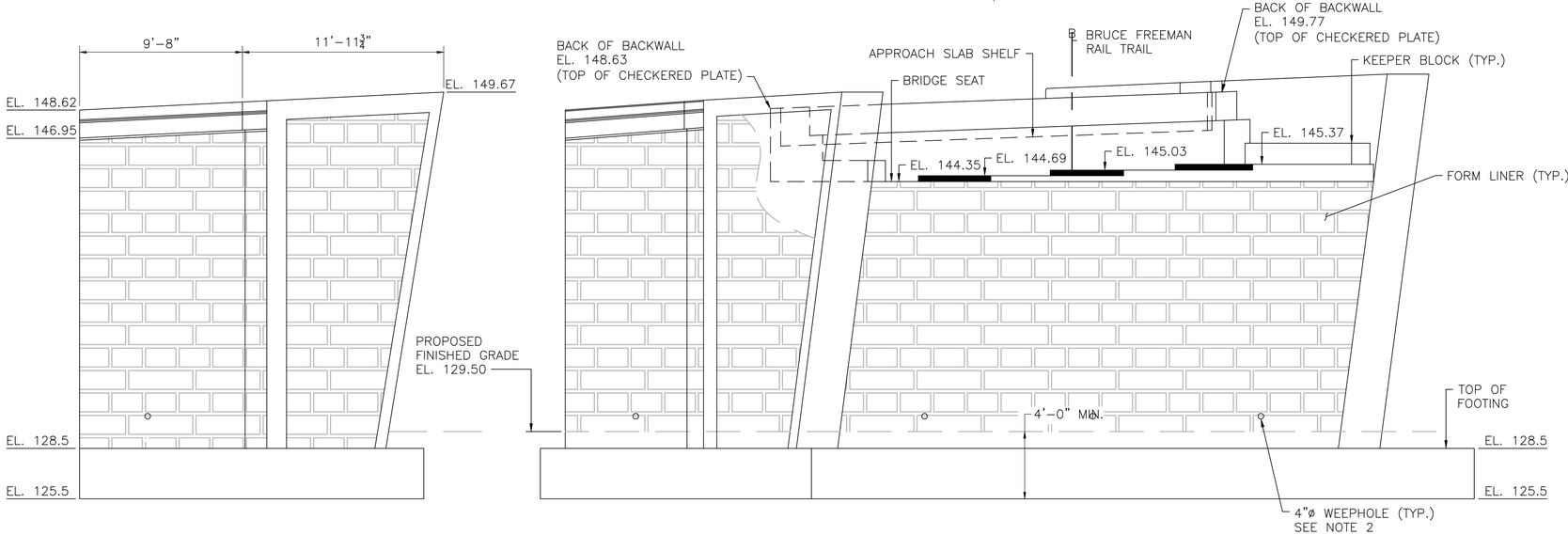
NORTH ABUTMENT PLAN

SCALE: ¼" = 1'–0"



TYPICAL ABUTMENT REINFORCING

SCALE: ¼" = 1'–0"

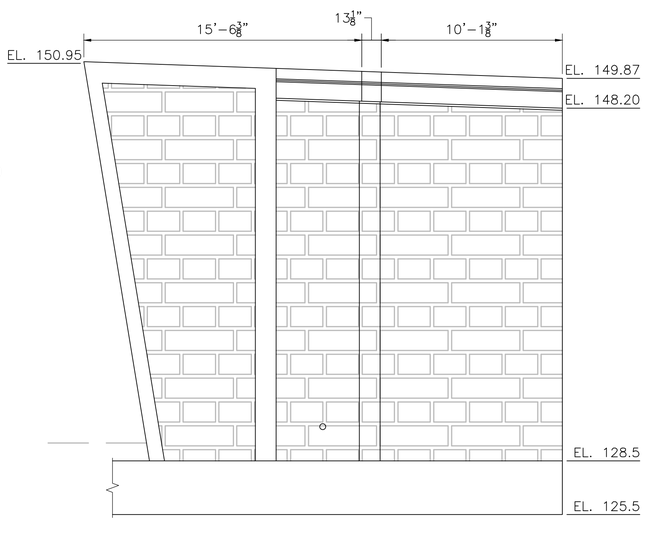


NORTHWEST ELEVATION

SCALE: ¼" = 1'–0"

NORTH ABUTMENT ELEVATION

SCALE: ¼" = 1'–0"



NORTHEAST ELEVATION

SCALE: ¼" = 1'–0"

NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, ¾ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ø WEEP HOLES 10'–0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE.
4. THE FACTORED BEARING PRESSURE = 6.71 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 8.00 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:37 AM
Second Structural Submittal (S2) 25-January-2019
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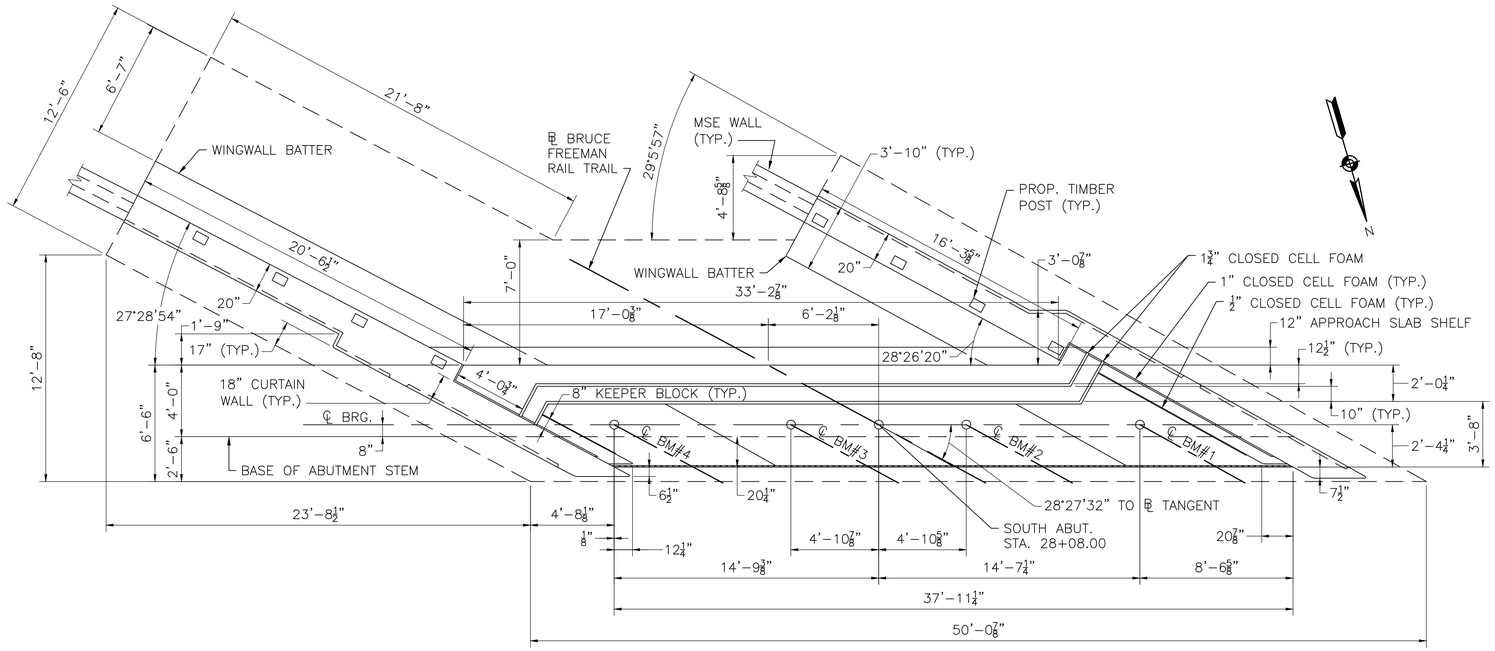
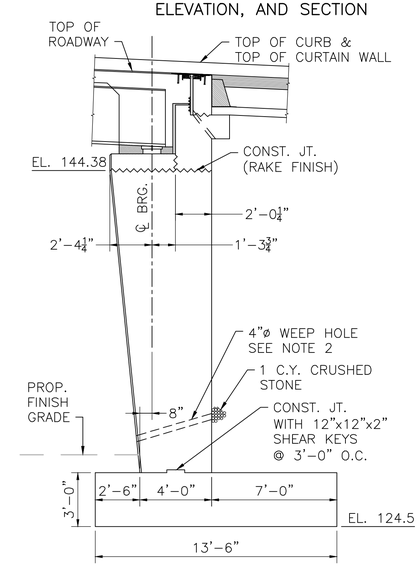
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

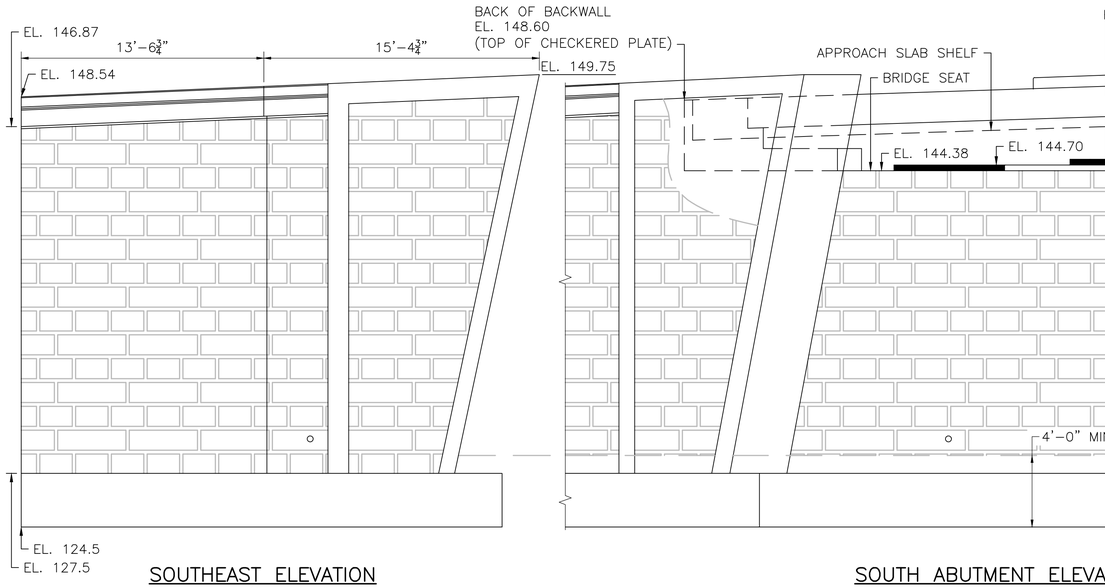
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	90	158
PROJECT FILE NO. 606223			



SOUTH ABUTMENT PLAN
SCALE: ¼" = 1'-0"

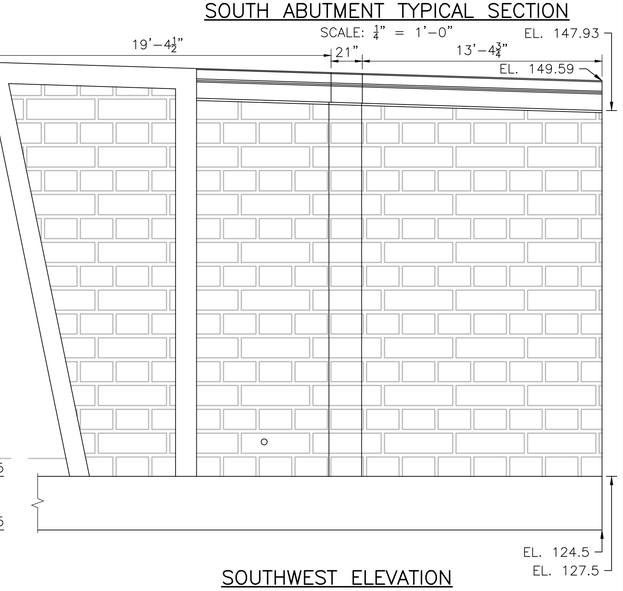


SOUTH ABUTMENT TYPICAL SECTION
SCALE: ¼" = 1'-0"



SOUTHEAST ELEVATION
SCALE: ¼" = 1'-0"

SOUTH ABUTMENT ELEVATION
SCALE: ¼" = 1'-0"



SOUTHWEST ELEVATION
SCALE: ¼" = 1'-0"

NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, ¾ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ø WEEP HOLES 10'–0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE.
4. THE FACTORED BEARING PRESSURE = 6.50 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 9.60 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 8 OF 24 SHEETS BRIDGE NO. C–19–039 (BUJ)

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:38 AM

Second Structural Submittal (S2) 25-January-2019

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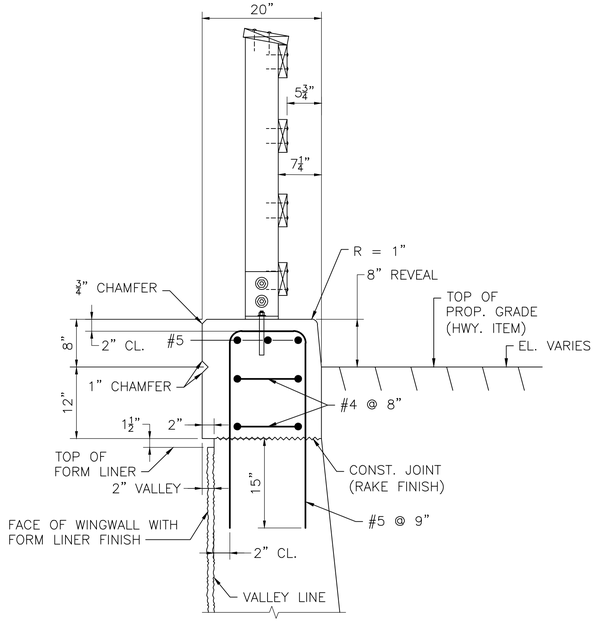
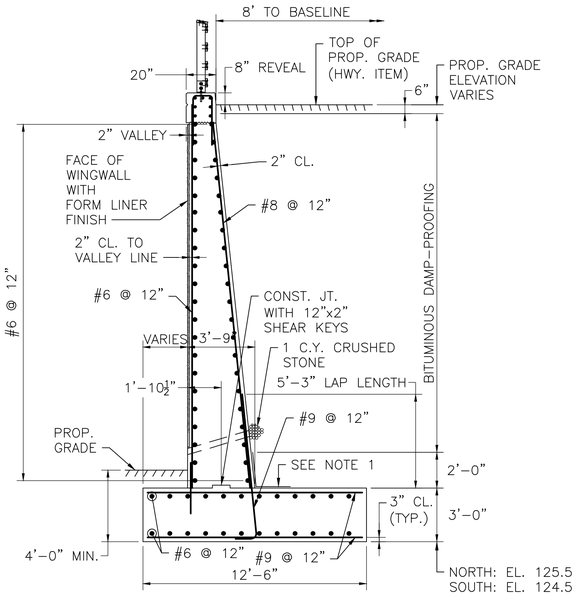
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	91	158
PROJECT FILE NO. 606223			

END OF DECK, WINGWALLS, AND FOUNDATION DETAILS



TOP OF WINGWALL DETAIL

SCALE: 1" = 1'–0"

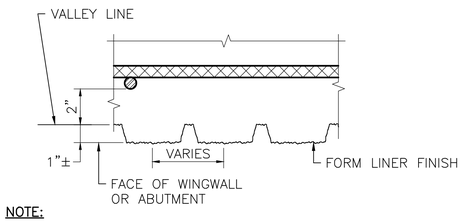


TYPICAL WINGWALL DETAIL

SCALE: ¼" = 1'–0"

WINGWALL NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, ¾ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ø WEEP HOLES 10'–0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.

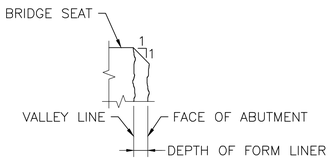


NOTE:

1. THE CONTRACTOR SHALL MAKE SURE THAT THE FORM LINER FINISH IS PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.

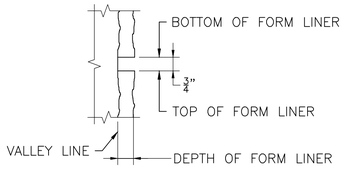
TYPICAL FORM LINER DETAIL

SCALE: 3" = 1'–0"



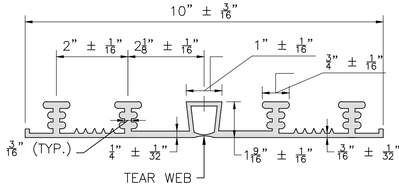
DETAIL AT BRIDGE SEAT

SCALE: 3" = 1'–0"



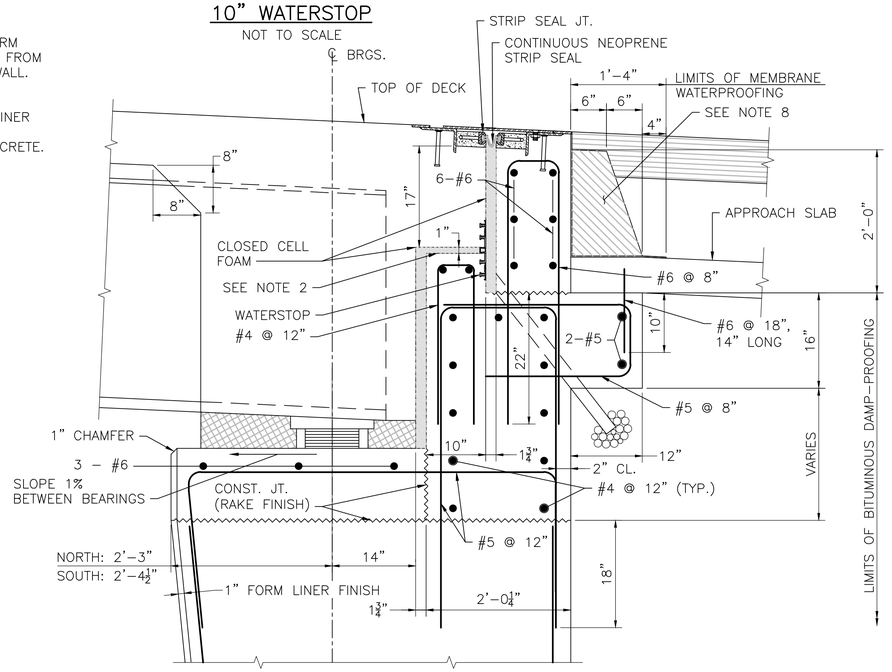
HORIZONTAL PANEL JOINT

SCALE: 3" = 1'–0"



10" WATERSTOP

NOT TO SCALE

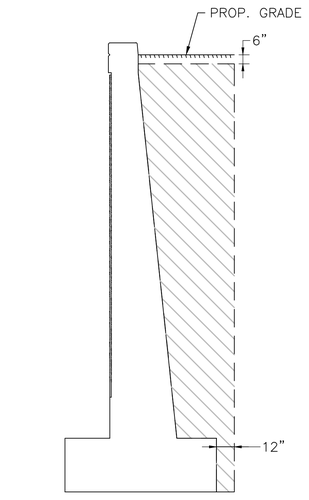


END OF DECK DETAIL

SCALE: 1" = 1'–0"

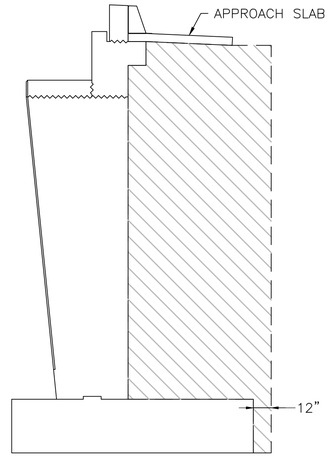
ROADWAY/SIDEWALK SECTION NOTES:

1. ALL REINFORCEMENT SHOWN IN THIS DETAIL SHALL BE COATED.
2. TOP OF BACKWALL SHALL BE TROWELED SMOOTH PARALLEL TO THE PROFILE GRADE.
3. BACKWALL BELOW CONSTRUCTION JOINT, KEEPER BLOCK AND CURTAIN WALL CONCRETE MUST BE PLACED AND SUFFICIENTLY CURED PRIOR TO PLACING THE END DIAPHRAGM CONCRETE.
4. THE END DIAPHRAGM CONCRETE SHALL BE 4000 PSI, ¾ IN, 585 HP CEMENT CONCRETE AND SHALL BE PLACED MONOLITHICALLY WITH THE DECK.
5. PRIOR TO PLACING THE END DIAPHRAGM CONCRETE, CLOSED CELL FOAM OF THE SPECIFIED THICKNESSES SHALL BE ATTACHED WITH ADHESIVE TO ALL SURFACES OF THE BACKWALL, KEEPER BLOCKS, AND CURTAIN WALLS AS SHOWN ON THE PLANS. EXPANDED POLYSTYRENE SHALL BE PLACED UNDER THE BEAM BOTTOM FLANGE AND THE BOTTOM OF THE END DIAPHRAGM SHALL BE FORMED AS SPECIFIED. THE CONTRACTOR SHALL INSURE THAT ALL ABUTMENT CONCRETE IS PROPERLY LINED. END DIAPHRAGM CONCRETE MUST NOT COME IN DIRECT CONTACT WITH THE ABUTMENT CONCRETE.
6. AFTER THE END DIAPHRAGM HAS CURED SUFFICIENTLY, PLACE THE APPROACH SLAB CONCRETE AND REMAINDER OF BACKWALL CONCRETE. THE BACKWALL TROUGH WILL BE FORMED WITH CLOSED CELL FOAM AND CARE SHALL BE TAKEN TO INSURE THAT CONCRETE DOES NOT ENTER THE TROUGH SUMP.
7. COVER THE BACKWALL TROUGH OPENING SECURELY TO KEEP DEBRIS OUT UNTIL READY TO INSTALL THE STRIP SEAL JOINT.
8. PROTECTIVE COURSE TO BE HOT MIX ASPHALT DENSE BINDER COURSE FOR BRIDGES, PLACED IN 2" LAYERS AND COMPACTED WITH A MECHANICAL HAND–GUIDED TAMPER WITHIN 12 HOURS AFTER PLACING MEMBRANE WATERPROOFING.



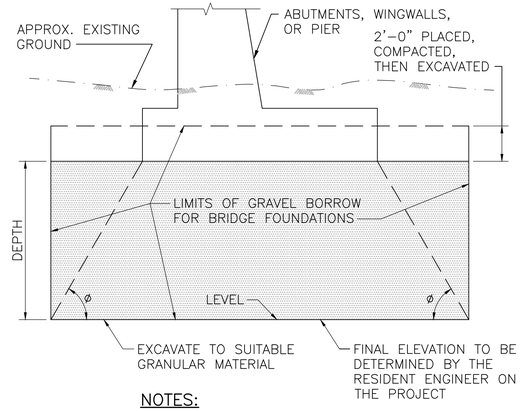
LIMITS OF GRAVEL BORROW FOR WINGWALLS

SCALE: ¼" = 1'–0"



LIMITS OF GRAVEL BORROW FOR ABUTMENTS

SCALE: ¼" = 1'–0"

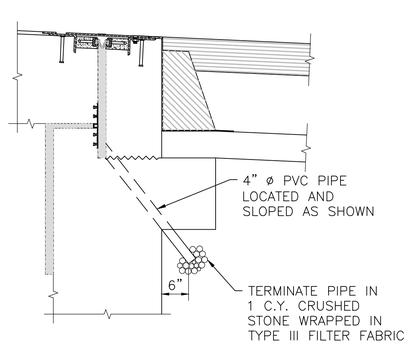


NOTES:

1. ø = 45° FOR DEPTH OF 5'–0" OR LESS.
   ø = 60° FOR DEPTH OVER 5'–0".
2. SAME TREATMENT IS TO BE USED AT ENDS OF WALLS, PIERS, AND ABUTMENTS.

LIMITS OF GRAVEL BORROW FOR BRIDGE FOUNDATIONS

NOT TO SCALE



END OF DECK DRAIN

SCALE: ¾" = 1'–0"

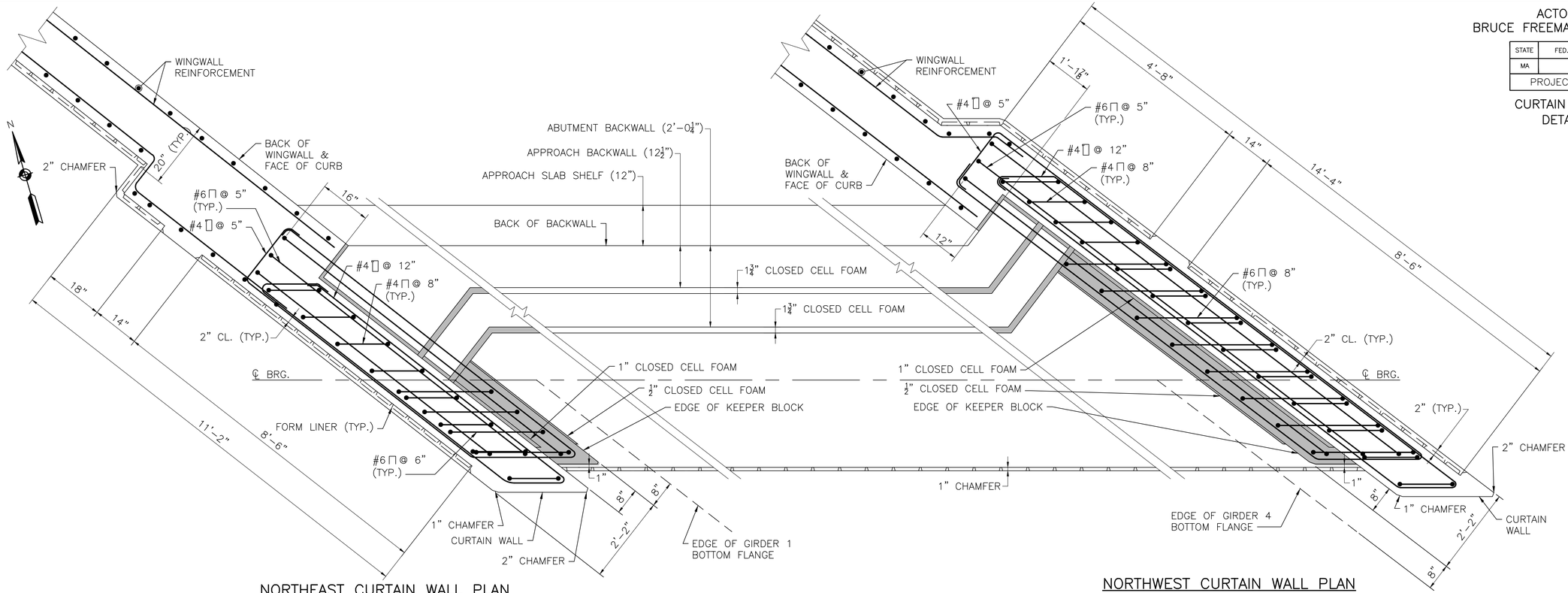
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:38 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-102\7614\Gr-BRF-2\Projects\2\Work\BRIM\623\1_BRC19039_07-11_14-16.dwg 2/1/2019 9:38:08 AM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

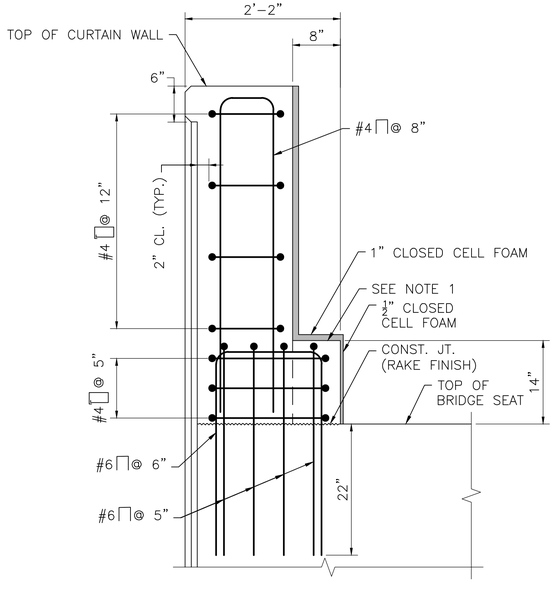
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	92	158
PROJECT FILE NO. 606223			

CURTAIN WALL PLANS AND DETAILS (1 OF 2)

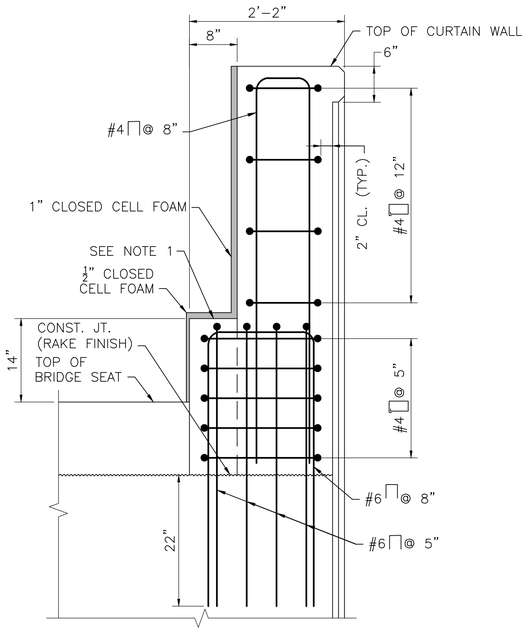


NORTHEAST CURTAIN WALL PLAN
SCALE: ¾" = 1'-0"

NORTHWEST CURTAIN WALL PLAN
SCALE: ¾" = 1'-0"



NORTHEAST CURTAIN WALL SECTION
SCALE: 1" = 1'-0"



NORTHWEST CURTAIN WALL SECTION
SCALE: 1" = 1'-0"

NOTES:
1. TOP OF KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.
2. ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:38 AM

Second Structural Submittal (S2) 25-January-2019

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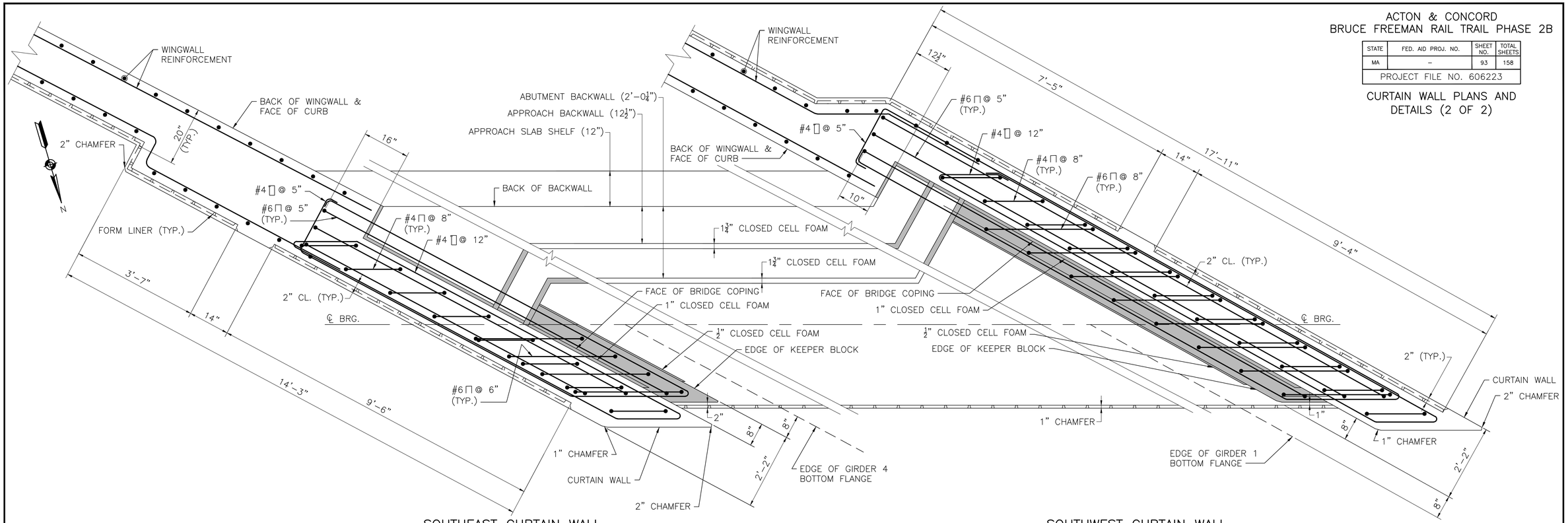
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

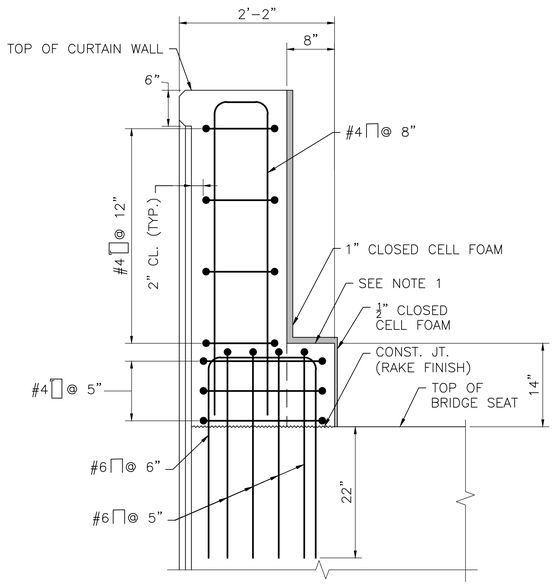
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	93	158
PROJECT FILE NO. 606223			

CURTAIN WALL PLANS AND DETAILS (2 OF 2)

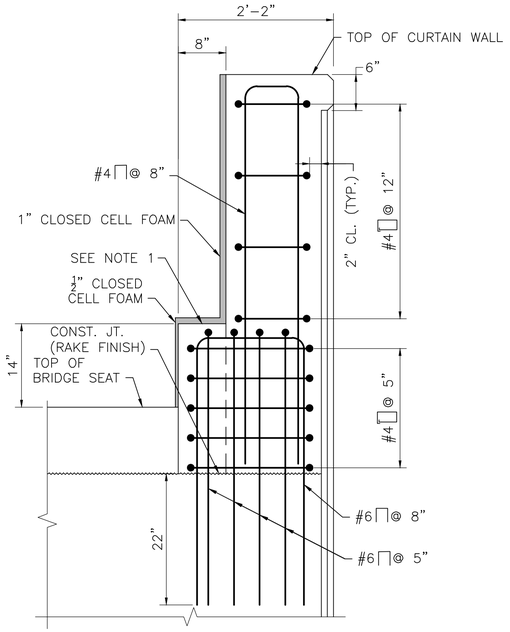


SOUTHEAST CURTAIN WALL
SCALE: ¾" = 1'–0"

SOUTHWEST CURTAIN WALL
SCALE: ¾" = 1'–0"



SOUTHEAST CURTAIN WALL SECTION
SCALE: 1" = 1'–0"



SOUTHWEST CURTAIN WALL SECTION
SCALE: 1" = 1'–0"

NOTES:
1. TOP OF KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.
2. ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

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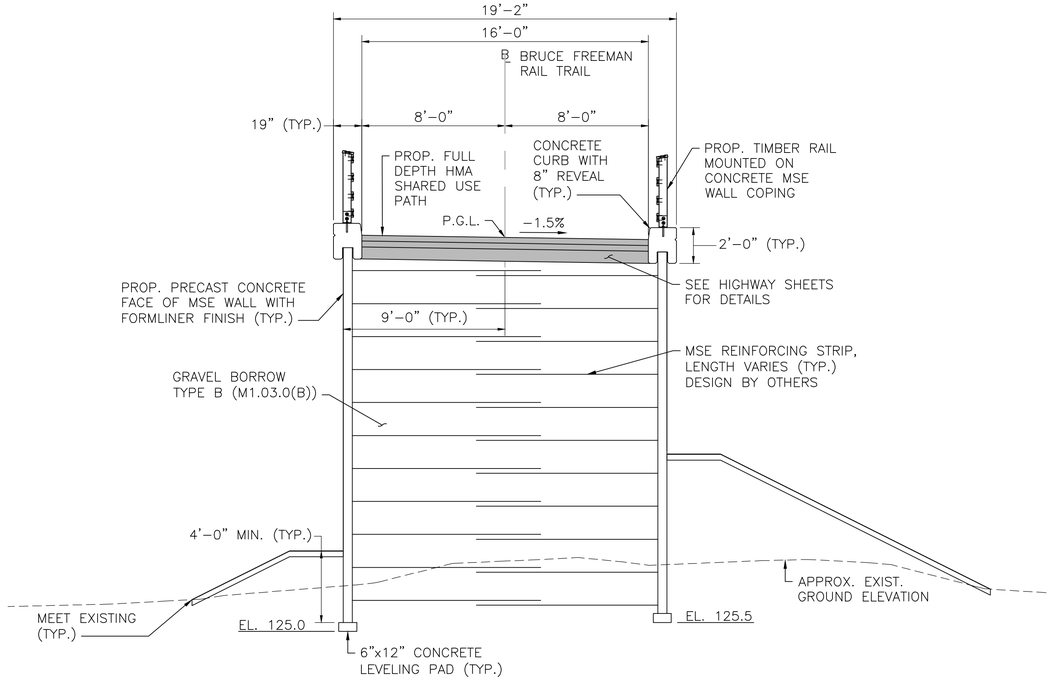
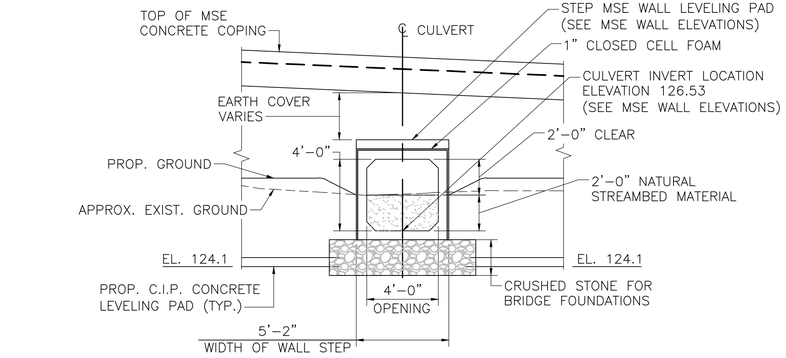
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	94	158
PROJECT FILE NO. 606223			

MSE WALL SECTIONS



NORTH MSE WALL APPROACH SECTION (LOOKING SOUTH, STA. 24+50)

SCALE: $\frac{1}{4}$" = 1'–0"

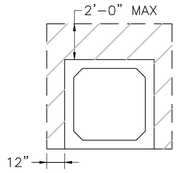


CONCRETE CULVERT FOR DRAINAGE

SCALE: $\frac{1}{4}$" = 1'–0"

NOTE:

SEE HIGHWAY SHEETS FOR ADDITIONAL CULVERT DETAILS.

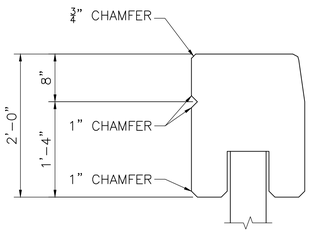


NOTE:

HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

SCALE: $\frac{1}{4}$" = 1'–0"

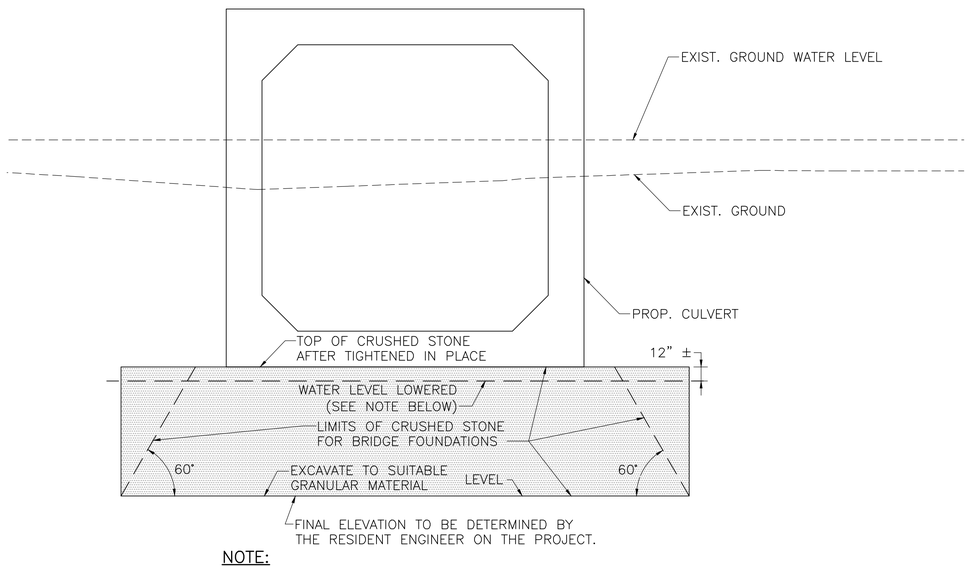


MSE CAP DETAIL

SCALE: 1" = 1'–0"

MSE NOTES:

1. UNSUITABLE SOILS SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW FOR BRIDGE FOUNDATIONS AS DETERMINED BY THE ENGINEER.
2. REFER TO SPECIAL PROVISIONS FOR THE FOLLOWING:
   - INFORMATION REGARDING PANELS, JOINTS, FILTER FABRIC AND MSE WALL REQUIREMENTS.
   - DESIGN CRITERIA AND MATERIAL REQUIREMENTS NOT SHOWN ON THESE PLANS.
   - MSE WALL FOUNDATION PREPARATION REQUIREMENTS
   - EXCAVATION PAYMENT LIMITS

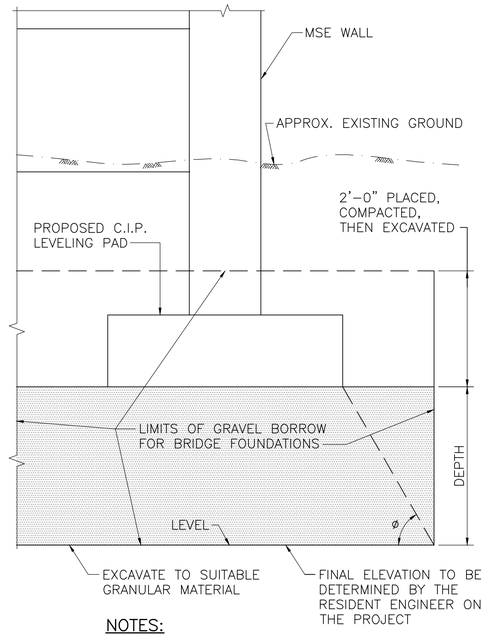


NOTE:

LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).

LIMITS OF CRUSHED STONE FOR BRIDGE FOUNDATIONS

NOT TO SCALE



NOTES:

1. ø = 45° FOR DEPTH OF 5'–0" OR LESS.
   ø = 60° FOR DEPTH OVER 5'–0".
2. SAME TREATMENT IS TO BE USED AT ENDS OF WALLS, PIERS, AND ABUTMENTS.

LIMITS OF GRAVEL BORROW FOR BRIDGE FOUNDATIONS

NOT TO SCALE

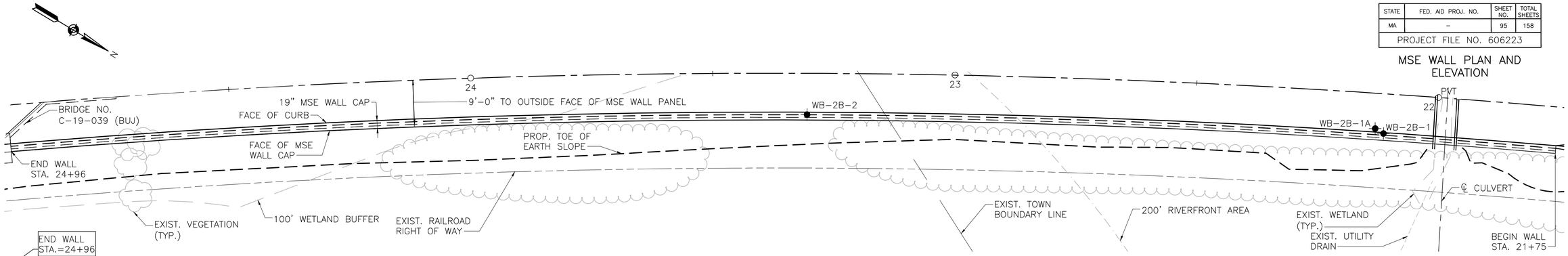
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_12-13.DWG Plotted on 1-Feb-2019 9:39 AM
Second Structural Submittal (S2) 25-January-2019
V:\AAA-2017\0436-BRT-JR\606223\DWG\BR\606223_BR(C19039)_12-13.dwg 2/1/2019 9:39:58 AM OWC to PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

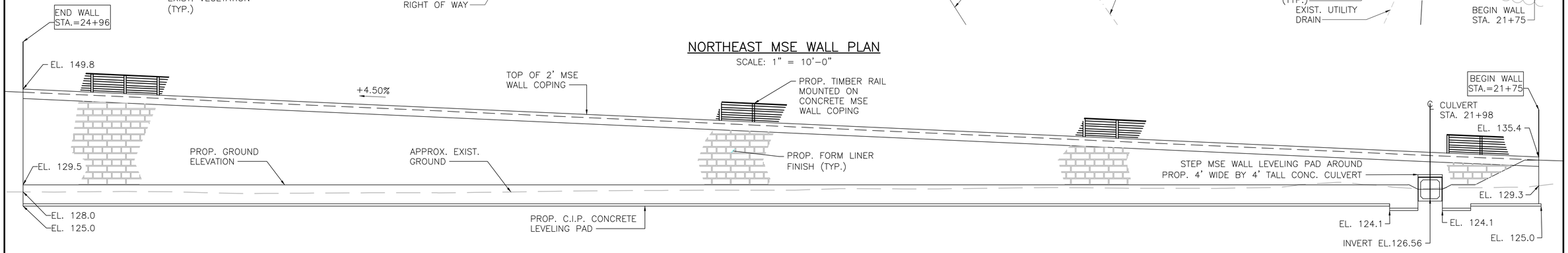
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	95	158
PROJECT FILE NO. 606223			

MSE WALL PLAN AND ELEVATION



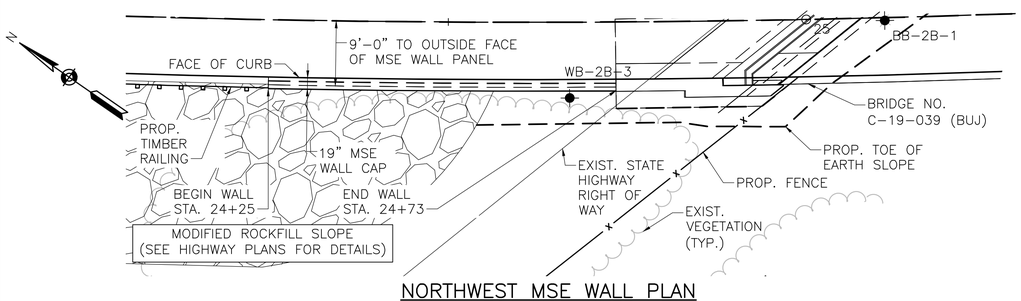
NORTHEAST MSE WALL PLAN

SCALE: 1" = 10'-0"



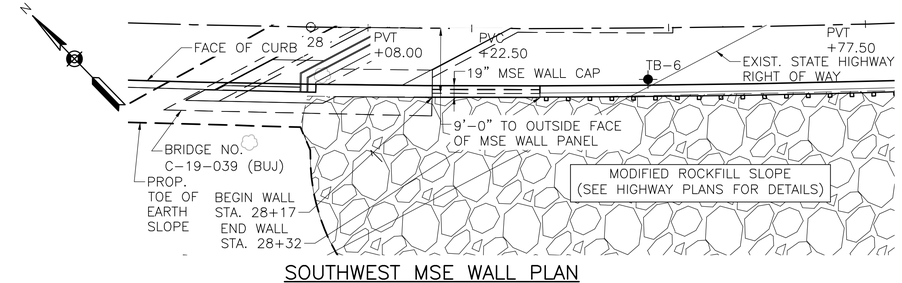
NORTHEAST MSE WALL ELEVATION

SCALE: 1" = 10'-0"



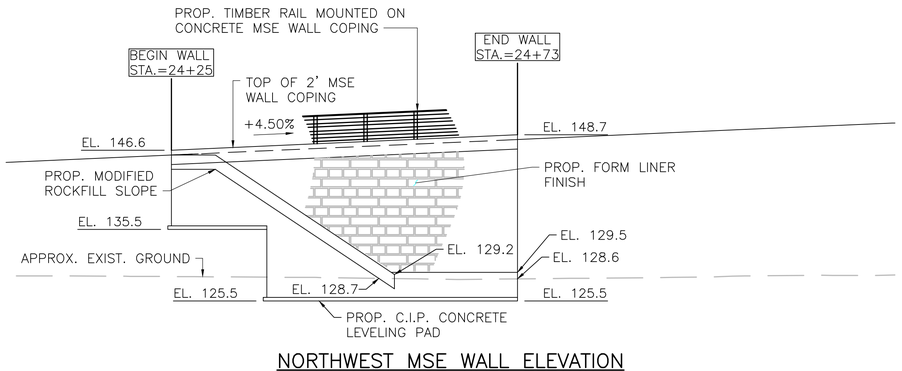
NORTHWEST MSE WALL PLAN

SCALE: 1" = 10'-0"



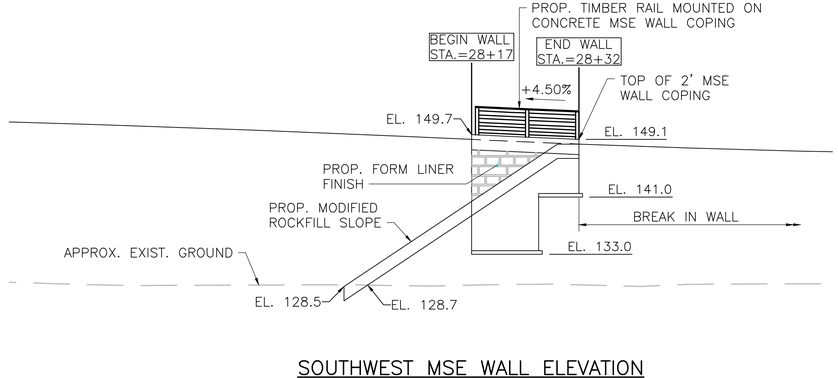
SOUTHWEST MSE WALL PLAN

SCALE: 1" = 10'-0"



NORTHWEST MSE WALL ELEVATION

SCALE: 1" = 10'-0"



SOUTHWEST MSE WALL ELEVATION

SCALE: 1" = 10'-0"

NOTE:
FOR SOUTHEAST MSE WALL PLAN AND ELEVATION, SEE BRIDGE C-19-037 (BF4) PLANS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_12-13.DWG Plotted on 1-Feb-2019 9:40 AM
Second Structural Submittal (S2) 25-January-2019
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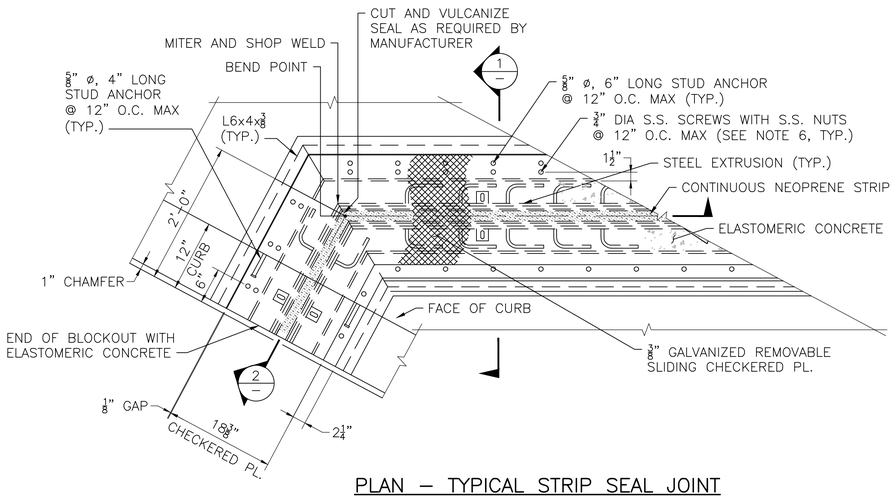
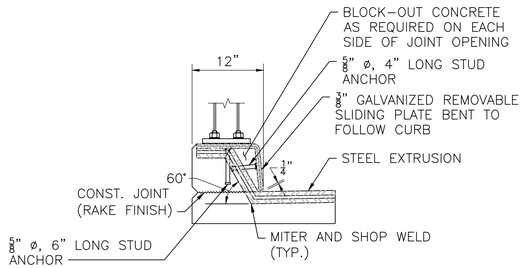
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	96	158
PROJECT FILE NO. 606223			

STRIP SEAL JOINT DETAILS



PLAN – TYPICAL STRIP SEAL JOINT

SCALE: 1" = 1'–0"

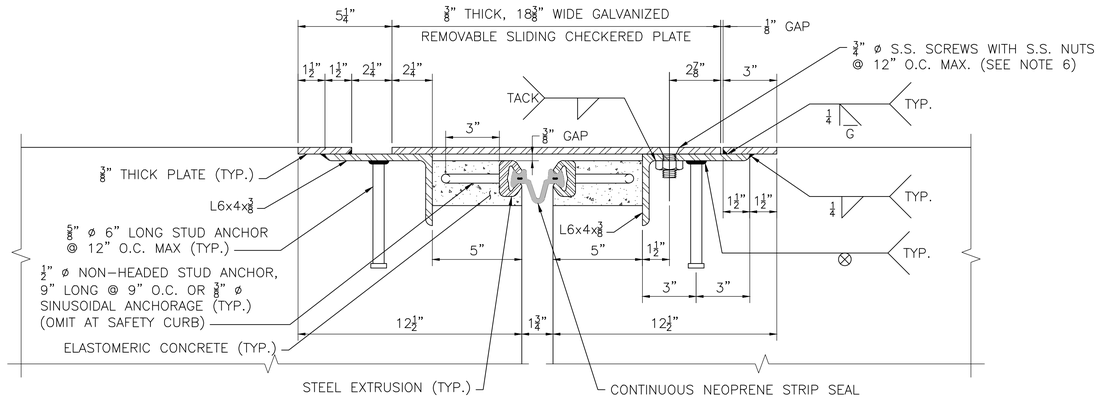


SECTION 2

SCALE: 1" = 1'–0"

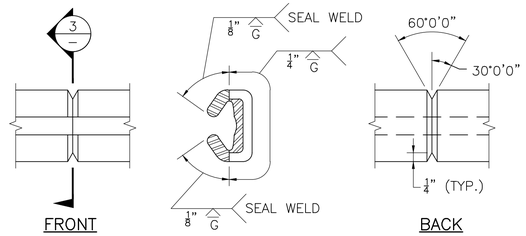
STRIP SEAL JOINT NOTES

1. THE DETAILS SHOWN HERE ARE INTENDED AS A GENERAL GUIDE FOR A TYPICAL GLANDULAR TYPE STRIP SEAL JOINT SYSTEM. SHOP DRAWINGS WHICH INCLUDE DETAILS OF THE GLAND SHAPE, STEEL EXTRUSION SHAPE, WELDING PROCEDURE SPECIFICATIONS, ANCHOR ARRANGEMENT, TEMPERATURE CORRECTION REQUIREMENTS, AND TEMPORARY SUPPORT DETAILS SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER ACCORDING TO THE STANDARD SPECIFICATIONS.
2. ALL STRUCTURAL STEEL COMPONENTS SHALL CONFORM TO AASHTO M270 GRADE 36. AFTER THE COMPLETION OF ALL WELDING OPERATIONS STEEL PLATE ASSEMBLIES SHALL BE HOT–DIP GALVANIZED.
3. ELASTOMERIC CONCRETE BLOCKOUT SHALL BE SANDBLASTED, CLEANED WITH COMPRESSED OIL LESS AIR, AND PRIMED WITH BONDING COMPOUND PRIOR TO CASTING ELASTOMERIC CONCRETE.
4. NEOPRENE STRIP SEAL SHALL BE BONDED TO STEEL EXTRUSION WITH APPROVED ADHESIVE.
5. INSTALL CONTINUOUS NEOPRENE STRIP SEAL IN THE FIELD. SPLICING OF SEAL IS NOT PERMITTED.
6. PRIOR TO PLACEMENT OF SAFETY CURB CONCRETE, LUBRICATE STAINLESS STEEL SCREWS WITH GRAPHITE AND SET SECURELY IN PLACE. MACHINE SCREWS TO BE TEMPORARILY REMOVED AFTER CONCRETE HAS ATTAINED FINAL SET.
7. NO WELDING OF PORTIONS OF STEEL EXTRUSIONS IN DIRECT CONTACT WITH NEOPRENE SEAL SHALL BE PERMITTED.



SECTION 1

SCALE: 3" = 1'–0"



SECTION 3

STEEL EXTRUSION SHOP SPLICE DETAIL

SCALE: 6" = 1'–0"

ACCEPTABLE STRIP SEAL JOINT			
MANUFACTURER	STEEL EXTRUSION MODEL	NEOPRENE STRIP SEAL MODEL	JOINT OPENING @ 70°F
WATSON BOWMAN ACME	TYPE A	SE–400	1 3/4"
D.S. BROWN	TYPE SSA2	A2R–400	1 3/4"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:40 AM
Second Structural Submittal (S2) 25-January-2019
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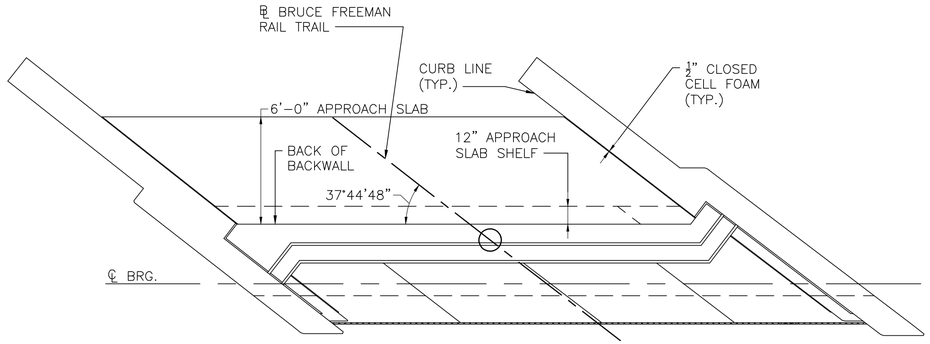
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

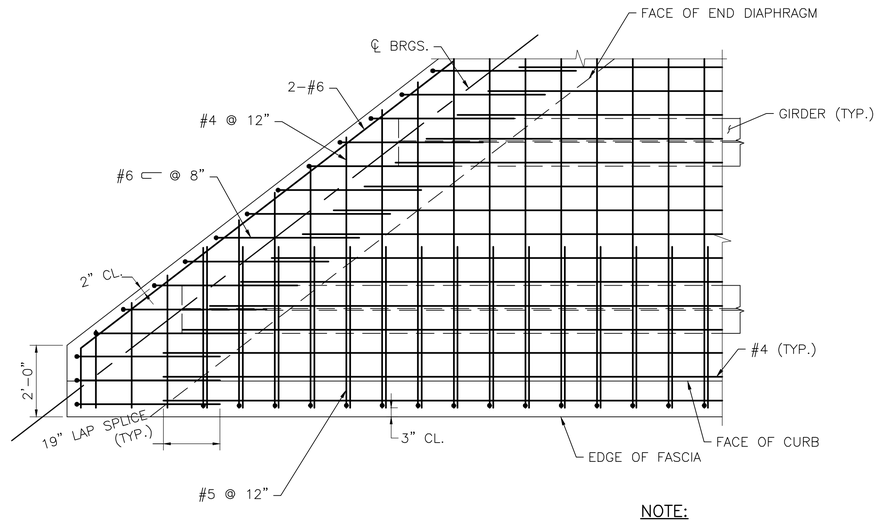
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	97	158
PROJECT FILE NO. 606223			

ACUTE CORNER & APPROACH SLAB PLANS AND DETAILS



NORTH APPROACH SLAB PLAN

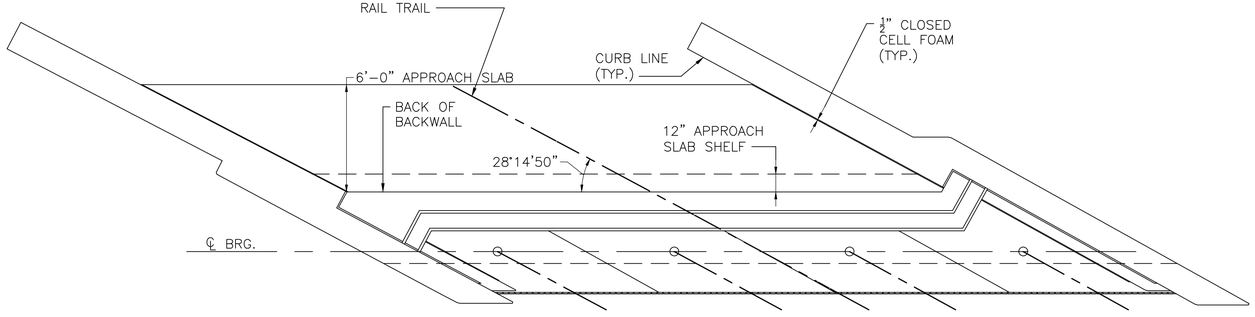
SCALE: ¼" = 1'–0"



PLAN AT ACUTE CORNER

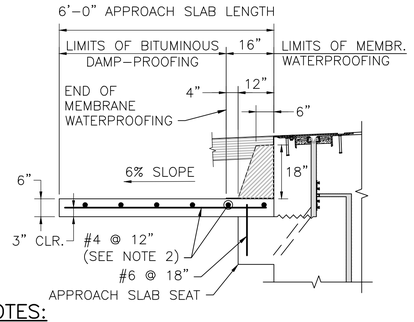
SCALE: ½" = 1'–0"

NOTE:
NORTHWEST CORNER SHOWN
SOUTHEAST CORNER SIMILAR



SOUTH APPROACH SLAB PLAN

SCALE: ¼" = 1'–0"



NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PERPENDICULAR TO ABUTMENT. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

MODIFIED APPROACH SLAB TYPICAL SECTION

SCALE: ½" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
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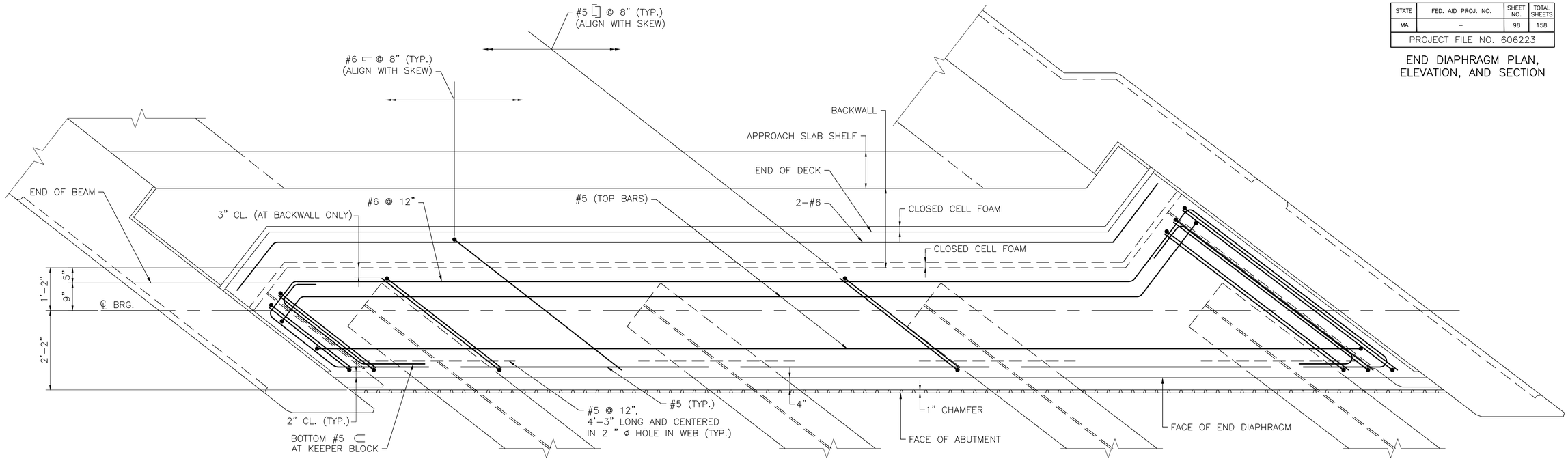
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

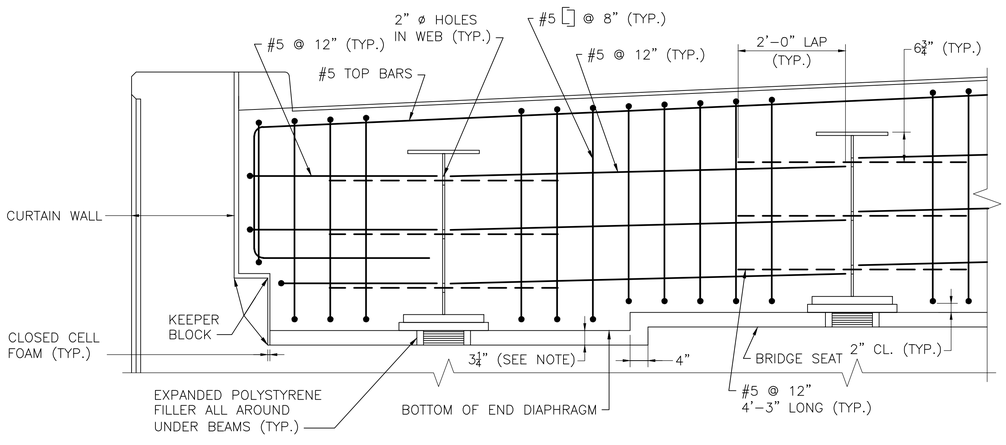
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	98	158
PROJECT FILE NO. 606223			

END DIAPHRAGM PLAN, ELEVATION, AND SECTION



TYPICAL END DIAPHRAGM PLAN

SCALE: $\frac{3}{4}$" = 1'–0"



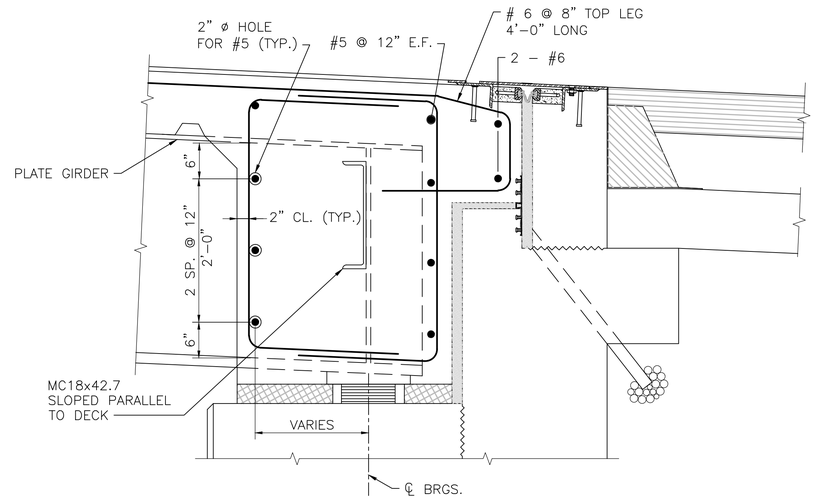
AT KEEPER BLOCK/CURTAIN WALL TYPICAL INTERIOR BAY

NOTES:

1. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.

TYPICAL END DIAPHRAGM ELEVATION

SCALE: $\frac{3}{4}$" = 1'–0"



DETAILS AT ABUTMENT – ROADWAY SECTION

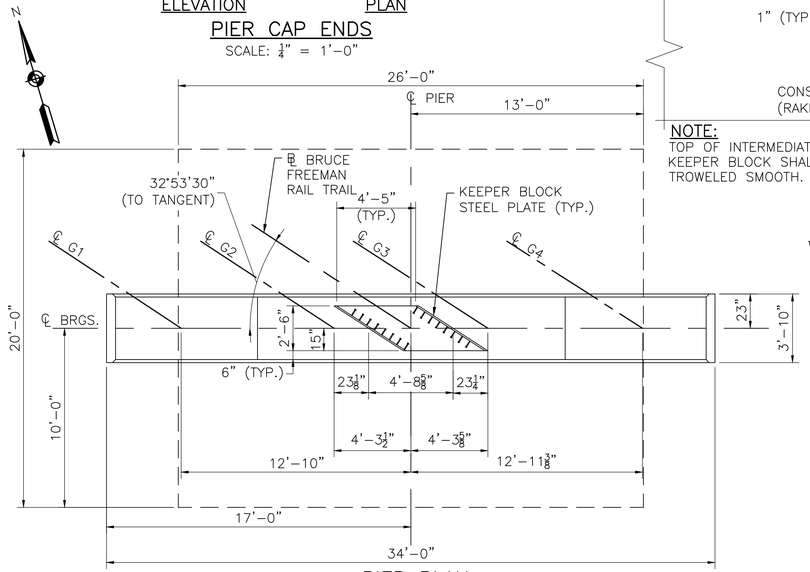
SCALE: 1" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\AAA-2017\0436\B-BRF-2R(606223)\CNSTR\BR\606223_BRC19039_07-11_14-16.dwg, 2/1/2019 9:45:02 AM, DWG To PDF.pc3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	99	158
PROJECT FILE NO. 606223			

PIER PLAN, ELEVATION, AND DETAILS

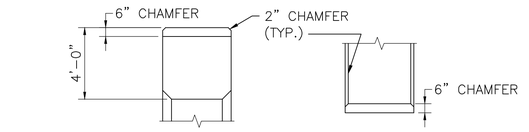


PIER PLAN
SCALE: $\frac{1}{4}$" = 1'–0"

PIER ELEVATION
SCALE: $\frac{1}{4}$" = 1'–0"

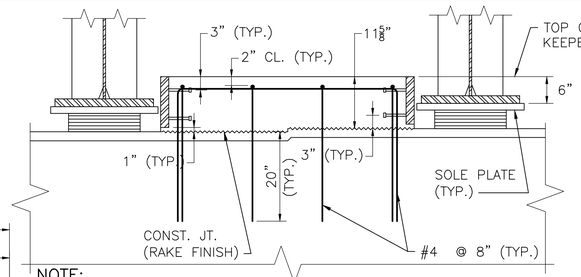
4000 PSI, 1 ½ IN, 565 CEMENT CONCRETE

NOTE:
ALL KEYS TO BE SLIGHTLY TAPERED.



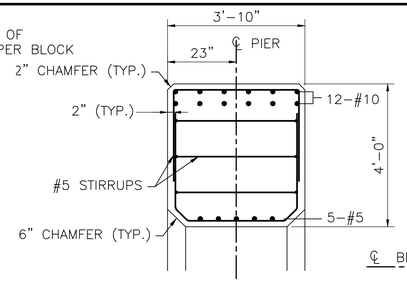
ELEVATION PLAN

PIER CAP ENDS
SCALE: $\frac{1}{4}$" = 1'–0"

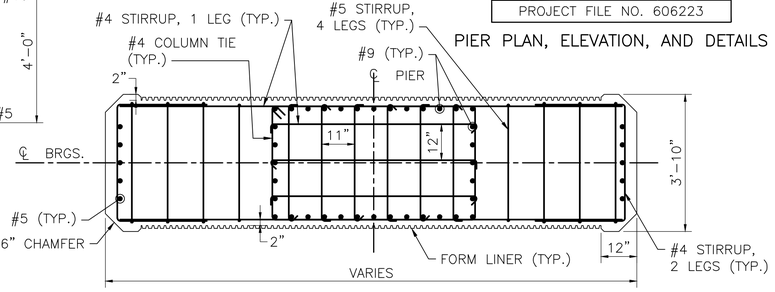


NOTE:
TOP OF INTERMEDIATE KEEPER BLOCK SHALL BE TROWELED SMOOTH.

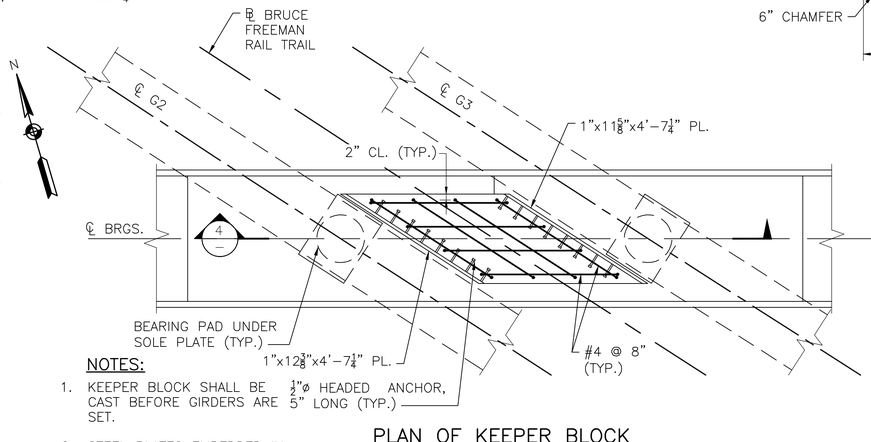
SECTION 4
SCALE: $\frac{3}{4}$" = 1'–0"



PIER CAP DETAIL
SCALE: $\frac{1}{2}$" = 1'–0"



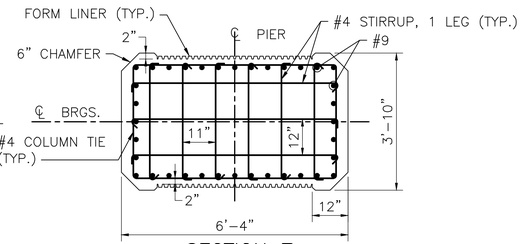
SECTION 6
SCALE: $\frac{1}{2}$" = 1'–0"



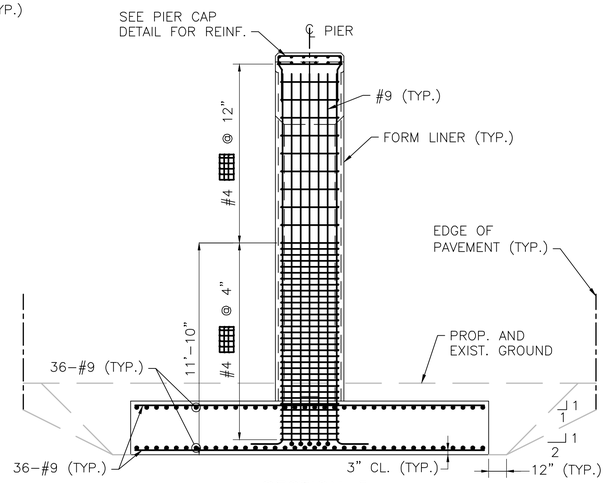
NOTES:
1. KEEPER BLOCK SHALL BE CAST BEFORE GIRDERS ARE SET.
2. STEEL PLATES EMBEDDED IN KEEPER BLOCK SHALL BE HOT–DIP GALVANIZED.

½"ø HEADED ANCHOR, 5" LONG (TYP.)

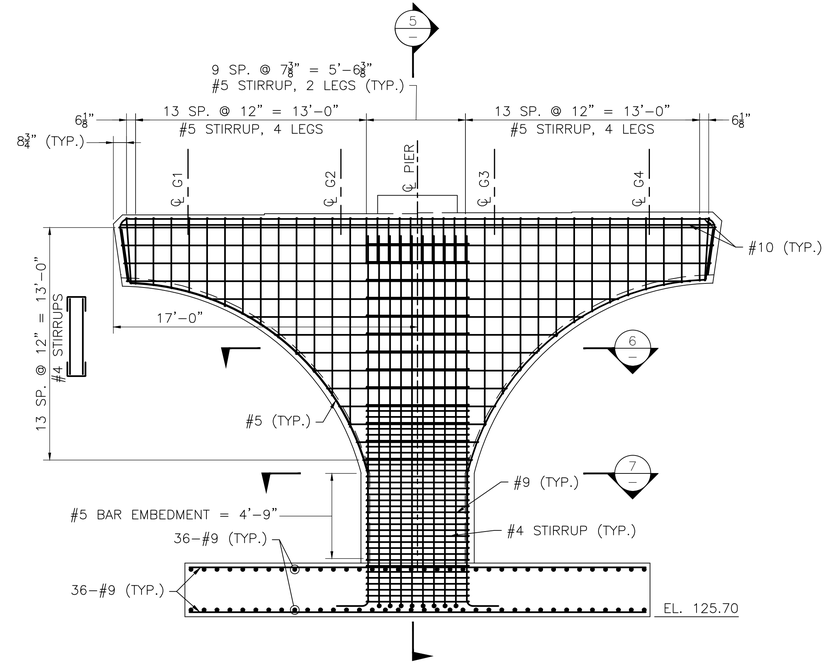
PLAN OF KEEPER BLOCK
SCALE: $\frac{1}{2}$" = 1'–0"



SECTION 7
SCALE: $\frac{1}{2}$" = 1'–0"



SECTION 5
SCALE: $\frac{1}{4}$" = 1'–0"



TYPICAL REINFORCEMENT
SCALE: $\frac{1}{4}$" = 1'–0"

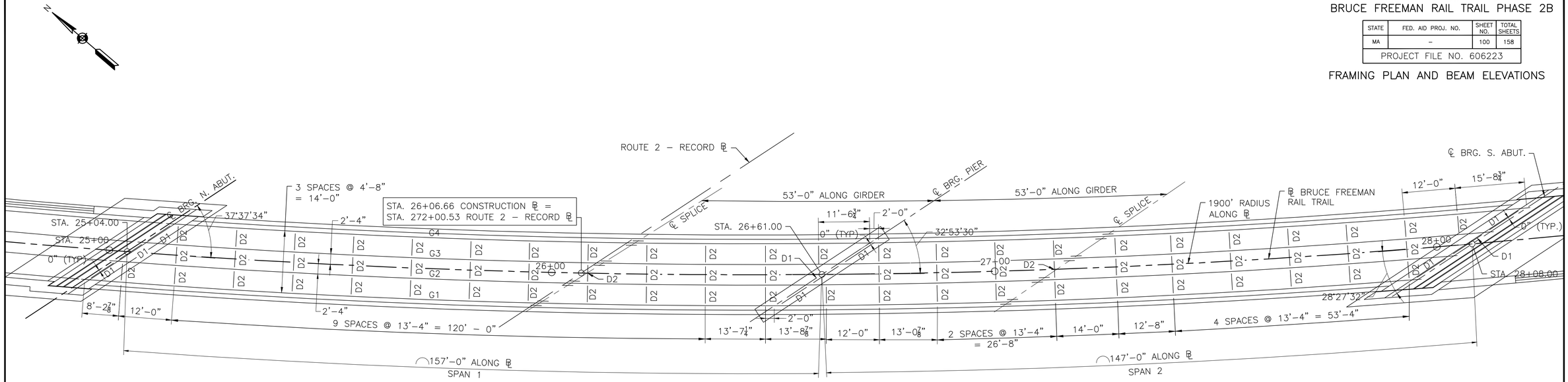
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_17.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA\2007026\08-BRT-2B\606223\DWG\BR\606223_BR(C19039)_17.dwg 1/1/2019 9:41:11 AM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

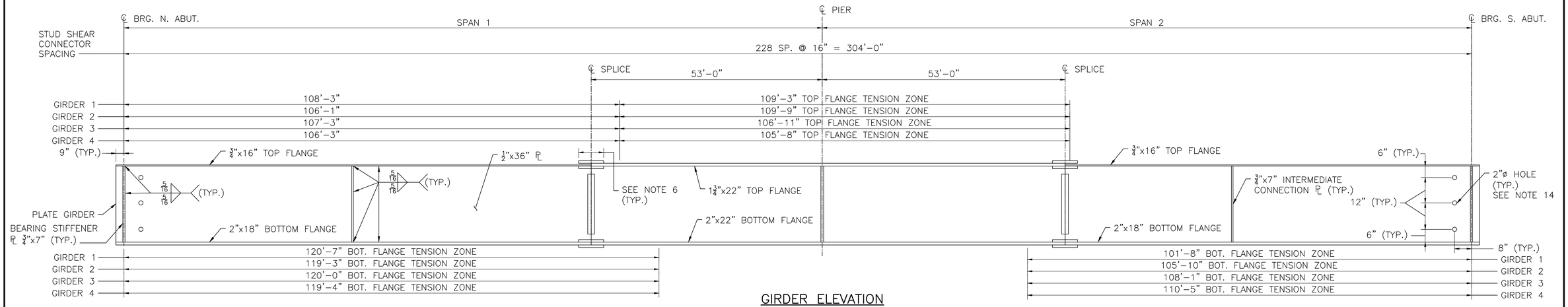
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	100	158
PROJECT FILE NO. 606223			

FRAMING PLAN AND BEAM ELEVATIONS



FRAMING PLAN

SCALE: $\frac{3}{32}$" = 1'–0"



GIRDER ELEVATION

N.T.S.

NOTES:

1. D1= MC18x42.7 (TYP. END DIAPHRAGM)
   D2= MC18x42.7 (TYP. INTERMEDIATE DIAPHRAGM)
2. SEE SHEET 20 FOR DIAPHRAGM AND SPLICE DETAILS.
3. THE MAIN LOAD CARRYING MEMBERS ARE GIRDERS 1 THROUGH 4.
4. ALL STEEL SHALL CONFORM TO AASHTO M 270 GRADE 50. ALL GIRDERS SHALL BE METALIZED WITH ZINC ALUMINUM WIRE (6 – 8 MILS) AND COATED WITH AN APPROPRIATE SEALER (ZONE 1).
5. FOR CAMBER TABLES SEE SHEET 21.
6. FOR PLACEMENT OF STUD SHEAR CONNECTORS OVER THE SPLICE, SEE SPLICE DETAIL ON SHEET 20.
7. GIRDER TENSION ZONE DIMENSIONS SHOWN ARE ORIENTED NORTH TO SOUTH.
8. CHANGE IN SPLICE LOCATION AND/OR ADDITIONAL FIELD SPLICES SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF MASSACHUSETTS AND SUBMITTED FOR APPROVAL BY THE ENGINEER OF RECORD.
9. ALL BEARING STIFFENERS/END CONNECTION PLATES SHALL BE PLUMB.
10. ALL INTERMEDIATE STIFFENERS SHALL BE PERPENDICULAR TO THE WEB AND TO THE GIRDER FLANGES.
11. END OF GIRDERS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS WILL BE PLUMB.
12. SEE CLIP DETAIL ON SHEET 20.
13. BEARING STIFFENER PLATE AT TENSION FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH $\frac{5}{16}$" FILLET WELDS, BOTH SIDES OF PLATE.
14. 2"ø HOLES AT END OF GIRDER ARE FOR END DIAPHRAGM REINFORCEMENT.
15. AN INTERMEDIATE CONNECTION PLATE WILL BE INSTALLED AT EACH DIAPHRAGM LOCATION, SEE FRAMING PLAN FOR NUMBER AND SPACING.

SPAN LENGTHS

GIRDER	SPAN 1	SPAN 2	TOTAL
G1	155'–10⅜"	145'–5¾"	301'–4⅛"
G2	156'–7⅜"	146'–5⅞"	303'–1¼"
G3	157'–4¾"	147'–6¼"	304'–11"
G4	158'–2¼"	148'–7"	306'–9¼"

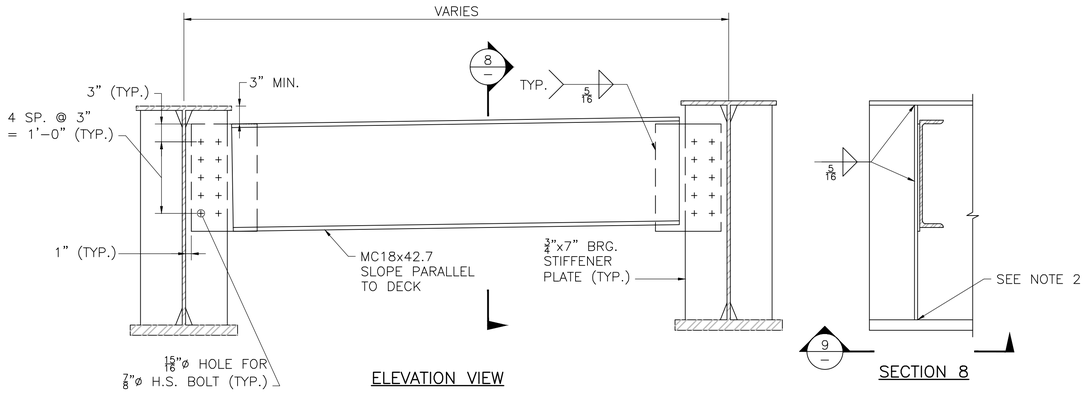
NOTE: GIRDERS ARE CONCENTRIC.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_18 FRAMING PLAN _BEAM ELEVATIONS.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-2007\DOUBT-BRT-2\606223\DWG\BR\606223_BR(C19039)_18 Framing Plan _Beam Elevations.dwg, 2/1/2019 9:43:24 AM, DWG To PDF.pc3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	101	158
PROJECT FILE NO. 606223			

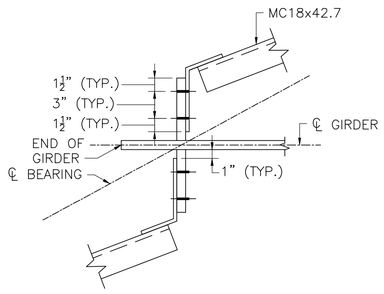
STRUCTURAL STEEL DETAILS



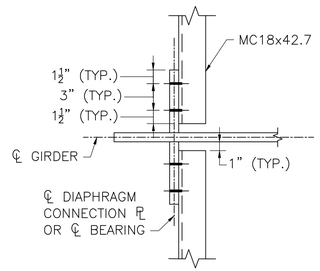
NOTES:

1. SEE CLIP DETAIL ON THIS SHEET.
2. BEARING STIFFENER PLATE AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH 5/16" FILLET WELDS BOTH SIDES OF PLATE.
3. TERMINATE FILLET WELDS 1/2" SHORT OF ALL PLATE ENDS.

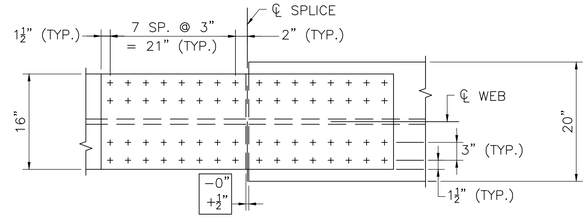
END DIAPHRAGM DETAILS
SCALE: 1" = 1'–0"

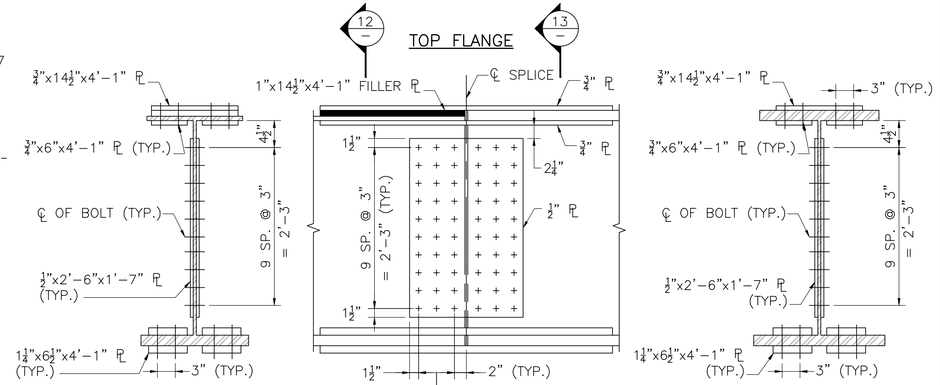


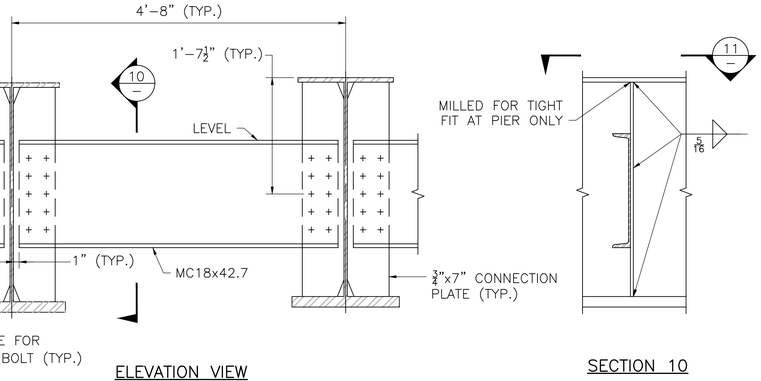
SECTION 9
SCALE: 1 1/2" = 1'–0"



SECTION 11
SCALE: 1 1/2" = 1'–0"

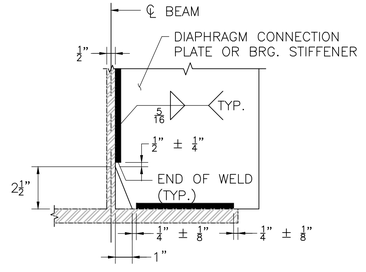




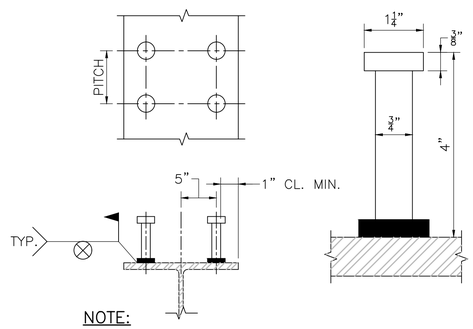


NOTE:
SEE CLIP DETAIL ON THIS SHEET.

INTERMEDIATE DIAPHRAGM DETAIL – D2
SCALE: 1" = 1'–0"

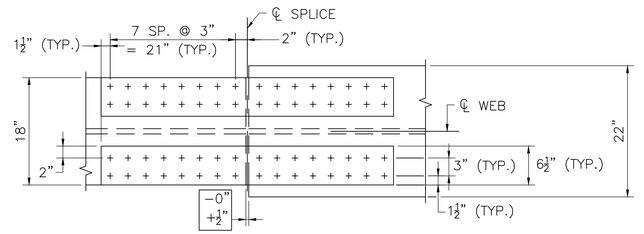


CLIP DETAIL
N.T.S.



NOTE:
7/8" ø STUDS MAY BE SUBSTITUTED FOR 3/4" ø STUDS BY ADJUSTING THE PITCH TO PROVIDE AN EQUIVALENT CROSS–SECTIONAL AREA PER FOOT.

STUD SHEAR CONNECTORS
N.T.S.



BOTTOM FLANGE

NOTES:

1. BOLTED FIELD SPLICES SHALL BE CONSIDERED SLIP–CRITICAL CONNECTIONS WITH CLASS C FAYING SURFACES.
2. + DENOTES 7/8" ø AASHTO M 164 HIGH STRENGTH BOLT IN 15/16" ø HOLE.
3. ONE ROW OF STUD SHEAR CONNECTORS SHALL BE PLACED ALONG THE CENTERLINE OF THE TOP FLANGE SPLICE PLATE.

BOLTED FIELD SPLICE DETAILS
SCALE: 1" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_19 STRUCTURAL STEEL DETAILS.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAX\2015\249-BRT-3R\606223\DWG\BR\606223_BRC19039_19 Structural Steel Details.dwg 2/1/2019 9:41:32 AM EWC 5 PDF.pc3

GIRDER NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE								
	INCREASING STATIONS →								
	℄ BRG. N. ABUT	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG. PIER
1	148.21 ft	149.36 ft	150.35 ft	151.11 ft	151.63 ft	151.92 ft	152.04 ft	152.06 ft	152.03 ft
2	148.55 ft	149.67 ft	150.60 ft	151.31 ft	151.79 ft	152.05 ft	152.16 ft	152.15 ft	152.11 ft
3	148.89 ft	149.96 ft	150.84 ft	151.51 ft	151.95 ft	152.19 ft	152.26 ft	152.24 ft	152.16 ft
4	149.22 ft	150.24 ft	151.08 ft	151.71 ft	152.12 ft	152.32 ft	152.37 ft	152.31 ft	152.21 ft

GIRDER NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE								
	INCREASING STATIONS →								
	℄ BRG. PIER	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG. S. ABUT
1	152.03 ft	152.01 ft	151.96 ft	151.85 ft	151.63 ft	151.26 ft	150.72 ft	150.02 ft	149.17 ft
2	152.11 ft	152.06 ft	151.98 ft	151.82 ft	151.55 ft	151.12 ft	150.53 ft	149.77 ft	148.88 ft
3	152.16 ft	152.09 ft	151.97 ft	151.77 ft	151.45 ft	150.97 ft	150.33 ft	149.51 ft	148.56 ft
4	152.21 ft	152.10 ft	151.95 ft	151.70 ft	151.34 ft	150.81 ft	150.11 ft	149.23 ft	148.24 ft

TOP OF FORM ELEVATIONS

NOTES:

1. AFTER THE BEAMS ARE ERECTED BUT BEFORE THE FORMS ARE BUILT, ELEVATIONS ON TOP OF THE FLANGE OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.
2. SEE FORM NOTES ON SHEET 22.

GIRDER NO.		CAMBER TABLE (INCHES) SPAN NO. 1										
		℄ BRG. N. ABUT	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	℄ BRG. PIER
1	STEEL DL DEFLECTION	0.00	1.32	2.45	3.24	3.59	3.47	2.94	2.13	1.26	0.48	0.00
	CONC. DL DEFLECTION	0.00	2.67	4.94	6.50	7.16	6.88	5.78	4.15	2.42	0.92	0.00
	S.D.L. DEFLECTION	0.00	0.22	0.40	0.53	0.59	0.58	0.50	0.36	0.22	0.08	0.00
	VERT. CURVE CAMBER	0.00	3.73	6.74	8.90	10.19	10.64	10.22	8.95	6.82	3.84	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.93	14.53	19.17	21.53	21.56	19.43	15.60	10.72	5.33	0.00
2	STEEL DL DEFLECTION	0.00	1.25	2.29	2.98	3.25	3.11	2.60	1.87	1.09	0.41	0.00
	CONC. DL DEFLECTION	0.00	2.52	4.61	5.98	6.49	6.16	5.11	3.63	2.09	0.79	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.37	0.49	0.53	0.51	0.43	0.31	0.18	0.07	0.00
	VERT. CURVE CAMBER	0.00	3.90	6.94	9.12	10.42	10.86	10.42	9.12	6.95	3.91	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.87	14.21	18.56	20.70	20.64	18.57	14.94	10.31	5.18	0.00
3	STEEL DL DEFLECTION	0.00	1.16	2.11	2.73	2.97	2.83	2.36	1.68	0.96	0.34	0.00
	CONC. DL DEFLECTION	0.00	2.35	4.25	5.48	5.93	5.60	4.63	3.27	1.85	0.65	0.00
	S.D.L. DEFLECTION	0.00	0.19	0.34	0.44	0.49	0.46	0.39	0.28	0.16	0.06	0.00
	VERT. CURVE CAMBER	0.00	3.97	7.06	9.27	10.59	11.03	10.59	9.26	7.06	3.97	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.67	13.76	17.92	19.97	19.92	17.97	14.49	10.02	5.02	0.00
4	STEEL DL DEFLECTION	0.00	1.05	1.93	2.51	2.75	2.62	2.18	1.54	0.87	0.30	0.00
	CONC. DL DEFLECTION	0.00	2.13	3.89	5.05	5.49	5.19	4.28	2.99	1.66	0.56	0.00
	S.D.L. DEFLECTION	0.00	0.17	0.31	0.41	0.45	0.43	0.36	0.25	0.14	0.05	0.00
	VERT. CURVE CAMBER	0.00	4.03	7.17	9.40	10.75	11.20	10.75	9.40	7.16	4.03	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.38	13.30	17.37	19.43	19.44	17.56	14.19	9.83	4.94	0.00

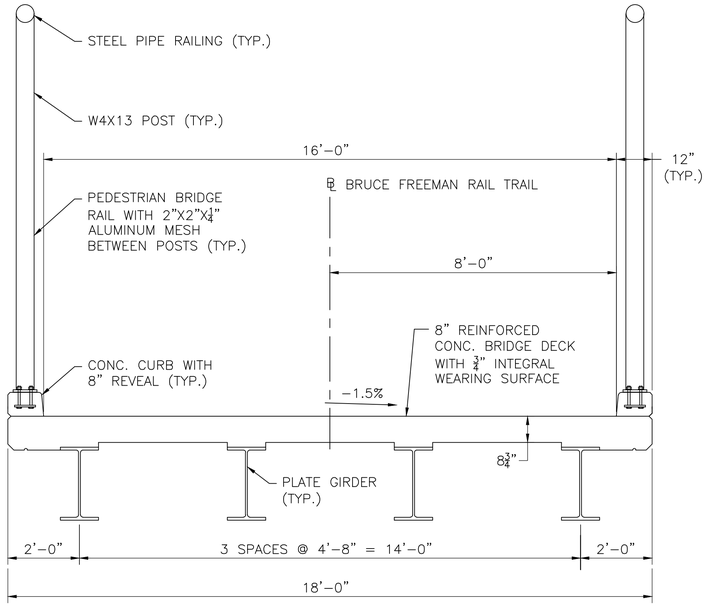
GIRDER NO.		CAMBER TABLE (INCHES) SPAN NO. 2										
		℄ BRG. PIER	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	℄ BRG. S. ABUT
1	STEEL DL DEFLECTION	0.00	-0.06	0.17	0.57	1.01	1.38	1.57	1.52	1.20	0.67	0.00
	CONC. DL DEFLECTION	0.00	-0.12	0.34	1.12	2.01	2.79	3.20	3.11	2.47	1.37	0.00
	S.D.L. DEFLECTION	0.00	-0.01	0.03	0.11	0.18	0.24	0.27	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.36	5.97	7.84	8.96	9.33	8.96	7.84	5.97	3.36	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.18	6.52	9.63	12.16	13.74	14.00	12.72	9.85	5.51	0.00
2	STEEL DL DEFLECTION	0.00	0.00	0.27	0.68	1.10	1.45	1.60	1.51	1.18	0.65	0.00
	CONC. DL DEFLECTION	0.00	0.00	0.54	1.34	2.21	2.92	3.25	3.09	2.42	1.34	0.00
	S.D.L. DEFLECTION	0.00	0.00	0.05	0.12	0.20	0.25	0.27	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.42	6.08	7.98	9.12	9.50	9.12	7.98	6.08	3.42	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.43	6.94	10.12	12.63	14.12	14.24	12.84	9.89	5.52	0.00
3	STEEL DL DEFLECTION	0.00	0.05	0.35	0.77	1.20	1.53	1.67	1.56	1.22	0.67	0.00
	CONC. DL DEFLECTION	0.00	0.10	0.69	1.53	2.40	3.09	3.39	3.19	2.49	1.37	0.00
	S.D.L. DEFLECTION	0.00	0.01	0.06	0.14	0.21	0.27	0.29	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.48	6.19	8.13	9.29	9.67	9.28	8.11	6.17	3.46	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.64	7.30	10.57	13.11	14.56	14.62	13.13	10.08	5.61	0.00
4	STEEL DL DEFLECTION	0.00	0.10	0.44	0.89	1.34	1.67	1.79	1.66	1.28	0.70	0.00
	CONC. DL DEFLECTION	0.00	0.19	0.86	1.75	2.66	3.36	3.63	3.39	2.63	1.44	0.00
	S.D.L. DEFLECTION	0.00	0.02	0.08	0.16	0.24	0.29	0.31	0.28	0.21	0.12	0.00
	VERT. CURVE CAMBER	0.00	3.52	6.26	8.21	9.36	9.72	9.30	8.08	6.08	3.28	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.83	7.64	11.01	13.59	15.04	15.03	13.42	10.20	5.53	0.00

CAMBER TABLE

NOTE:
ALL CAMBER DIMENSIONS ARE INCHES.

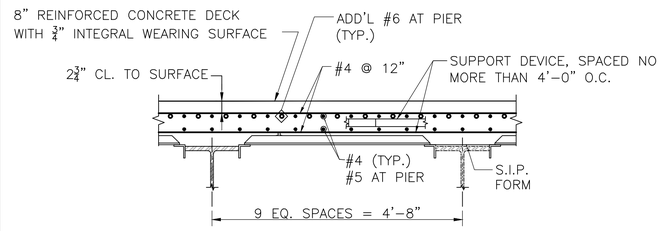
DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-2007\24\B-BWT-3\606223\DWG\BR\606223_BR(C19039)_20-24 TOF_Deck_Bearing_Rail.dwg 2/1/2019 9:41:43 AM, DWG To PDF.pc3



TYPICAL BRIDGE DECK SECTION

SCALE: ½" = 1'–0"

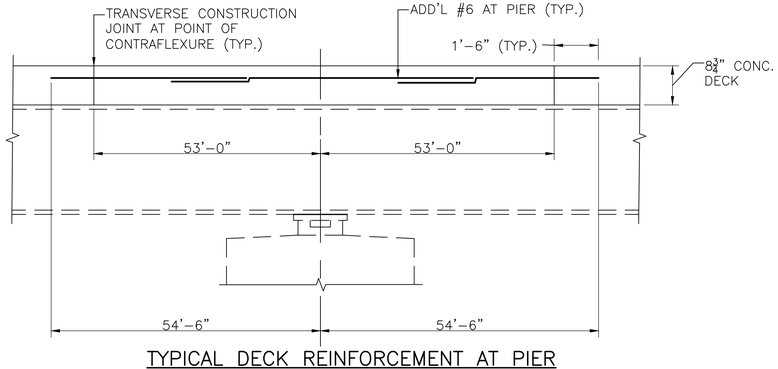


NOTES:

1. ROADWAY DECK SLAB SHALL BE 4000 PSI, ¾ IN, 585 HP CEMENT CONCRETE.
2. LONGITUDINAL REINFORCEMENT SHALL BE PLACED PARALLEL TO THE ℄ OF CONSTRUCTION. TRANSVERSE (PRIMARY) REINFORCEMENT SHALL BE PLACED PERPENDICULAR TO THE ℄ OF CONSTRUCTION.
3. ALL REINFORCEMENT AND SUPPORT DEVICES SHALL BE COATED.
4. BRIDGE DECK SHALL BE GROOVED TRANSVERSELY USING MULTI–BLADE SELF–PROPELLED SAWCUTTING EQUIPMENT.

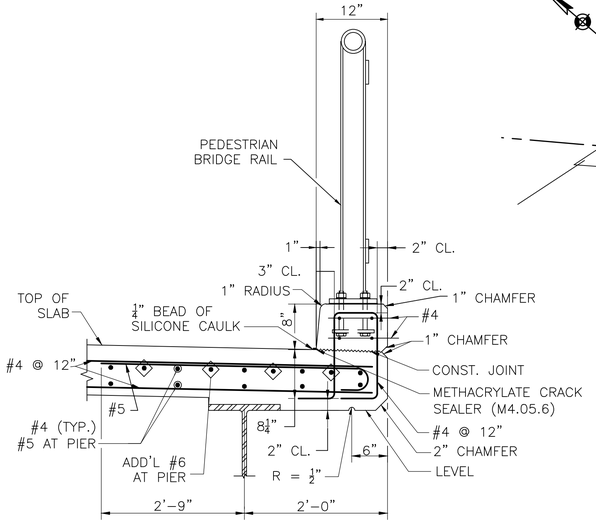
TYPICAL DECK REINFORCEMENT

SCALE: ¾" = 1'–0"



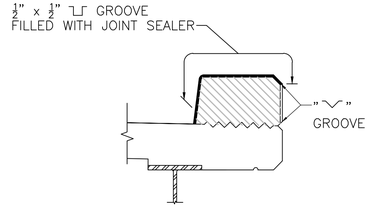
TYPICAL DECK REINFORCEMENT AT PIER

NOT TO SCALE



SECTION THRU SAFETY CURB

SCALE: 1" = 1'–0"

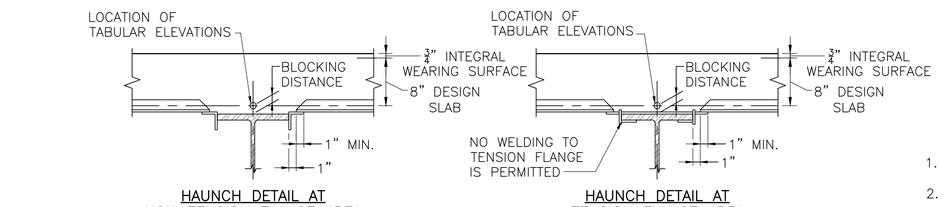


SAFETY CURB NOTES:

1. ALL CONCRETE ABOVE SLAB SHALL BE POURED IN ALTERNATING SECTIONS WITH NOT LESS THAN 3 DAYS BETWEEN POURS.
2. DO NOT CARRY LONGITUDINAL BARS THROUGH THE PARAFFIN JOINTS. END THE REINFORCEMENT 2" CLEAR OF JOINT.
3. JOINT SHALL BE SQUARE TO FACE OF CURB

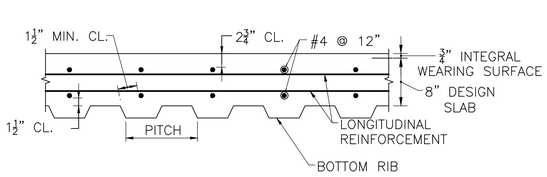
SAFETY CURB DETAIL

SCALE: ¾" = 1'–0"

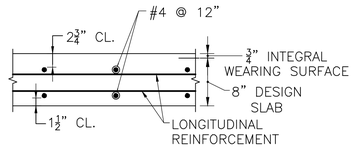


HAUNCH DETAIL AT NON–TENSION FLANGE AREA

HAUNCH DETAIL AT TENSION FLANGE AREA



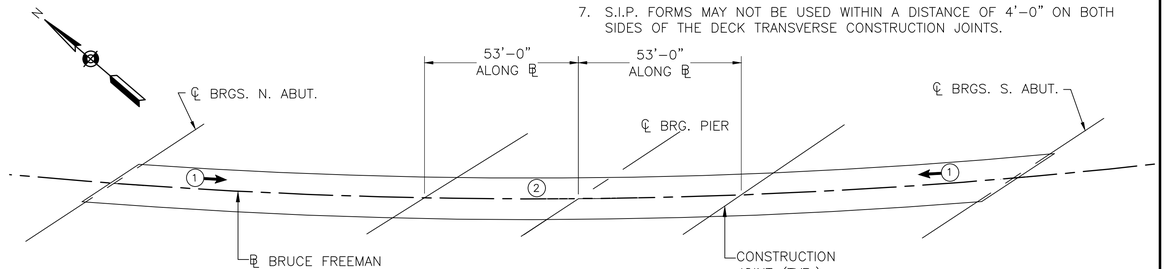
STAY–IN–PLACE FORM



REMOVABLE FORM

FORM DETAILS

NOT TO SCALE



NOTES:

(1) INDICATES POSITIVE MOMENT REGION

(2) INDICATES NEGATIVE MOMENT REGION

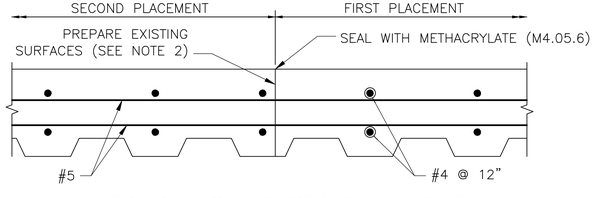
← INDICATES DIRECTION OF PLACEMENT

SAFETY CURB NOTES:

1. METHACRYLATE CRACK SEALER SHALL BE APPLIED AFTER SAFETY CURB CURING PERIOD IS COMPLETE AND IN ACCORDANCE WITH REQUIREMENTS OF MANUFACTURER AND THE STANDARD SPECIFICATIONS.
2. BEFORE SEALING, THE CONCRETE AT THE INTERFACE OF DECK AND CURB SHALL BE SWEPT CLEAN AND BLOWN OFF USING OIL FREE COMPRESSED AIR IMMEDIATELY PRIOR TO APPLYING THE SEALER.
3. APPLY ¼" HIGH BEAD OF SILICONE CAULKING COMPOUND ABOUT ¼" FROM THE FACE OF CURB.
4. METHACRYLATE SHALL THEN BE POURED INTO THE ¼" WIDE GAP BETWEEN THE FACE OF CURB AND THE BEAD OF CAULK.

DECK PLACEMENT SEQUENCE

NOT TO SCALE



TRANSVERSE CONSTRUCTION JOINT DETAIL IN DECK SLAB

SCALE: 1½" = 1'–0"

CONSTRUCTION JOINT NOTES:

1. BRIDGE DECK SLAB SHALL BE PLACED IN ACCORDANCE WITH THE PLACEMENT SEQUENCE SHOWN ON THE PLANS. THE CONTRACTOR MAY PLACE THE ENTIRE DECK IN ONE CONTINUOUS OPERATION WITHOUT CONSTRUCTION JOINTS WITH THE APPROVAL OF THE ENGINEER PROVIDED THAT THE INITIAL SET (Fc = 500 PSI) OF ALL CONCRETE DOES NOT OCCUR UNTIL AFTER THE COMPLETION OF THE PLACEMENT. AN APPROVED RETARDER SHALL BE USED, WHEN NECESSARY, TO RETAIN THE WORKABILITY OF THE CONCRETE. IF MULTIPLE PLACEMENTS ARE MADE, POSITIVE MOMENT REGIONS SHALL BE PLACED PRIOR TO NEGATIVE MOMENT REGIONS AND A MINIMUM OF 72 HOURS SHALL PASS BETWEEN PLACEMENTS.
2. THE SURFACE OF THE PREVIOUSLY CAST CONCRETE SHALL BE BLAST CLEANED, ROUGHENED, WETTED WITH CLEAN WATER, AND THEN FLUSHED WITH A MORTAR COMPOSED OF EQUAL PARTS OF THE CEMENT AND SAND SPECIFIED FOR THE NEW CONCRETE, BEFORE NEW CONCRETE IS PLACED ADJACENT THERETO. NEW CONCRETE SHALL BE PLACED BEFORE MORTAR HAS TAKEN INITIAL SET.
3. IN LIEU OF THE MORTAR, AN EPOXY ADHESIVE SUITABLE FOR BONDING FRESH CONCRETE TO HARDENED CONCRETE FOR LOAD BEARING APPLICATIONS MAY BE USED. THE EPOXY ADHESIVE SHALL CONFORM TO AASHTO M 235 TYPE V AND SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
4. DOWEL BAR SPLICERS SHALL BE USED WHERE USE OF LAP SPLICES IS NOT FEASIBLE.

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	103	158
PROJECT FILE NO. 606223			

DECK SECTION AND DETAILS

FORM NOTES:

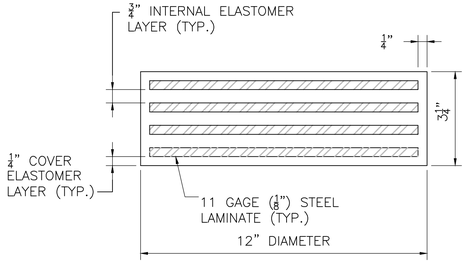
1. SET TOP OF FORMS AT ELEVATIONS GIVEN IN TABLE.
2. FILL THE VALLEYS OF THE S.I.P. FORM WITH EXPANDED POLYSTYRENE (EPS).
3. FORM ENDS SHALL BE CRIMPED CLOSED IN A TAPERED MANNER. TAPER THE EPS FILL AND SEPARATE END CLOSURE PIECES WILL NOT BE ALLOWED.
4. SUPPORT ANGLES SHALL BE PLACED IN THE "LEG DOWN" POSITION WHERE POSSIBLE. WHERE "LEG UP" POSITION IS NECESSARY, THE UPPER MOST PORTION OF THE ANGLE SHALL NOT PROJECT MORE THAN 1" ABOVE THE TOP FLANGE. THE CONTRACTOR SHALL HAVE AN ASSORTMENT OF ANGLES OF VARIOUS SIZES AVAILABLE ON THE SITE TO CONFORM TO THIS REQUIREMENT.
5. CONTRACTOR SHALL DESIGN AND DETAIL ALL ELEMENTS OF THE FORMING SYSTEM AND SHALL SUBMIT TO THE ENGINEER FOR APPROVAL.
6. IN CASES WHERE STANDARD 2" OR 3" DEEP S.I.P FORMS DO NOT SATISFY DESIGN REQUIREMENTS AN ALTERNATIVE FORMING SYSTEM CONSISTING OF DEEPER S.I.P. FORMS OR REMOVABLE FORMS SHALL BE DESIGNED AND DETAILS BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL. THE DESIGN THICKNESS OF THE SLAB SHALL NOT BE REDUCED.
7. S.I.P. FORMS MAY NOT BE USED WITHIN A DISTANCE OF 4'–0" ON BOTH SIDES OF THE DECK TRANSVERSE CONSTRUCTION JOINTS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

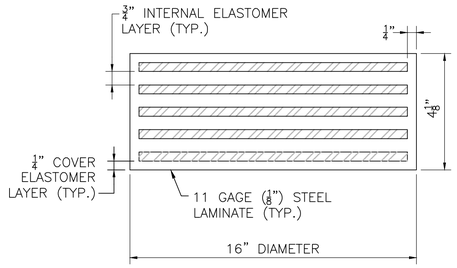
Second Structural Submittal (S2) 25-January-2019
606223_BRC(19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM
V:\WAY\JOTO\ENGR\PROJECTS\606223_BRC(19039)_20-24 TOF_Deck_Bearing_Rail.dwg 2/1/2019 9:45:44 AM, DWG To PDF.pc3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	104	158
PROJECT FILE NO. 606223			

BEARING DETAILS



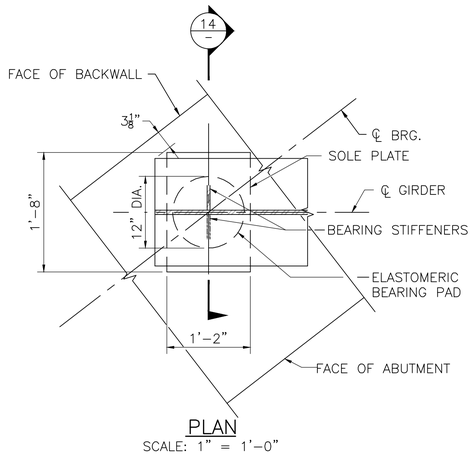
TYPICAL ELASTOMERIC BEARING PAD AT ABUTMENTS
NOT TO SCALE



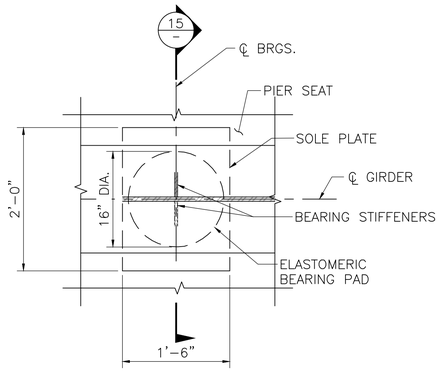
TYPICAL ELASTOMERIC BEARING PAD AT PIER
NOT TO SCALE

NOTES:

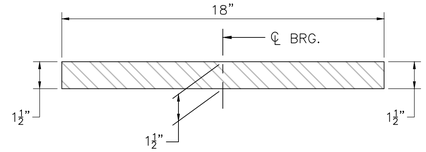
1. ELASTOMER SHALL HAVE A HARDNESS OF 60 DUROMETER.
2. STEEL LAMINATES SHALL CONFORM TO ASTM A 1011 GRADE 36.
3. THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD LOCATED AT THE ABUTMENTS IS 121.30 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 1.073 KSI.
4. THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD LOCATED AT THE PIER IS 285.04 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 1.418 KSI.
5. ELASTOMERIC BEARING PAD SHALL NOT BE VULCANIZED TO THE SOLE PLATE.



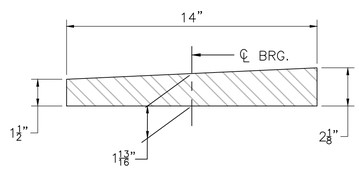
PLAN
SCALE: 1" = 1'–0"



PLAN
SCALE: 1" = 1'–0"



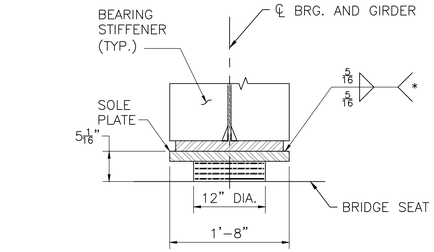
TYPICAL SOLE PLATE DETAIL AT PIER
SCALE: 3" = 1'–0"



TYPICAL SOLE PLATE DETAIL AT ABUTMENTS
SCALE: 3" = 1'–0"

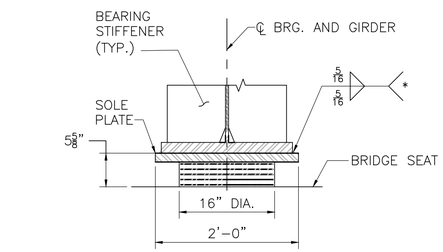
BEARING NOTES:

1. STEEL SOLE PLATE SHALL CONFORM TO AASHTO M 270 GRADE 36 AND SHALL BE HOT–DIP GALVANIZED.
2. CENTER THE ELASTOMERIC PAD UNDER THE SOLE PLATE DURING BEAM ERECTION.
3. BEAMS SHALL BE ERECTED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 50 °F AND 77 °F. IF BEAMS ARE ERECTED AT OTHER AMBIENT TEMPERATURES, THEY WILL HAVE TO BE JACKED AND THE ELASTOMERIC BEARINGS RECENTERED WHEN THE TEMPERATURE RETURNS TO THAT RANGE.



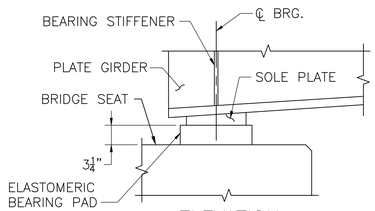
(*) – WELDS SHALL TERMINATE ¼" FROM EDGE OF PLATE.

SECTION 14
SCALE: 1" = 1'–0"

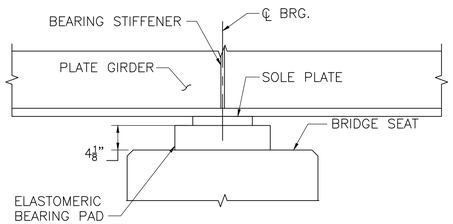


(*) – WELDS SHALL TERMINATE ¼" FROM EDGE OF PLATE.

SECTION 15
SCALE: 1" = 1'–0"



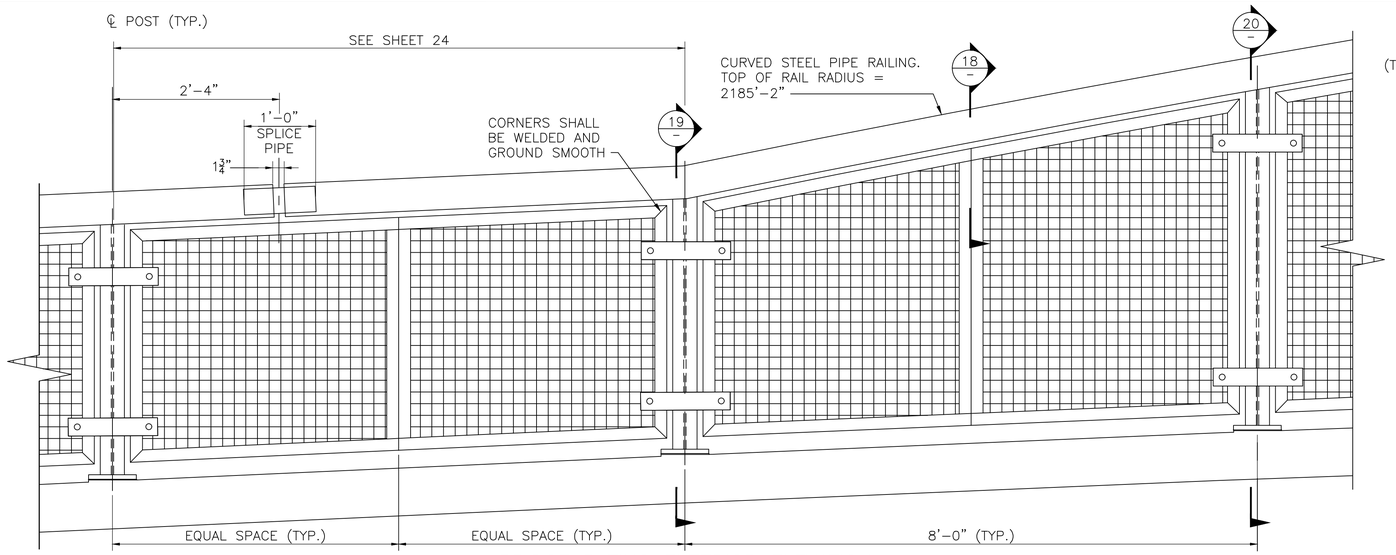
ELEVATION
SCALE: 1" = 1'–0"



ELEVATION
SCALE: 1" = 1'–0"

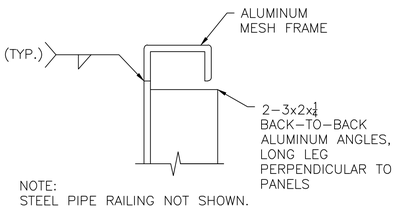
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-2007\0436-BRT-3R\606223\DWG\BR\606223_BRC19039_20-24 TOF_Deck_Bearing_Rail.dwg 2/1/2019 9:42:48 AM, DWG To PDF.pc3



BRIDGE RATING EXTERIOR ELEVATION

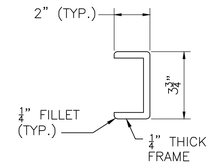
SCALE: 1" = 1'–0"



NOTE:
STEEL PIPE RAILING NOT SHOWN.

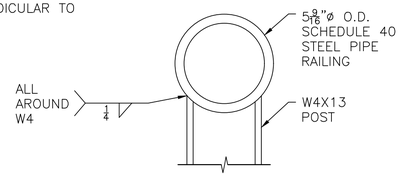
SECTION 18

SCALE: 3" = 1'–0"



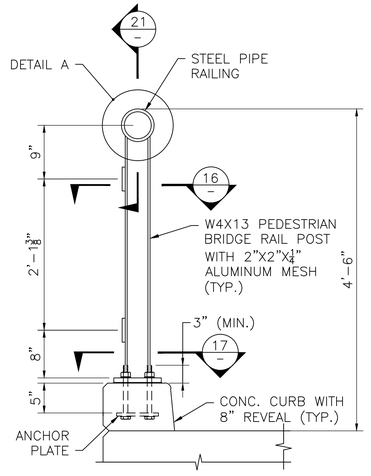
INFILL PANEL FRAME

SCALE: 3" = 1'–0"



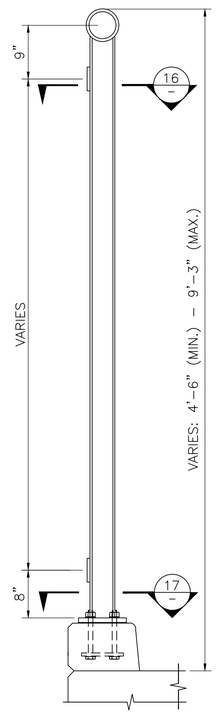
DETAIL A

SCALE: 3" = 1'–0"



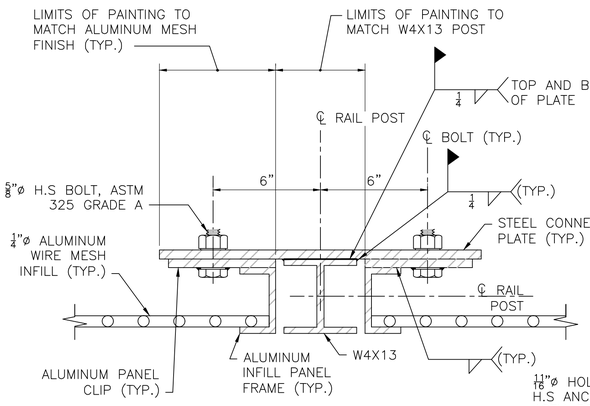
SECTION 19

SCALE: 1" = 1'–0"



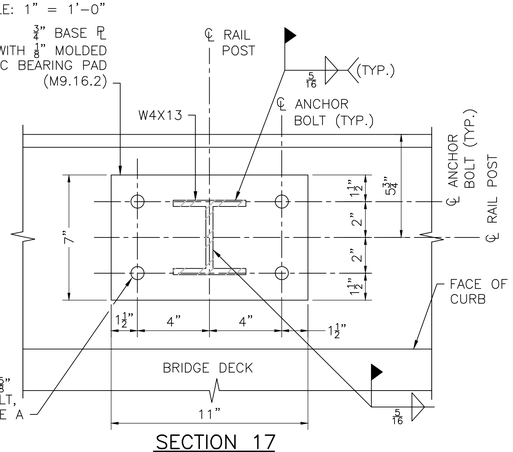
SECTION 20

SCALE: 1" = 1'–0"



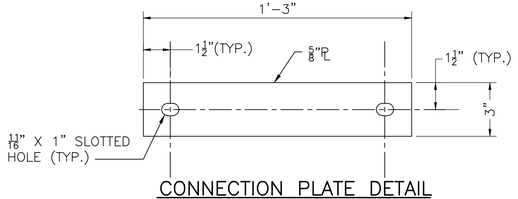
SECTION 16

SCALE: 3" = 1'–0"



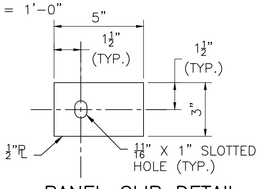
SECTION 17

SCALE: 3" = 1'–0"



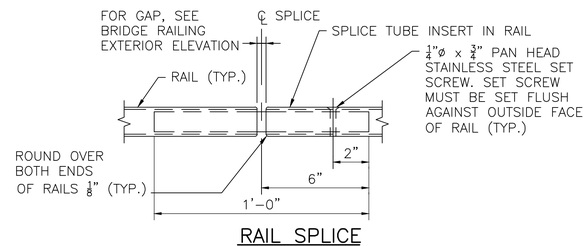
CONNECTION PLATE DETAIL

SCALE: 3" = 1'–0"



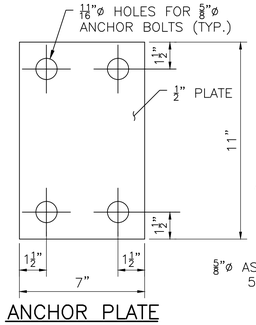
PANEL CLIP DETAIL

SCALE: 3" = 1'–0"



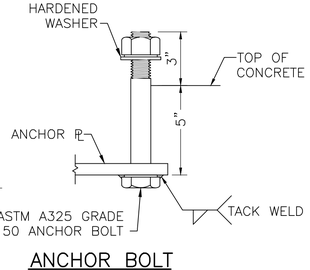
RAIL SPLICE

SCALE: 3" = 1'–0"



ANCHOR PLATE

SCALE: 3" = 1'–0"

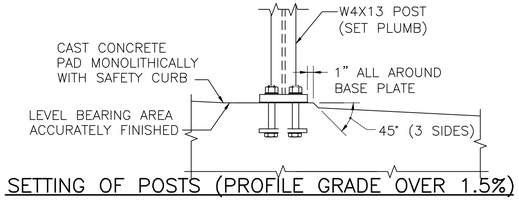


ANCHOR BOLT

SCALE: 3" = 1'–0"

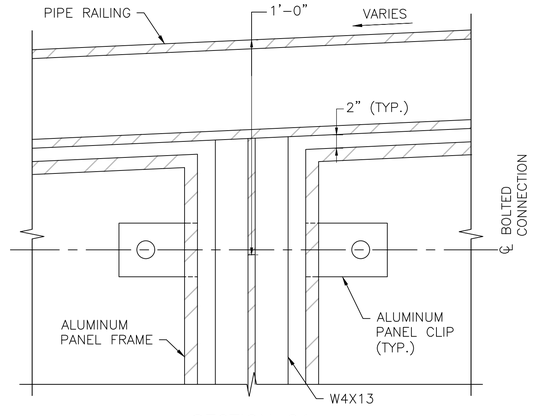
RAILING NOTES:

1. RAIL POST AND BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 50. PIPE RAILING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 WITH A CERTIFIED Fy = 50 KSI MINIMUM. PIPE RAILING, ANCHOR PLATES, AND SPLICE PIPE SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 36.
2. ALL STEEL (EXCEPT FASTENERS) SHALL BE GALVANIZED AND PAINTED (COLOR TO BE DETERMINED BY THE TOWN OF CONCORD). ANCHOR PLATE SHALL BE GALVANIZED ONLY.
3. ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
4. RAILINGS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPLICES WHERE POSSIBLE. RAILING SHALL HAVE A MAXIMUM 30 FOOT DISTANCE BETWEEN SPLICES. RAILING BETWEEN POSTS SHALL HAVE AN ALLOWABLE HORIZONTAL TOLERANCE OF ¼" FROM THE CENTERLINE OF POSTS.
5. ENDS OF RAILING SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.
6. ALL POSTS TO BE PLUMB WHEN PROFILE GRADE EXCEEDS 1.5%. FOR PROFILE GRADES LESS THAN 1.5%, POSTS SHALL BE SET PERPENDICULAR TO GRADE.
7. POST WELDS DO NOT REQUIRE MAGNETIC PARTICLE TESTING.
8. ALUMINUM: PROVIDE ALLOY AND TEMPER RECOMMENDED BY ALUMINUM PRODUCER AND FINISHER FOR TYPE OF USE AND FINISH INDICATED, AND WITH NOT LESS THAN THE STRENGTH AND DURABILITY PROPERTIES OF THE ALLOY AND TEMPER DESIGNATED BELOW FOR EACH ALUMINUM FORM REQUIRED:
   8.a. EXTRUDED BARS AND TUBE: ASTM B 221, ALLOYS 6005–T5, 6061–T6 AND 6063–T6
   8.b. PANEL CLIPS AND STRUCTURAL FASTENERS: ALLOY 6063–T6
9. MESH PANEL: RAILING MANUFACTURER TO PROVIDE ¼ IN. DIAMETER ALUMINUM WIRE WITH 2" SQUARE MESH. PANEL SHALL BE SURROUNDED IN U–CHANNEL AND ANGLE ALUMINUM FRAME. ALL WIRES WELDED TO FRAME WITHIN CHANNEL AND ANGLE LEGS AND HIDDEN FROM VIEW. BOTTOM CHANNEL OF FRAME SHALL BE OPEN IN ORDER TO ALLOW DRAINAGE OF WATER.
10. ALL ALUMINUM SHALL HAVE AN ANODIZED FINISH, CLASS I PROVIDED IN ACCORDANCE WITH AA–M12–C22–A41.



SETTING OF POSTS (PROFILE GRADE OVER 1.5%)

SCALE: 1" = 1'–0"



SECTION 21

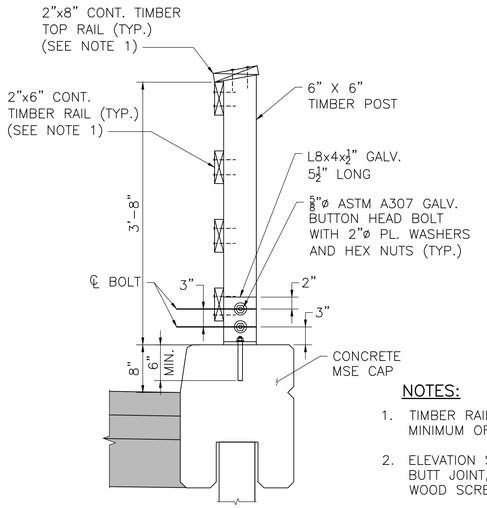
SCALE: 3" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

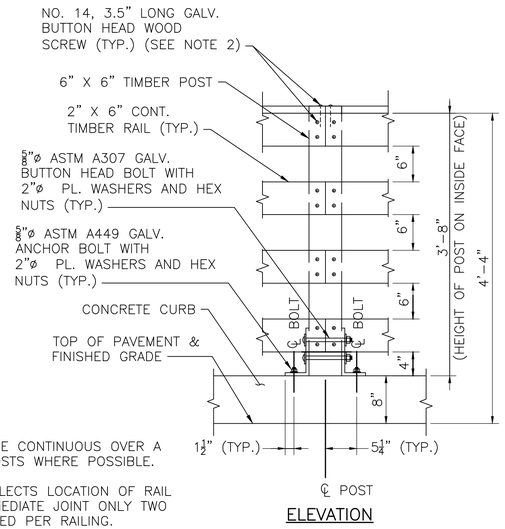
606223_BR(C19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\AAA-2021\0426-BRT-JB\606223\DWG\BR\606223_BRC19039_20-24 TOF_Deck_Bearing_Rail.dwg 2/1/2019 9:40:48 AM DWG To PDF.pc3

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	106	158
PROJECT FILE NO. 606223			

TIMBER RAIL TRANSITION



TRANSVERSE SECTION



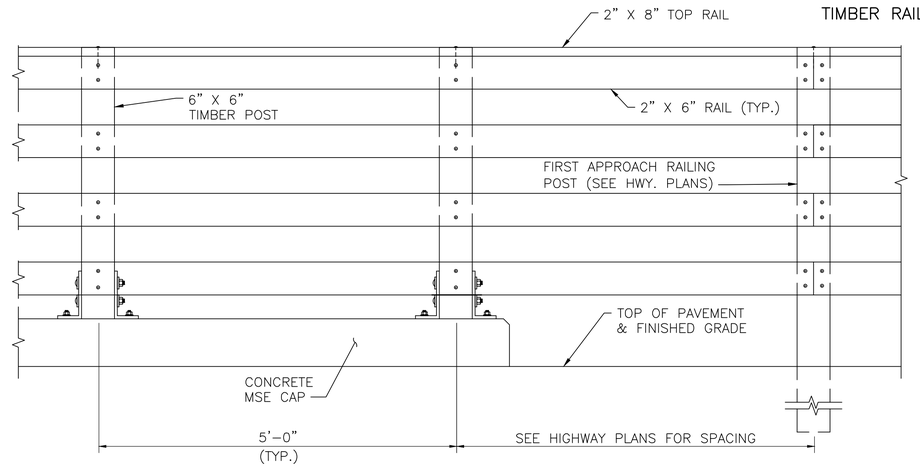
ELEVATION

NOTES:

1. TIMBER RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF THREE POSTS WHERE POSSIBLE.
2. ELEVATION SHOWN REFLECTS LOCATION OF RAIL BUTT JOINT, AT INTERMEDIATE JOINT ONLY TWO WOOD SCREWS REQUIRED PER RAILING.

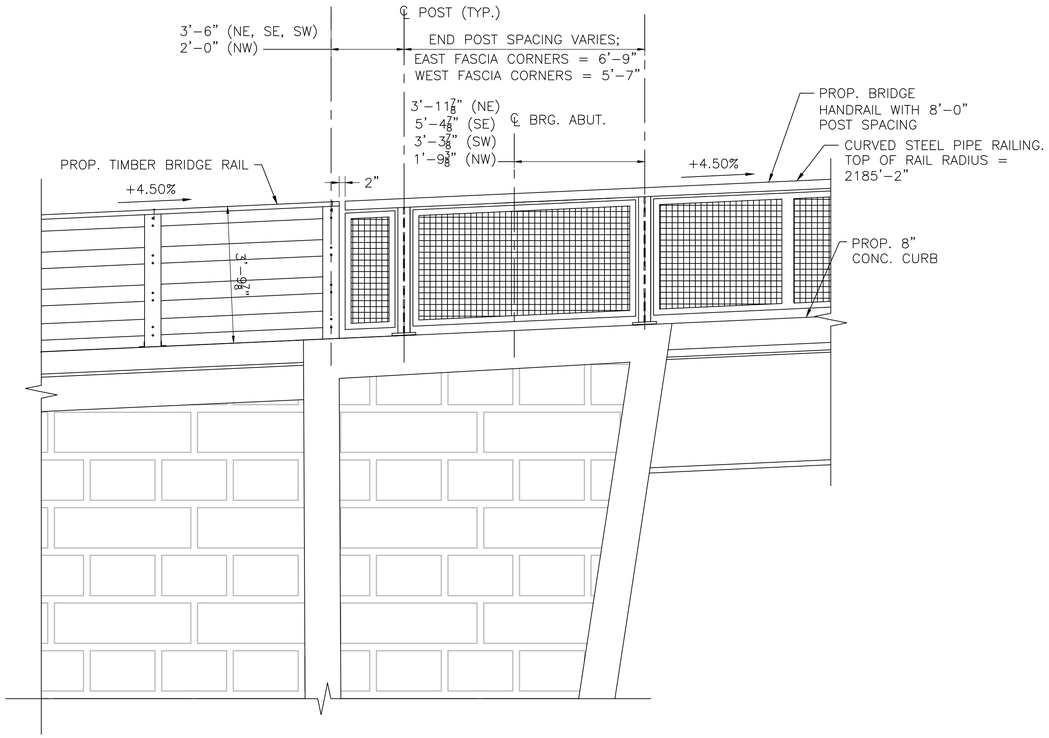
TIMBER BRIDGE RAILING DETAILS

SCALE: 1" = 1'-0"



TIMBER BRIDGE RAILING TRANSITION TO APPROACH RAILING

SCALE: 1" = 1'-0"



PEDESTRIAN BRIDGE RAIL TO TIMBER RAIL TRANSITION

SCALE: ½" = 1'-0"

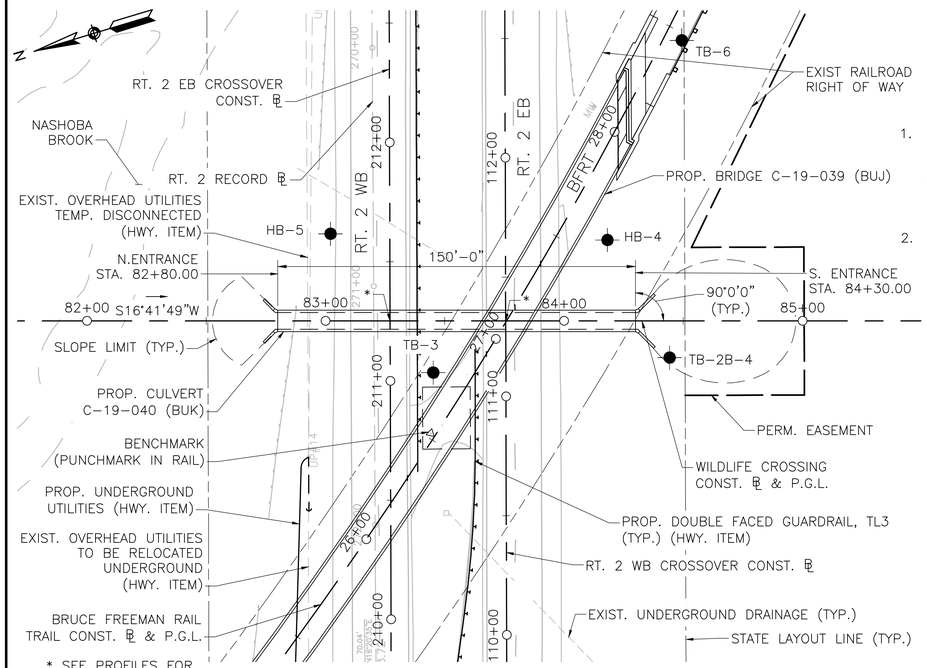
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR(C19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM
Second Structural Submittal (S2) 25-January-2019
V:\MAA-102704.00 BRF-2\606223\DWG\BRIDGE\606223_BRC19039_20-24 TOF_Deck_Bearing_Rail.dwg 2/1/2019 9:40:30 AM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

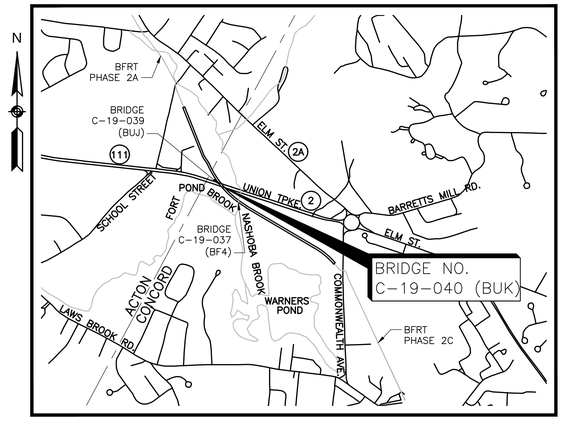
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	107	158
PROJECT FILE NO. 606223			

KEY PLAN, LOCUS MAP & PROFILES



KEY PLAN
SCALE: 1" = 30'

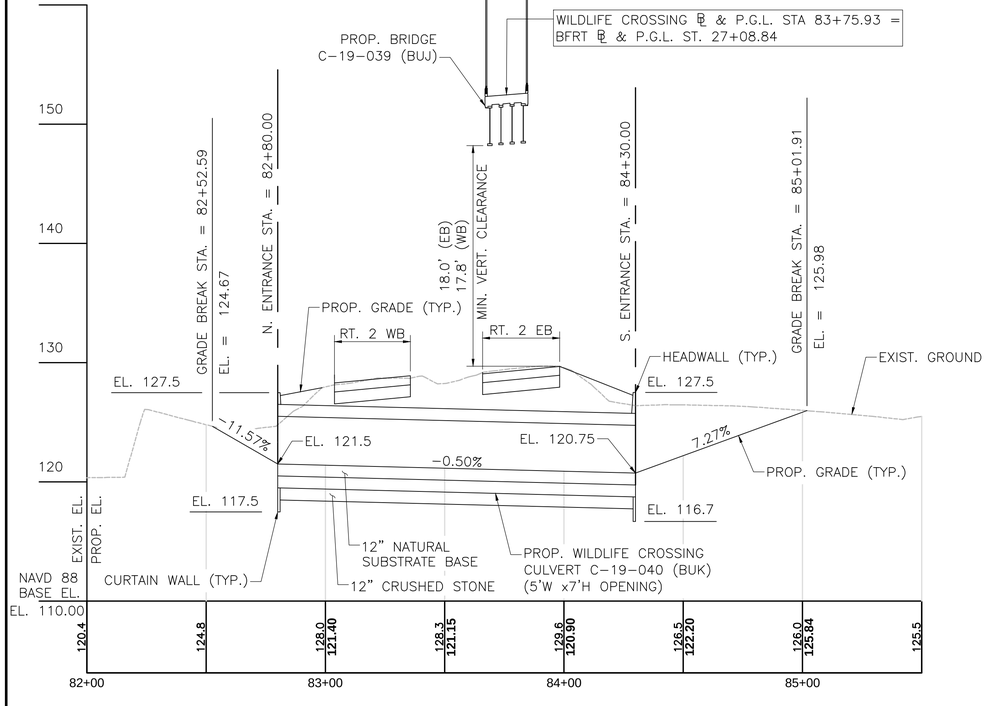
NOTES:
1. RT. 2 EB & WB CROSSOVER BASELINES ARE SHOWN SINCE THEY WILL BE IN PLACE DURING CULVERT CONSTRUCTION. REFER TO CONSTRUCTION STAGING PLANS FOR ADDITIONAL DETAILS.
2. ROUTE 2 RECORD BASELINE IS SHOWN FOR REFERENCE ONLY.



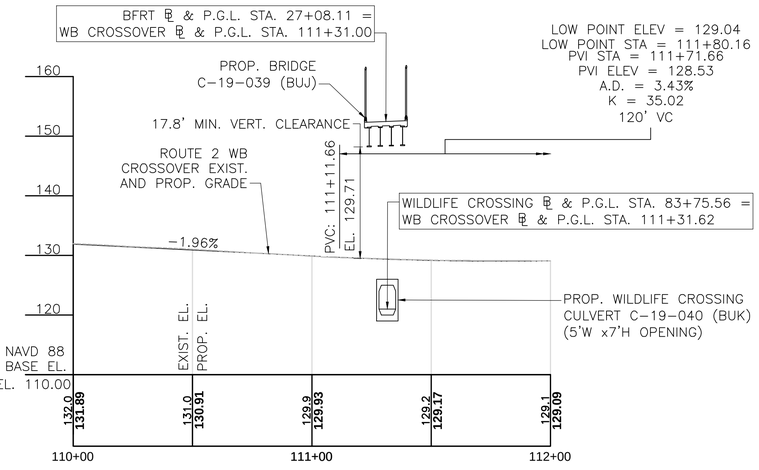
LOCUS
SCALE: 1" = 1500'

INDEX OF BRIDGE SHEETS

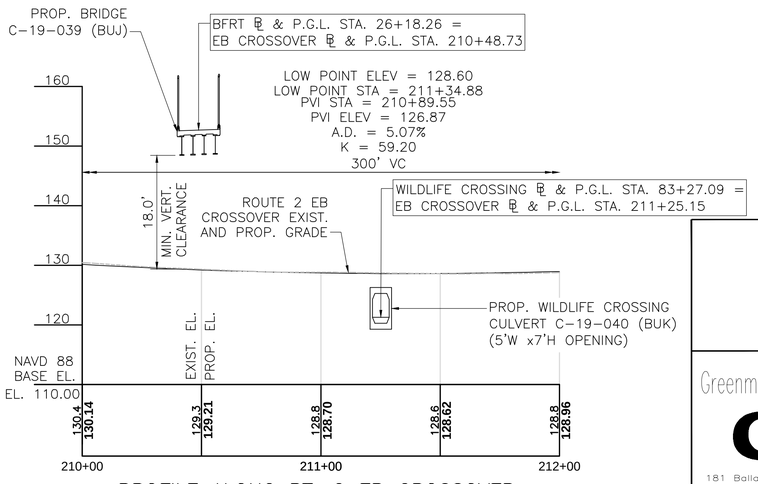
1. KEY PLAN, LOCUS MAP & PROFILES
2. GENERAL NOTES & QUANTITIES
3. BORING LOGS
4. BORING LOGS
5. PLAN AND LONGITUDINAL SECTION
6. CULVERT CROSS SECTION, ELEVATION, & DETAILS



PROFILE ALONG WILDLIFE CROSSING CONST. ℄ & P.G.L.
SCALE: HORZ: 1" = 30'
VERT: 1" = 6'



PROFILE ALONG RT. 2 WB CROSSOVER
SCALE: HORZ: 1" = 30'
VERT: 1" = 12'



PROFILE ALONG RT. 2 EB CROSSOVER
SCALE: HORZ: 1" = 30'
VERT: 1" = 12'

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION

MassDOT Massachusetts Department of Transportation Highway Division

PROPOSED BRIDGE
CONCORD
MA 2 (UNION TURNPIKE) OVER WILDLIFE CROSSING

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Greenman–Pedersen, Inc.
GPI
181 Ballardvale Street, Suite 202
Wilmington, MA 01887

TITLE: _____ CHIEF ENGINEER

Plotted on 4-Feb-2019 10:45 AM
606223_BR01_02(C19040)-KEYPLAN_NOTES.DWG
Second Structural Submittal (S2) 28-Jan-2019

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	108	158
PROJECT FILE NO. 606223			

GENERAL NOTES & QUANTITIES

GENERAL NOTES

DESIGN:
IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016 FOR HL–93 LOADING.

MASSDOT BENCH MARK:
PUNCHMARK IN RAIL
N2996046.040 E681142.400
WILDLIFE CROSSING ℄ STA. 83+44.10 47.11' RT
EL. 128.80

ELEVATIONS:
ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE:
TO BE PLACED ON THE OUTSIDE FACES OF BOTH CULVERT HEADWALLS, CENTERED HORIZONTALLY AND VERTICALLY ON THE HEADWALLS. A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF THE CONTRACT COMPLETION AS OF THE DATE THE CULVERT IS CAST. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

MASSDOT SURVEY NOTEBOOKS:
COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM MASSDOT.

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

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

UNSUITABLE MATERIAL:
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:
DESIGN RETURN PERIOD: 1000 YEARS

DESIGN SPECTRA:

$A_S = 0.128$
$S_{DS} = 0.256$
$S_{D1} = 0.096$
SITE CLASS = D

SEISMIC DESIGN CATEGORY (SDC) = A

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

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	21"	26"	31"
2. 12" OF CONCRETE BELOW BAR	29"	36"	43"
3. COATED BARS, COVER < 3db, OR CLEAR SPACING < 6db	31"	39"	46"
4. COATED BARS, ALL OTHER CASES	25"	31"	37"
5. CONDITION 2. AND 3.	35"	44"	53"
6. CONDITION 2. AND 4.	34"	43"	51"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES:

(1)	(2)	(3)	TO BE USED IN CONSTRUCTION OF:
4000	1½	565	WINGWALLS, HEADWALLS, CURTAIN WALLS, CULVERT TO WINGWALL CLOSURE POURS

(1) 28 DAY COMPRESSIVE STRENGTH (PSI)
(2) MAXIMUM AGGREGATE SIZE (INCH)
(3) CEMENTITIOUS CONTENT (POUNDS/C.Y.)

ROUTE 2 STAGED CONSTRUCTION:
STAGED CONSTRUCTION IS REQUIRED FOR CULVERT INSTALLATION BENEATH ROUTE 2. REFER TO HIGHWAY PLANS AND SPECIAL PROVISIONS FOR SPECIFIC DETAILS AND RESTRICTIONS PERTINENT TO STAGED CONSTRUCTION AND ROADWAY CLOSURES.

PRECAST BOX CULVERT:
THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS PREPARED IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS FOR HL–93 LOADING FOR APPROVAL BY THE ENGINEER. THE DESIGN COMPUTATIONS SHALL CONSIDER ALL LOADINGS AS ARE APPROPRIATE DURING FABRICATION, SHIPMENT, ERECTION, CONSTRUCTION, AND IN THE FINAL CONDITION BASED UPON THESE CONSTRUCTION DRAWINGS.

THE DIMENSIONS PROVIDED ARE SHOWN TO ESTABLISH THE SIZE OF THE PROPOSED OPENING. THE WIDTH AND THICKNESS OF THE PROPOSED UNITS MAY VARY DEPENDING UPON THE MANUFACTURER'S SPECIFICATIONS, PROVIDED THAT THE OPENING SIZE AND BURIED DEPTH ARE MAINTAINED.

THE BOX OPENING SHALL BE AS SHOWN ON THE PLANS. THE END CULVERT UNITS SHALL BE BEVELED TO PROVIDE A VERTICALLY SQUARE OPENING. THE CONTRACTOR SHALL DETERMINE THE CONFIGURATION OF THE SEGMENTS OF THE PRECAST CULVERT AS LONG AS THE LIMITS OF THE CULVERT REMAIN IN THE LOCATION SHOWN ON THE PLANS. ANY MODIFICATIONS TO THE GEOMETRY WILL REQUIRE APPROVAL FROM THE ENGINEER PRIOR TO FABRICATION.

THE CONTRACTOR SHALL SUBMIT FOR APPROVAL A COMPLETE DESIGN OF THE BOX CULVERT UNITS BASED ON THE ASSUMED GEOMETRY SHOWN. THE FACTORED BEARING RESISTANCE IS 9.1 KSF WHICH IS A PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45, AS OUTLINED IN THE GEOTECHNICAL REPORT.

THE MINIMUM 28 DAY CONCRETE COMPRESSIVE STRENGTH FOR THE PRECAST BOX CULVERT UNITS SHALL BE 5000 PSI. A MASSDOT PRE–APPROVED CONCRETE MIX SHALL BE USED.

ALL SHOP DRAWINGS AND DESIGN CALCULATIONS SHALL BE STAMPED BY A MASSACHUSETTS REGISTERED PROFESSIONAL ENGINEER.

REFER TO ITEM 995.011 OF THE SPECIAL PROVISIONS FOR FURTHER REQUIREMENTS AND CLARIFICATIONS.

UTILITIES:
THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
BRIDGE EXCAVATION	680	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	225	CY
CRUSHED STONE FOR BRIDGE FOUNDATIONS	115	TON
CONTROL OF WATER – STRUCTURE NO. C–19–040	1	LS
CULVERT STRUCTURE, CULVERT NO. C–19–040 (BUK)	1	LS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR01_02(C19040)KEYPLAN_NOTES.DWG Plotted on 4-Feb-2019 10:45 AM
Second Structural Submittal (S2) 28-Jan-2019
V:\AAA 2007\606\BR_BR\606223\DWG\BR\606223_BR01_02(C19040)-KeyPlan_Notes.dwg 2/4/2019 10:45:12 AM EMC To PDF.pc3

BORING LOGS

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring # HB-5
Scale 1" = 5'

City/Town: Concord | Highway Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-08-09 7:50AM | Total Hours: 4
Groundwater Depth: 9' 6" | Date & Time: 10-08-09 11:30AM | Date & Time Completed: 10-08-09 12:00PM
Coordinates: N 2996062.2 E 681234.6 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre
Ground Elevation: 130.2' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	6 6 7 6	19"	Dry, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-2	4' - 6'	4 3 5 5	18"	Dry, loose, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-3	9' - 11'	7 3 4 6	10"	Wet, loose, brown, COARSE SAND, trace inorganic silt.	EL. 120.7
					EL. 119.5 ASSUMED BOTTOM OF BASE SLAB AT N. ENTRANCE
S-4	14' - 16'	7 7 8 10	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	
S-5	19' - 21'	7 8 10 5	12"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	
S-6	24' - 26'	11 9 8 9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
				29'	EL. 101.2
S-7	29' - 31'	3 4 6 4	14"	Wet, loose, grey, FINE SAND, some inorganic silt.	
S-8	34' - 36'	6 10 5 12	15"	Wet, medium dense, grey, FINE SAND AND INORGANIC SILT.	
				39'	EL. 91.2
S-9	39' - 40'8"	34 35 36 84/2"	12"	Wet, very dense, grey, COARSE SAND AND FINE GRAVEL, some fine sand, trace inorganic silt.	
				Top of BEDROCK at 42'. 42'	EL. 88.2
C-1	42' - 47'	3 2 1 2 3	32"	Began coring. Hard, white, GRANTINE, some weathering. Percent Recovery= 53%	
				Bottom of Exploration= 47' 47'	EL. 83.2

Notes: Changed location, moved boring prior to drilling from 2996067.2, E681234.6 to N2996062.2, E681234.6, boring relocated up hill. Sample by cathead.

Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:
Type of Drill Rig: Mobile B-47
Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Fall: 30" Depth: 41' Signs: Cones: Arrow-Board:
Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N=Sum of Second and Third 6" Blow Counts
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

BORING HB–5

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-3
Scale 1" = 5'

City/Town: Concord | Trail Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-09-09 7:00AM | Total Hours: 7
Groundwater Depth: 9' | Date & Time: 10-09-09 2:00PM | Date & Time Completed: 10-09-09 2:00PM
Coordinates: N 2996037.7 E 681166.5 | Driller's Name: Peter Labossiere Helper's Name: Jack Lefebvre
Ground Elevation: 129.0' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	3 4 3 5	16"	Dry, loose, brown, COARSE SAND ANDFINE SAND, trace organic silt.	
S-2	4' - 6'	14 9 7 7	12"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	EL. 119.1 ASSUMED BOTTOM OF BASE SLAB AT MIDPOINT
S-3	9' - 11'	7 5 6 6	8"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic, silt.	EL. 120.0
				13'	EL. 116.0
S-4	14' - 16'	7 7 12 13	12"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	
S-5	19' - 21'	13 19 8 11	6"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	
S-6	24' - 26'	16 13 12 6	7"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-7	29' - 31'	4 3 3 5	12"	Wet, loose, gray, FINE SAND, some inorganic silt.	
				33'	EL. 96.0
S-8	34' - 36'	14 13 15 15	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
				37'	EL. 92.0
S-9	39' - 40'	70 67	10"	Wet, very dense, gray, FINE SAND AND COARSE SAND, some inorganic silt, (till).	
S-10	44' - 44'6"	120/6"	6"	Wet, very dense, gray, FINE SAND, some inorganic silt, trace coarse sand, (till).	
				49'	EL. 80.0
S-11	49' - 49'8"	51 70/2"	8"	Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt, trace bedrock pieces in tip of spoon. Top of BEDROCK at 50'	
				50'	EL. 79.0
C-1	50' - 55'	3 4 4 3 4	39"	Began coring at 50'. Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Pecent Recovery = 78%	
C-2	55' - 60'	3 3 2 3 3	29"	Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 48%	
				60'	EL. 69.0
				Bottom of Exploration = 60'	

Notes: Sample by cathead

Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:
Type of Drill Rig: Mobile B-47
Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Fall: 30" Depth: 45' Signs: Cones: 6 Arrow-Board:
Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N=Sum of Second and Third 6" Blow Counts
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

BORING TB–3

BORING LOGS

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: TB–2
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
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 A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2014.
7. BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR03_04(C19040)-BORINGS.DWG Plotted on 4-Feb-2019 10:46 AM
Second Structural Submittal (S2) 28-Jan-2019
V:\AAA 2007\610-BRT-2B\606223\DWG\BR\606223_BR03_(ACC19040)-Borings.dwg 2/4/2019 10:46:13 AM LWG To PDF.ctb

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	110	158
PROJECT FILE NO. 606223			

BORING LOGS

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-6
Scale 1" = 5'

City/Town: Concord | Trail Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-05-09 11:25AM | Total Hours: 4
Groundwater Depth: 10' | Date & Time: 10-06-09 7:00AM | Date & Time Completed: 10-06-09 7:30AM
Coordinates: N 2995897.9 E 681269.9 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre
Ground Elevation: 128.2' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	4 6 7 7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.	
					4' — EL. 124.2
S-2	4' - 6'	4 2 2 4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.	EL. 118.8 ASSUMED BOTTOM OF BASE SLAB AT S. ENTRANCE
					9' — EL. 119.2
S-3	9' - 11'	12 12 11 9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	EL. 118.2
S-4	14' - 16'	13 9 9 11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-5	19' - 21'	7 13 8 13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	
					24' — EL. 104.2
S-6	24' - 26'	17 11 7 5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.	
S-7	29' - 31'	18 8 21 100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.	
				Top of BEDROCK at 32'.	32' — EL. 96.2
				Began coring.	
C-1	32' - 37'	4 5 14 5 6	54"	Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%	
				Bottom of Exploration = 37'	37' — EL. 91.2

Notes: Sample by cathead

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Mobile B-47
Casing Type: HW Size: 4" Signs:
Hammer Weight: 300Lbs. Cones:
Fall: 30" Arrow-Board:
Depth: 30'
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING TB–6

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring # HB-4
Scale 1" = 5'

City/Town: Concord | Highway Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-02-09 1:15PM | Total Hours: 5.25
Groundwater Depth: 11' | Date & Time: 10-05-09 10:30AM | Date & Time Completed: 10-05-09 10:30AM
Coordinates: N 2995951.8 E 681198.7 | Driller's Name: Roger Burne | Helper's Name: Patrick Schofield
Ground Elevation: 128.2' | Inspector's Name: Christopher Cheu | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL * 2"	*
S-1	0' - 2'	4 3 4 5	5"	Dry, loose, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-2	4' - 6'	5 5 9 9	12"	Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt.	EL. 118.8 ASSUMED BOTTOM OF BASE SLAB AT S. ENTRANCE
S-3	9' - 11'	5 5 5 5	18"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	EL. 117.2
					14' — EL. 114.2
S-4	14' - 16'	7 9 10 11	15"	Wet, medium dense, grey, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.	
S-5	19' - 21'	9 11 13 12	18"	Wet, medium dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
					24' — EL. 104.2
S-6	24' - 26'	19 15 9 10	15"	Wet, medium dense, grey, FINE SAND, some inorganic silt, trace clay lenses.	
					28'6" — EL. 99.7
S-7	29' - 31'	29 22 23 27	12"	Wet, dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-8	34' - 34'9"	44 120/3"	9"	Wet, very dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	34'9" — EL. 93.5
				Encountered BOULDER 34'9" to 35'. * 35'	EL. 93.2
				Advanced Rollerbit to 38'.	
				Top of BEDROCK at 38'.	38' — EL. 90.2
				Began coring.	
C-1	38' - 43'	4 5 3 4 5	27"	Severely fractured, white/ black, GRANITE, trace quartz lenses. Percent Recovery= 45%	
				Bottom of Exploration= 43'	43' — EL. 85.2

Notes: Stopped coring at 5' per order of on-site engineer due to having obtained sufficient information. Well installed at 15'. 4 bags sand/ 1 cement. Sample by cathead.

Protective Device - Stand: Box:
Well Depth: 15' Solid Pipe: 8'
Stick Up Pipe: 3' Screen Pipe: 10'

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: Diedrich- 50
Casing Type:HW Size:4" Signs:
Hammer Weight: 300Lbs. Cones: 7
Fall: 30" Arrow-Board:
Depth: 34'
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140Lbs.
Donut Hammer Weight:
Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING HB–4

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-2B-4
Scale 1" = 5'

City/Town: Acton - Concord | Bridge: Bruce Freeman Rail Trail (Phase II-B) | Project File No: 606223 | Contract No: 76859
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B) | Date & Time Started: 11-14-14 12:00 pm | Total Hours: 3.5
Groundwater Depth: 6.4' | Date & Time: 11-14-14 3:15 pm | Date & Time Completed: 11-14-14 3:30 pm
Coordinates: N 2995941 E 681144 | Driller's Name: Manlea Thompson | Helper's Name: Donald Palmer
Ground Elevation: 126.5 | Inspector's Name: Weijie Dong | Inspector's Company: Lamson Engineering, Corp., for *

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
				TOPSOIL 5"	5" — EL. 126.1
S-1	0' - 2'	2 3 4 4	18"	Moist, loose, red-brown FINE TO COARSE SAND, some inorganic silt, trace fine gravel.	
					4' — EL. 122.5
S-2	5' - 7'	6 4 5 6	14"	Wet, loose, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	EL. 120.1
					EL. 118.8 ASSUMED BOTTOM OF BASE SLAB AT S. ENTRANCE
S-3	10' - 11'	4 5 14 14	8"	Wet, loose, brown, FINE SAND, trace inorganic silt.	11' — EL. 115.5
S-3A	11' - 12'		6"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel.	
S-4	15' - 17'	9 7 11 13	15"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-5	20' - 22'	8 8 8 8	13"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-6	25' - 27'	9 8 8 6	10"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-7	30' - 31'8"	7 7 30 80/2"	9"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.	
S-8	35' - 37'	28 47 51 54	19"	Wet, very dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.	
				Bottom of Exploration = 37'	37' — EL. 89.5

Remarks: * AECOM (Consultants)

Protective Device - Stand: Box:
Well Depth: Solid Pipe:
Stick Up Pipe: Screen Pipe:

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: CME 550X
Arrow-Board: Signs: Cones:
Casing: HW Size: 4" Amt: 35'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8"
Automatic Hammer Weight:
Safety Hammer Weight: 140 lbs.
Donut Hammer Weight: Fall: 30"
Core Barrel Type: Size:

BORING TB–2B–4

NOTES:

1. FOR LOCATION OF BORINGS, SEE SHEET 1.
2. FOR BORING NOTES, SEE SHEET 3.

BORING LOGS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR02_04(C19040)-BORINGS.DWG Plotted on 4-Feb-2019 10:46 AM
Second Structural Submittal (S2) 28-Jan-2019
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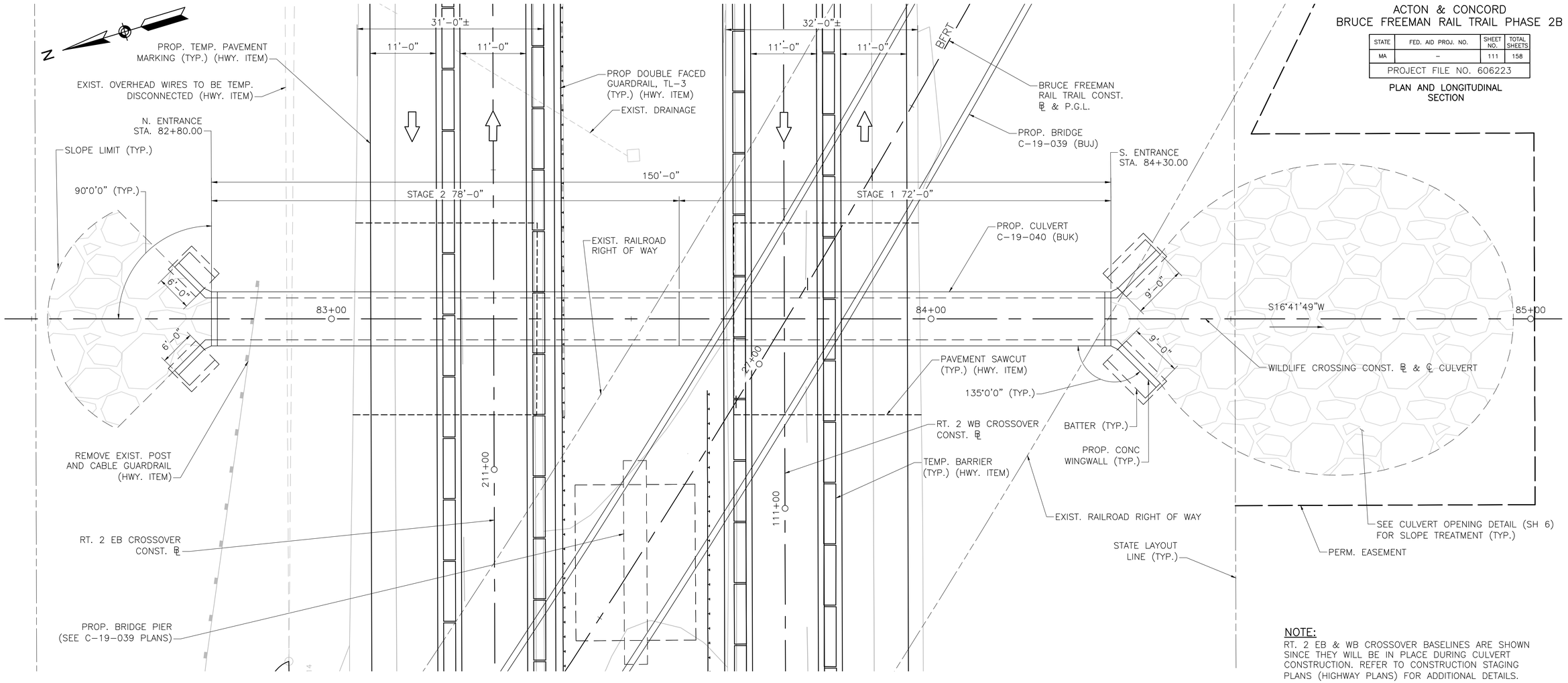
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

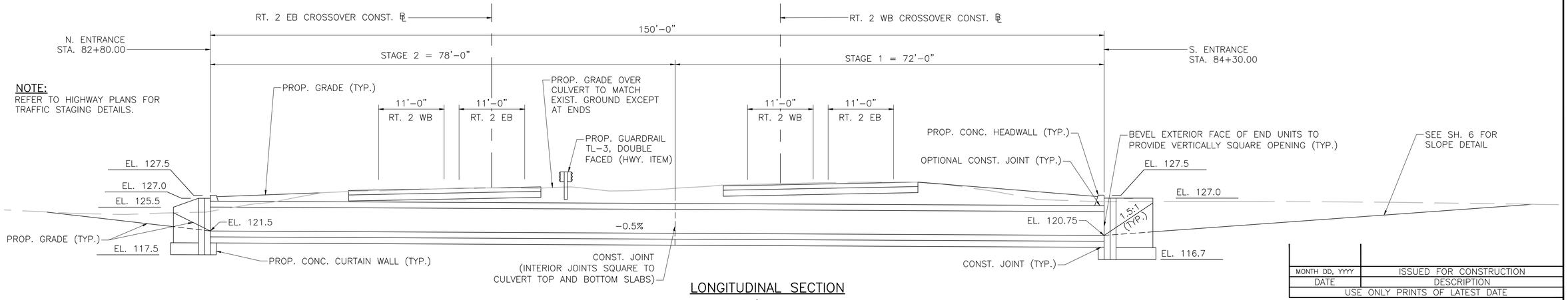
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	111	158
PROJECT FILE NO. 606223			

PLAN AND LONGITUDINAL SECTION



PLAN
SCALE: 1/8" = 1'–0"

NOTE:
RT. 2 EB & WB CROSSOVER BASELINES ARE SHOWN SINCE THEY WILL BE IN PLACE DURING CULVERT CONSTRUCTION. REFER TO CONSTRUCTION STAGING PLANS (HIGHWAY PLANS) FOR ADDITIONAL DETAILS.



LONGITUDINAL SECTION
SCALE: 1/8" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 5 OF 6 SHEETS BRIDGE NO. C–19–040 (BUK)

606223_BR05(C19040)-PLAN_ELEVATION.DWG Plotted on 4-Feb-2019 10:46 AM

Second Structural Submittal (S2) 28-Jan-2019

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ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

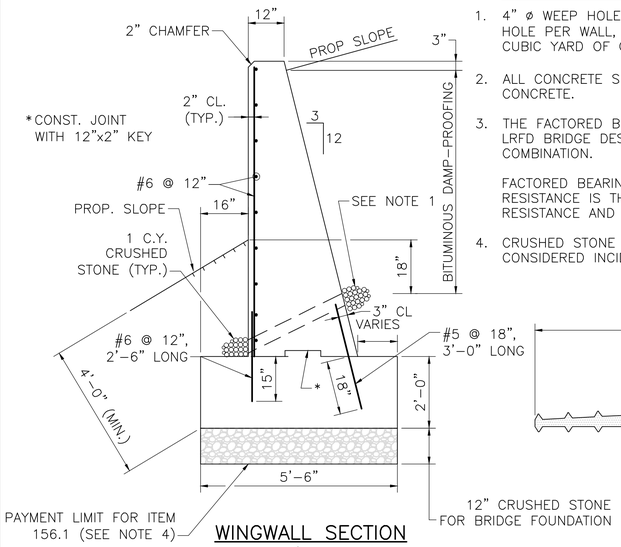
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	112	158
PROJECT FILE NO. 606223			

CULVERT CROSS SECTION, ELEVATION, & DETAILS

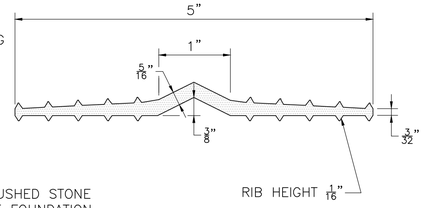
WINGWALL NOTES:

1. 4" ø WEEP HOLES (JUST ABOVE FOOTING). PROVIDE 1 WEEP HOLE PER WALL, CENTERED ALONG WALL LENGTH. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. ALL CONCRETE SHALL BE 4000 PSI, 1 ½ IN, 565 CEMENT CONCRETE.
3. THE FACTORED BEARING PRESSURE = 3.0 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

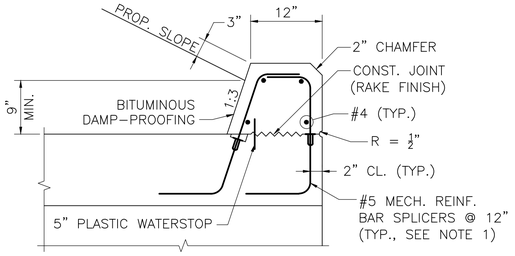
   FACTORED BEARING RESISTANCE = 3.6 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.55.
4. CRUSHED STONE REQUIRED BEYOND PAYMENT LIMIT SHALL BE CONSIDERED INCIDENTAL TO WATER CONTROL ITEM 991.1.



WINGWALL SECTION
SCALE: ½" = 1'-0"

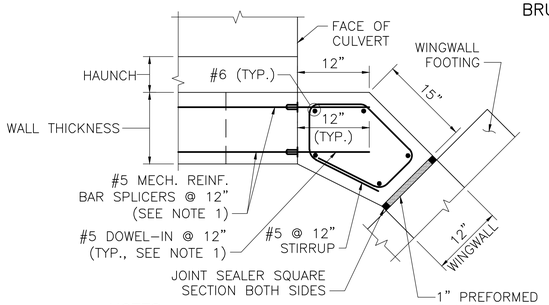


5" WATERSTOP
NOT TO SCALE



NOTES:

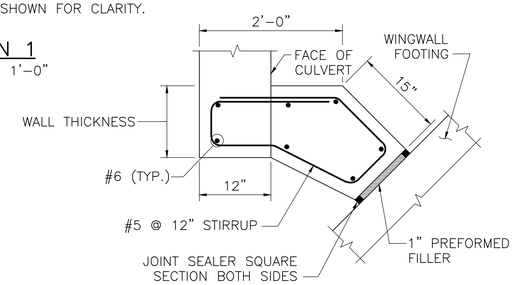
1. THE CONTRACTOR MAY SUBSTITUTE #5 ∫∫ DOWELS, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.
3. THE CONTRACTOR HAS THE OPTION TO PRECAST THE HEADWALL INTEGRALLY WITH THE CULVERT. IF CAST INTEGRALLY THE 5" WATERSTOP IS NOT REQUIRED.
4. THE PROPOSED SLOPE OVER THE NORTH END OF THE CULVERT PARALLEL TO ROUTE 2 SHALL BE GRADED AT A MAXIMUM SLOPE OF 10H:1V.



NOTES:

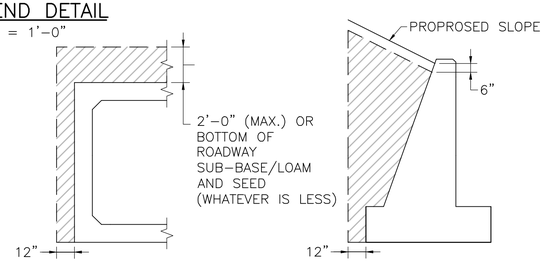
1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG, FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

SECTION 1
SCALE: 1" = 1'-0"

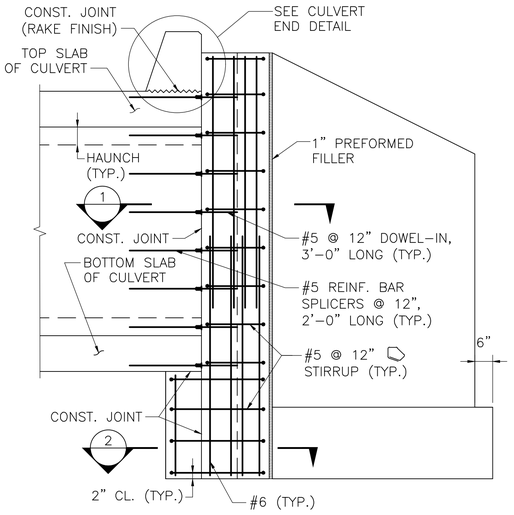


SECTION 2
SCALE: 1" = 1'-0"

CULVERT END DETAIL
SCALE: 1" = 1'-0"



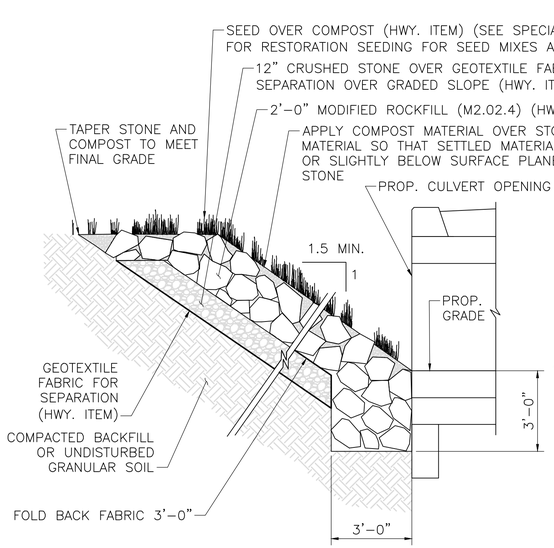
BOX CULVERT WINGWALL



NOTES:

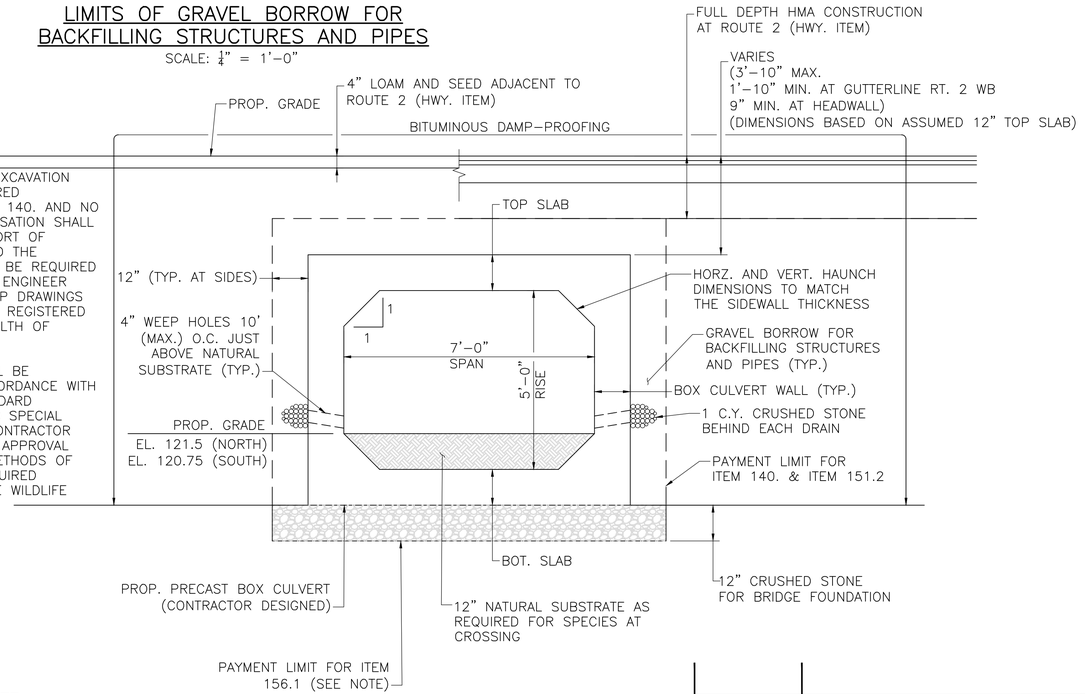
1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG FOR MECHANICAL REINFORCING BAR SPLICERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

SECTION AT WINGWALL
SCALE: ½" = 1'-0"



CULVERT OPENING DETAIL
SCALE: ⅜" = 1'-0"

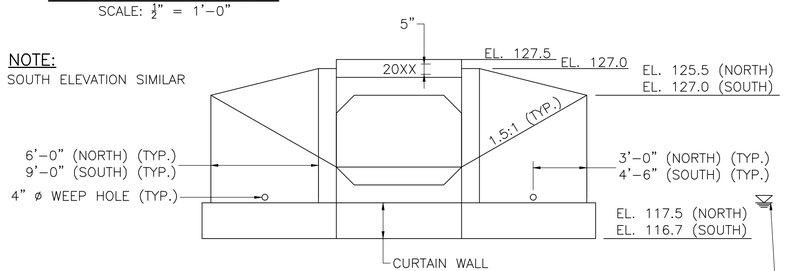
LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES
SCALE: ¼" = 1'-0"



NOTES:

1. ANY SUPPORT OF EXCAVATION SHALL BE CONSIDERED INCIDENTAL TO ITEM 140. AND NO ADDITIONAL COMPENSATION SHALL BE GIVEN. IF SUPPORT OF EXCAVATION IS USED THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT TO THE ENGINEER FOR APPROVAL SHOP DRAWINGS STAMPED BY A P.E. REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
2. ALL BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH THE MASSDOT STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS. THE CONTRACTOR SHALL SUBMIT FOR APPROVAL THE ANTICIPATED METHODS OF OBTAINING THE REQUIRED COMPACTION AT THE WILDLIFE CROSSING.

NOTE:
SOUTH ELEVATION SIMILAR



BOX CULVERT NORTH DEVELOPED ELEVATION
SCALE: ¼" = 1'-0"

CULVERT NOTES:

1. THE CULVERT IS CONTRACTOR DESIGNED AND THE FACTORED BEARING PRESSURE AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS WILL BE DETERMINED BY THE CONTRACTOR.
2. FACTORED BEARING RESISTANCE = 9.1 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45
3. REFER TO SPECIAL PROVISIONS FOR PRECAST CULVERT JOINT AND JOINT SEALING REQUIREMENTS.

NOTE:
CRUSHED STONE REQUIRED BEYOND PAYMENT LIMIT SHALL BE CONSIDERED INCIDENTAL TO WATER CONTROL ITEM 991.1

BOX CULVERT CROSS SECTION
SCALE: ½" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR06(C19040)-DETAILS.DWG Plotted on 4-Feb-2019 10:47 AM

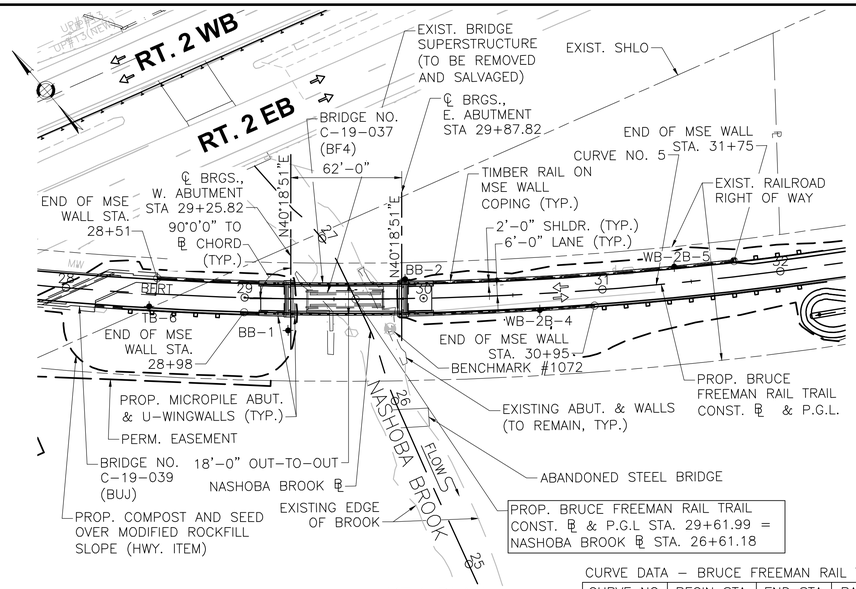
Second Structural Submittal (S2) 28-Jan-2019

V:\MAA\2017\2436.BWT-28\606223\DWG\BR06(C19040)-Details.dwg, 2/4/2019 10:47:13 AM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	113	158
PROJECT FILE NO. 606223			

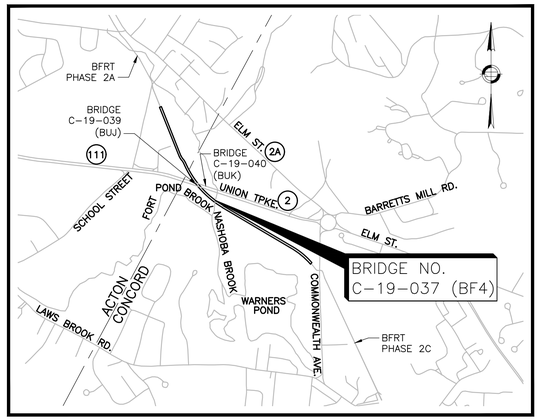
KEY PLAN, LOCUS MAP & PROFILES



KEY PLAN
SCALE: 1" = 40'

CURVE DATA – BRUCE FREEMAN RAIL TRAIL CONST. ℄ & P.G.L.

CURVE NO.	BEGIN STA.	END STA.	RADIUS	DELTA	LENGTH
5	20+75.83	33+33.96	1900.00'	37°56'23"	1258.13'

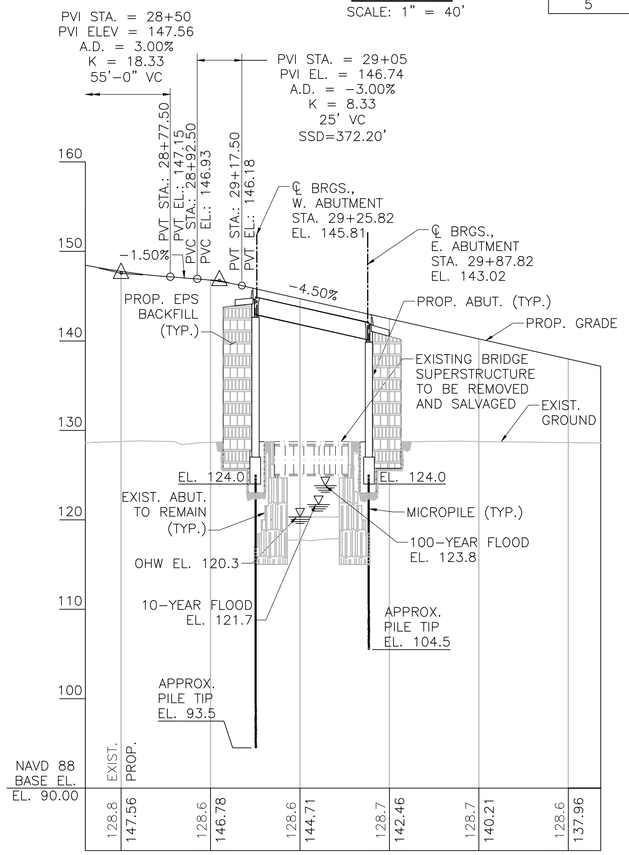


LOCUS
SCALE: 1" = 1500'

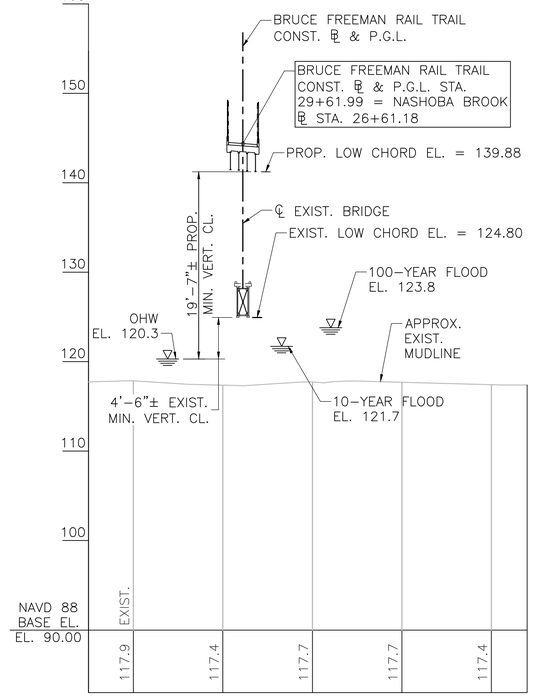
INDEX OF BRIDGE SHEETS

1. KEY PLAN, LOCUS MAP & PROFILES
2. GENERAL NOTES & QUANTITIES
3. BORING LOGS
4. PLAN & ELEVATION
5. WEST ABUTMENT PLAN & ELEVATION
6. EAST ABUTMENT PLAN & ELEVATION
7. MSE WALL PLANS & ELEVATIONS
8. ABUTMENT DETAILS (1 OF 2)
9. ABUTMENT DETAILS (2 OF 2)
10. WALL DETAILS
11. APPROACH SLAB PLAN & DETAILS
12. FRAMING PLAN & STRUCTURAL STEEL DETAILS
13. DECK & TIMBER RAILING DETAILS
14. BEARING DETAILS

NOTE:
FOR GENERAL NOTES AND QUANTITIES, SEE SHEET 2.



PROFILE ALONG BRUCE FREEMAN RAIL TRAIL CONST. ℄ & P.G.L.
HORIZ. SCALE: 1" = 40'
VERT. SCALE: 1/8" = 1'



PROFILE ALONG NASHOBA BROOK ℄
HORIZ. SCALE: 1" = 40'
VERT. SCALE: 1/8" = 1'

HYDRAULIC DESIGN DATA:

DRAINAGE AREA:.....20.3 SQUARE MILES
DESIGN FLOOD DISCHARGE:.....845 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY:.....100 YEARS
DESIGN FLOOD VELOCITY:.....3.90 FEET PER SECOND
DESIGN FLOOD ELEVATION:.....123.8 FEET, NAVD

BASE (100-YEAR) FLOOD DATA

BASE FLOOD DISCHARGE:.....845 CUBIC FEET PER SECOND
BASE FLOOD ELEVATION:.....123.8 FEET, NAVD

DESIGN AND CHECK SCOUR DATA

DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY:.....25 YEARS
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY:.....50 YEARS

FLOOD OF RECORD

THERE IS NO FLOOD OF RECORD FOR NASHOBA BROOK.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION

MassDOT Massachusetts Department of Transportation Highway Division

PROPOSED BRIDGE
CONCORD
BRUCE FREEMAN RAIL TRAIL
OVER NASHOBA BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Greenman-Pedersen, Inc.
GPI
181 Ballardvale Street, Suite 202
Wilmington, MA 01887

TITLE: CHIEF ENGINEER

Plotted on 5-Feb-2019 3:29 PM
606223_BR01(C19037)-KEYPLANLOCUS.DWG
Second Structural Submittal (S2) 21-Jan-2019
V:\MAA-2007\606-BIRT-3\606223\DWG\BR\606223_BR01(C19037)-KeyPlanLocus.dwg, 2/5/2019 2:29:09 PM, DWG To PDF.pc3

606223_BR02(C19037)-GENERAL NOTES.DWG Plotted on 5-Feb-2019 3:29 PM

GENERAL NOTES

DESIGN:
IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016 AND THE 2009 AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES WITH INTERIM SPECIFICATIONS THROUGH 2015 FOR PEDESTRIAN LOADING OF 90 PSF AND H10 LOADING.

EXISTING BRIDGE PLANS:
PLANS OF THE EXISTING BRIDGE DO NOT EXIST. THE CONTRACTOR SHALL TAKE ALL REQUIRED MEASUREMENTS OF THE EXISTING STRUCTURE TO APPROPRIATELY BID THE REMOVAL OF SUPERSTRUCTURE ITEM.

MASSDOT BENCH MARK:
BENCHMARK #1072 IRON PIN
N2995801.24 E681364.41 EL. 124.85 STA. 29+81.08 16.72' RT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

MASSDOT SURVEY NOTEBOOKS:
COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION–HIGHWAY DIVISION.

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

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

UNSUITABLE MATERIAL:
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:
DESIGN RETURN PERIOD: 1000 YEAR

DESIGN SPECTRA:

AS = 0.128
SDS = 0.256
SD1 = 0.096

SITE CLASS = D

SEISMIC DESIGN CATEGORY (SDC) = A

ANCHOR BOLTS:
ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

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

MODIFICATION CONDITION:	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12 INCHES OF CONCRETE BELOW BAR	29"	36"
3. COATED BARS, COVER <3db, OR CLEAR SPACING < 6db	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2 AND 3	35"	44"
6. CONDITION 2 AND 4	34"	43"

IF THE ABOVE BARS ARE SPACED 6 INCHES OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES

(1)	(2)	(3)	
4000	1½"	565	PILE CAPS, ABUTMENT & WINGWALL STEMS, CURTAIN WALLS & APPROACH SLABS
4000	¾"	610	KEEPER BLOCKS & BACKWALLS
4000	¾"	585 HP	DECK, END DIAPHRAGMS & CURBS

(1) 28 DAY COMPRESSIVE STRENGTH (PSI)
(2) MAXIMUM AGGREGATE SIZE (INCH)
(3) CEMENTITIOUS CONTENT (POUNDS/CY)

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
REMOVAL OF SUPERSTRUCTURE OF BRIDGE NO. C–19–037	1	LS
HANDLING AND TRANSPORTATION OF SUPERSTRUCTURE OF BRIDGE NO. C–19–037	1	LS
BRIDGE EXCAVATION	740	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	635	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	30	CY
SUPERPAVE BRIDGE SURFACE COURSE – 9.5 (SSC–B–9.5)	10	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE – 9.5 (SPC–B–9.5)	10	TON
SAWING & SEALING JOINTS IN ASPHALT PAVEMENT AT BRIDGES	32	FT
DRILLED MICROPILES	380	FT
MICROPILE VERIFICATION LOAD TEST	1	EA
MICROPILE PROOF LOAD TEST	2	EA
BRIDGE STRUCTURE, BRIDGE NO. C–19–037 (BF4)	1	LS
MECHANICALLY STABILIZED EARTH WALL	605	SY
MSE WALL MANUFACTURER'S REPRESENTATIVE	8	DAY
EXPANDED POLYSTYRENE	260	CY
EPS MANUFACTURER'S REPRESENTATIVE	5	DAY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

Second Structural Submittal (S2) 21-Jan-2019

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ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	115	158

PROJECT FILE NO. 606223

BORING LOGS

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. TB-6
Scale 1" = 5'

City/Town: Concord | Trail Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-05-09 11:25AM | Total Hours: 4
Groundwater Depth: 10' | Date & Time: 10-06-09 7:00AM | Date & Time Completed: 10-06-09 7:30AM
Coordinates: N 2995897.9 E 681269.9 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre
Ground Elevation: 128.2' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	4 6 7 7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.	
S-2	4' - 6'	4 2 2 4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.	4' — EL. 124.2
S-3	9' - 11'	12 12 11 9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	9' — EL. 119.2 / EL. 118.2
S-4	14' - 16'	13 9 9 11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-5	19' - 21'	7 13 8 13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	
S-6	24' - 26'	17 11 7 5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.	24' — EL. 104.2
S-7	29' - 31'	18 8 21 100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.	
				Top of BEDROCK at 32'.	32' — EL. 96.2
C-1	32' - 37'	4 5 14 5 6	54"	Began coring. Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%	
				Bottom of Exploration = 37'	37' — EL. 91.2

EL. 130.0 / EL. 120.0 / EL. 110.0 / EL. 100.0 / EL. 90.0

Notes: Sample by cathead

Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:
Type of Drill Rig: Mobile B-47

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Fall: 30" Depth: 30' Signs: Cones: Arrow-Board:
Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING TB–6
SCALE: 1" = 5'

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. BB-1
Scale 1" = 5'

City/Town: Concord | Bridge: Bridge Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 10-02-09 10:45AM | Total Hours: 9
Groundwater Depth: 10' | Date & Time: 10-05-10 7:00PM | Date & Time Completed: 10-05-10 11:15AM
Coordinates: N 2995843.1200 E 681321.7253 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre
Ground Elevation: 129.0' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	4 5 3 5	10"	Dry, loose, brown, COARSE SAND, some fine sand, trace organic silt.	
S-2	4' - 6'	14 4 5 9	8"	Wet, loose, brown, COARSE SAND, some fine gravel, trace fine sand.	EL. 124.0 PROP. BOTTOM OF WEST ABUTMENT
S-3	9' - 11'	12 12 10 9	12"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	EL. 119.0
S-4	14' - 16'	7 11 15 7	6"	Wet, medium dense, brown, COARSE SAND, some fine sand.	
S-5	19' - 21'	15 26 21 18	10"	Wet, dense, brown, COARSE SAND, some fine gravel, trace fine sand.	23' — EL. 106.0
S-6	24' - 25'6"	16 22 98/6"	8"	Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt.	
				Top of BEDROCK encountered at 29'.	29' — EL. 100.0
C-1	29' 29' - 34'	120 6 4 5 6 6	0" 56"	Began coring at 29'. Hard, moderately weathered, moderately fractured, pink-white to gray, GRANITE. Percent Recovery = 93%	
C-2	34' - 39'	4 6 5 6 6	59"	Hard, fresh, slightly fractured, gray and white GRANITE. Percent Recovery = 98%	EL. 93.5 APPROXIMATE PILE TIP ELEVATION, WEST ABUTMENT
				Bottom of Exploration = 39'	39' — EL. 90.0

Remarks: Sampling with cathead.

Arrow-Board: Signs: Cones:
Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:
Type of Drill Rig: Mobile B-47

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Casing HW Size: 4" Depth: 29'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140 lbs. Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING BB–1
SCALE: 1" = 5'

NEW HAMPSHIRE BORING, INC.
P.O. Box 165
Derry, NH 03038
Phone: (603)437-1610
Fax: (603) 437-0034
E Mail: nhb@nhboring.com

Boring No. BB-2
Scale 1" = 5'

City/Town: Concord | Bridge: Bridge Borings | Project File No: 602091 | Contract No: 58183
Project: Route 2 Construction at the Concord Rotary | Date & Time Started: 11-10-09 9:00AM | Total Hours: 6
Groundwater Depth: 8' | Date & Time: 11-10-09 2:00PM | Date & Time Completed: 11-10-09 3:00PM
Coordinates: N 2995815.9 E 681385.5 | Driller's Name: Peter Labossiere | Helper's Name: Jack Lefebvre
Ground Elevation: 128' | Inspector's Name: Derek Lee | Inspector's Company: Lamson Engineering, Inc. for AECOM

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches	Field Description	Strata Changes
S-1	0' - 2'	4 4 3 3	12"	Dry, loose, brown, COARSE SAND, some fine sand.	
S-2	4' - 6'	4 3 3 3	18"	Dry, loose, brown, COARSE SAND, some fine sand.	EL. 124.0 PROP. BOTTOM OF EAST ABUTMENT
S-3	9' - 11'	8 6 4 3	10"	Wet, loose to medium dense, COARSE SAND, some fine sand, trace inorganic silt.	EL. 120.0
					13'
S-4	14' - 16'	20 25 50 30	10"	Wet, very dense, brown, FINE SAND AND COARSE SAND, some inorganic silt.	
				Top of BEDROCK at 17', casing refusal at 17'.	17' — EL. 111.0
C-1	18' - 23'	8 8 7 9 11	47"	Rollerbit to 18' and began coring. Hard, gray, white GNEISS. Percent Recovery = 78%	
C-2	23' - 28'	8 4 5 6 6	60"	Hard, gray, white GNEISS. Percent Recovery = 78%	EL. 104.5 APPROXIMATE PILE TIP ELEVATION, EAST ABUTMENT
				Bottom of Exploration = 28'	28' — EL. 100.0

Remarks: Sampling with cathead.

Arrow-Board: Signs: Cones:
Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:
Type of Drill Rig: Mobile B-47

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Casing HW Size: 4" Depth: 17'
Hammer Weight: 300 lbs. Fall: 30"
Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140 lbs. Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BORING BB–2
SCALE: 1" = 5'

BORING NOTES:

BB–1

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS:
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
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 A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2009.
7. BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE DEPTHS AS SHOWN ON THE BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS.

NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR03(C19037)-BORINGS.DWG Plotted on 5-Feb-2019 3:29 PM
Second Structural Submittal (S2) 21-Jan-2019
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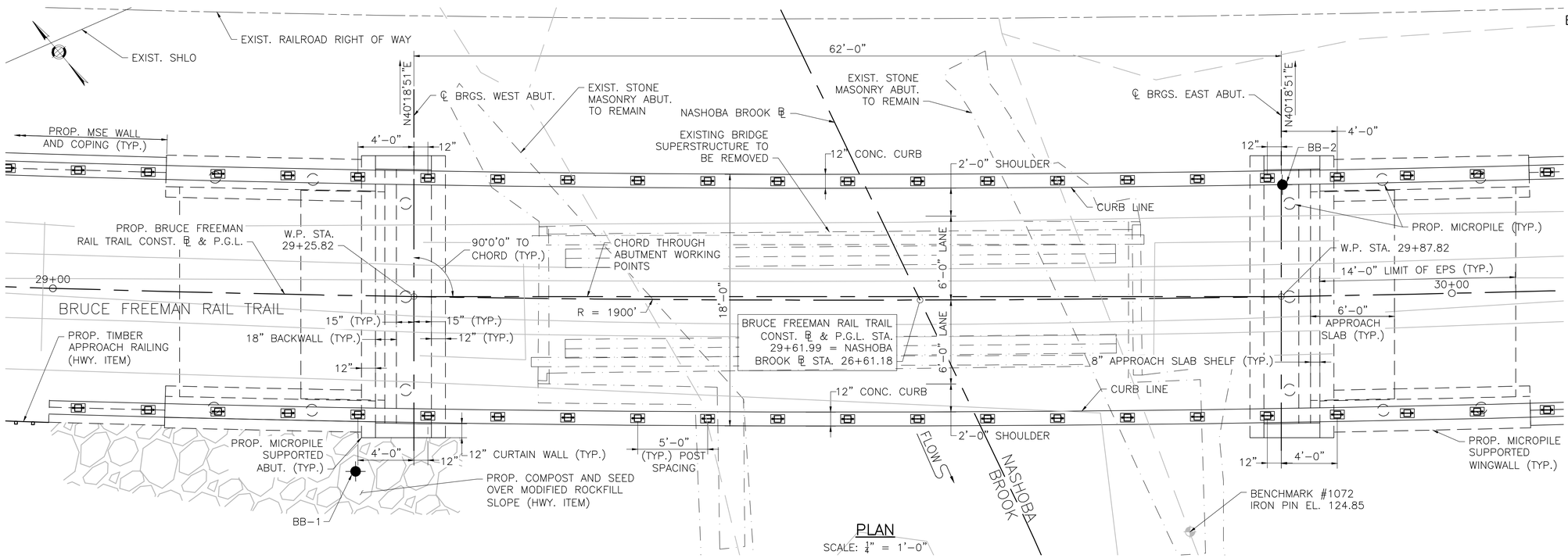
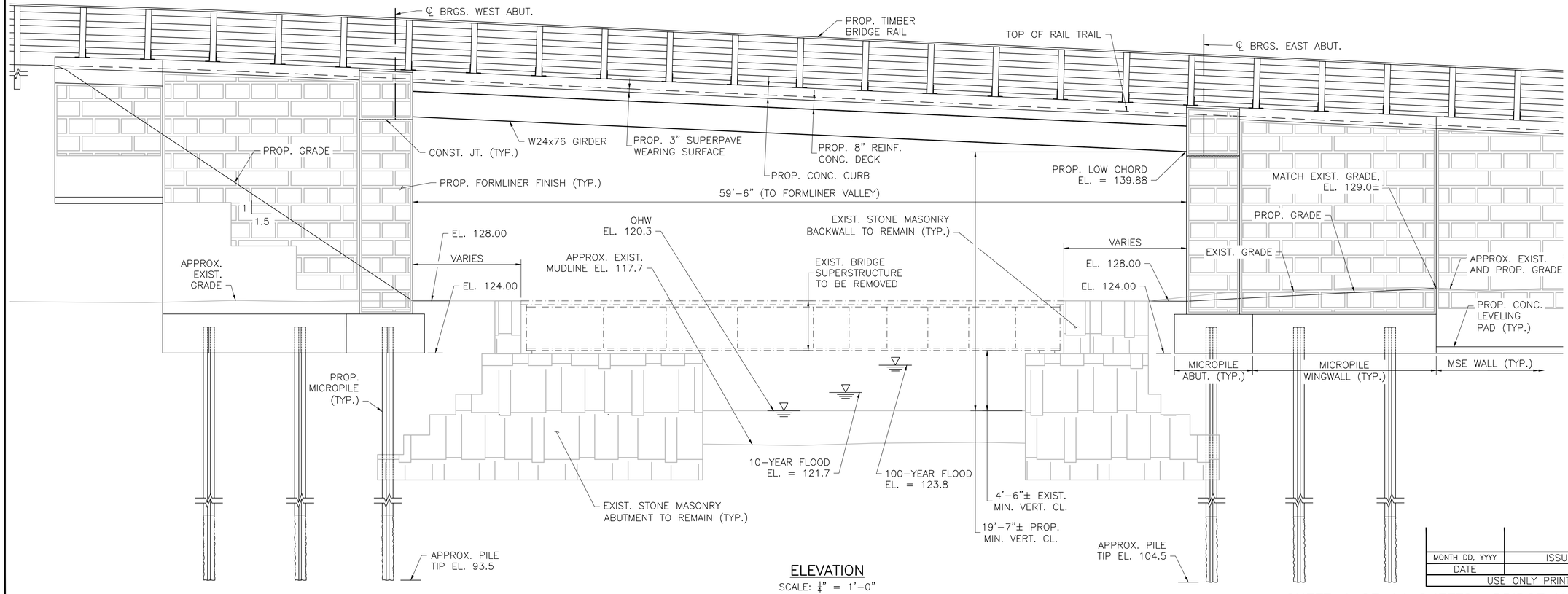
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	116	158
PROJECT FILE NO. 606223			

PLAN & ELEVATION



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



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

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 4 OF 14 SHEETS BRIDGE NO. C-19-037 (BF4)

Second Structural Submittal (S2) 21-Jan-2019

606223_BR04(C19037)-PLAN & ELEVATION.DWG Plotted on 5-Feb-2019 3:30 PM

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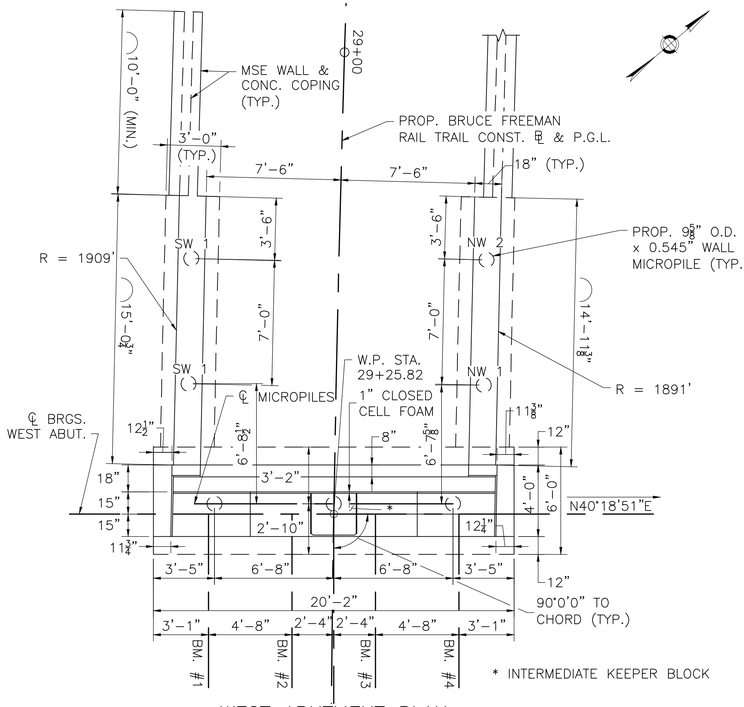
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	117	158
PROJECT FILE NO. 606223			

WEST ABUTMENT PLAN & ELEVATION

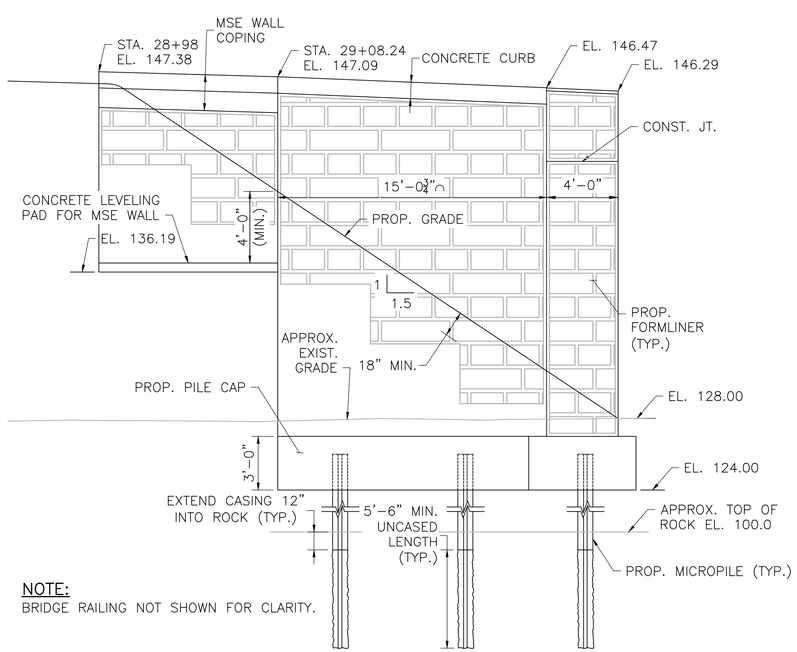


WEST ABUTMENT PLAN

SCALE: ¼" = 1'-0"

WINGWALL MICROPILE LOCATION TABLE

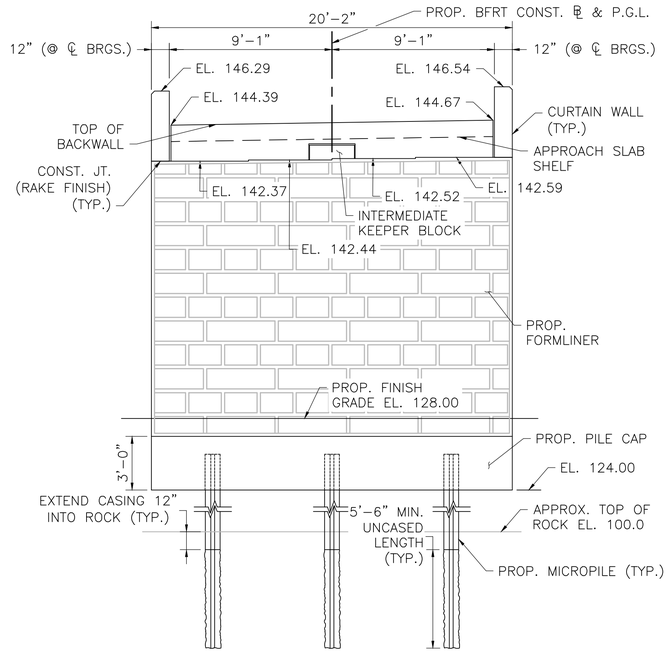
MICROPILE NO.	STATION	OFFSET	NORTHING	EASTING
NW 1	29+18.44	8.25' LT	2995861.0134	681332.9178
NW 2	29+11.41	8.25' LT	2995865.6589	681327.6814
SW 1	29+18.69	8.25' RT	2995848.4804	681322.1828
SW 2	29+11.72	8.25' RT	2995853.1249	681316.9455



NOTE:
BRIDGE RAILING NOT SHOWN FOR CLARITY.

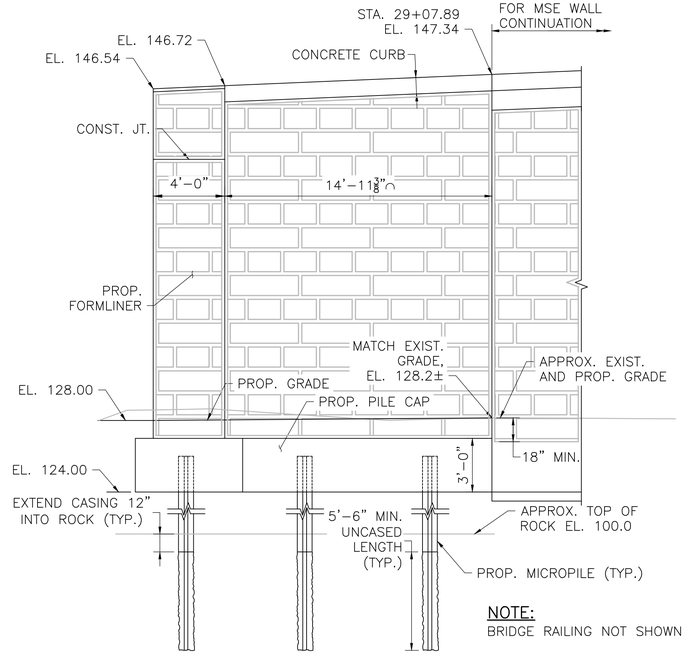
SOUTHWEST WALL ELEVATION

SCALE: ¼" = 1'-0"



WEST ABUTMENT ELEVATION

SCALE: ¼" = 1'-0"



NOTE:
BRIDGE RAILING NOT SHOWN FOR CLARITY.

NORTHWEST WALL ELEVATION

SCALE: ¼" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 5 OF 14 SHEETS BRIDGE NO. C-19-037 (BF4)

606223_BR05(C19037)-WABUT. PLAN & ELEV.DWG Plotted on 5-Feb-2019 3:31 PM

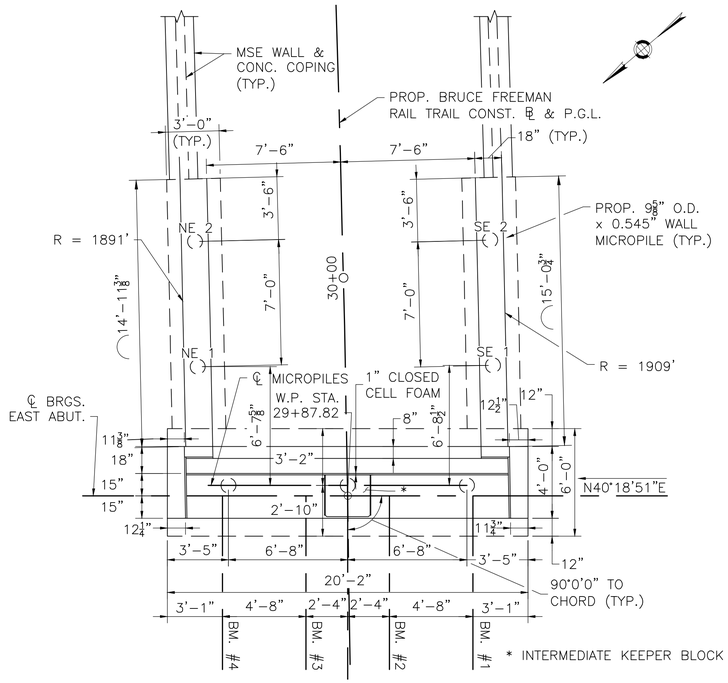
Second Structural Submittal (S2) 21-Jan-2019

V:\MAA-2007\01\06-BRF-2B\606223\DWG\BR05\C19037-WAbut. Plan & Elev.dwg 2/5/2019 3:30:59 PM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	118	158
PROJECT FILE NO. 606223			

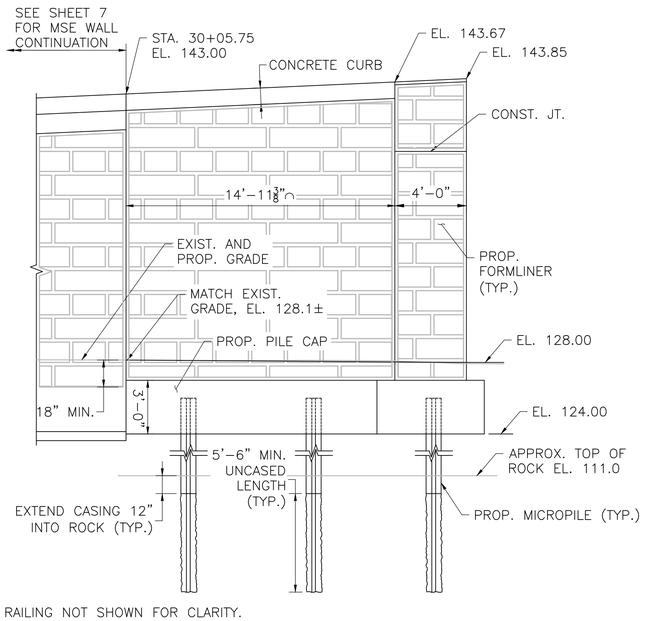
EAST ABUTMENT PLAN & ELEVATION



EAST ABUTMENT PLAN
SCALE: ¼" = 1'-0"

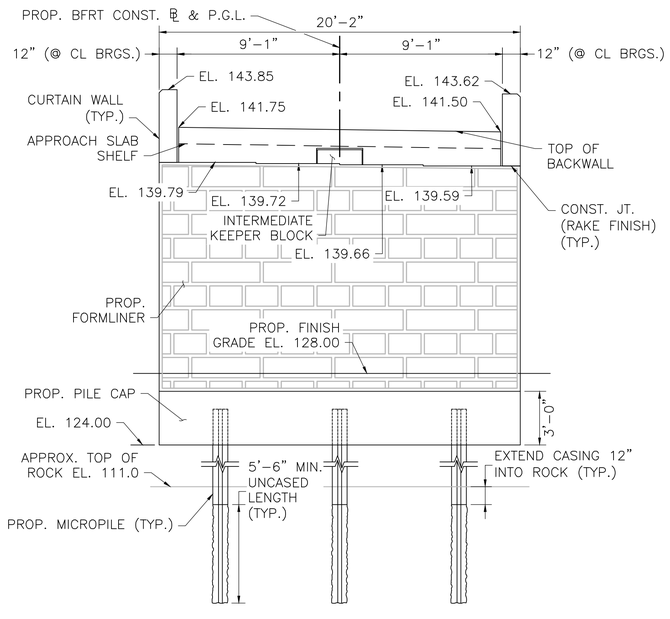
WINGWALL MICROPILE LOCATION TABLE

MICROPILE NO.	STATION	OFFSET	NORTHING	EASTING
SE 1	29+94.95	8.25' RT	2995798.9354	681380.5751
SE 2	30+01.92	8.25' RT	2995794.5245	681386.0106
NE 1	29+95.20	8.25' LT	2995811.5672	681391.1922
NE 2	30+02.23	8.25' LT	2995807.1553	681396.6269

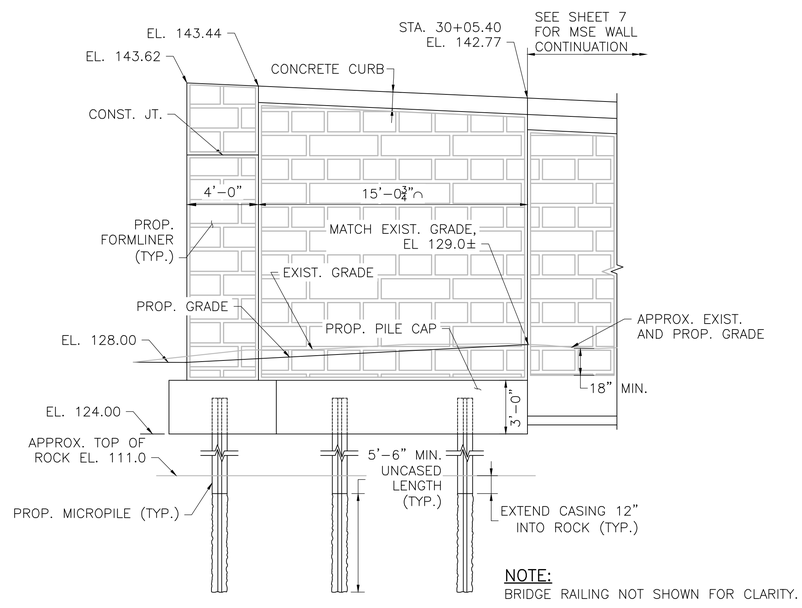


NOTE:
BRIDGE RAILING NOT SHOWN FOR CLARITY.

NORTHEAST WALL ELEVATION
SCALE: ¼" = 1'-0"



EAST ABUTMENT ELEVATION
SCALE: ¼" = 1'-0"



NOTE:
BRIDGE RAILING NOT SHOWN FOR CLARITY.

SOUTHEAST WALL ELEVATION
SCALE: ¼" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606222_BR06(C19037)-EABUT. PLAN & ELEV.DWG Plotted on 5-Feb-2019 3:31 PM
Second Structural Submittal (S2) 21-Jan-2019
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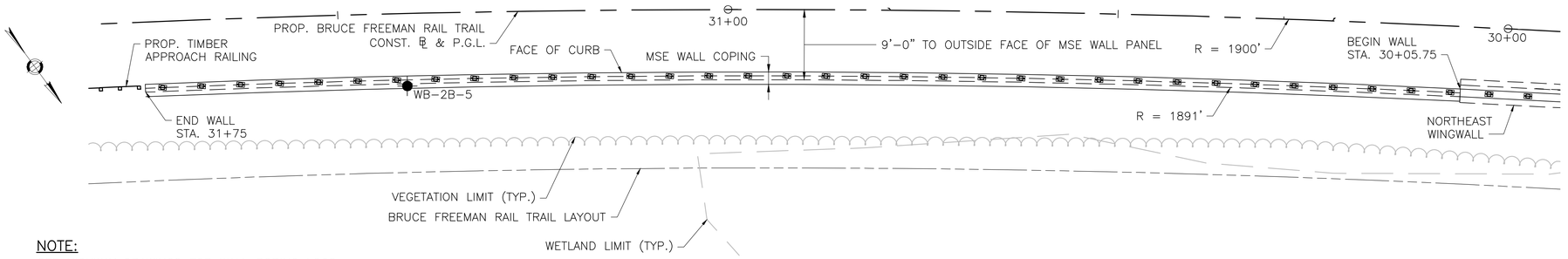
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

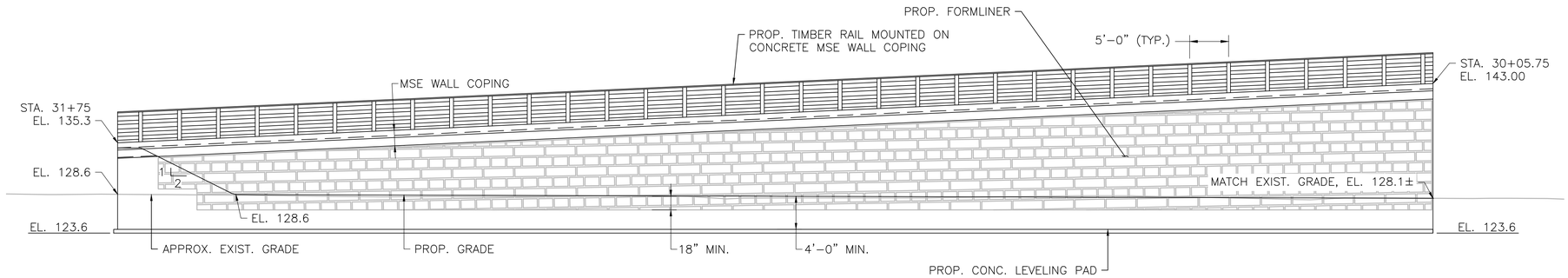
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	119	158
PROJECT FILE NO. 606223			

MSE WALL PLANS & ELEVATIONS

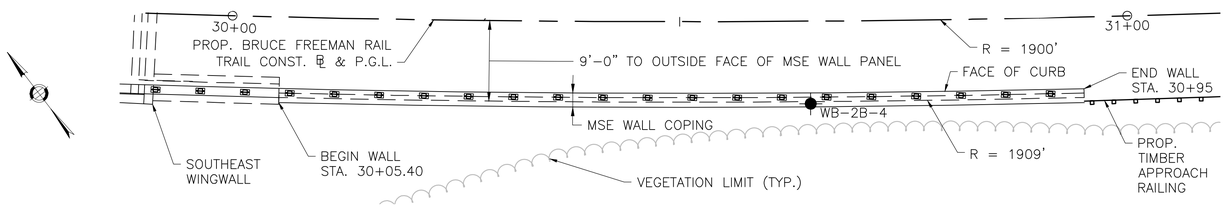


NOTE:
SEE HIGHWAY DRAWINGS FOR WALL BORING LOGS.

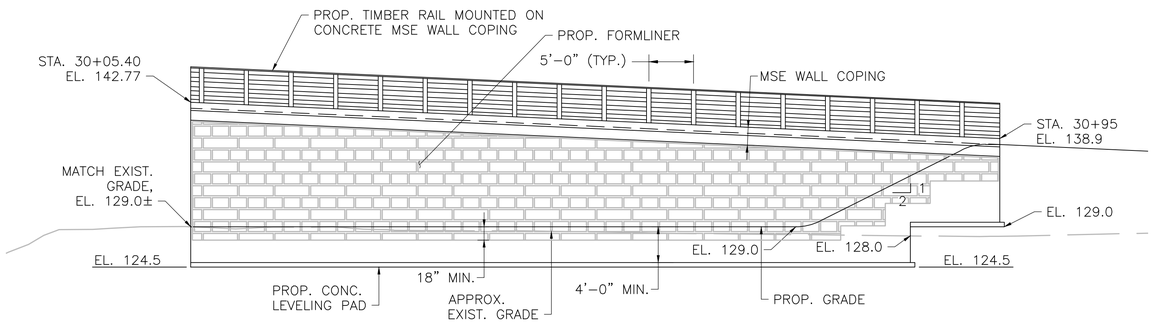
NORTHEAST MSE WALL PLAN
SCALE: ⅛" = 1'–0"



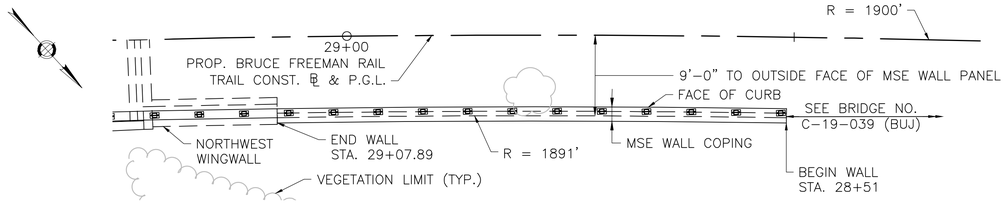
NORTHEAST MSE WALL ELEVATION
SCALE: ⅛" = 1'–0"



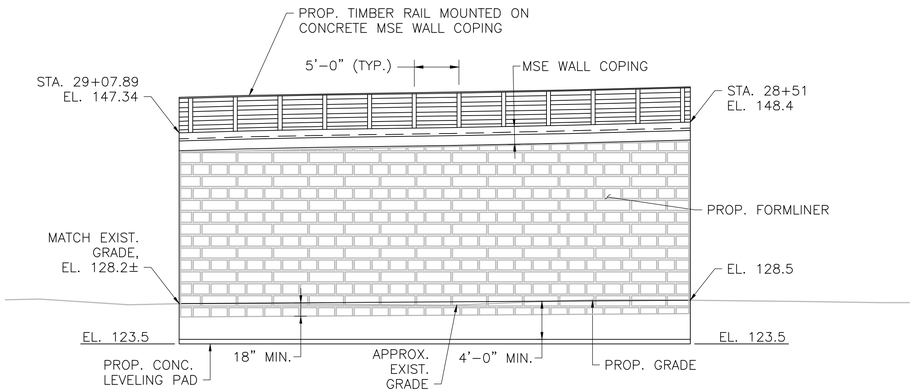
SOUTHEAST MSE WALL PLAN
SCALE: ⅛" = 1'–0"



SOUTHEAST MSE WALL ELEVATION
SCALE: ⅛" = 1'–0"



NORTHWEST MSE WALL PLAN
SCALE: ¼" = 1'–0"



NORTHWEST MSE WALL ELEVATION
SCALE: ⅛" = 1'–0"

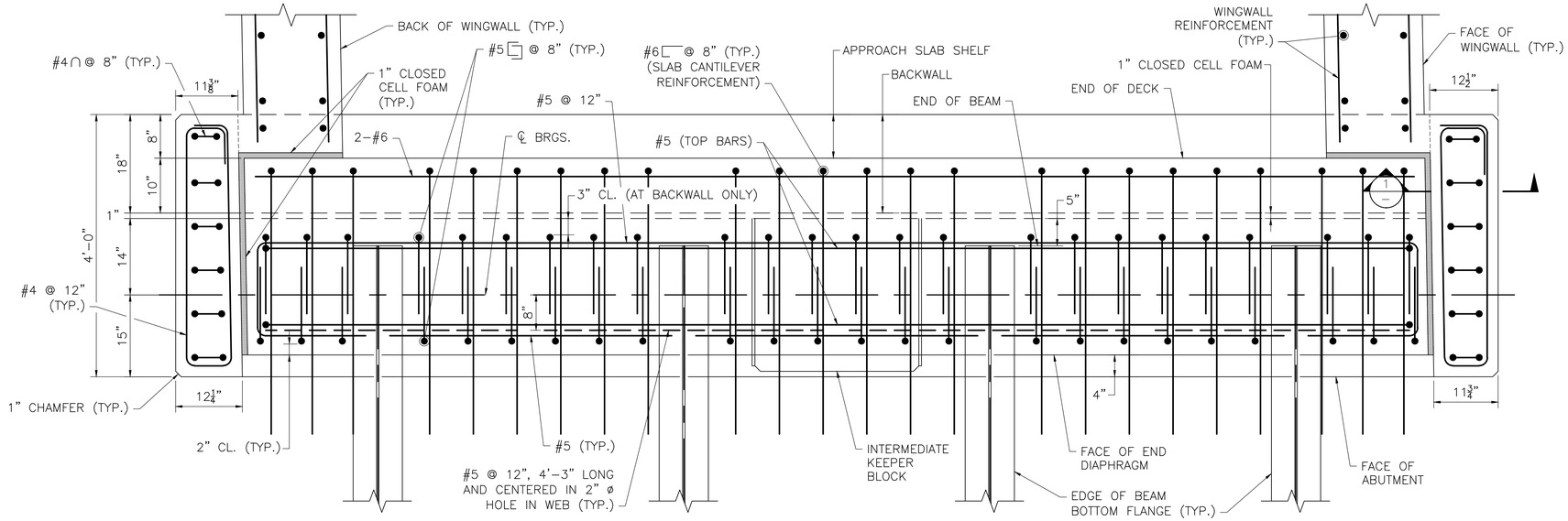
DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR07(C19037)-MSE WALLS PLANS & ELEVS.DWG Plotted on 5-Feb-2019 3:34 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\AAA-2007\245-BRF-2B\606223\DWG\BRI\MSE\21.BMSTC19037-MSE Walls Plans & Elevs.dwg 2/5/2019 3:32:30 PM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	120	158
PROJECT FILE NO. 606223			

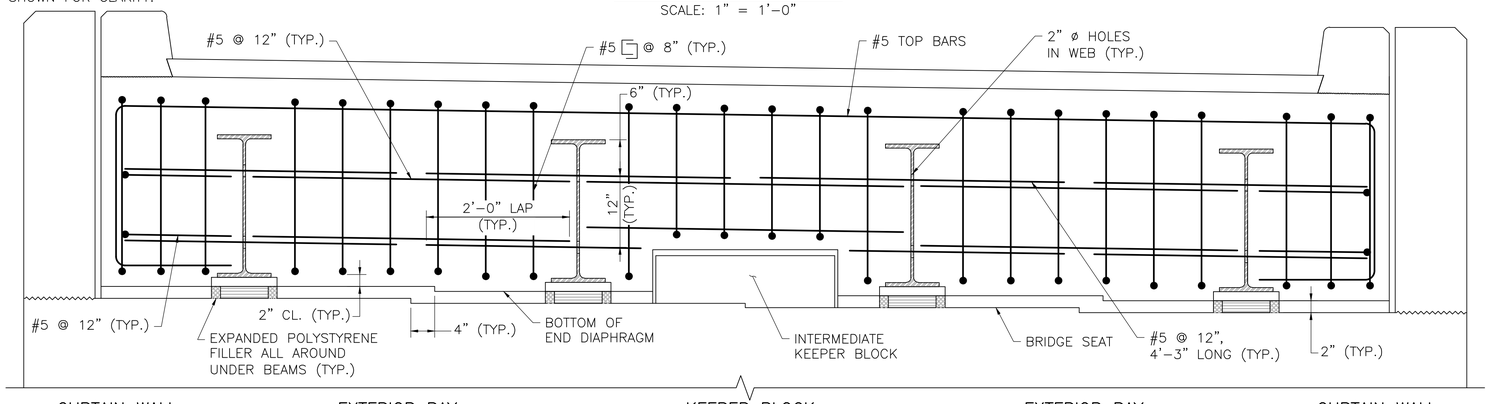
ABUTMENT DETAILS (1 OF 2)



CURTAIN WALL | EXTERIOR BAY | KEEPER BLOCK | EXTERIOR BAY | CURTAIN WALL

NOTES:
1. EAST ABUTMENT SHOWN, WEST ABUTMENT SIMILAR.
2. FORMLINER NOT SHOWN FOR CLARITY.

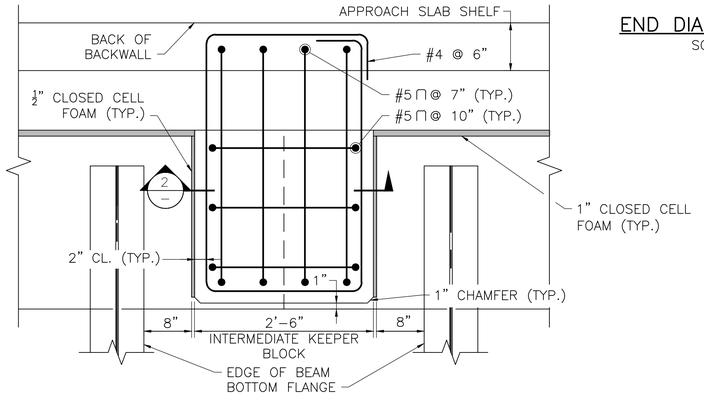
END DIAPHRAGM PLAN
SCALE: 1" = 1'–0"



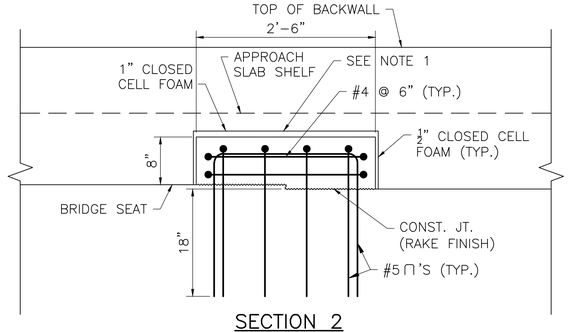
CURTAIN WALL | EXTERIOR BAY | KEEPER BLOCK | EXTERIOR BAY | CURTAIN WALL

END DIAPHRAGM ELEVATION
SCALE: 1" = 1'–0"

NOTE:
CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.



INTERMEDIATE KEEPER BLOCK
SCALE: 1" = 1'–0"



SECTION 2
SCALE: 1" = 1'–0"

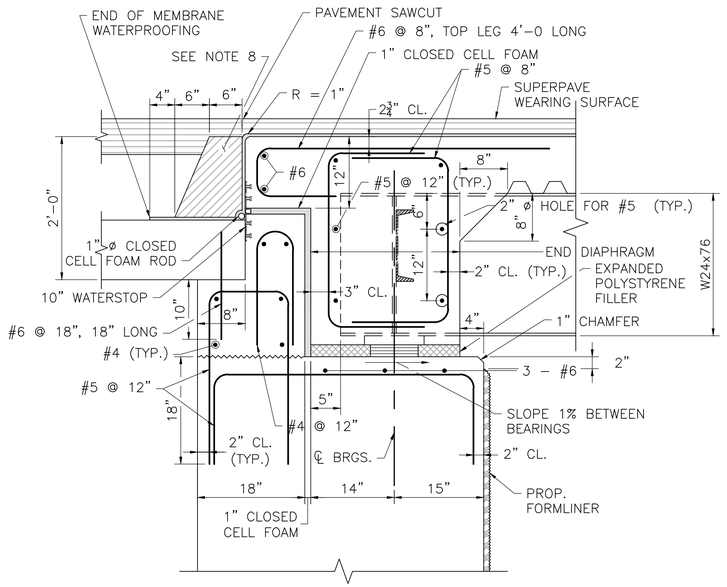
NOTES:
1. TOP OF KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.
2. ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

NOTE:
ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

SECTION 1
SCALE: 1" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR08(C19037)-ABUT. DETAILS 1 OF 2.DWG Plotted on 5-Feb-2019 3:34 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\AAA-2021\248-BRT-JR\606223\DWG\BR08\021.BR08(C19037)-Abut. Details 1 of 2.dwg 3/5/2019 1:34:25 PM, DWG To PDF.pc3

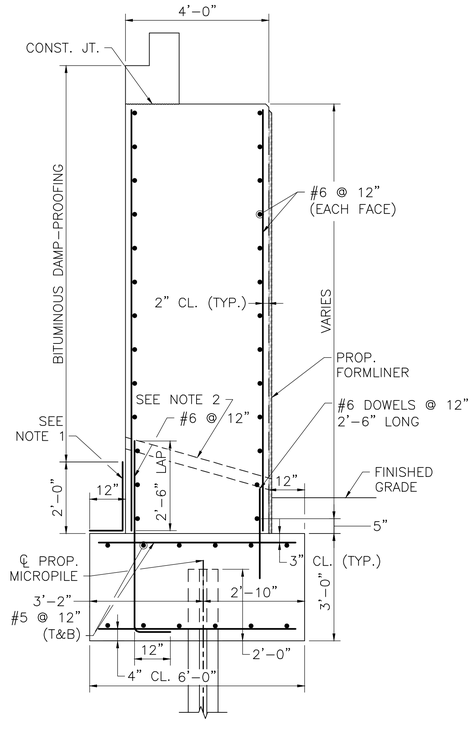


DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'–0"

ROADWAY SECTION NOTES:

1. ALL REINFORCEMENT SHOWN IN THIS DETAIL SHALL BE COATED.
2. ALL BACKWALL CONCRETE ABOVE THE CONSTRUCTION JOINT LOCATED AT THE BRIDGE SEAT SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE. THE CONSTRUCTION JOINT SHALL BE GIVEN A RAKE FINISH WITH A ¼" MINIMUM AMPLITUDE.
3. TOP OF BACKWALL SHALL BE TROWELED SMOOTH PARALLEL TO THE PROFILE GRADE.
4. THE BACKWALL, KEEPER BLOCK, AND CURTAIN WALL CONCRETE MUST BE PLACED AND SUFFICIENTLY CURED PRIOR TO PLACING THE END DIAPHRAGM CONCRETE.
5. THE END DIAPHRAGM CONCRETE SHALL BE 4000 PSI, ¾ IN, 585 HP CEMENT CONCRETE AND SHALL BE PLACED MONOLITHICALLY WITH THE DECK.
6. PRIOR TO PLACING THE END DIAPHRAGM CONCRETE, CLOSED CELL FOAM OF THE SPECIFIED THICKNESSES SHALL BE ATTACHED WITH ADHESIVE TO ALL SURFACES OF THE BACKWALL, KEEPER BLOCKS, AND CURTAIN WALLS AS SHOWN ON THE PLANS. EXPANDED POLYSTYRENE FILLER SHALL BE PLACED UNDER THE BEAM SOLE PLATE AND THE BOTTOM OF THE END DIAPHRAGM SHALL BE FORMED AS SPECIFIED. THE CONTRACTOR SHALL INSURE THAT ALL ABUTMENT CONCRETE IS PROPERLY LINED. END DIAPHRAGM CONCRETE MUST NOT COME IN DIRECT CONTACT WITH ABUTMENT CONCRETE.
7. DRAPE MEMBRANE WATERPROOFING OVER CLOSED CELL FOAM BACKER ROD.
8. PROTECTIVE COURSE TO BE SUPERPAVE BRIDGE PROTECTIVE COURSE (SPC–B–12.5), PLACED IN 2" LAYERS AND COMPACTED WITH A MECHANICAL HAND–GUIDED TAMPER WITHIN 12 HOURS AFTER PLACING MEMBRANE WATERPROOFING.



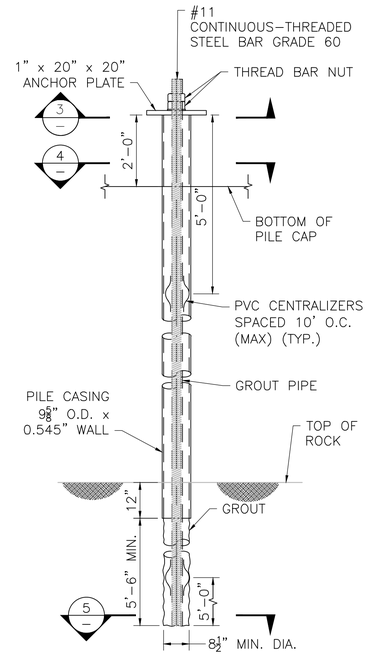
TYPICAL ABUTMENT SECTION

SCALE: ½" = 1'–0"

ABUTMENT NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, ¾ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ø WEEP HOLES 10'–0" O.C. (JUST ABOVE PROTECTIVE COURSE).
3. ALL CONCRETE SHALL BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE.
4. THE FACTORED AXIAL DESIGN LOAD PER PILE IS 193 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   THE FACTORED STRUCTURAL RESISTANCE PER PILE IS 198 KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF 264 KIPS AND A RESISTANCE FACTOR OF 0.75.
5. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 195 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 354 KIPS AND A RESISTANCE FACTOR OF 0.55. THE ESTIMATED TIP ELEVATIONS ARE 93.5 AT THE WEST ABUTMENT AND 104.5 AT THE EAST ABUTMENT.

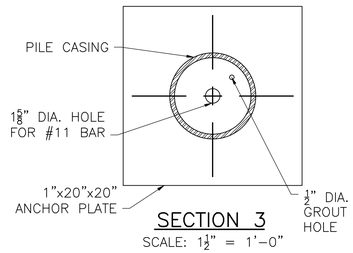


MICROPILE ELEVATION

SCALE: ½" = 1'–0"

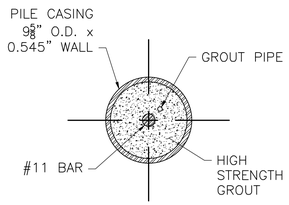
MICROPILE NOTES:

1. STEEL CASING SHALL CONFORM TO THE REQUIREMENTS OF API 5L GRADE X52 PSL 2 WHICH HAS A MINIMUM YIELD STRENGTH OF 52,000 PSI.
2. ANCHOR PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A709 GRADE 50.
3. GROUT SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 5000 PSI AND BE PLACED BY GRAVITY HEAD ONLY.
4. CENTRAL REINFORCING BAR SHALL CONFORM TO ASTM A615 GRADE 60 AND BE CONTINUOUSLY THREADED FOR THE ENTIRE BAR LENGTH.
5. FOR CASING SPLICE REQUIREMENTS, SEE SPECIAL PROVISIONS.
6. PRIOR TO THE START OF THE INSTALLATION OF THE MICROPILES, THE CONTRACTOR SHALL SUBMIT A PILE SCHEDULE, PILE INSTALLATION AND PILE TESTING PLAN FOR REVIEW AND APPROVAL OF THE ENGINEER.



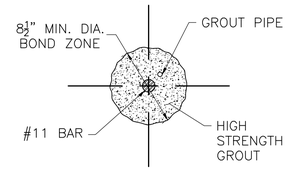
SECTION 3

SCALE: 1½" = 1'–0"



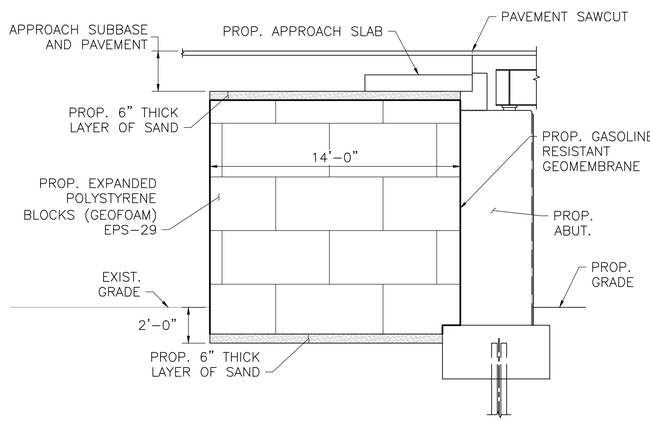
SECTION 4

SCALE: 1½" = 1'–0"



SECTION 5

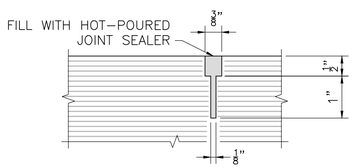
SCALE: 1½" = 1'–0"



ABUTMENT EPS DETAILS

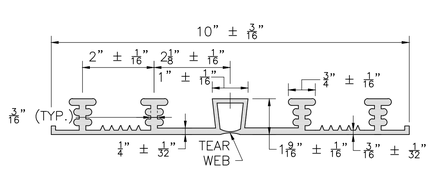
SCALE: ¼" = 1'–0"

NOTE:
REFER TO SPECIAL PROVISIONS FOR ADDITIONAL EPS REQUIREMENTS.



PAVEMENT SAWCUT DETAIL

NOT TO SCALE

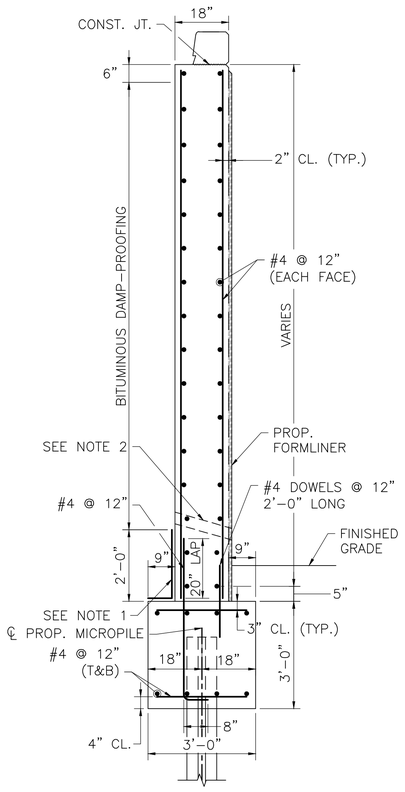


10" WATERSTOP

NOT TO SCALE

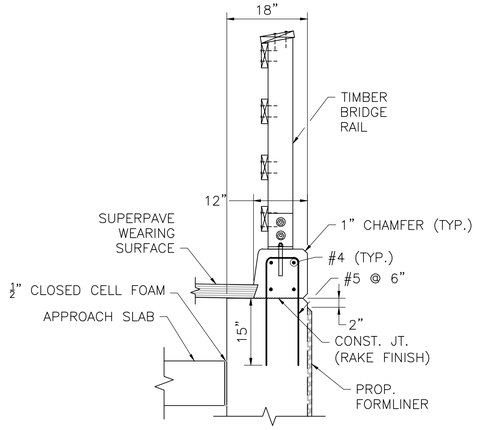
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR09(C19037)-ABUT. DETAILS 2 OF 2.DWG Plotted on 5-Feb-2019 3:34 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\MAA-2007001\00-BRF-2BVBIO\2%5CWS\BRIDGE\1_BR09C19037-Abut Details 2 of 2.dwg 2/1/2019 3:33:34 PM DWG To PDF.pc3



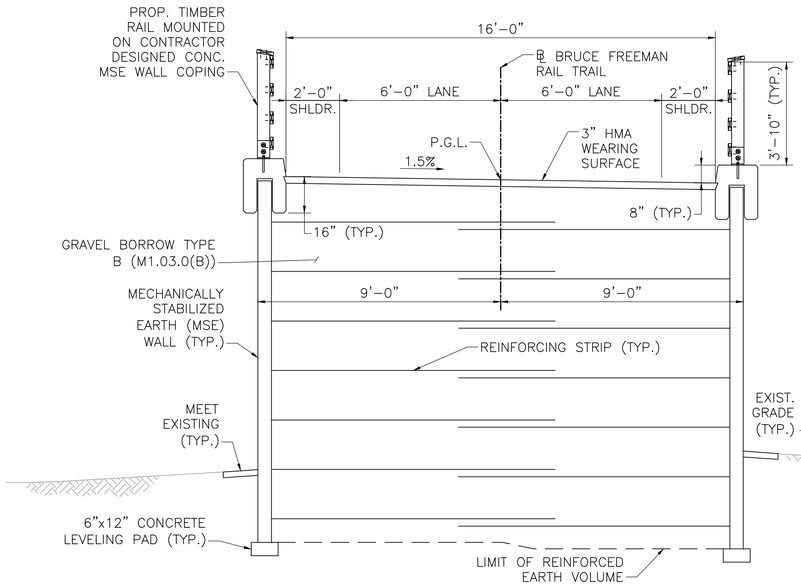
TYPICAL WINGWALL SECTION

SCALE: $\frac{1}{2}$" = 1'–0"



TOP OF WINGWALL DETAILS

SCALE: $\frac{3}{4}$" = 1'–0"



APPROACH MSE WALL DETAILS

SCALE: $\frac{3}{8}$" = 1'–0"

MSE WALL NOTES:

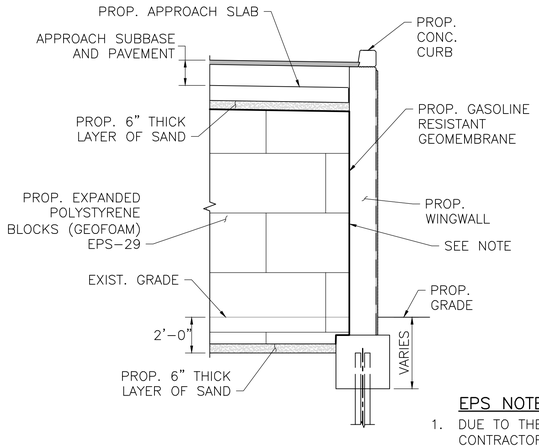
1. THE FACTORED BEARING PRESSURE = 6.07 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

   FACTORED BEARING RESISTANCE = 6.10 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.65.

2. THE SOIL REINFORCEMENT LENGTH SHALL BE AS A MINIMUM 70% OF THE DESIGN HEIGHT (H) BUT NOT LESS THAN 8'–0".

WINGWALL NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ø WEEP HOLES 10'–0" O.C. (JUST ABOVE PROTECTIVE COURSE).
3. ALL CONCRETE SHALL BE 4000 PSI, 1$\frac{1}{2}$ IN, 565 CEMENT CONCRETE.
4. THE FACTORED AXIAL DESIGN LOAD PER PILE IS 193 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
5. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 195 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 354 KIPS AND A RESISTANCE FACTOR OF 0.55. THE ESTIMATED TIP ELEVATIONS ARE 93.5 AT THE WEST WINGWALLS AND 104.5 AT THE EAST WINGWALLS.



WINGWALL EPS DETAILS

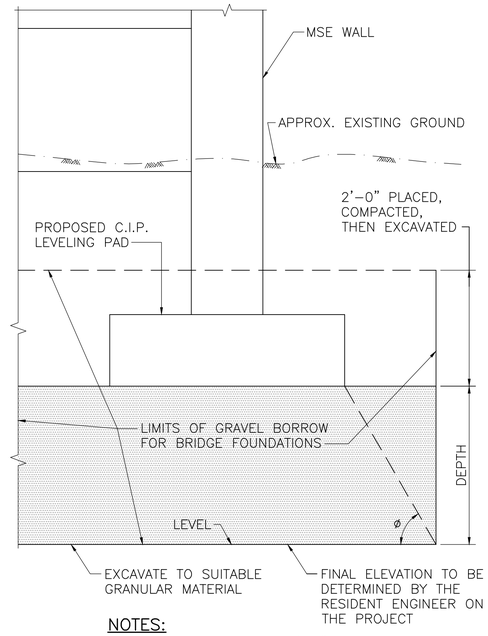
SCALE: $\frac{1}{4}$" = 1'–0"

EPS NOTES:

1. DUE TO THE CURVATURE OF THE TRAIL AND THE WINGWALLS, THE CONTRACTOR HAS THE OPTION TO TERMINATE THE EPS 6" FROM THE BACK OF THE PROPOSED WINGWALLS AND INSTALL THE EPS WITH A VERTICAL FACE. IF THIS OPTION IS CHOSEN, THE VOID SHALL BE FILLED WITH COMPACTED SAND FILL.
2. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL EPS REQUIREMENTS.

MSE NOTES:

1. UNSUITABLE SOILS SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW FOR BRIDGE FOUNDATIONS AS DETERMINED BY THE ENGINEER.
2. REFER TO SPECIAL PROVISIONS FOR THE FOLLOWING:
   - INFORMATION REGARDING PANELS, JOINTS, FILTER FABRIC AND MSE WALL REQUIREMENTS.
   - DESIGN CRITERIA AND MATERIAL REQUIREMENTS NOT SHOWN ON THESE PLANS.
   - MSE WALL FOUNDATION PREPARATION REQUIREMENTS
   - EXCAVATION PAYMENT LIMITS



NOTES:

1. ø = 45° FOR DEPTH OF 5'–0" OR LESS.
   ø = 60° FOR DEPTH OVER 5'–0".
2. SAME TREATMENT IS TO BE USED AT ENDS OF WALLS, PIERS, AND ABUTMENTS.

LIMITS OF GRAVEL BORROW FOR BRIDGE FOUNDATIONS

NOT TO SCALE

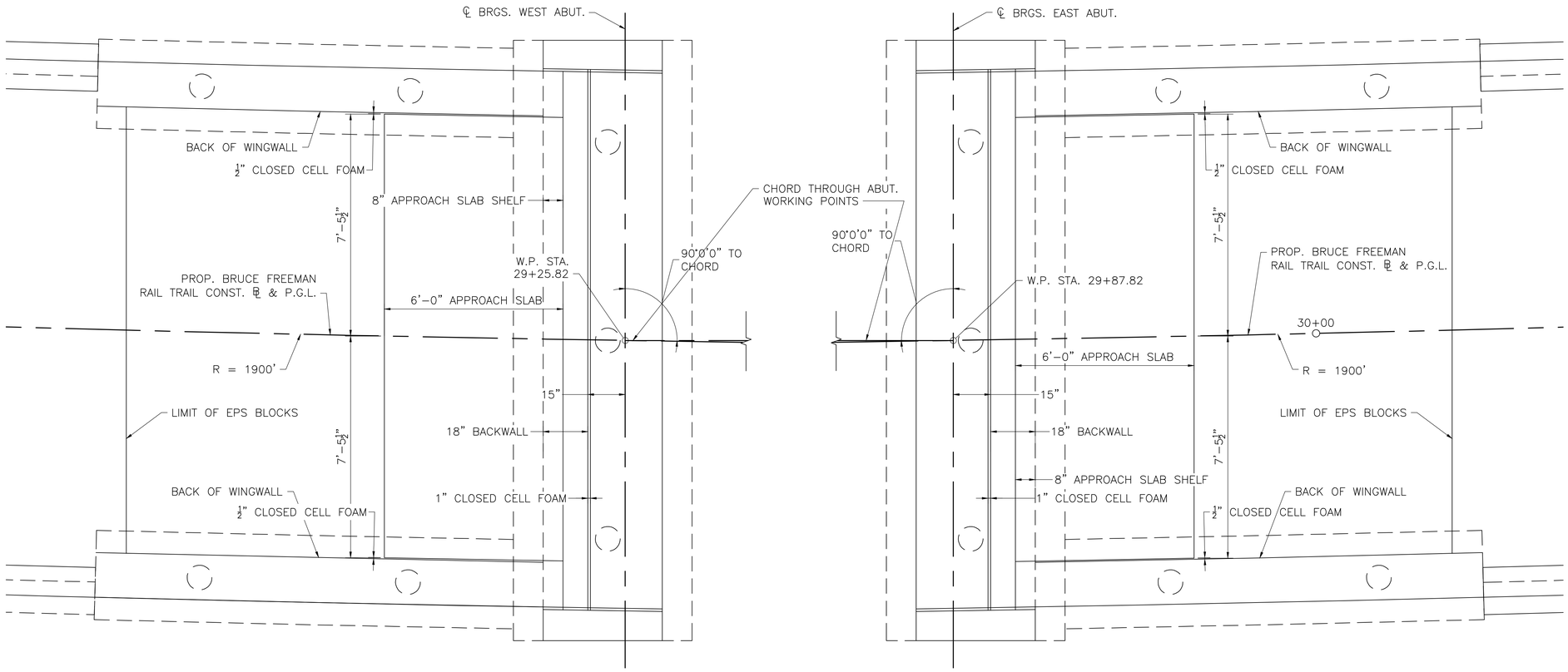
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR10(C19037)-WALL DETAILS.DWG Plotted on 5-Feb-2019 3:34 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\MAA-2007\0436-BRT-3R\606223\DWG\BR4\BD21_BR10(C19037)-Wall Details.dwg 2/5/2019 3:34:43 PM, DWG To PDF.pc3

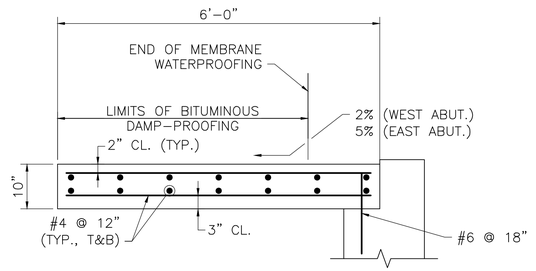
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	123	158
PROJECT FILE NO. 606223			

APPROACH SLAB PLAN & DETAILS



APPROACH SLAB PLAN
SCALE: ½" = 1'–0"



NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO THE ℄ OF CONSTRUCTION. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

APPROACH SLAB DETAILS
SCALE: ¾" = 1'–0"

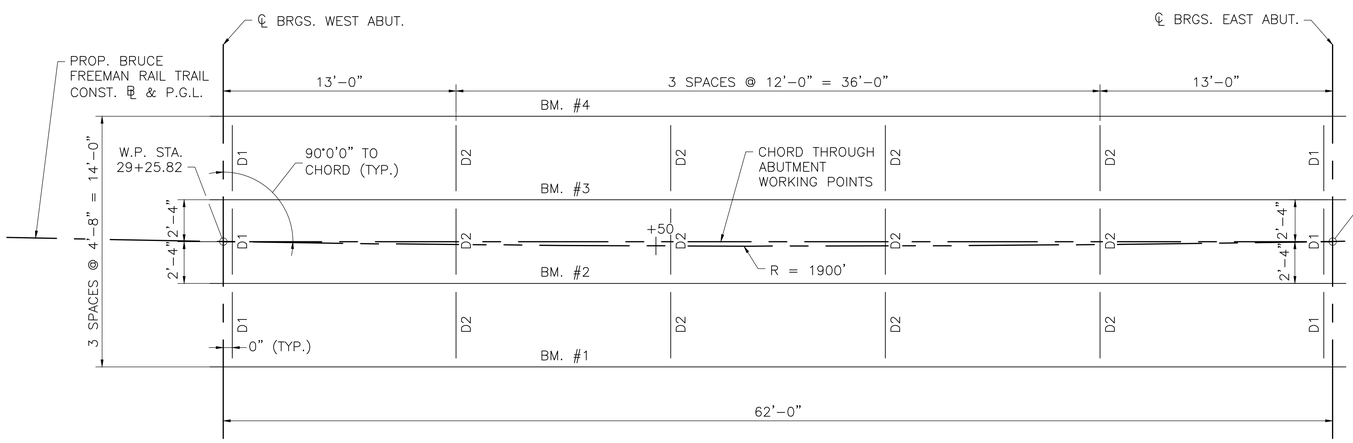
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR11(C19037)-APPR. SLAB.DWG Plotted on 5-Feb-2019 3:34 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\MAA\2870\49.BRT-3R\606223\DWG\BR#\BR11\C19037- Appr. Slab.dwg 2/5/2019 3:34:19 PM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	124	158
PROJECT FILE NO. 606223			

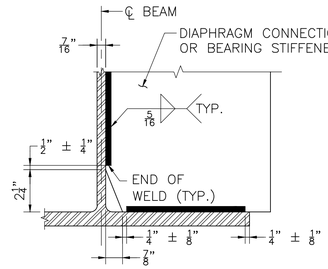
FRAMING PLAN & STRUCTURAL STEEL DETAILS



FRAMING PLAN
SCALE: 1/4" = 1'–0"

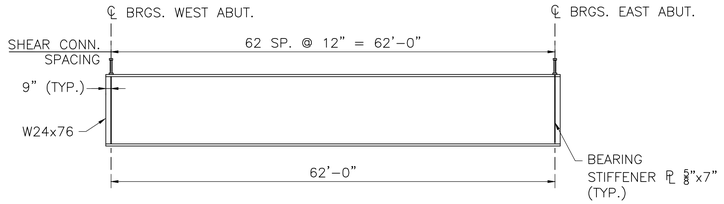
FRAMING PLAN NOTES:

1. D1 = C12x20.7
   D2 = C12x20.7
2. SEE THIS SHEET FOR DIAPHRAGM DETAILS.
3. THE MAIN LOAD CARRYING MEMBERS ARE BM. #1 THROUGH BM. #4.
4. ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50 (GALVANIZED) AND PAINTED TO MATCH COLOR CHIP NO. 16495 OF FEDERAL STANDARD 595B.
5. SEE THIS SHEET FOR CAMBER TABLE.
6. FOR SHEAR STUD SPACING, SEE BEAM ELEVATION (THIS SHEET).

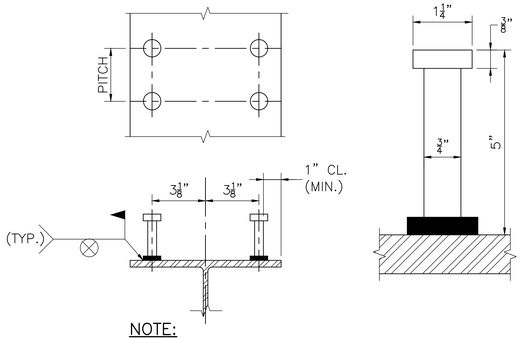


CLIP DETAIL
NOT TO SCALE

NOTE:
AT STIFFENER LOCATIONS, MODIFY THE PLATE ATTACHMENT TO THE FLANGES AS SHOWN IN THE TYPICAL STIFFENER ATTACHMENTS ON THIS SHEET.



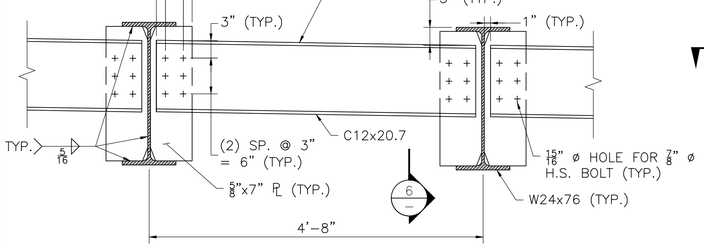
BEAM ELEVATION
HORIZ. SCALE: 1" = 10'–0"
VERT. SCALE: 1/2" = 1'–0"



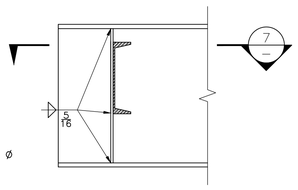
NOTE:
7/8" ø STUDS MAY BE SUBSTITUTED FOR 3/4" ø STUDS BY ADJUSTING THE PITCH TO PROVIDE AN EQUIVALENT CROSS–SECTIONAL AREA PER FOOT.

STUD SHEAR CONNECTORS
NOT TO SCALE

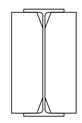
CAMBER TABLE (INCHES)												
BM. NO.		SPAN NO. 1										
		℄ BRG. W. ABUT	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	℄ BRG. E. ABUT
1	STEEL DL DEFLECTION	0.00	0.16	0.29	0.38	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.90	1.64	2.21	2.62	2.75	2.63	2.25	1.64	0.90	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.49	0.58	0.61	0.58	0.50	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.42	2.60	3.55	4.28	4.61	4.28	3.61	2.60	1.42	0.00
2	STEEL DL DEFLECTION	0.00	0.16	0.29	0.39	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.88	1.61	2.17	2.57	2.69	2.57	2.21	1.61	0.88	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.48	0.57	0.60	0.57	0.49	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.39	2.56	3.50	4.21	4.54	4.22	3.55	2.56	1.39	0.00
3	STEEL DL DEFLECTION	0.00	0.16	0.29	0.39	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.87	1.57	2.12	2.52	2.64	2.52	2.16	1.57	0.87	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.49	0.58	0.60	0.58	0.49	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.38	2.53	3.46	4.17	4.49	4.17	3.51	2.53	1.38	0.00
4	STEEL DL DEFLECTION	0.00	0.16	0.29	0.38	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.85	1.54	2.08	2.47	2.59	2.47	2.12	1.54	0.85	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.37	0.50	0.59	0.62	0.59	0.51	0.37	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.37	2.51	3.43	4.13	4.46	4.14	3.48	2.51	1.37	0.00



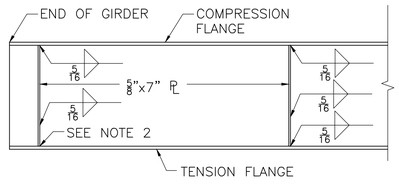
END DIAPHRAGM (D1) DETAILS
SCALE: 1" = 1'–0"



SECTION 6
SCALE: 1" = 1'–0"



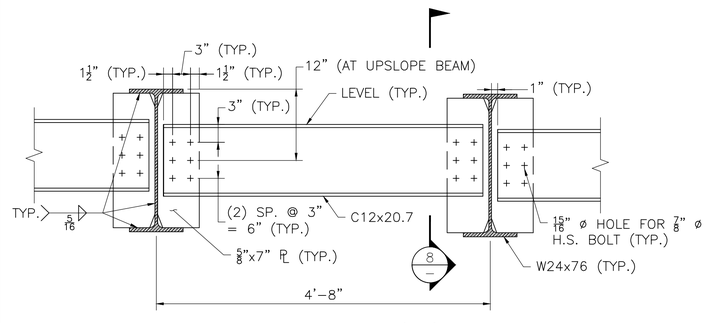
SECTION



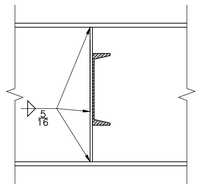
END BEARING

INTERMEDIATE DIAPHRAGM

STIFFENER ATTACHMENT DETAILS
SCALE: 3/4" = 1'–0"



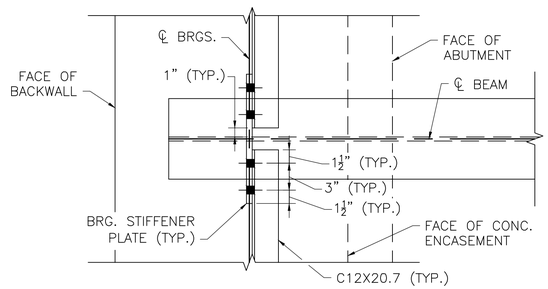
INTERMEDIATE DIAPHRAGM (D2) DETAILS
SCALE: 1" = 1'–0"



SECTION 8
SCALE: 1" = 1'–0"

NOTES:

1. SEE CLIP DETAIL ON THIS SHEET.
2. BEARING STIFFENER PLATE AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH 5/16" FILLET WELDS BOTH SIDES OF PLATE.
3. ALL INTERMEDIATE STIFFENERS SHALL BE PERPENDICULAR TO THE WEB AND TO THE GIRDER FLANGES.
4. ALL BEARING STIFFENERS SHALL BE PLUMB.
5. ENDS OF BEAMS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS WILL BE PLUMB.



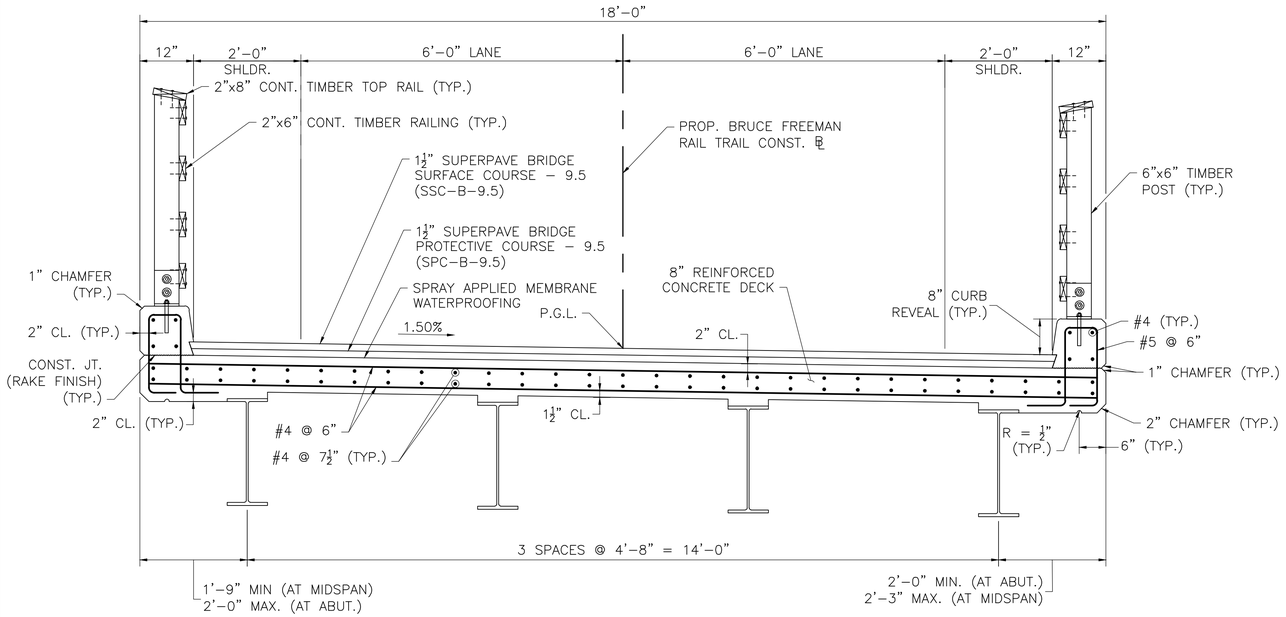
SECTION 7
SCALE: 1 1/2" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

Second Structural Submittal (S2) 21-Jan-2019

606223_BR12(C19037)-FRAMING PLAN.DWG Plotted on 5-Feb-2019 3:35 PM

V:\MAA\2007\0436.BMT-2B\606223\DWG\BR\606223_BR12(C19037)-Framing Plan.dwg, 2/5/2019 3:34:57 PM, DWG To PDF.pc3



PROPOSED CROSS SECTION

SCALE: ¾" = 1'–0"

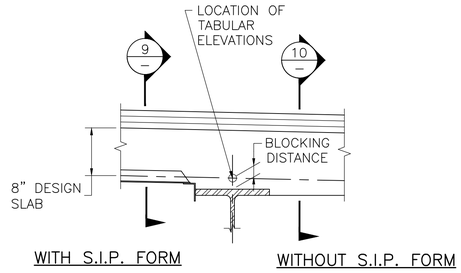
	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE								
	INCREASING STATIONS →								
BEAM NO.	℄ BRG. W. ABUT	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG. E. ABUT
1	144.78	144.54	144.28	144.00	143.67	143.30	142.89	142.46	142.00
2	144.85	144.61	144.35	144.06	143.74	143.37	142.96	142.52	142.07
3	144.93	144.68	144.42	144.13	143.80	143.43	143.02	142.59	142.13
4	145.00	144.76	144.49	144.20	143.87	143.50	143.09	142.66	142.20

NOTE:

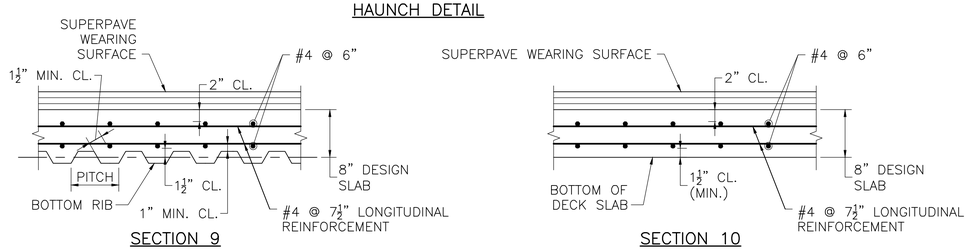
AFTER THE BEAMS ARE ERECTED BUT BEFORE THE FORMS ARE BUILT, ELEVATIONS ON TOP OF THE FLANGE OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.

NOTES:

1. CONCRETE DECK SLAB AND CURB SHALL BE 4000 PSI, ¾ IN., 585 HP CEMENT CONCRETE.
2. LONGITUDINAL REINFORCEMENT SHALL BE PLACED PARALLEL TO THE ℄ OF CONSTRUCTION. TRANSVERSE (PRIMARY) REINFORCEMENT SHALL BE PLACED PERPENDICULAR TO THE ℄ OF CONSTRCUTION.
3. ALL REINFORCEMENT AND SUPPORT DEVICES SHALL BE COATED.
4. THE FINISHED SURFACE OF BRIDGE DECK SHALL BE SMOOTH AND WITHOUT ANY PROJECTIONS THAT COULD PUNCTURE THE MEMBRANE WATERPROOFING OR DEPRESSION THAT COULD RETAIN WATER.



HAUNCH DETAIL

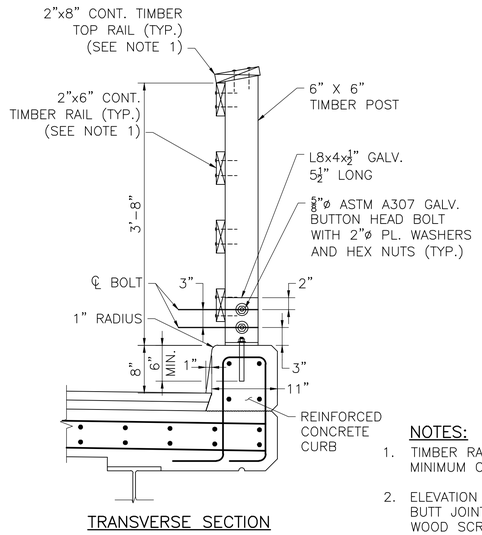


STAY–IN–PLACE FORM DETAILS

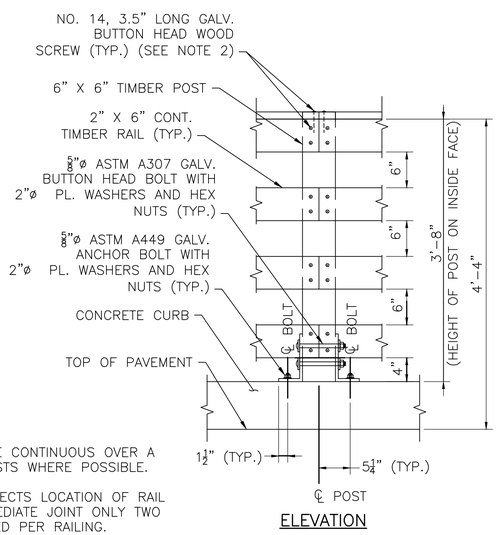
NOT TO SCALE

S.I.P FORM NOTES:

1. FOR 2" S.I.P. FORM, SET BOTTOM OF FORM 1" BELOW ELEVATION GIVEN IN TABLE. FOR 3" S.I.P. FORM, SET BOTTOM OF FORM 1½" BELOW TABLE ELEVATIONS.
2. FORM ENDS SHALL BE CRIMPED CLOSED IN A TAPERED MANNER. SEPARATE END CLOSURE PIECES WILL NOT BE ALLOWED.
3. SUPPORT ANGLES SHALL BE PLACED IN THE "LEG DOWN" POSITION WHERE POSSIBLE. WHERE "LEG UP" POSITION IS NECESSARY, THE UPPER MOST PORTION OF THE ANGLE SHALL NOT PROJECT MORE THAN 1" ABOVE THE TOP FLANGE OR COVER PLATE. THE CONTRACTOR SHALL HAVE AN ASSORTMENT OF ANGLES OF VARIOUS SIZES AVAILABLE ON THE SITE TO CONFORM TO THIS REQUIREMENT.
4. ALL MAIN STEEL REINFORCEMENT IN THE LOWER MAT SHALL BE CENTERED OVER THE VALLEY OF THE S.I.P. FORM.
5. CONTRACTOR SHALL DESIGN AND DETAIL ALL ELEMENTS OF THE FORMING SYSTEM AND SHALL SUBMIT TO THE ENGINEER FOR APPROVAL.
6. IN CASES WHERE STANDARD 2" OR 3" DEEP S.I.P. FORMS DO NOT SATISFY DESIGN REQUIREMENTS AN ALTERNATIVE FORMING SYSTEM CONSISTING OF DEEPER S.I.P. FORMS OR REMOVABLE FORMS SHALL BE DESIGNED AND DETAILED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL. THE DESIGN THICKNESS OF THE SLAB SHALL NOT BE REDUCED.
7. S.I.P FORMS SHALL NOT BE USED TO FORM OVERHANGS.



TRANSVERSE SECTION



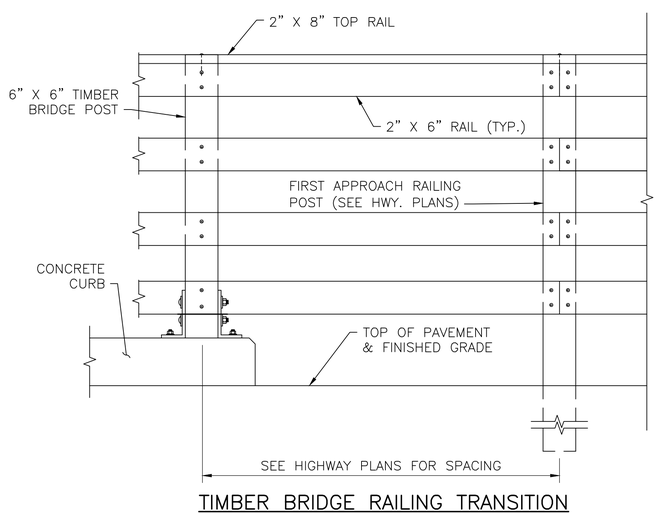
ELEVATION

NOTES:

1. TIMBER RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF THREE POSTS WHERE POSSIBLE.
2. ELEVATION SHOWN REFLECTS LOCATION OF RAIL BUTT JOINT, AT INTERMEDIATE JOINT ONLY TWO WOOD SCREWS REQUIRED PER RAILING.

TIMBER BRIDGE RAILING DETAILS

SCALE: 1" = 1'–0"



TIMBER BRIDGE RAILING TRANSITION TO APPROACH RAILING

SCALE: 1" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	125	158
PROJECT FILE NO. 606223			

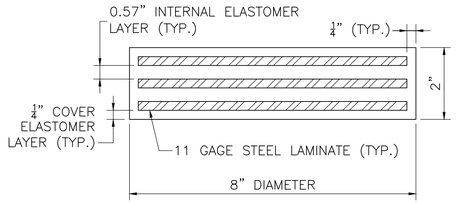
DECK & TIMBER RAILING DETAILS

606223_BR13(C19037)-DECK & RAIL.DWG Plotted on 5-Feb-2019 3:35 PM
Second Structural Submittal (S2) 21-Jan-2019
V:\MAA\c0076400-BFF-JB\606223\DWG\BR\606223_BR13(C19037)-Deck & Railing_2/5/2019 3:35:07 PM, DWG To PDF.pc3

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	126	158
PROJECT FILE NO. 606223			

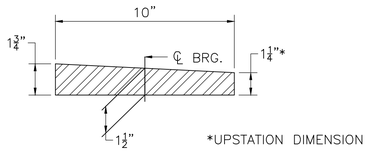
BEARING DETAILS



ELASTOMERIC BEARING PAD
SCALE: N.T.S.

NOTES:

1. ELASTOMER SHALL HAVE A SHEAR MODULUS OF 0.160 KSI.
2. STEEL LAMINATES SHALL CONFORM TO ASTM A 1011 GRADE 36.
3. THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD IS 45.5 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 0.90 KSI.
4. ELASTOMERIC BEARING PAD SHALL NOT BE VULCANIZED TO THE SOLE PLATE.

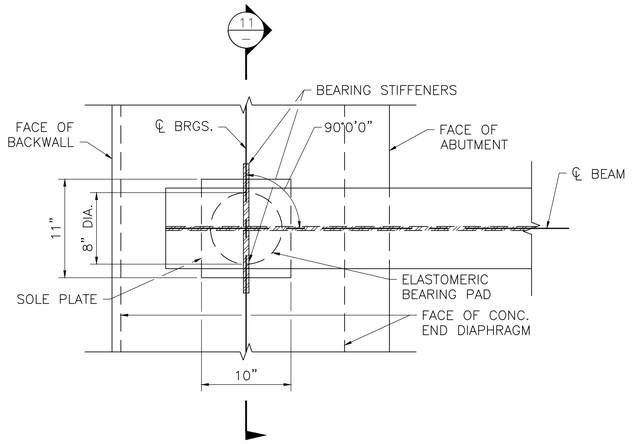


*UPSTATION DIMENSION

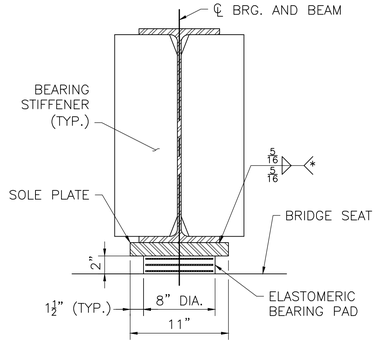
SOLE PLATE DETAIL
SCALE: 3" = 1'–0"

SOLE PLATE NOTES:

1. STEEL SOLE PLATE SHALL CONFORM TO AASHTO M 270 GRADE 36 AND SHALL BE HOT–DIP GALVANIZED.
2. CENTER THE ELASTOMERIC PAD UNDER THE SOLE PLATE DURING BEAM ERECTION.
3. BEAMS SHALL BE ERECTED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 50°F AND 77°F. IF BEAMS ARE ERECTED AT OTHER AMBIENT TEMPERATURES, THEY WILL HAVE TO BE JACKED AND THE ELASTOMERIC BEARINGS RE–CENTERED WHEN THE TEMPERATURE RETURNS TO THAT RANGE.

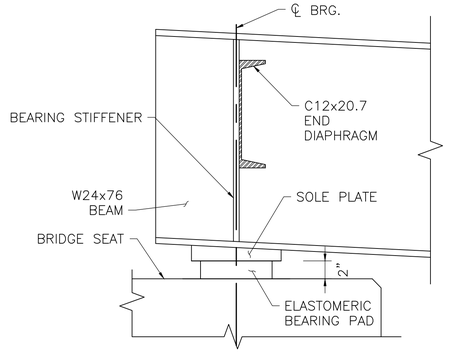


PLAN
SCALE: 1½" = 1'–0"



(*) – WELDS SHALL TERMINATE ¼" FROM EDGE OF PLATE

SECTION 11
SCALE: 1½" = 1'–0"



ELEVATION
SCALE: 1½" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

606223_BR14(C19037)-BEARING DETAILS.DWG Plotted on 5-Feb-2019 3:35 PM
Second Structural Submittal (S2) 21-Jan-2019
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HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

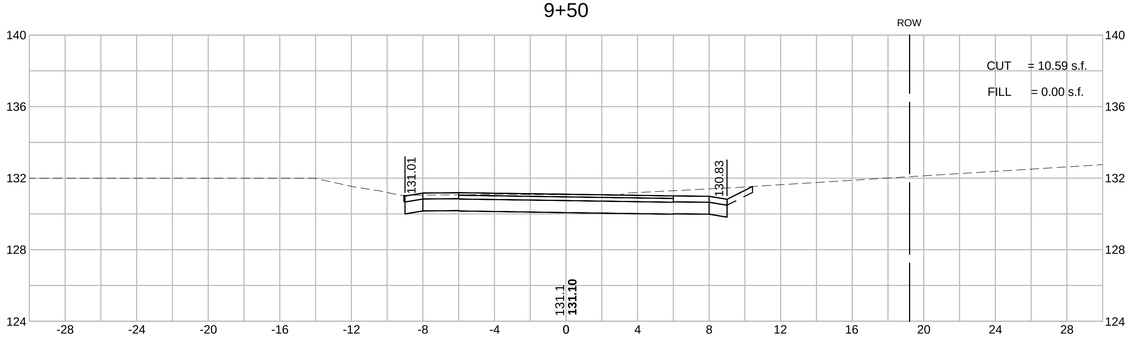
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	127	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:45 PM

9+50



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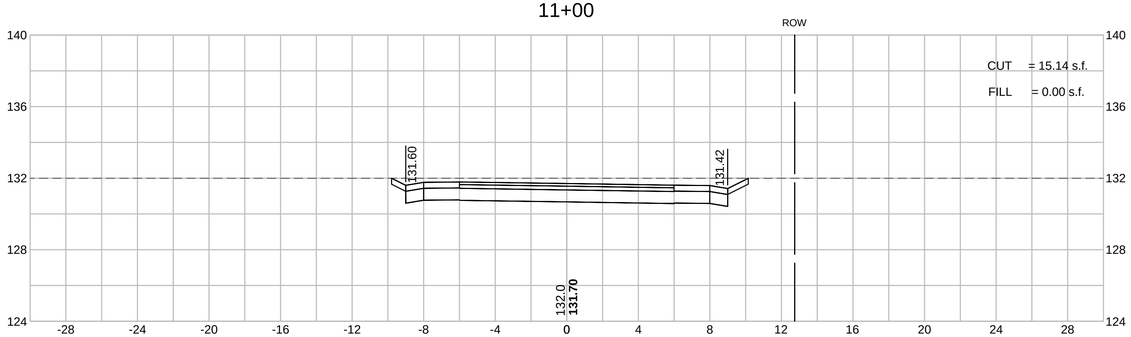

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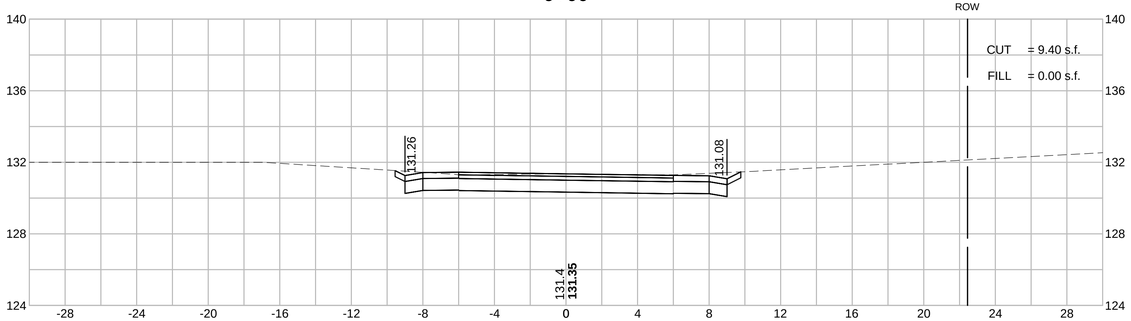

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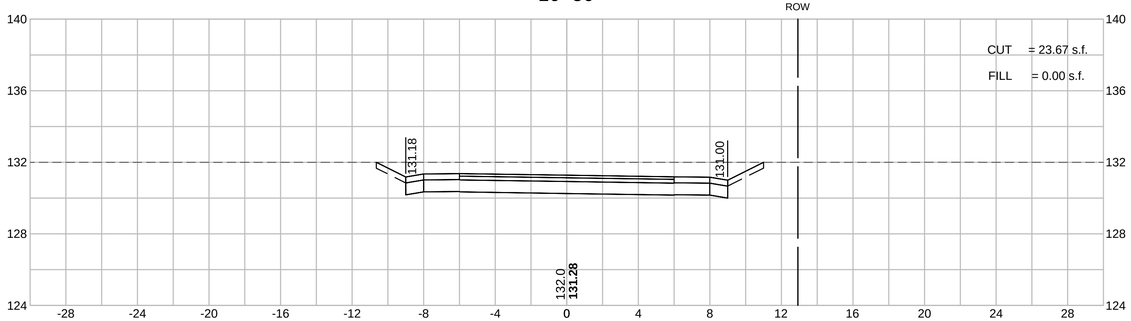

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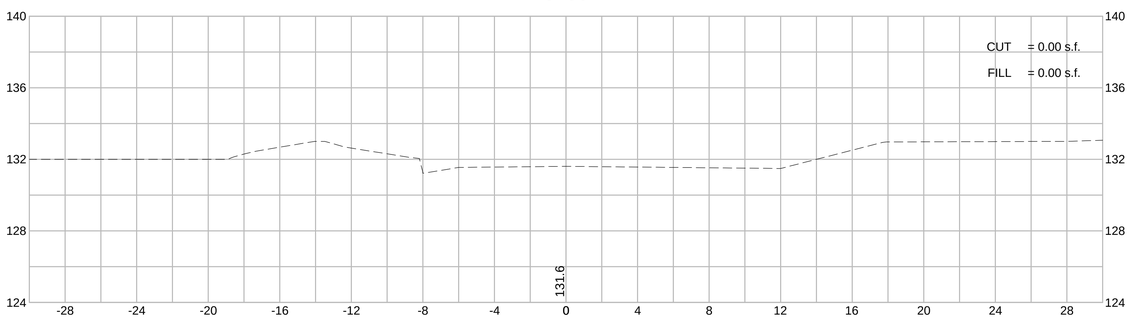

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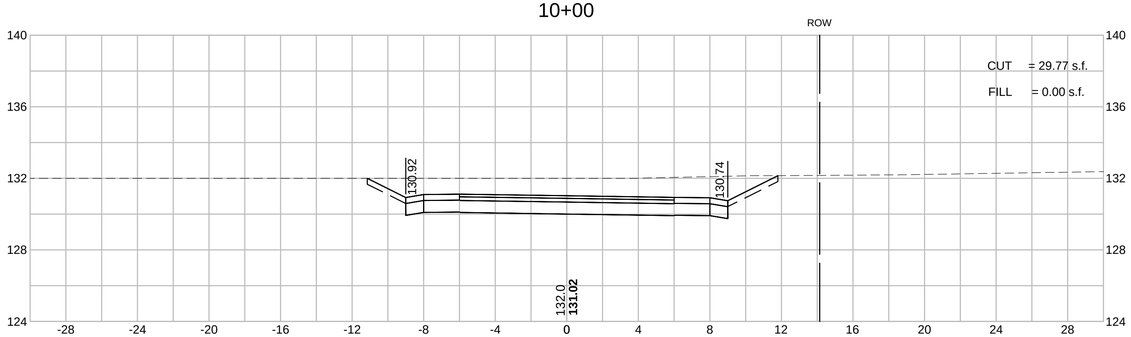

HOR. SCALE IN FEET
4 0 4 8
VER. SCALE IN FEET
4 0 4 8

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	128	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

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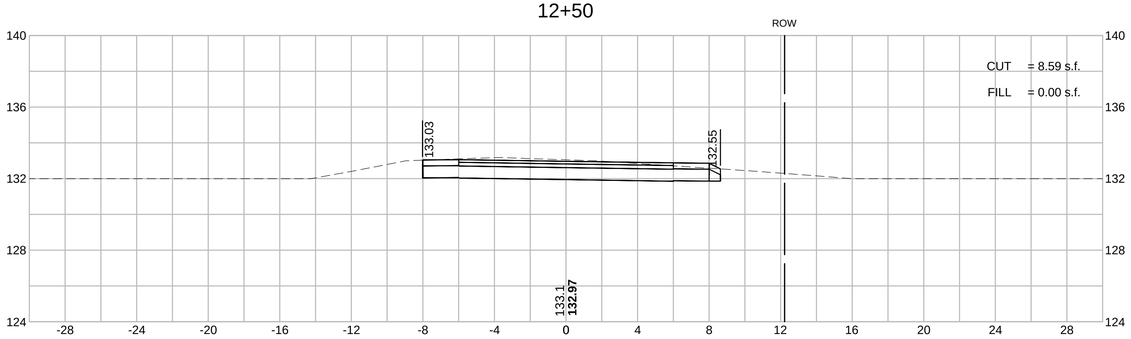
12+50



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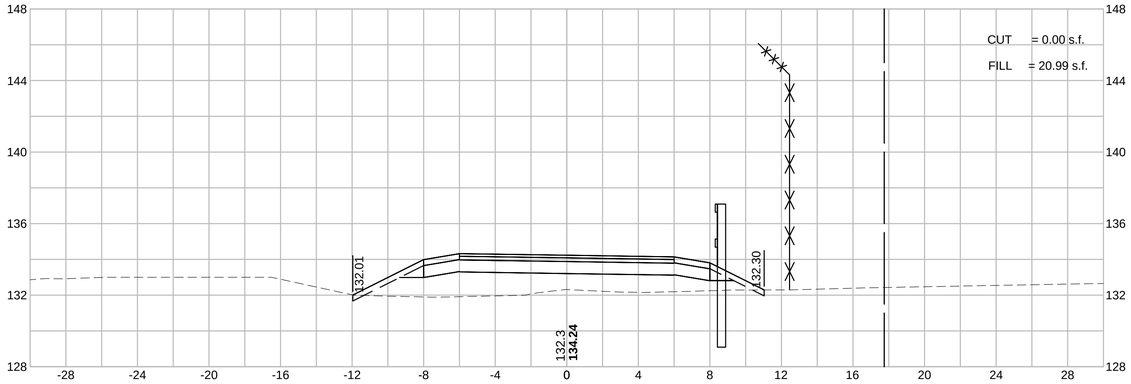

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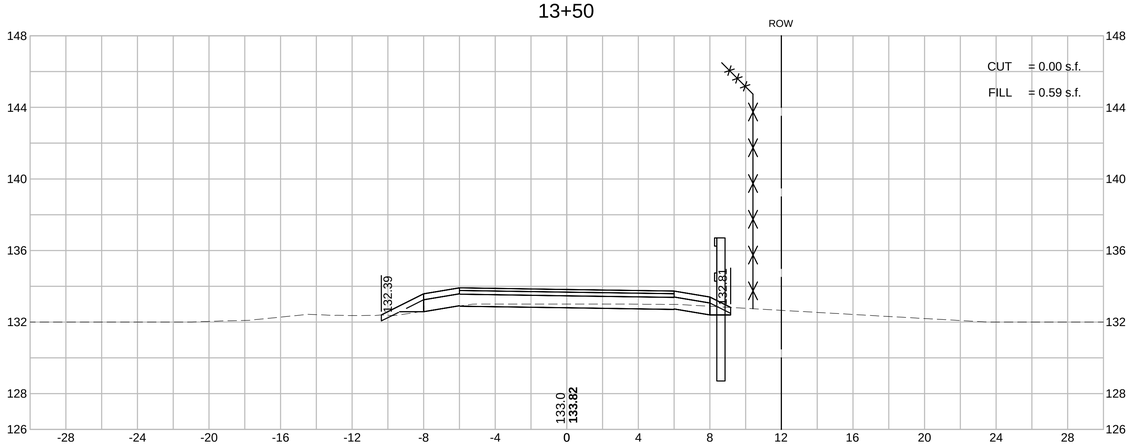

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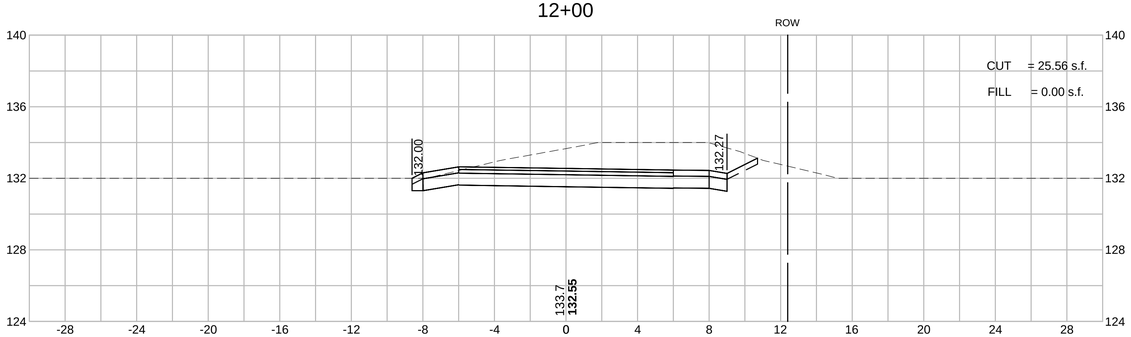

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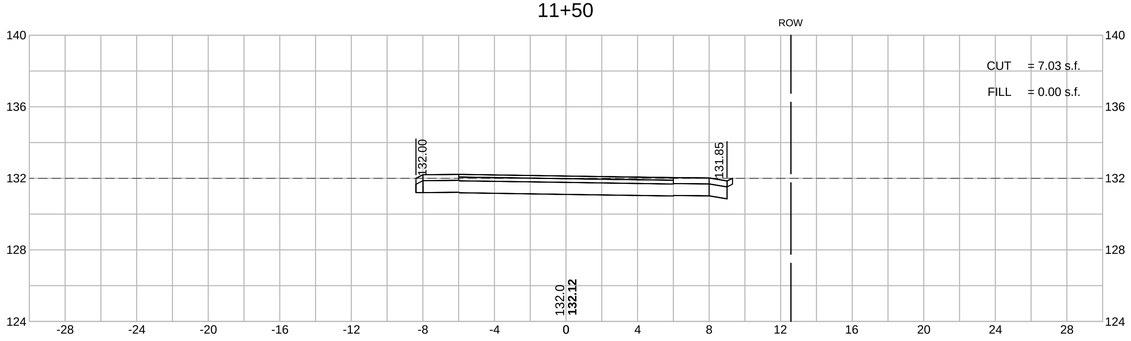

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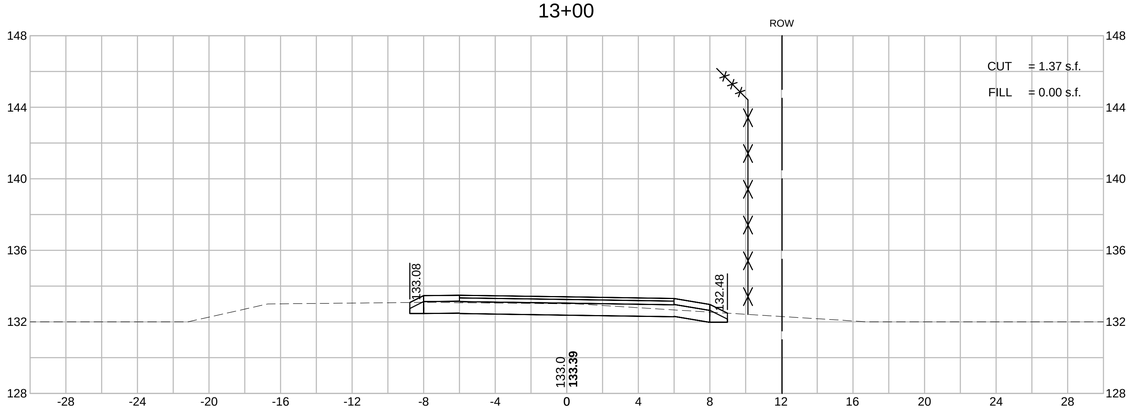

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	129	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

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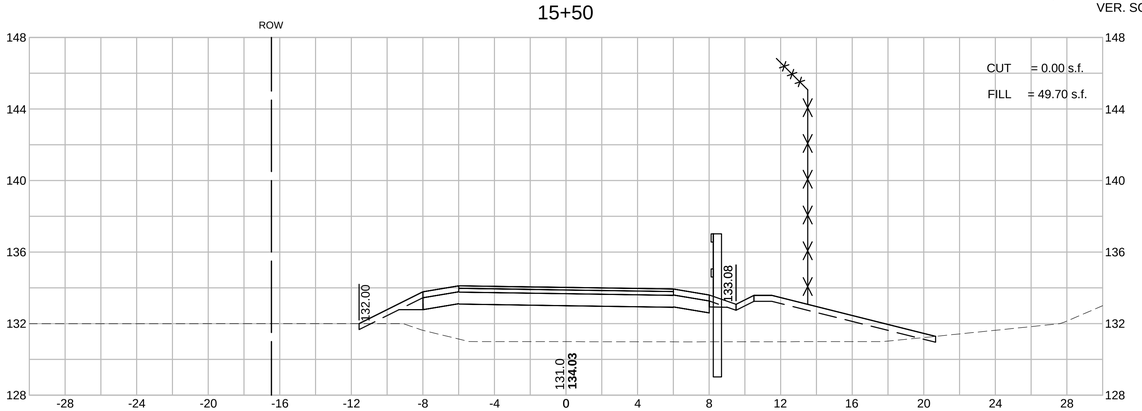
606223_HD_(XS).DWG

15+50



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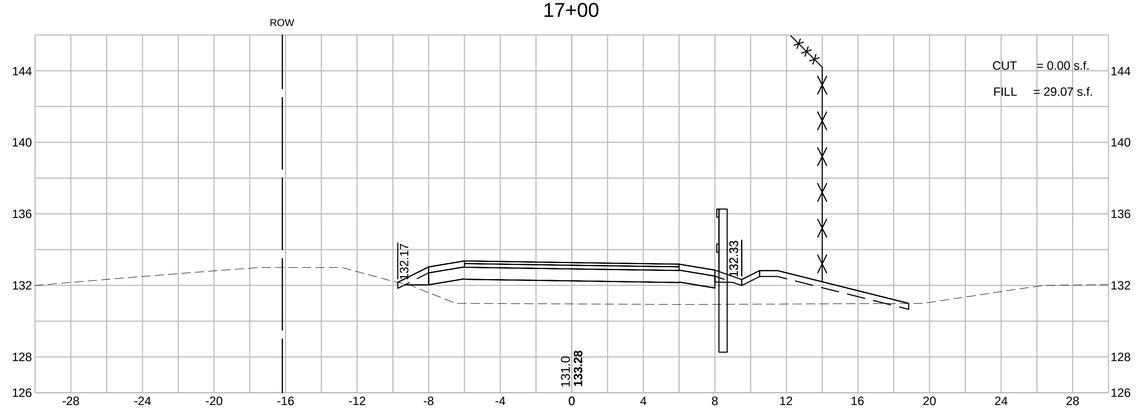

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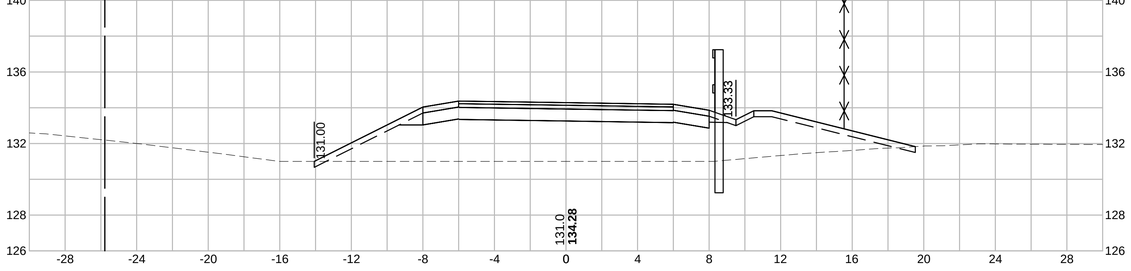

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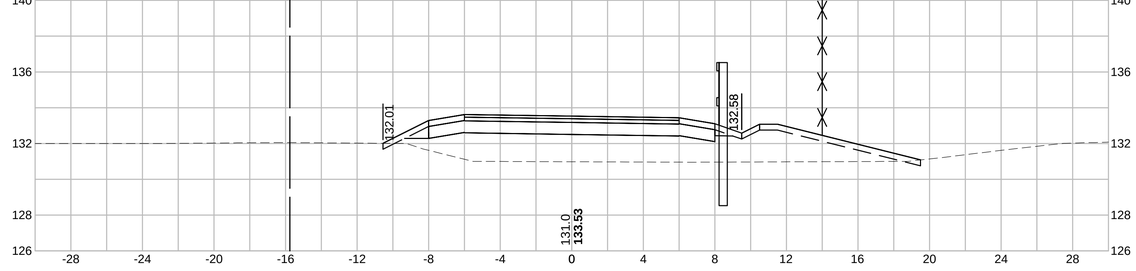

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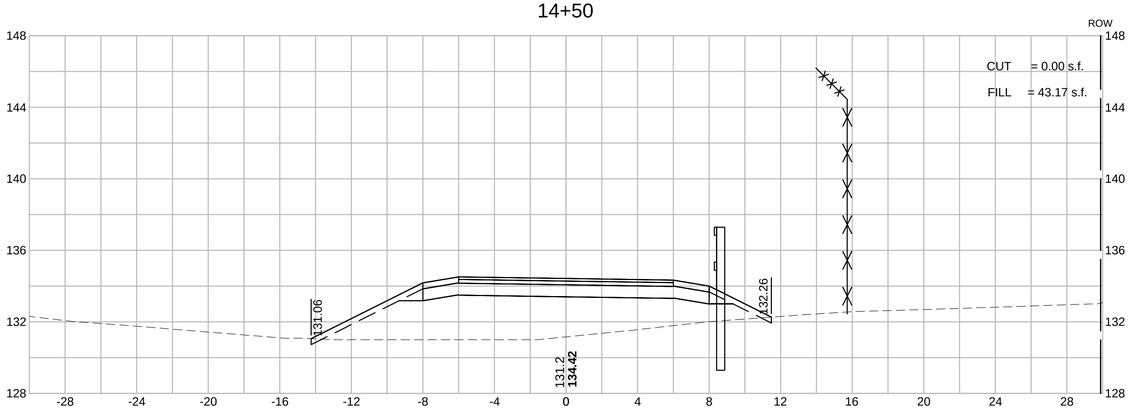

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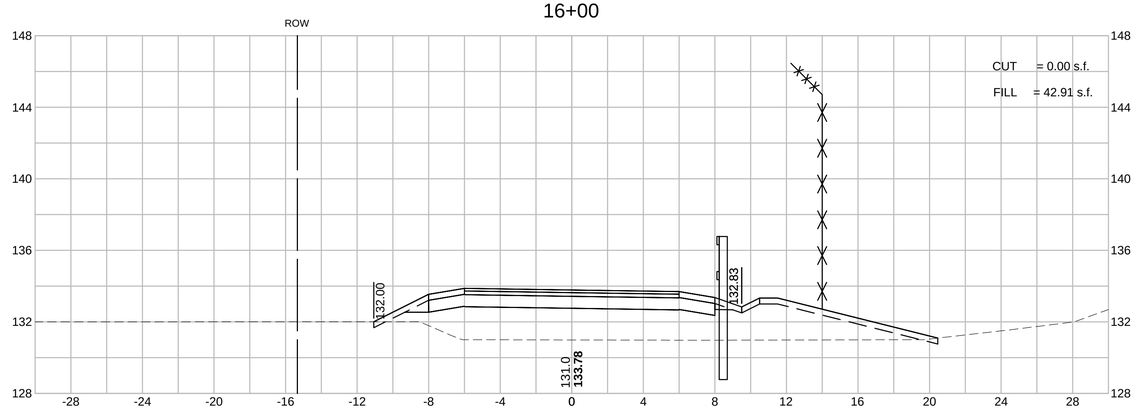

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	130	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

Plotted on 4-Feb-2019 3:46 PM
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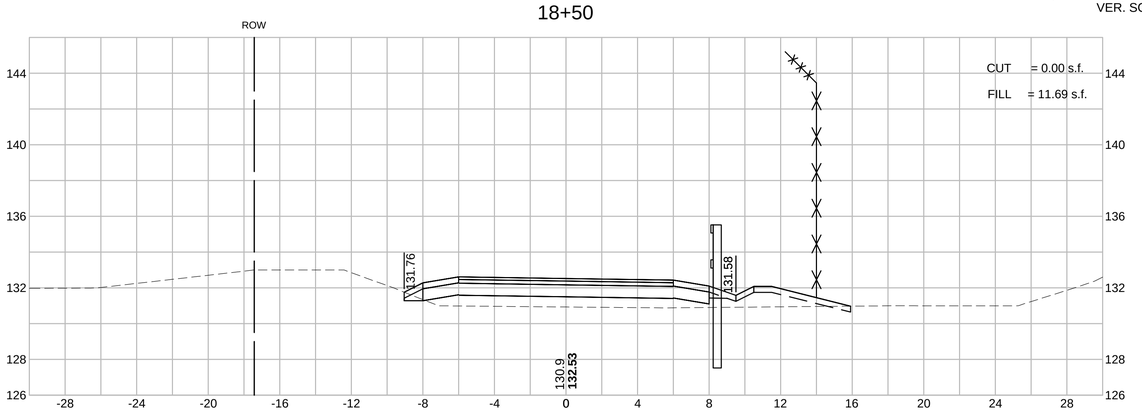
18+50



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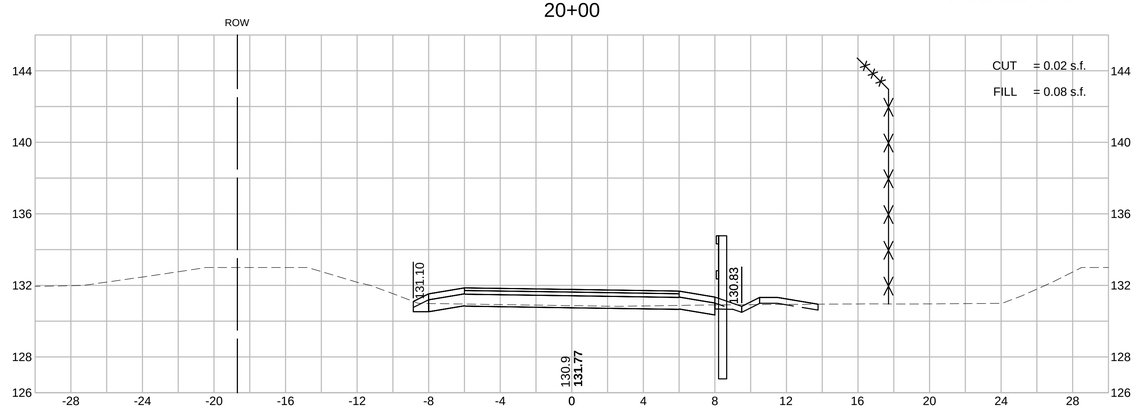


18+00

19+50

17+50

19+00

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

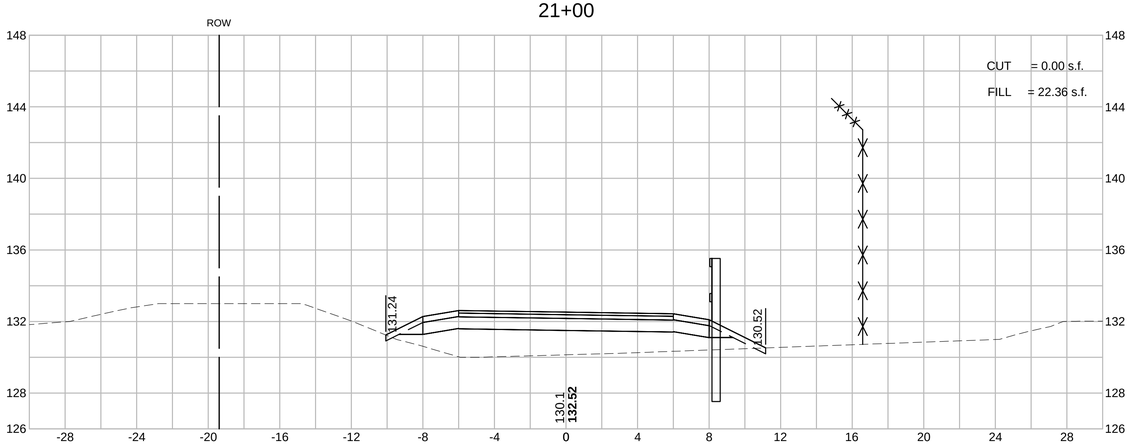
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	131	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:47 PM

21+00



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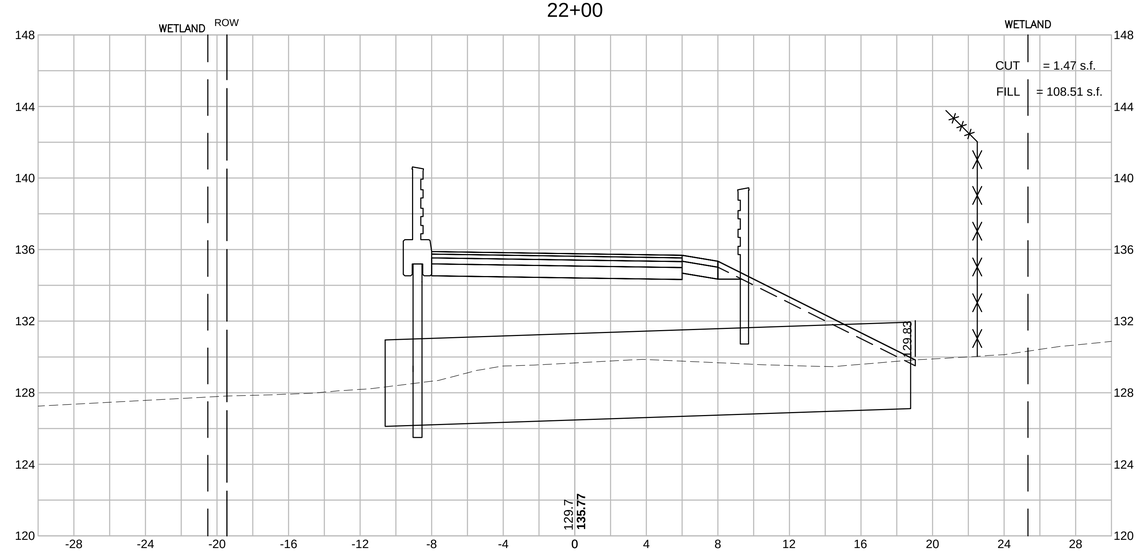

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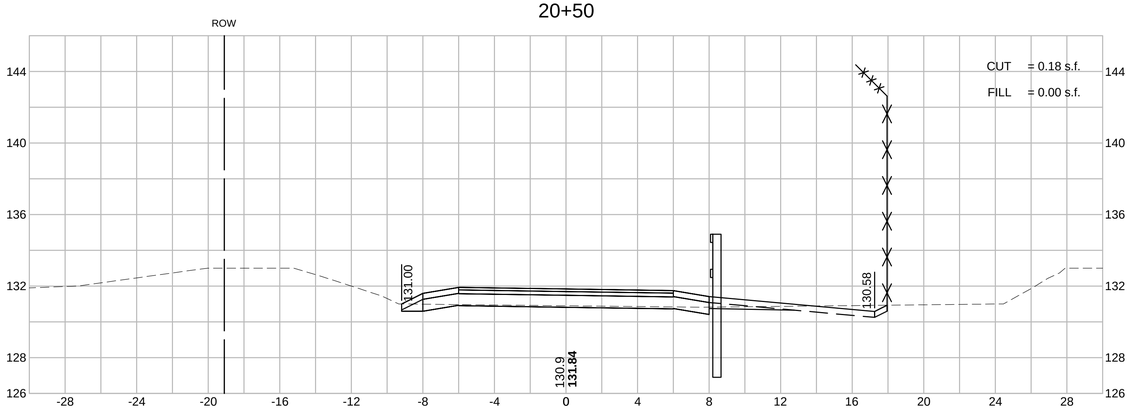

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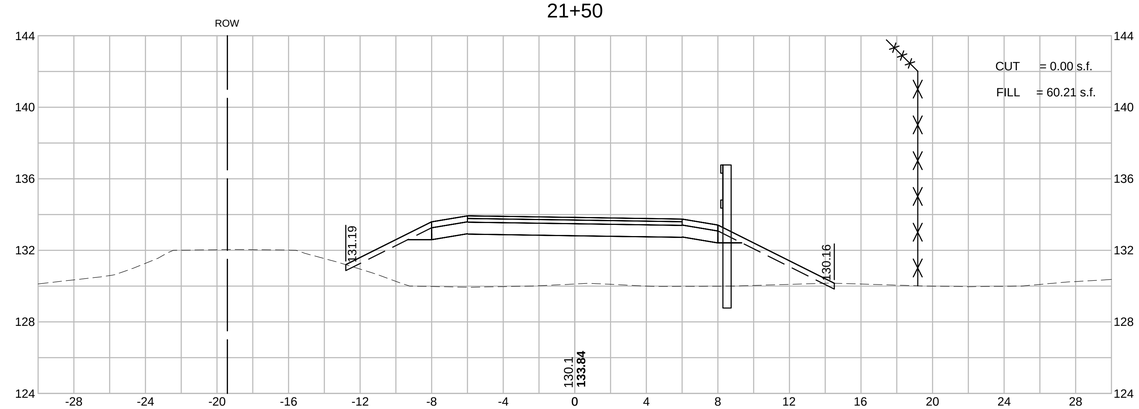


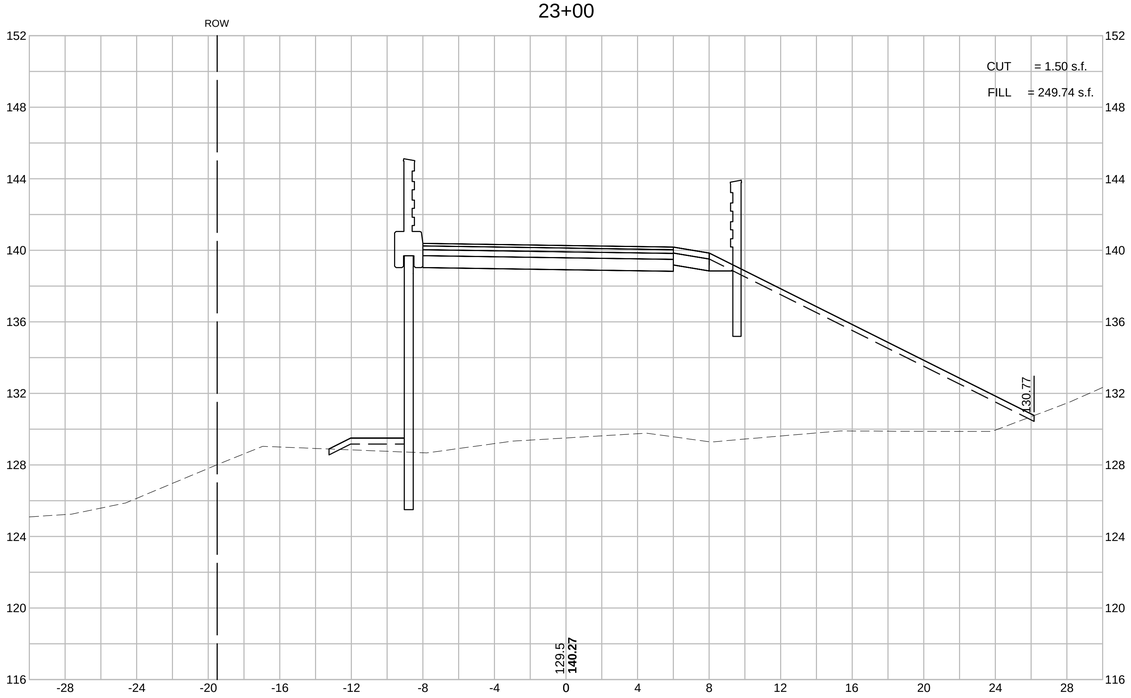
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	132	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

23+00



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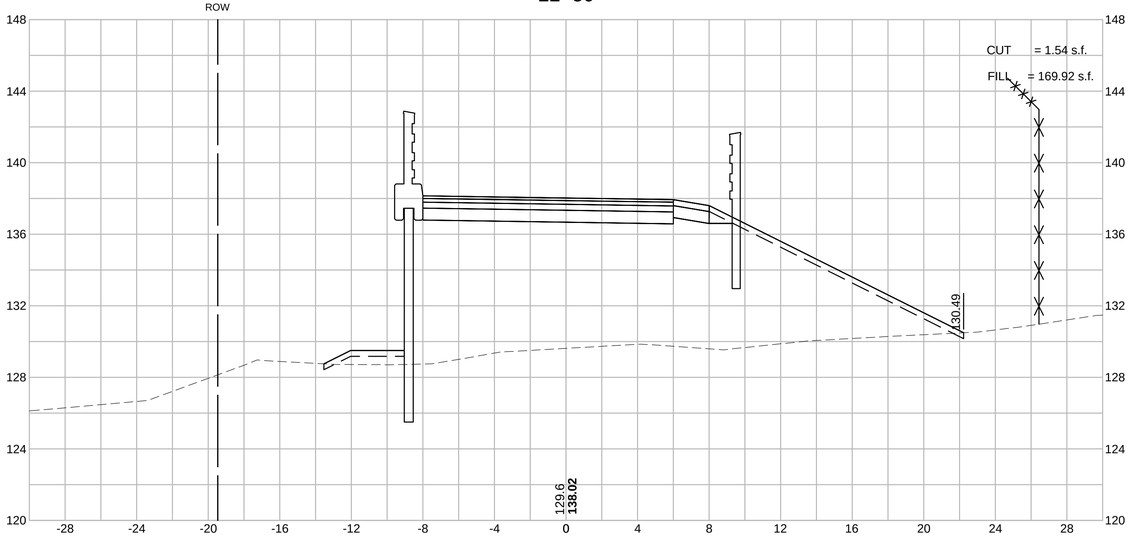

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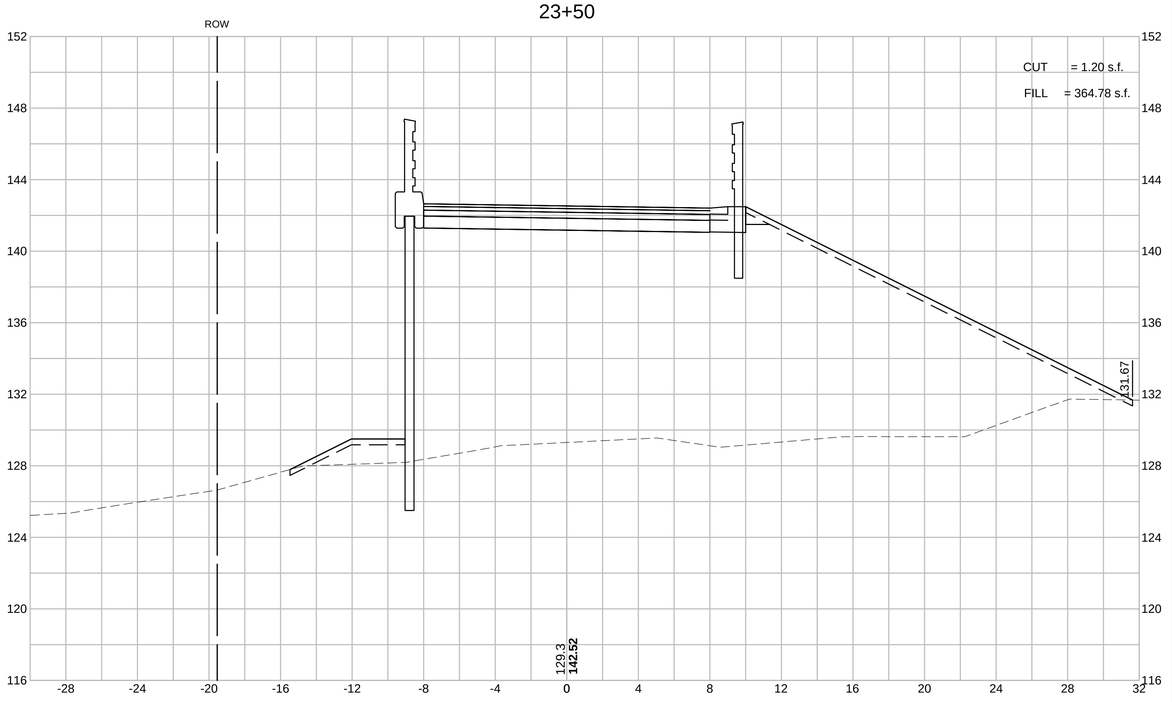

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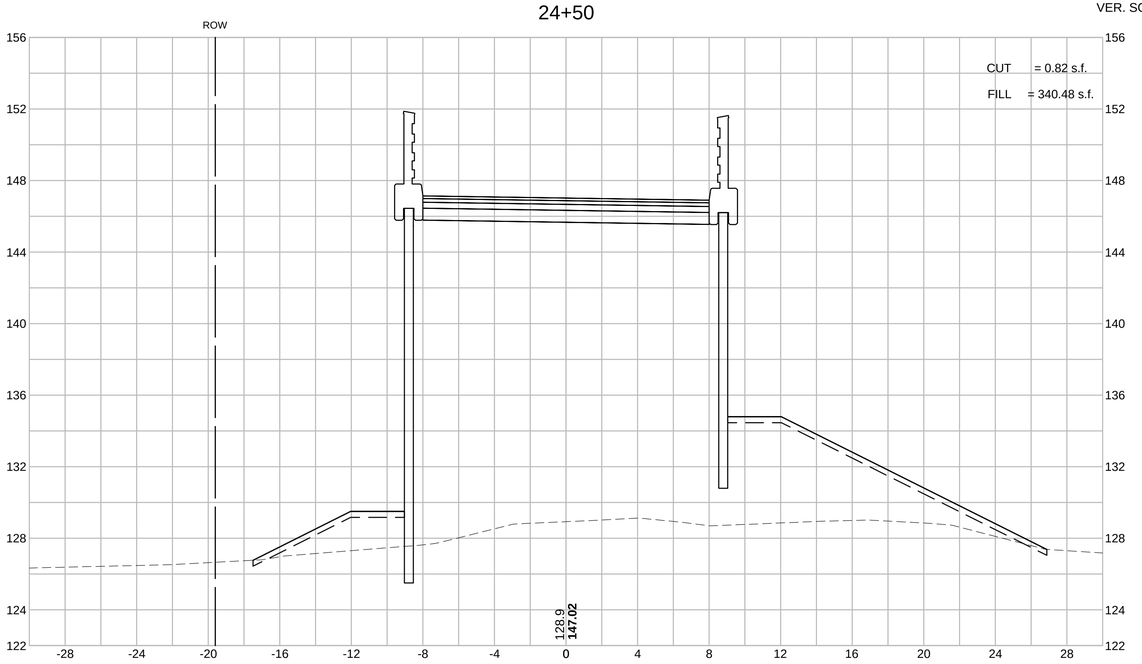
HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

24+50



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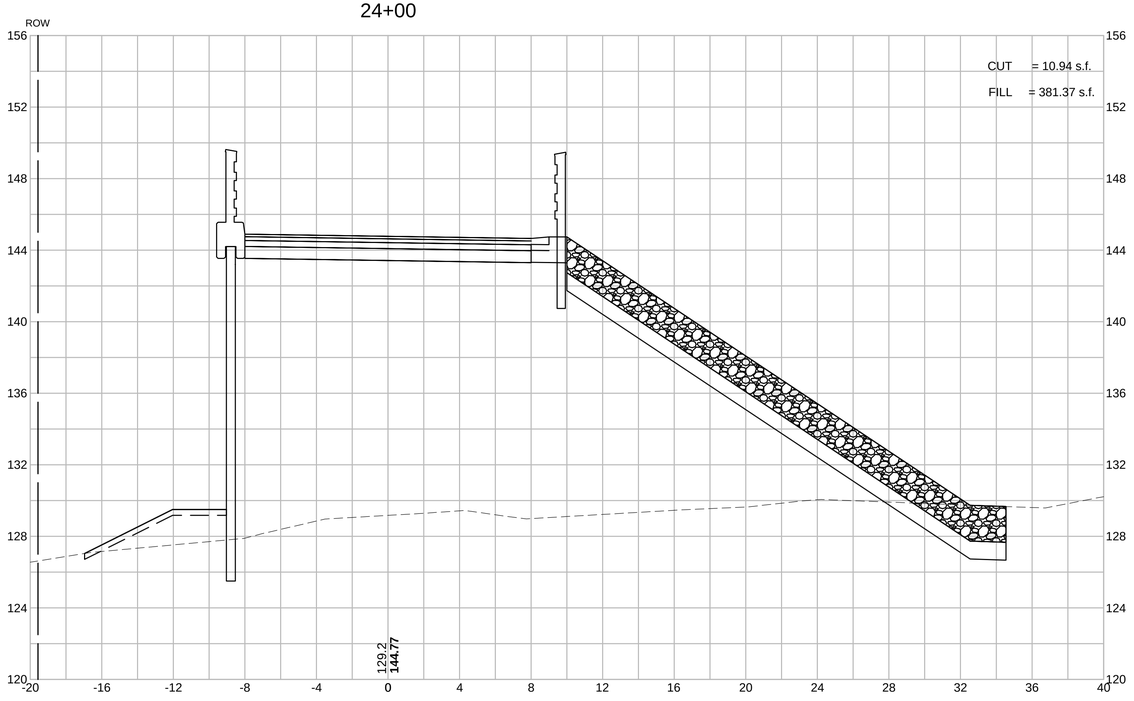


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	133	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:48 PM

HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

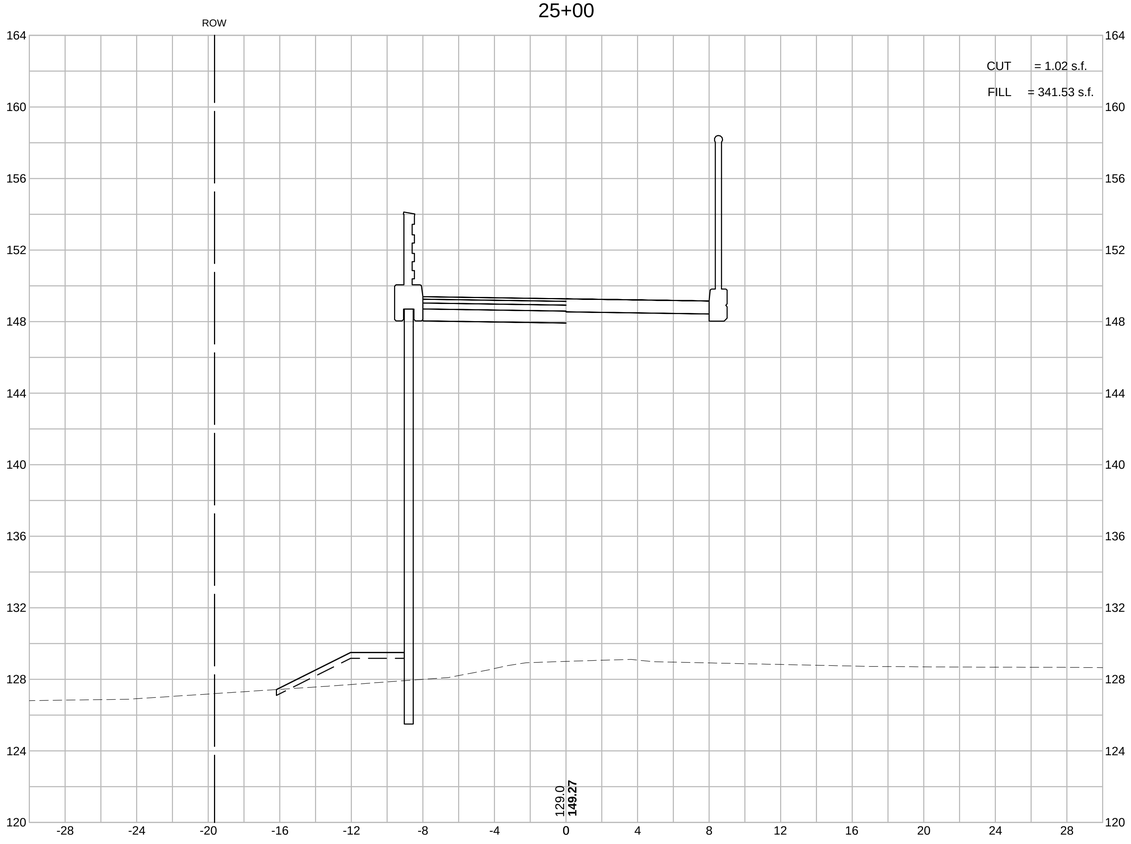
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	134	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:48 PM

25+00



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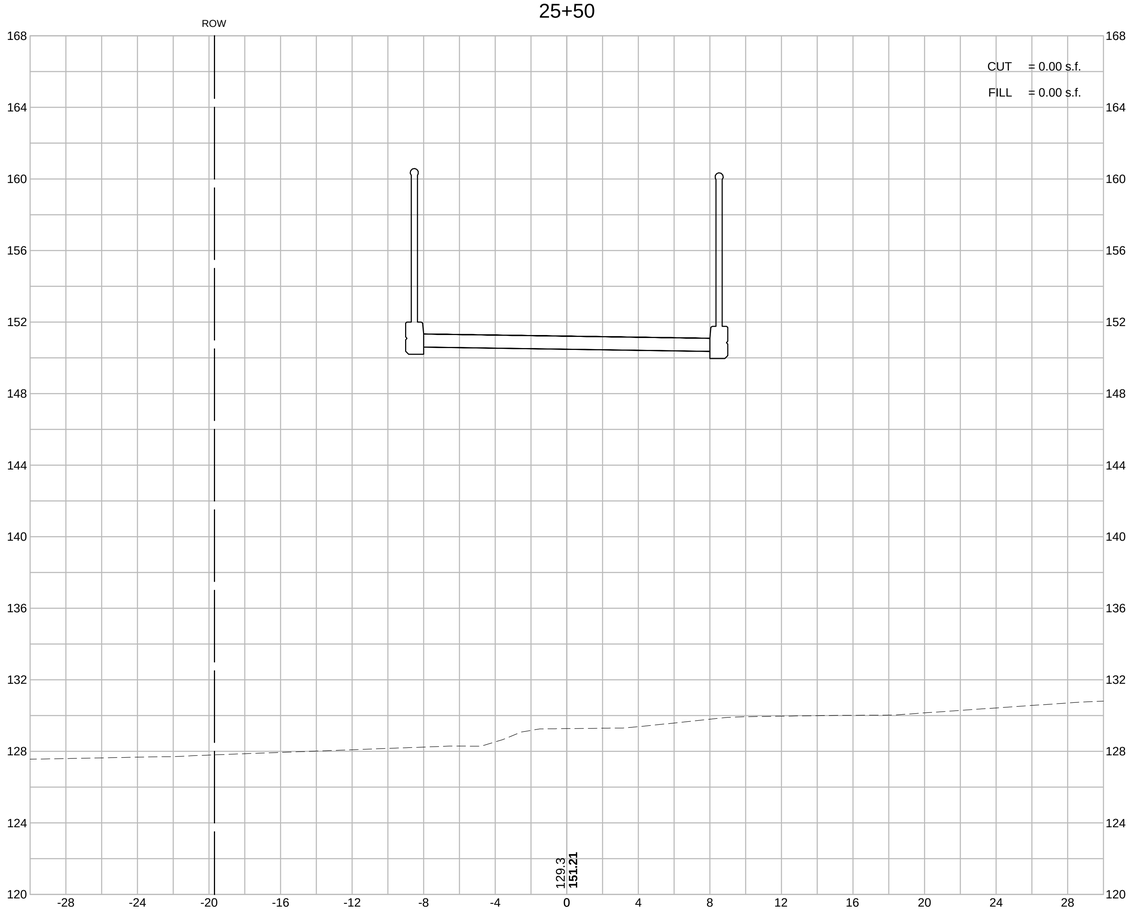


HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

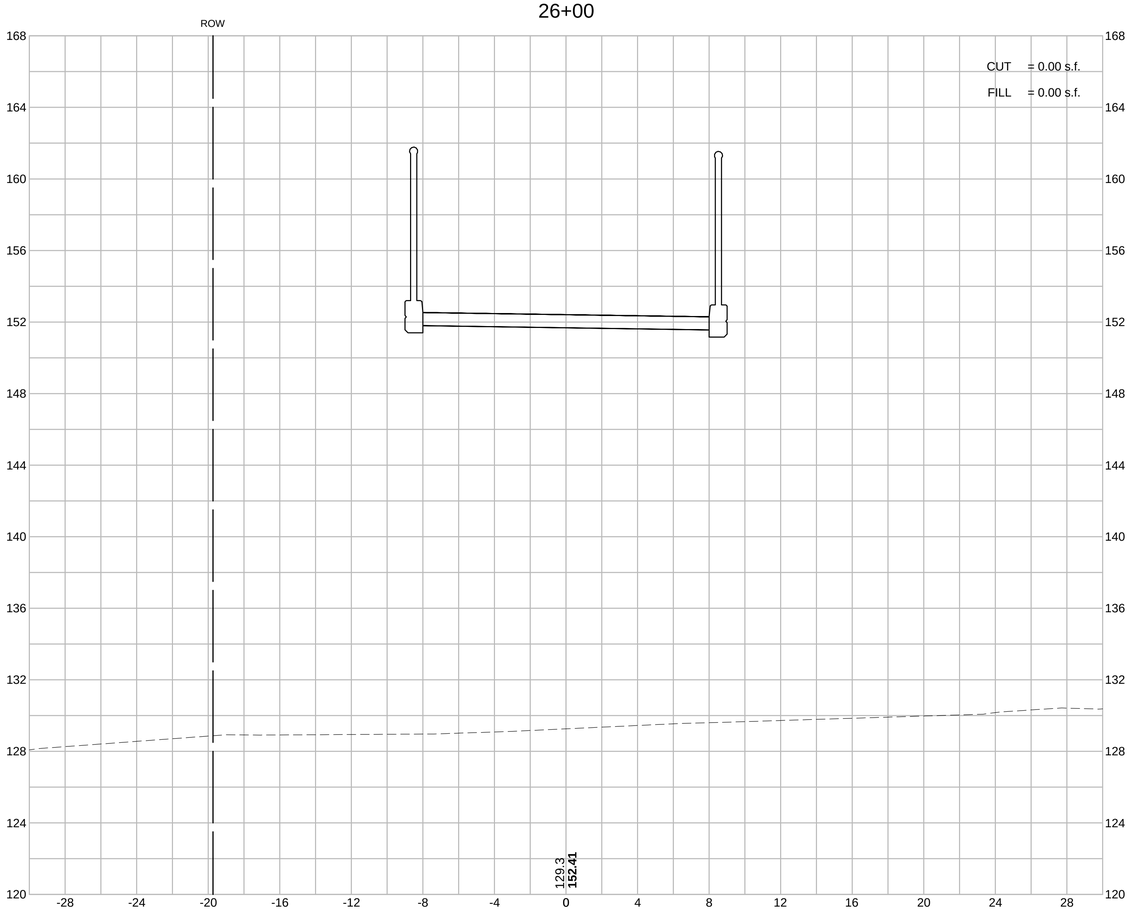
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	135	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:49 PM

26+00



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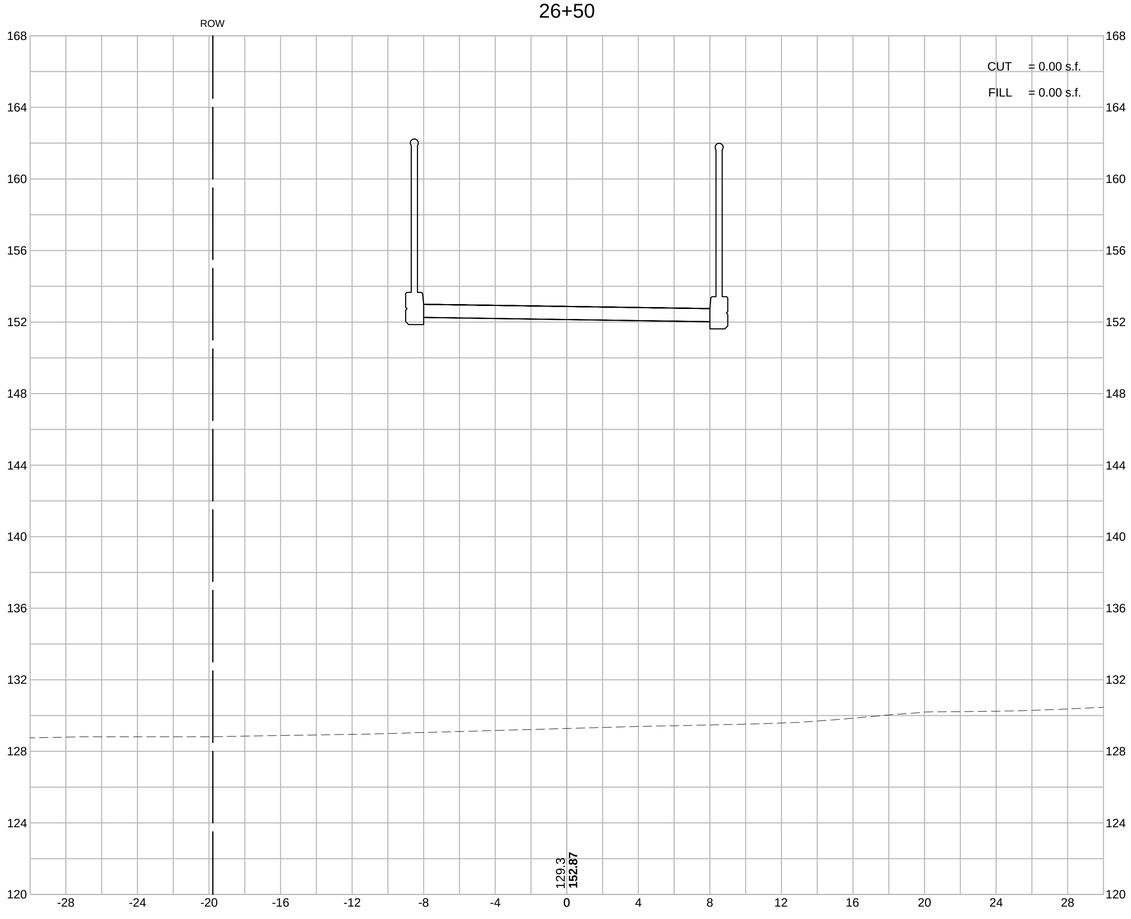

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	136	158
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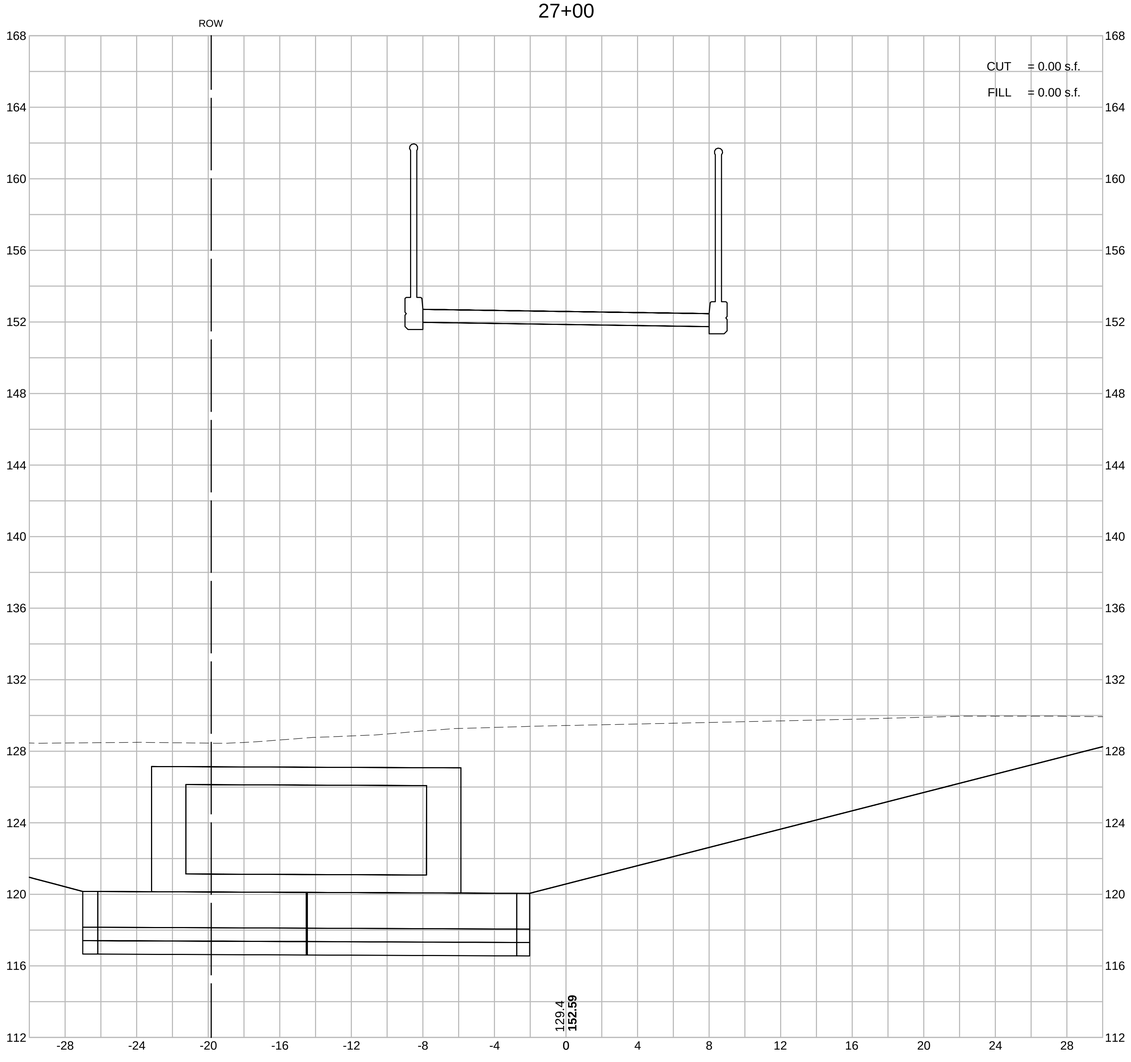
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:49 PM

27+00



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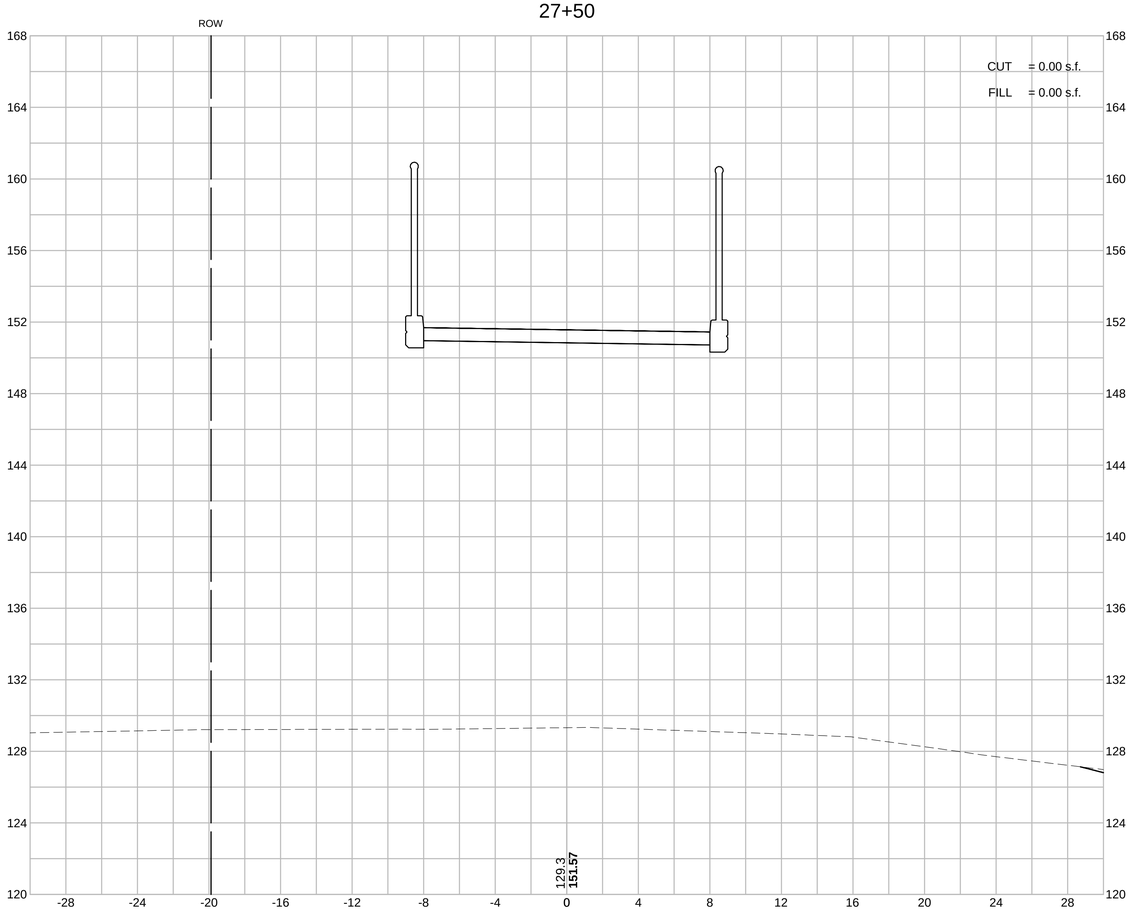


HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

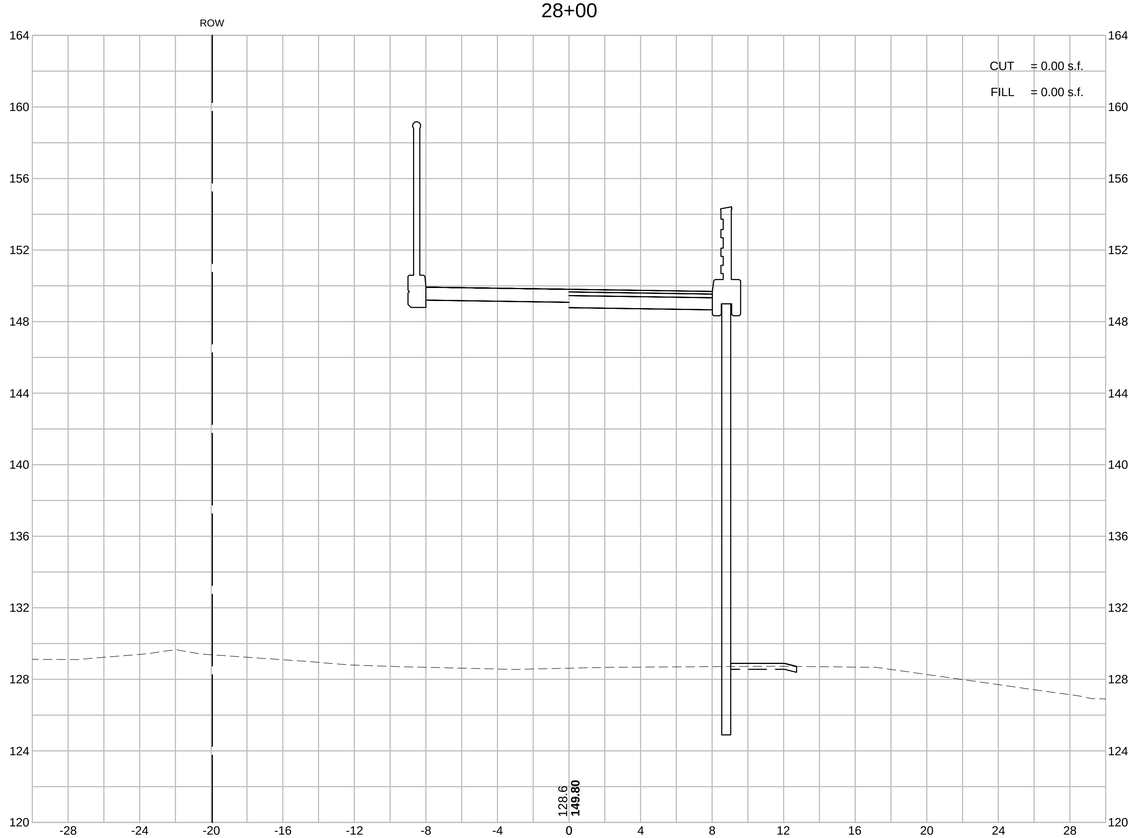
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	137	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:49 PM

28+00



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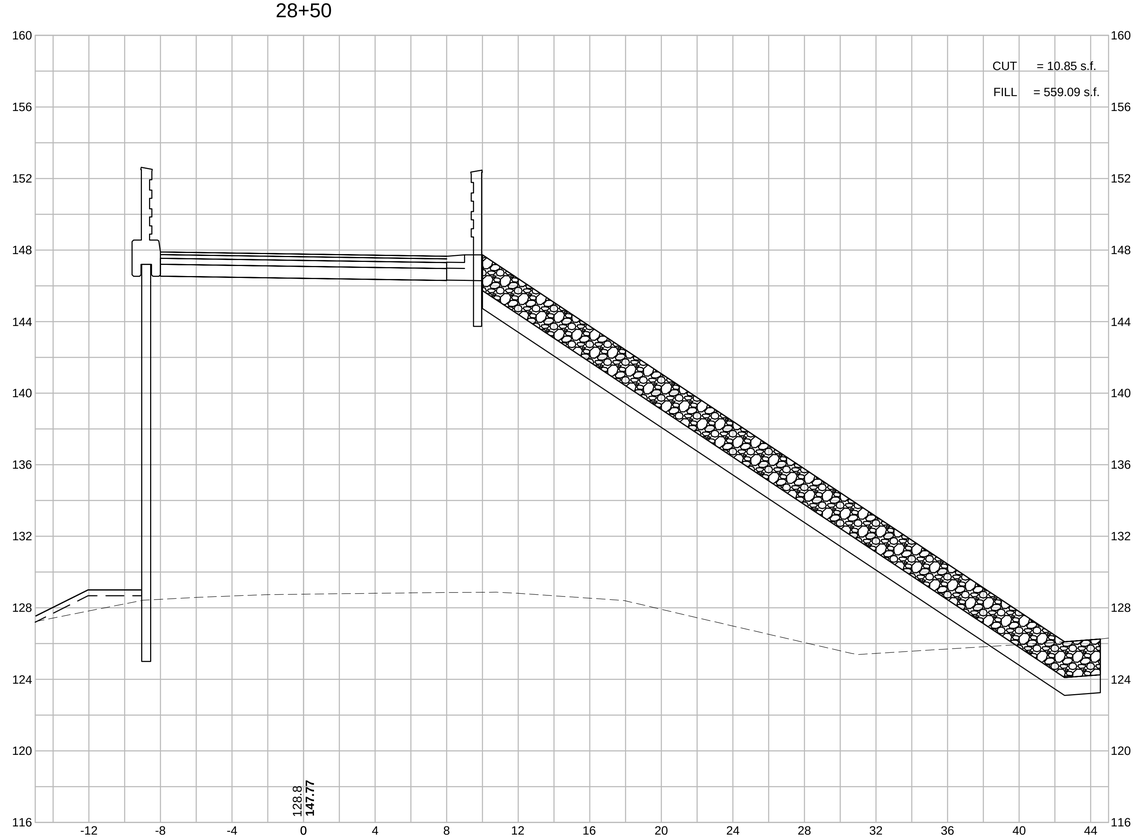


HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

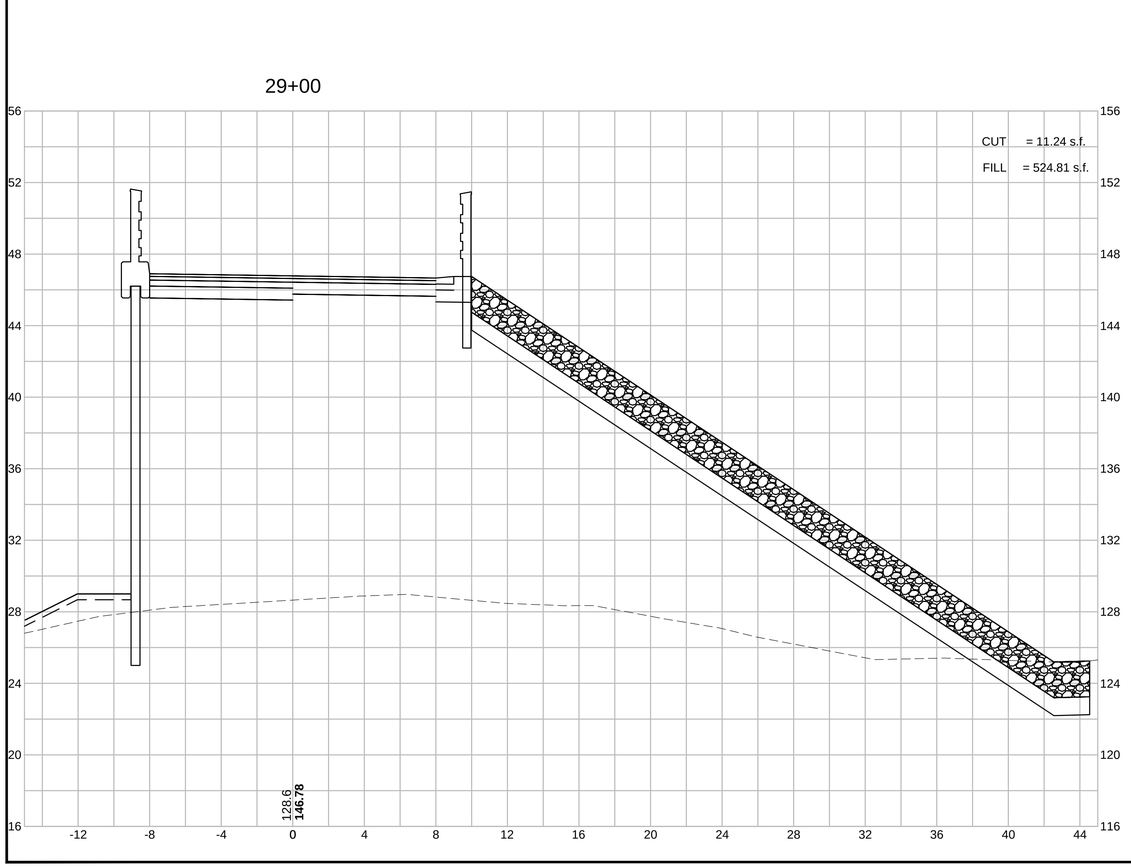
VER. SCALE IN FEET

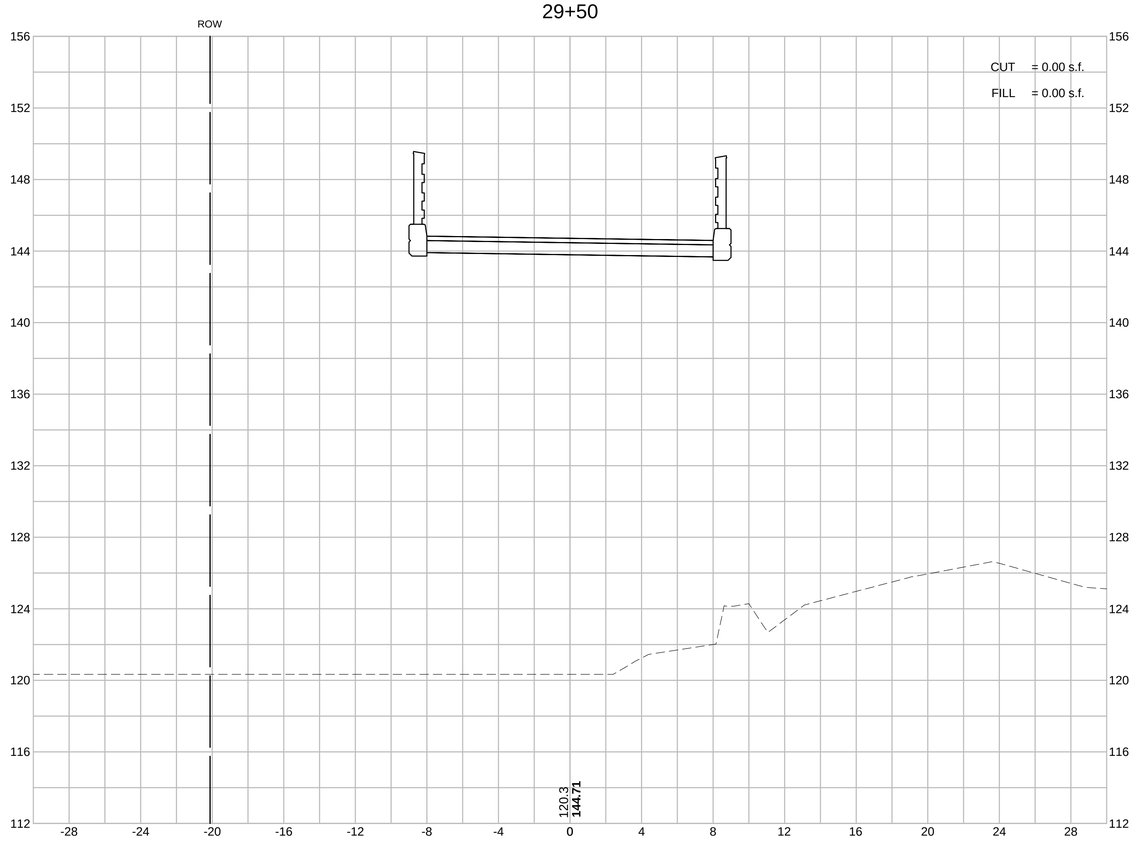
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

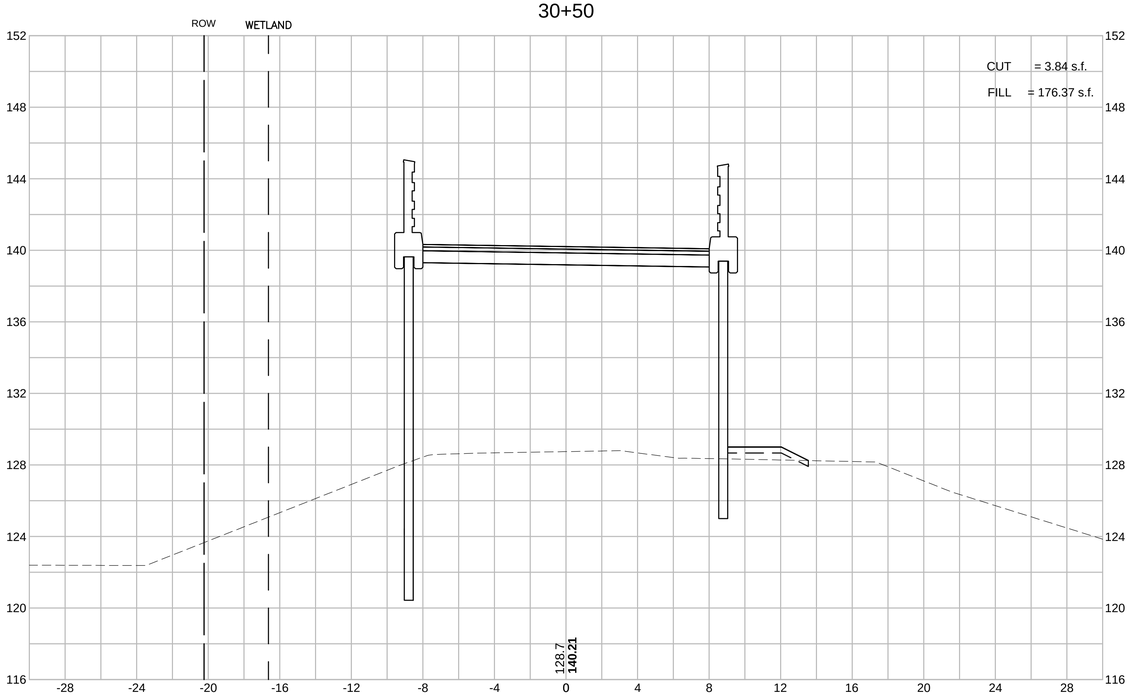
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	138	158
PROJECT FILE NO.	606223		

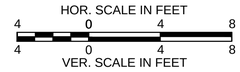
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:50 PM





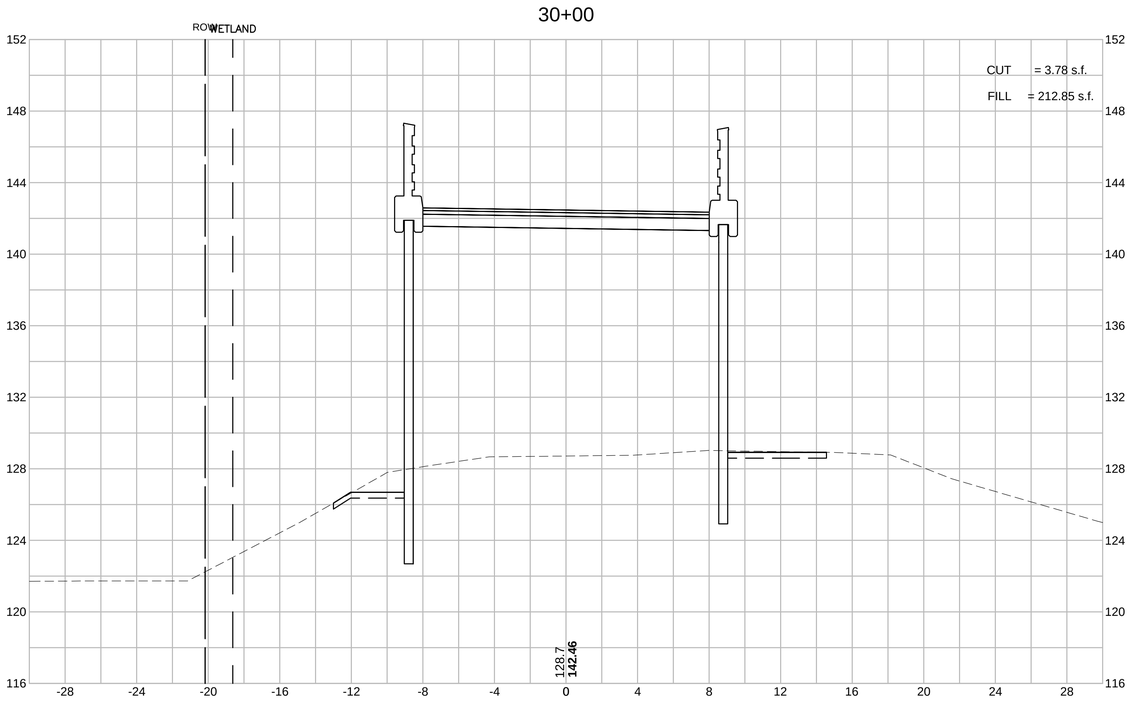


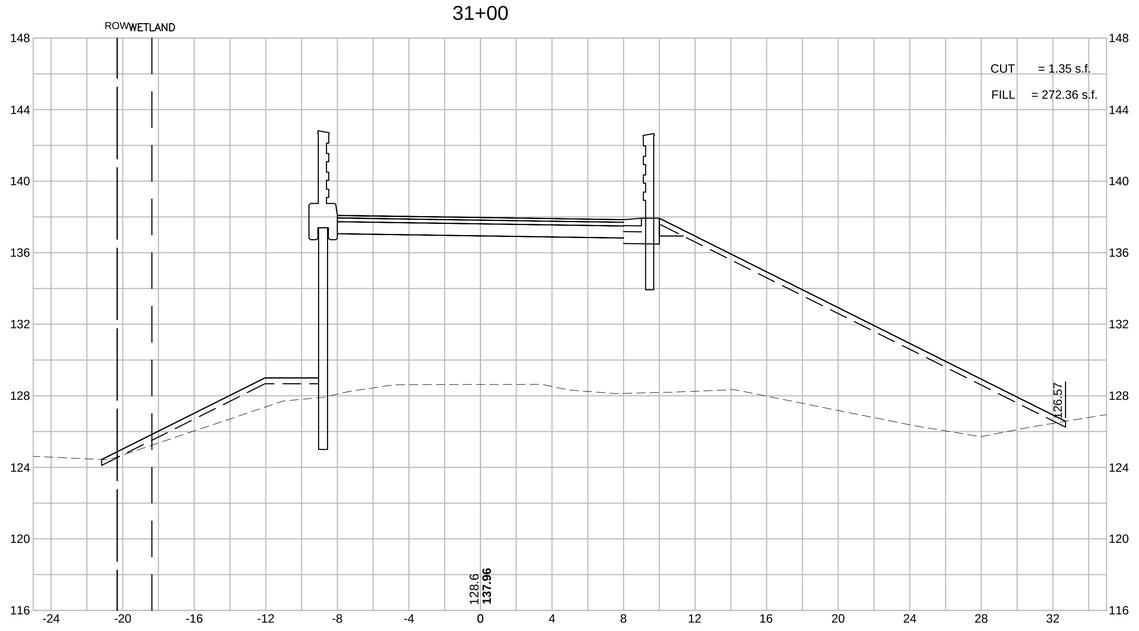


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	139	158
PROJECT FILE NO.	606223		

CROSS SECTIONS





606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:50 PM

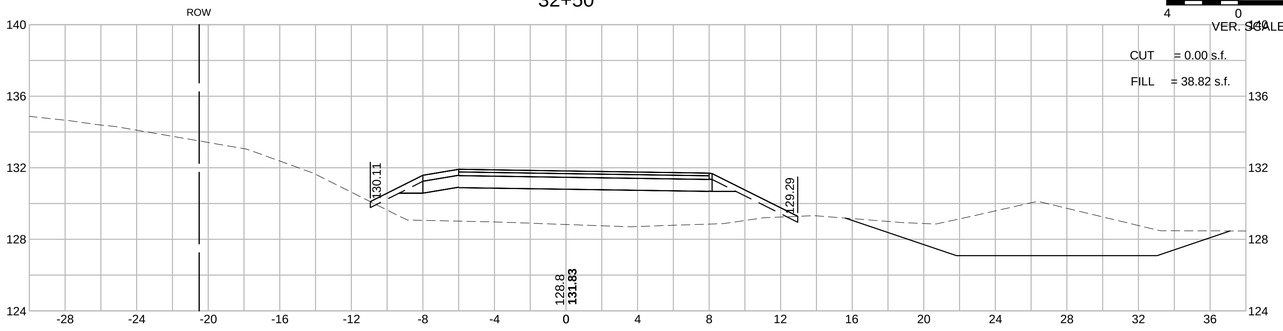
HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

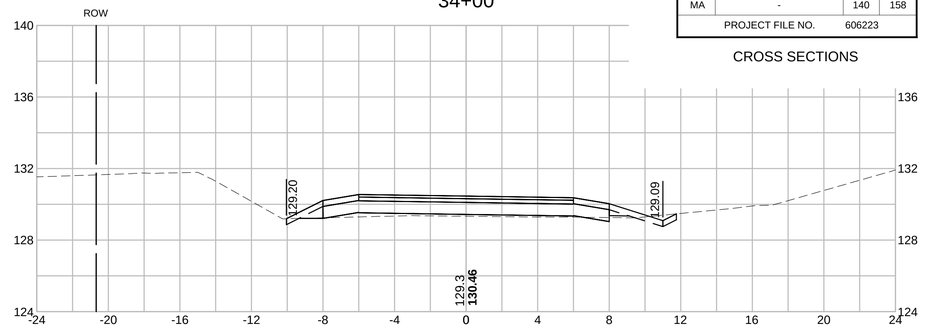
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	140	158
PROJECT FILE NO.	606223		

CROSS SECTIONS

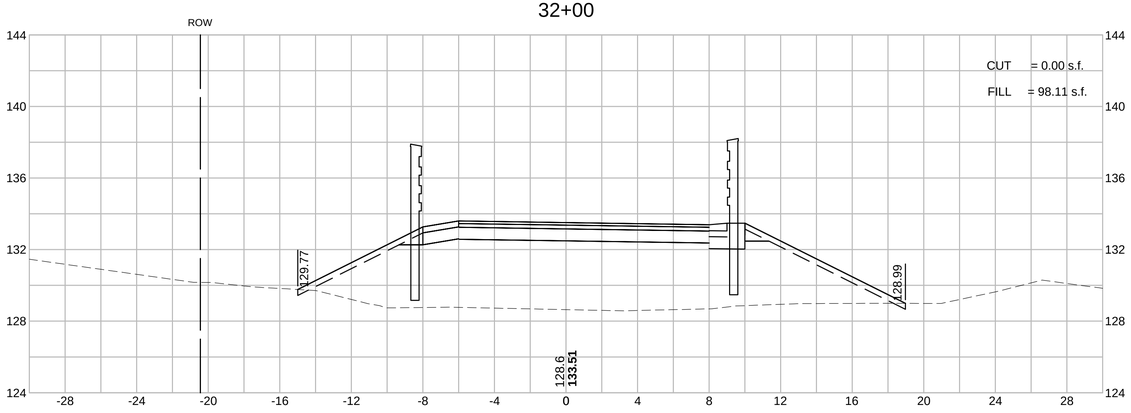
32+50



34+00



32+00



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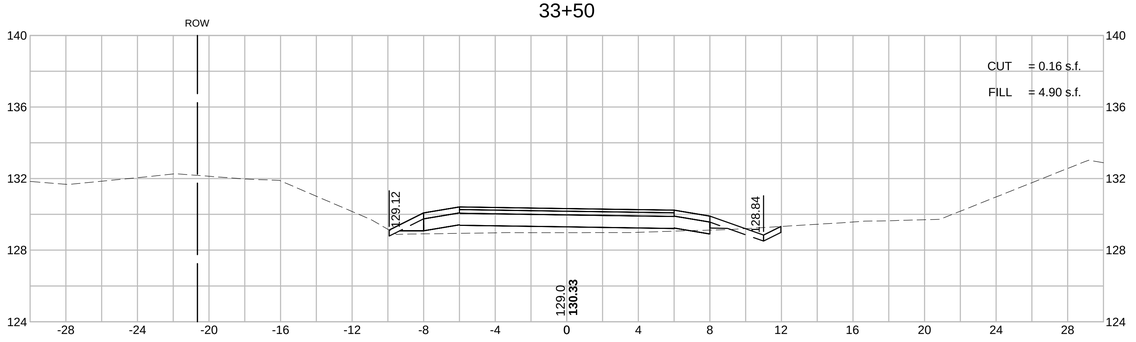
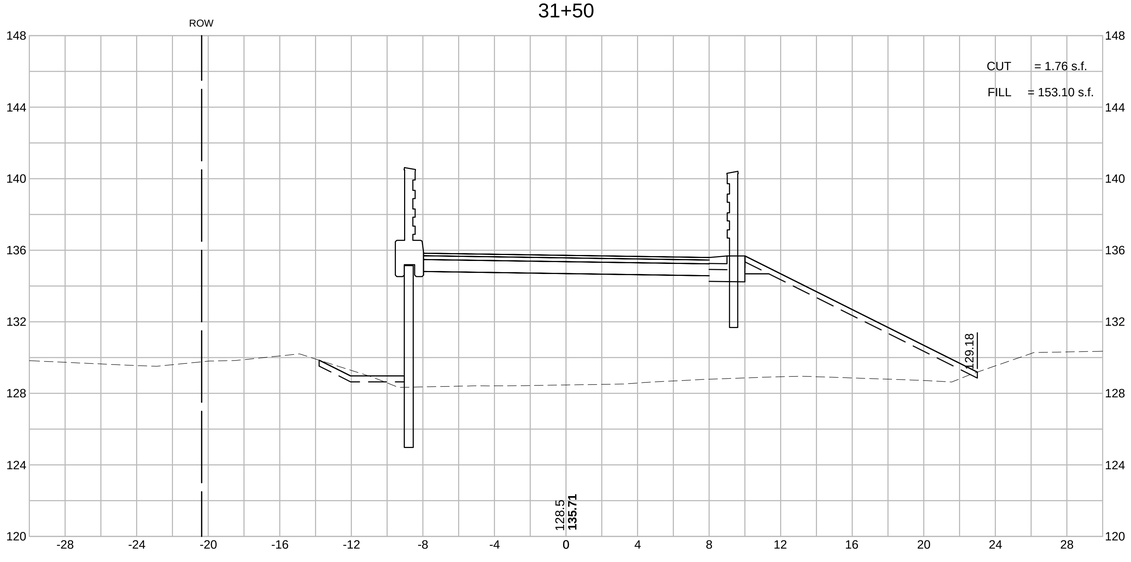
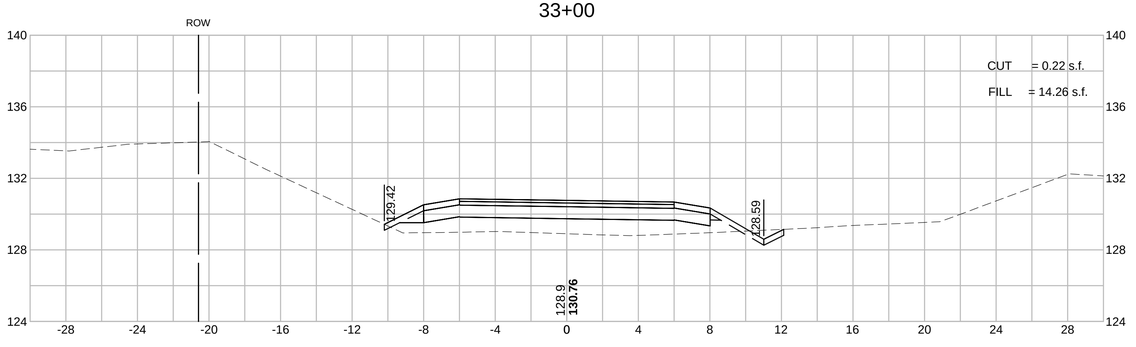


31+50



33+00



606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:51 PM

HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

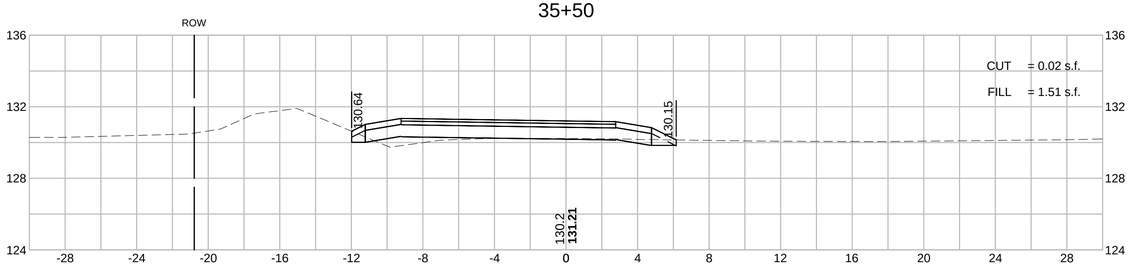
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	141	158
PROJECT FILE NO.	606223		

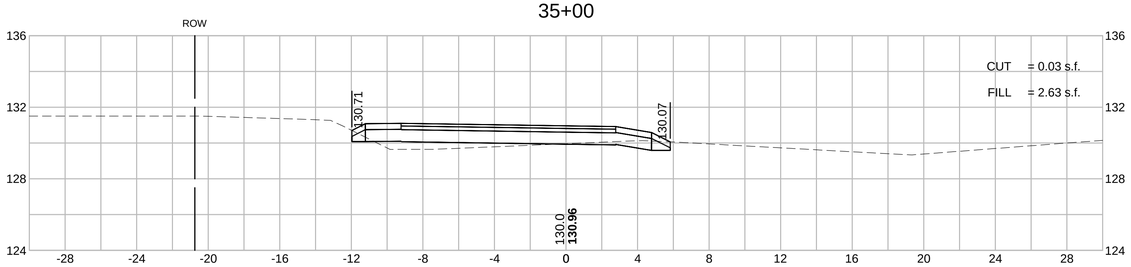
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:51 PM

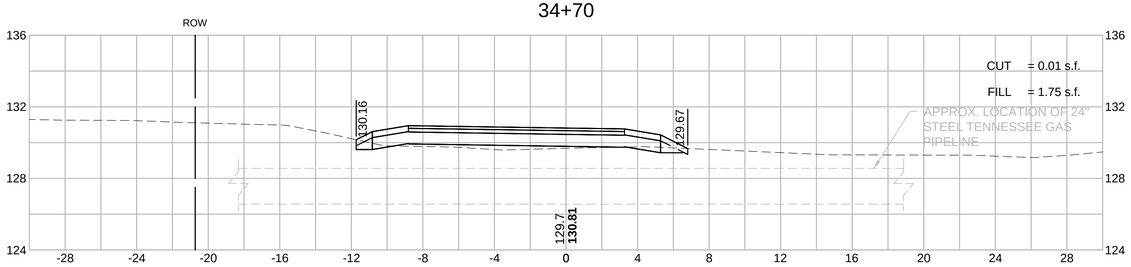
35+50



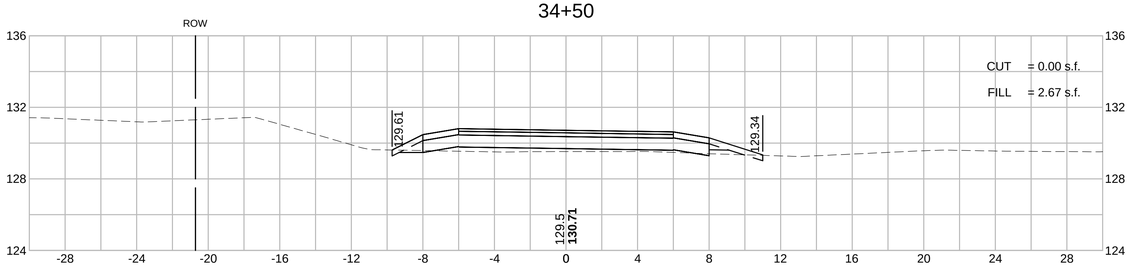
35+00



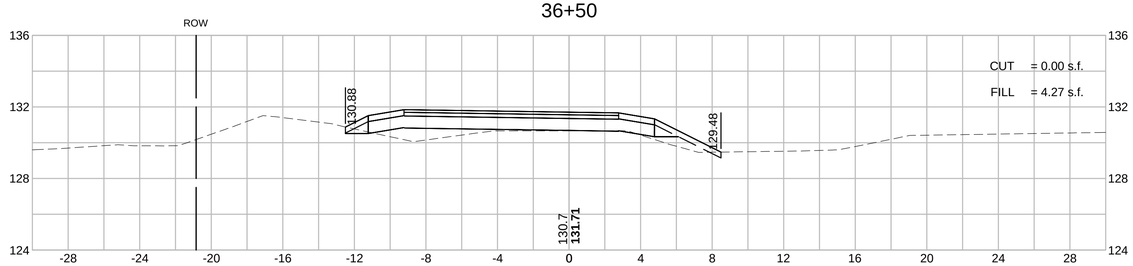
34+70



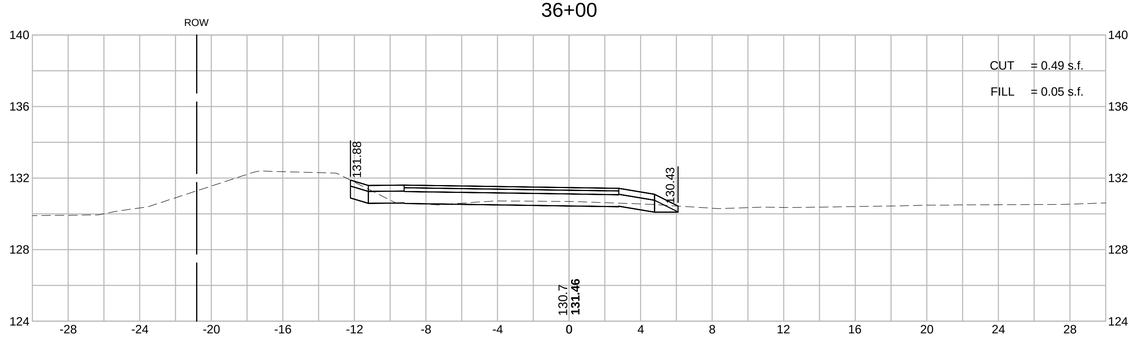
34+50



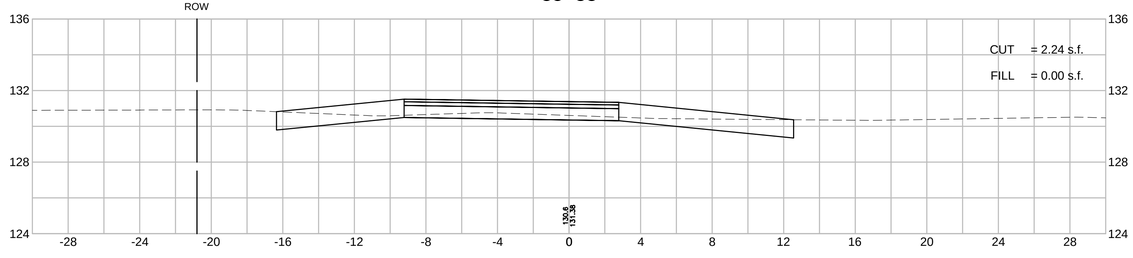
36+50



36+00



35+83



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

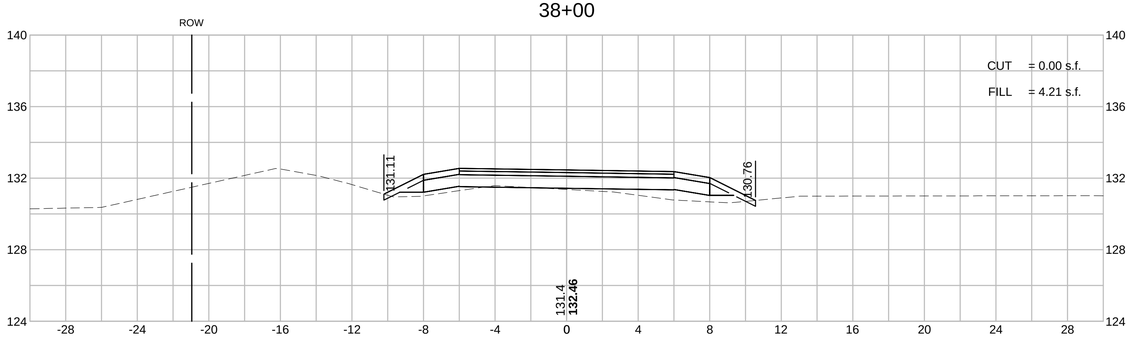
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	142	158
PROJECT FILE NO.	606223		

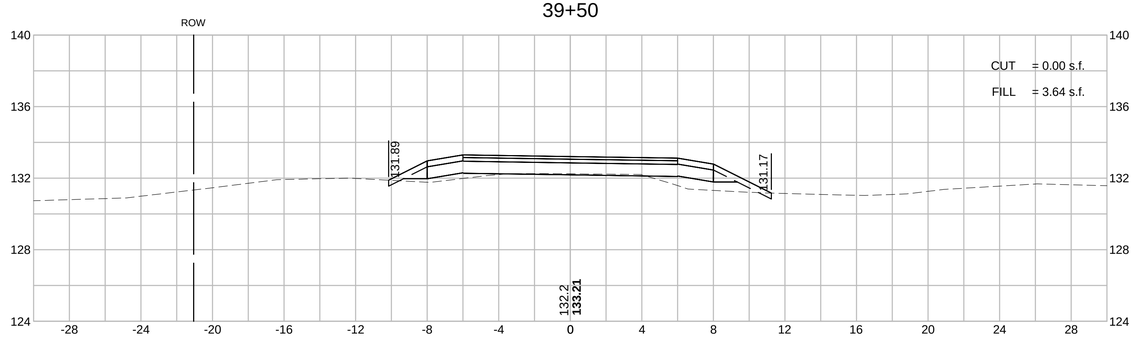
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:52 PM

38+00



39+50



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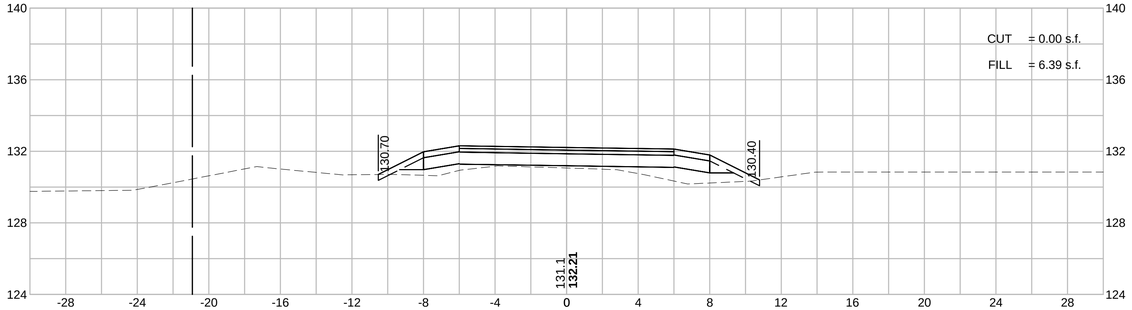

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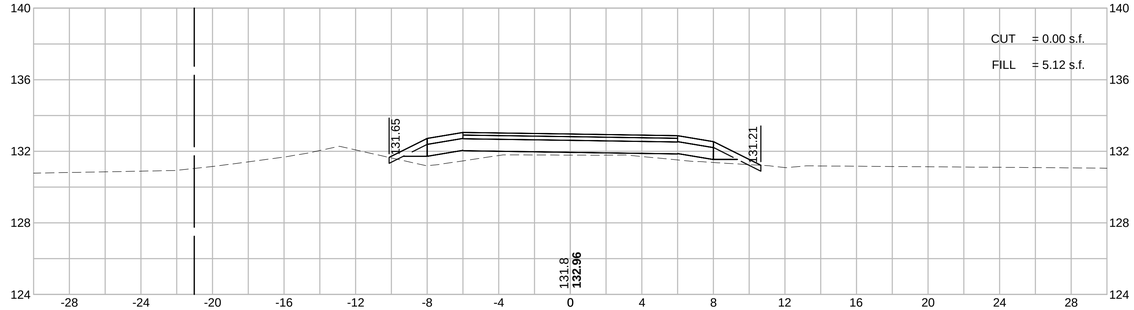

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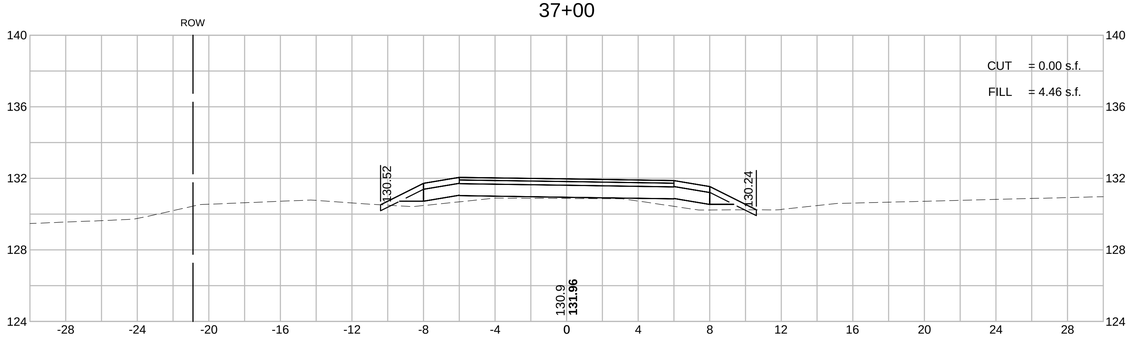
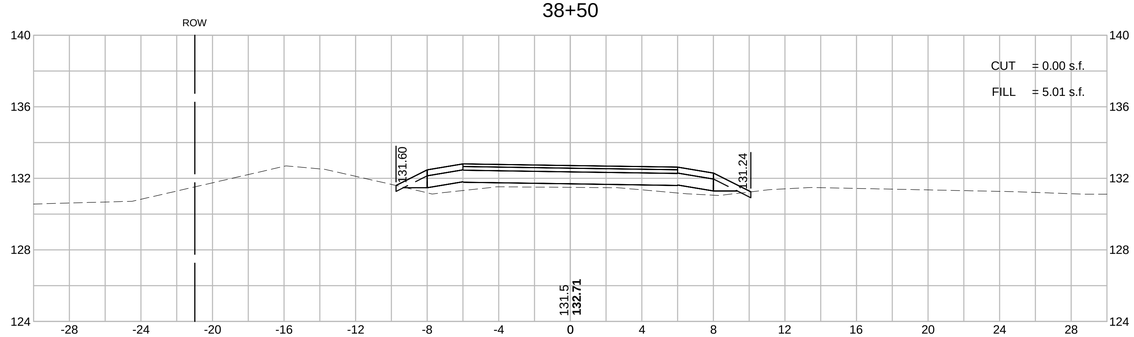


38+50



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

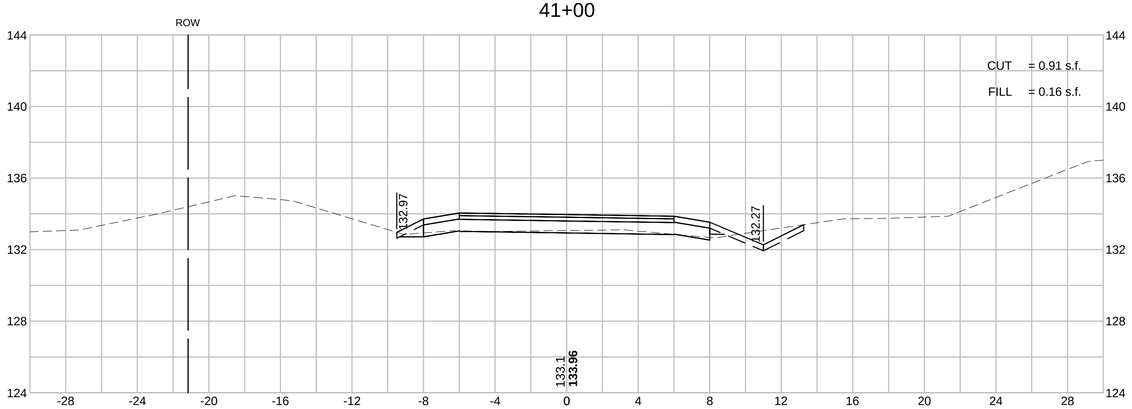
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	143	158
PROJECT FILE NO.	606223		

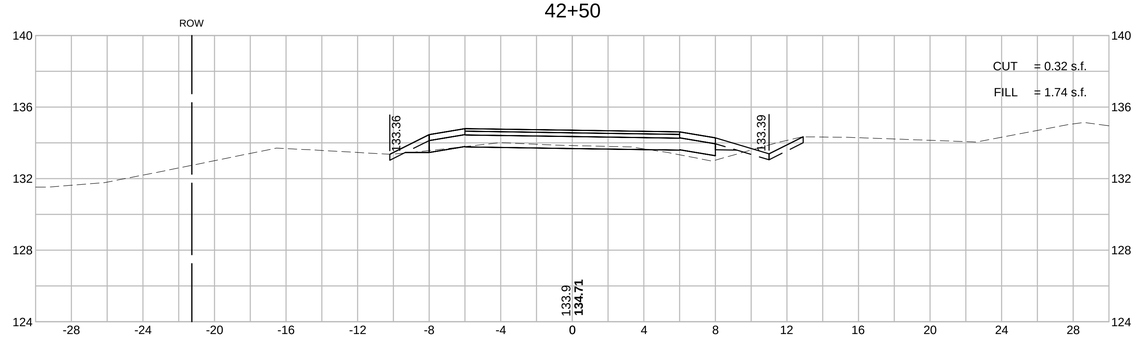
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:52 PM

41+00



42+50



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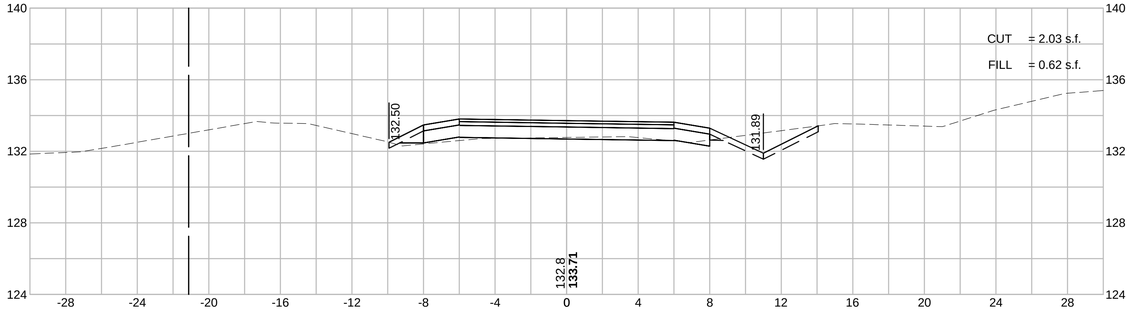

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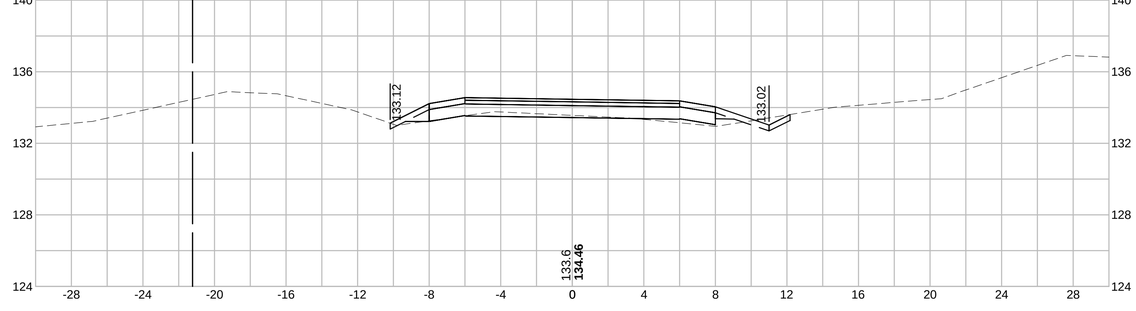

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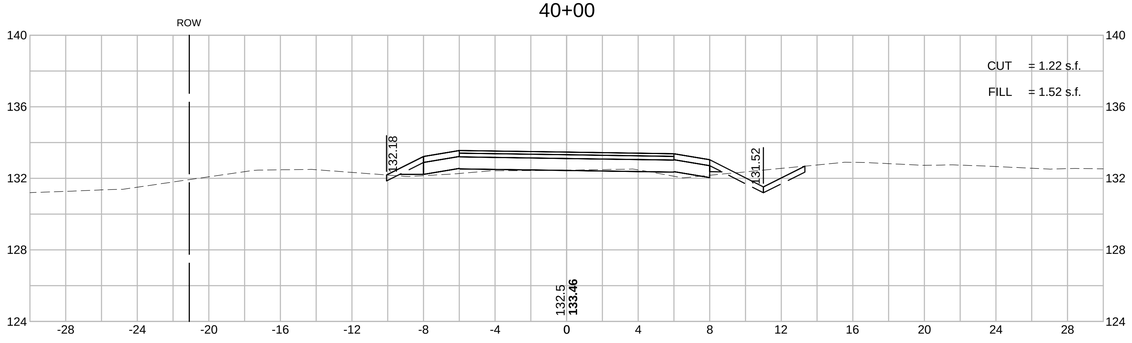
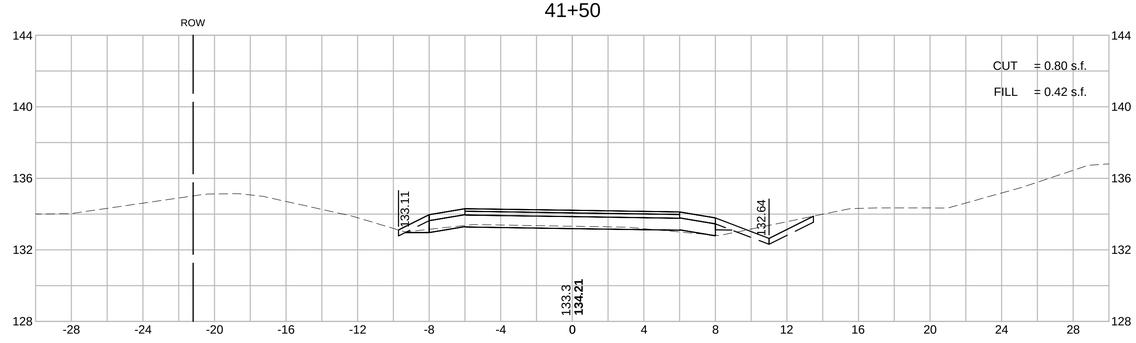


41+50



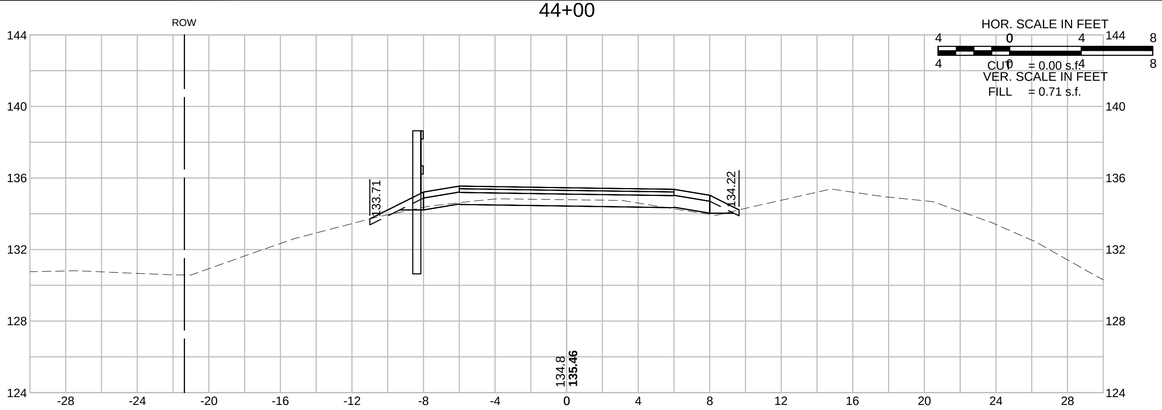
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	144	158
PROJECT FILE NO.	606223		

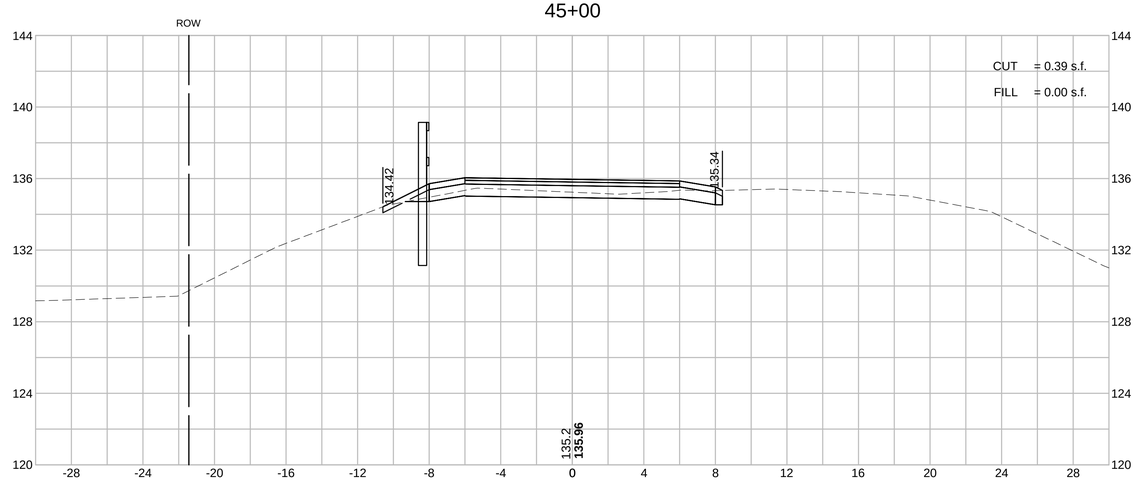
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:53 PM

44+00



45+00



43+50

43+00

44+50

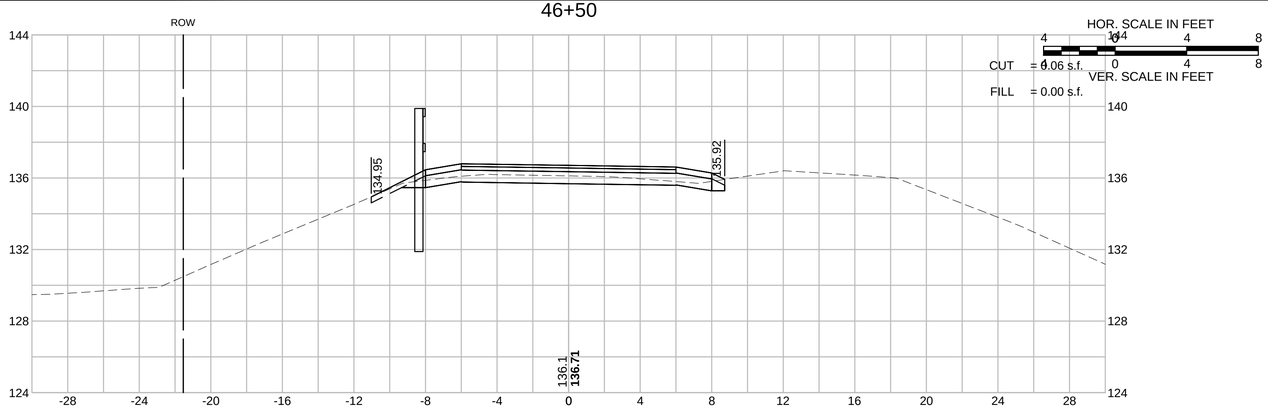
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	145	158
PROJECT FILE NO.	606223		

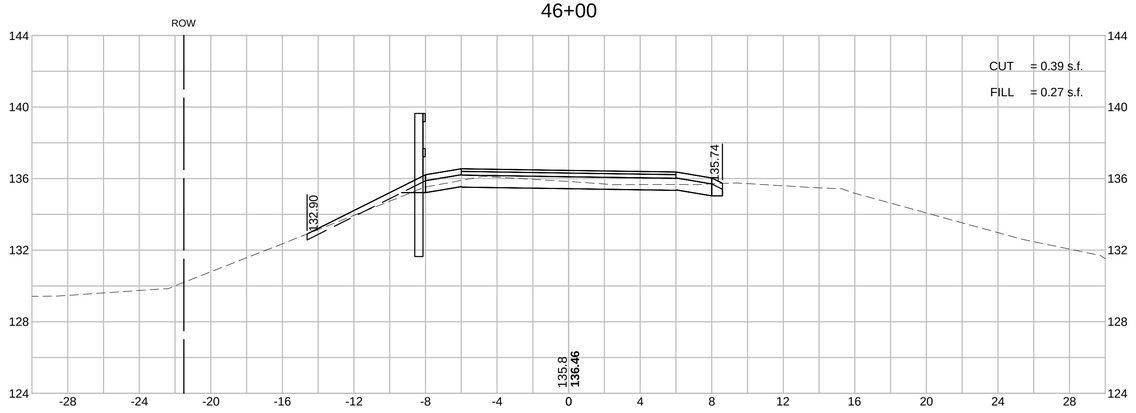
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:53 PM

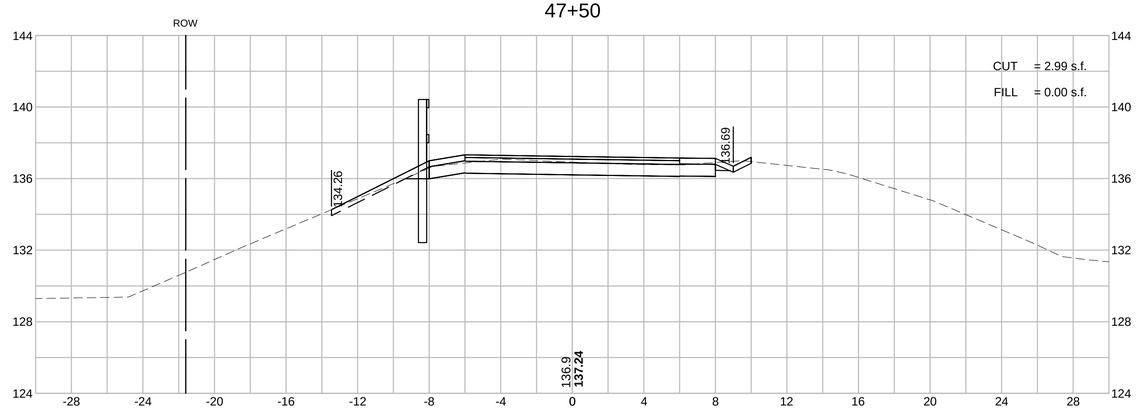
46+50



46+00



47+50



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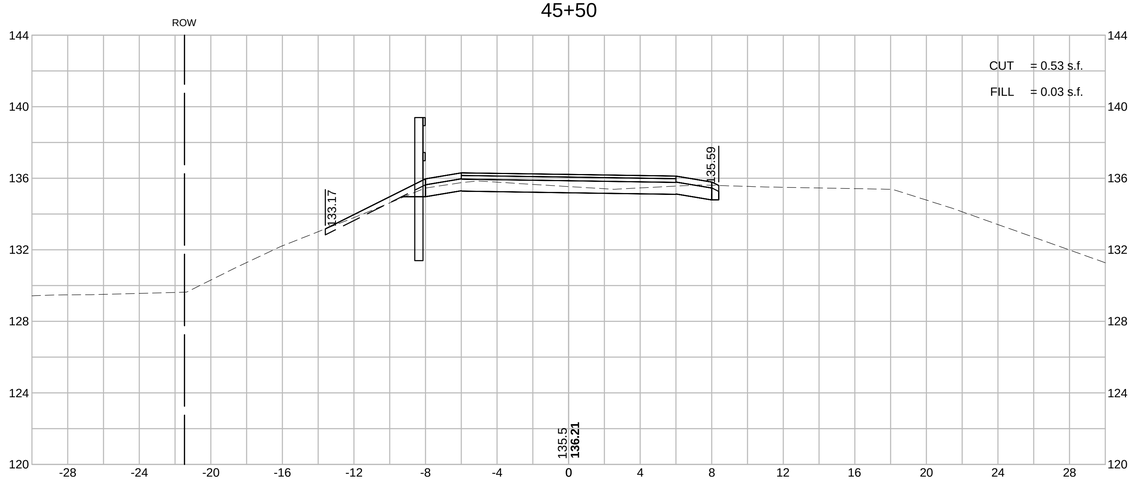
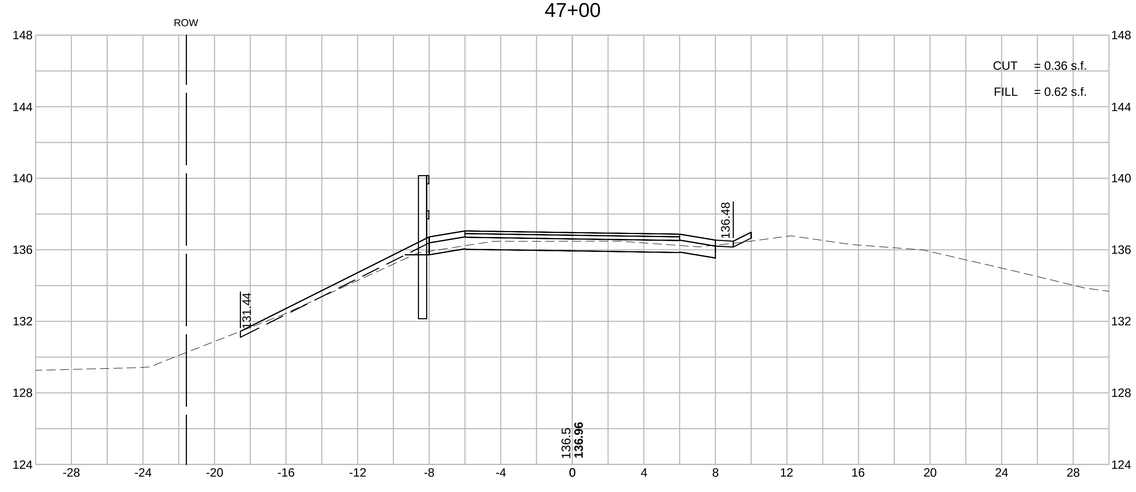


47+00



HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

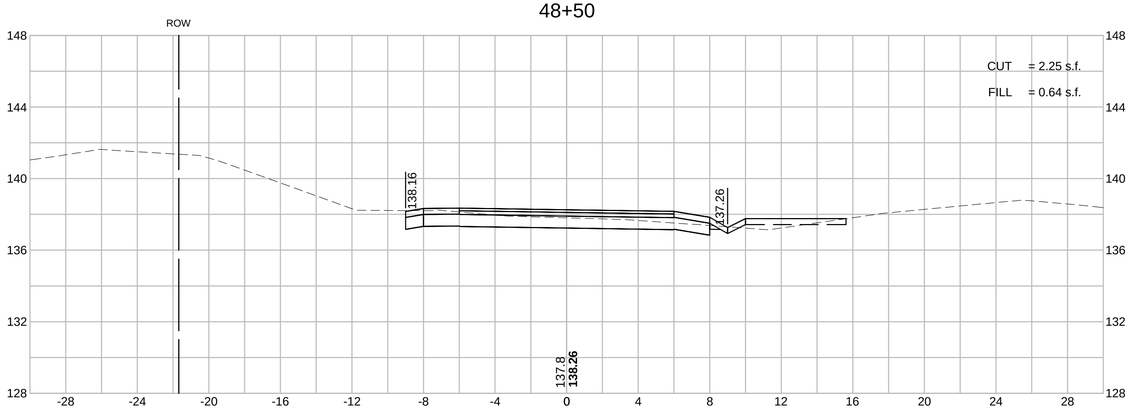
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	146	158
PROJECT FILE NO.	606223		

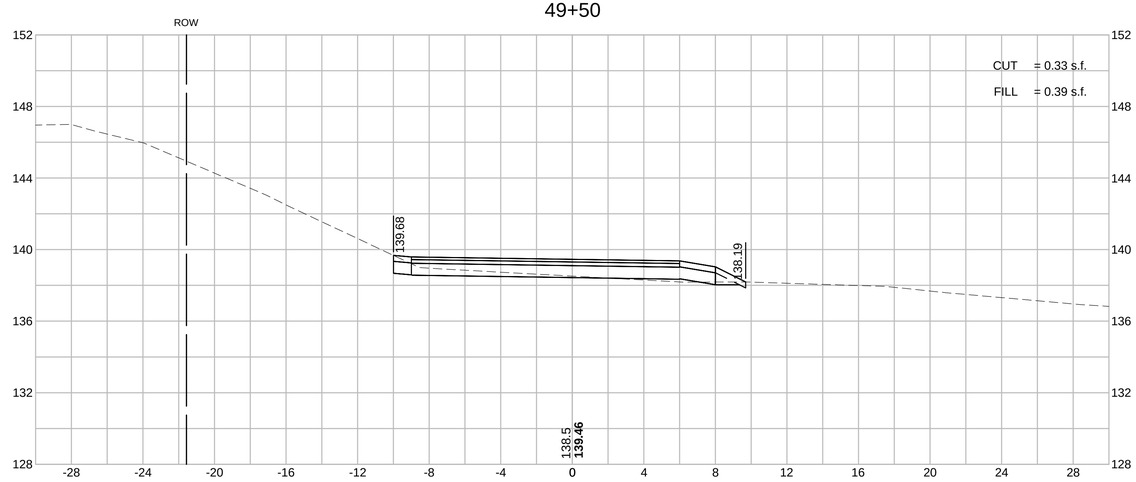
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:54 PM

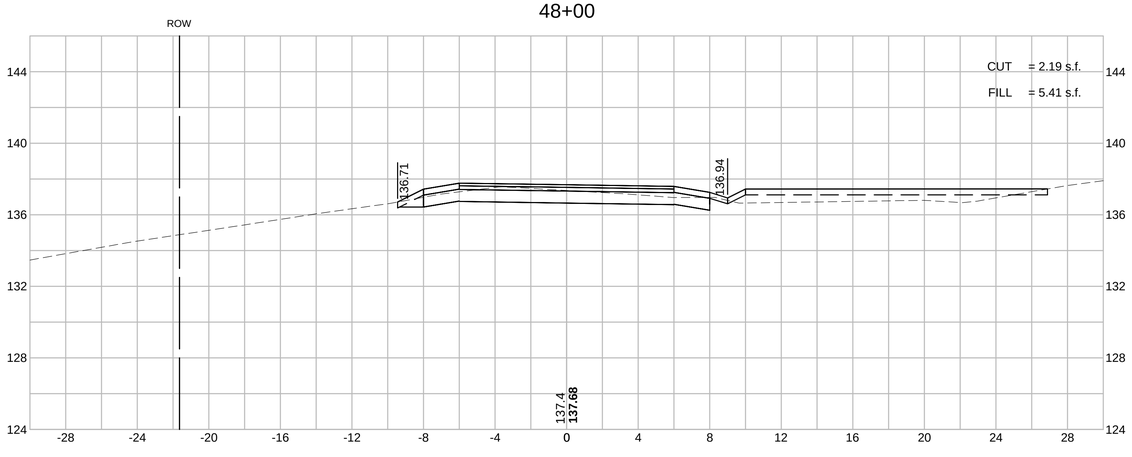
48+50



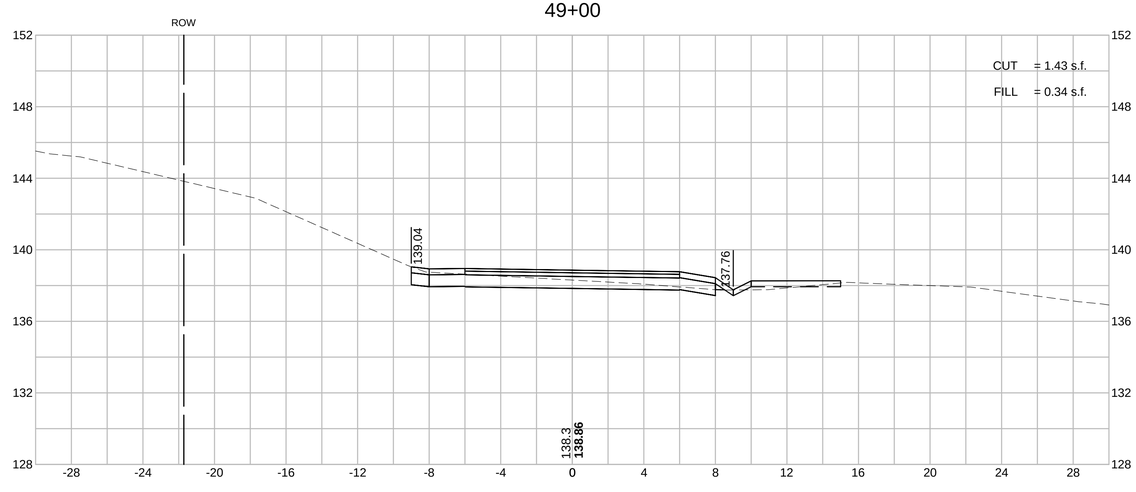
49+50



48+00



49+00



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

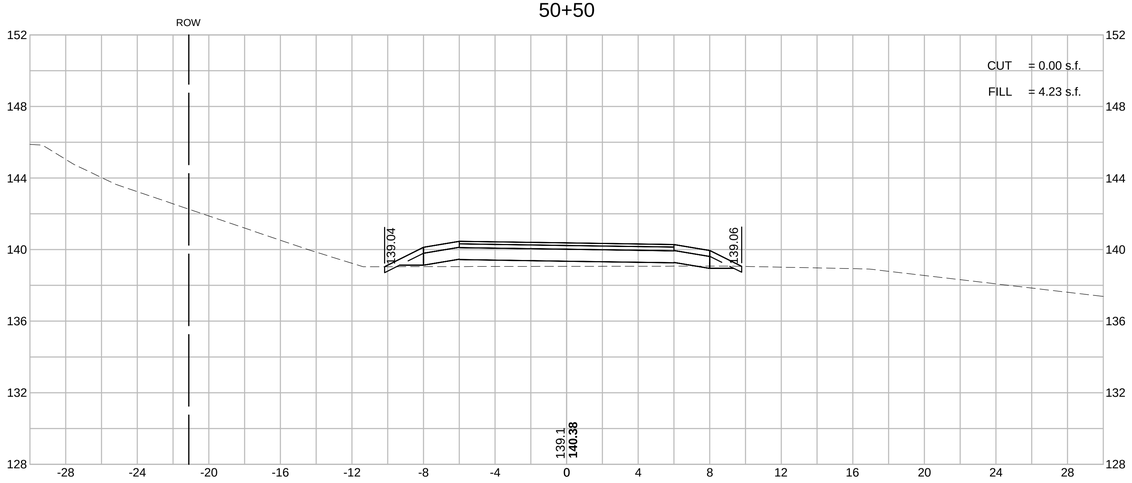
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	147	158
PROJECT FILE NO.	606223		

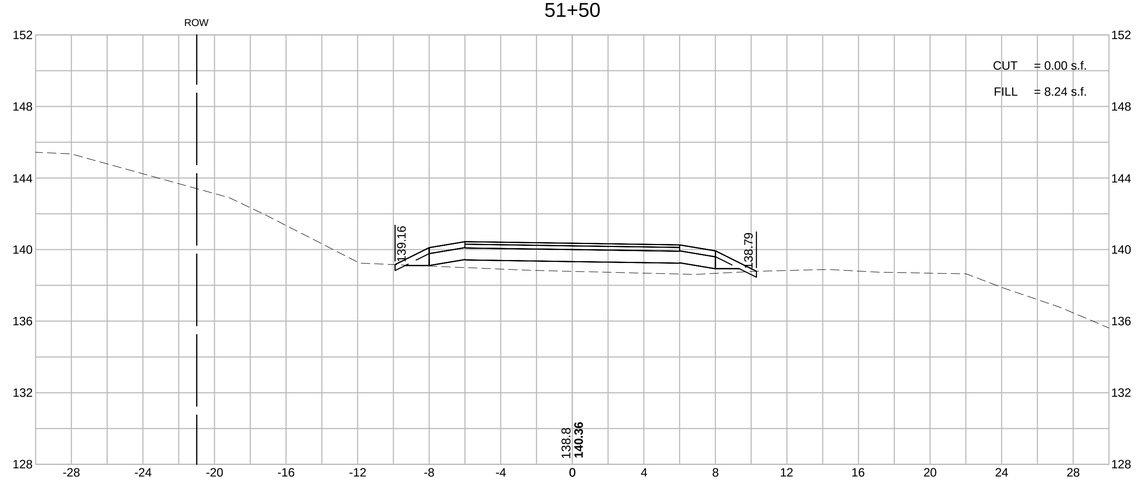
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:54 PM

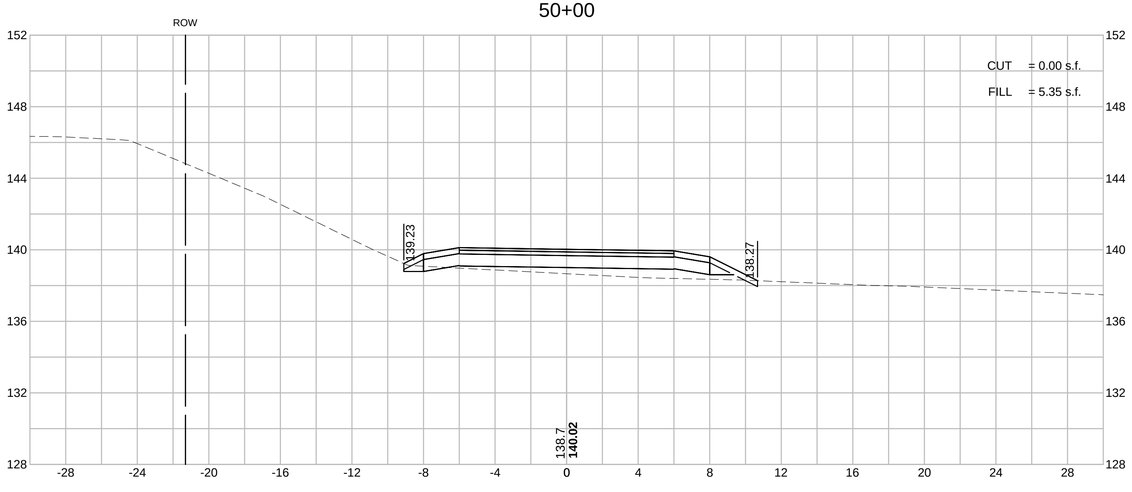
50+50



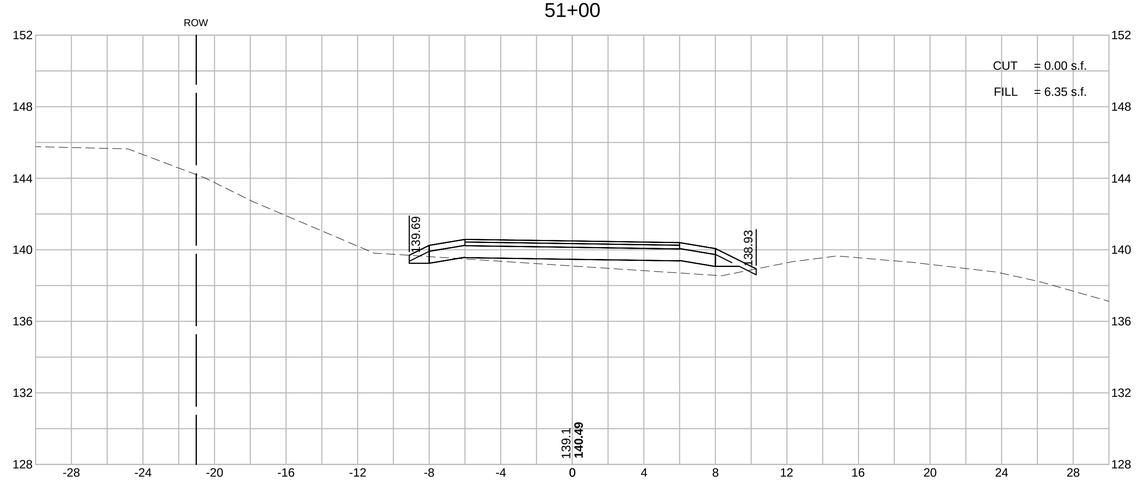
51+50



50+00



51+00



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

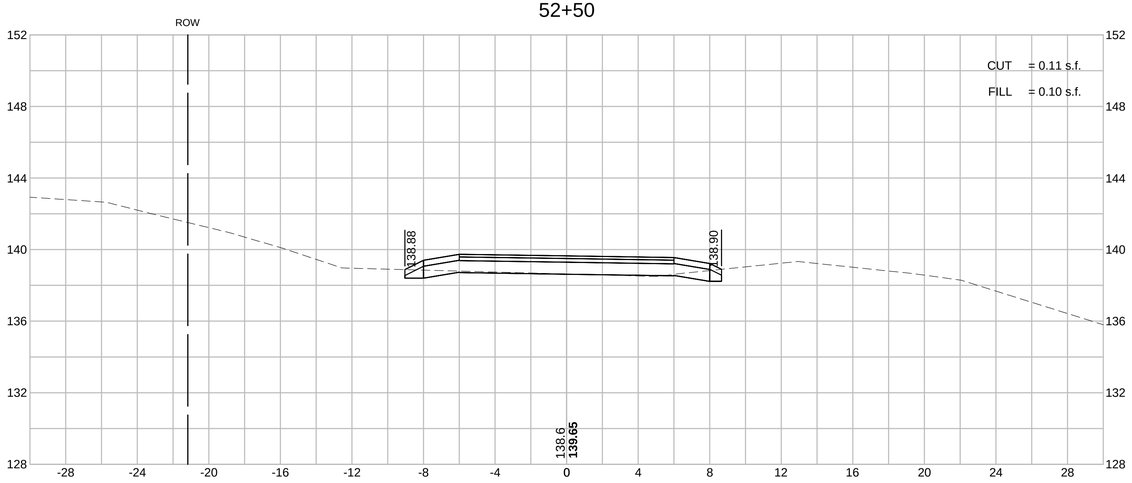
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	148	158
PROJECT FILE NO.	606223		

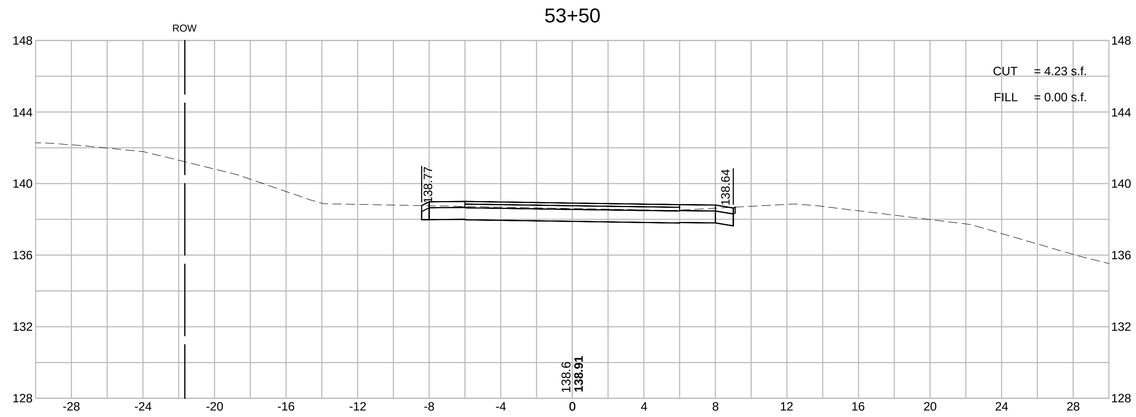
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:55 PM

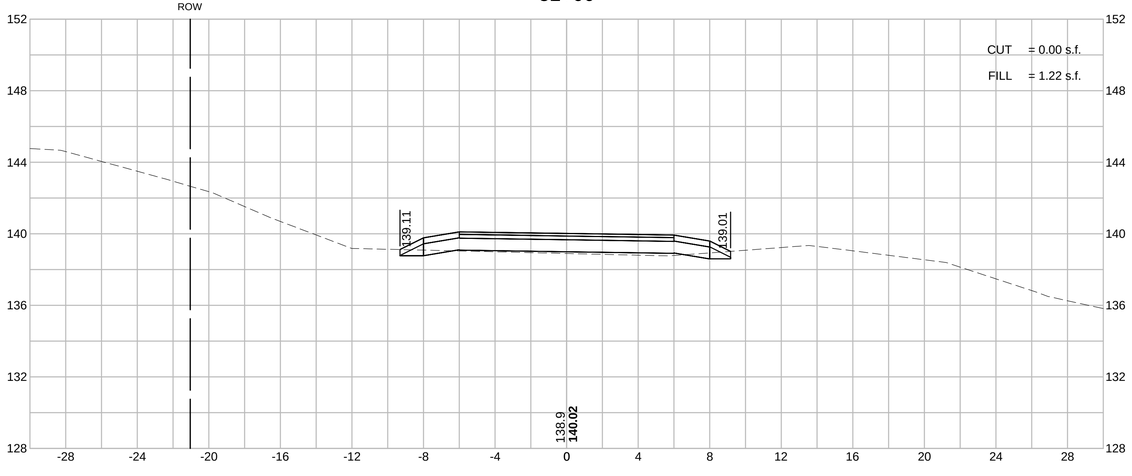
52+50



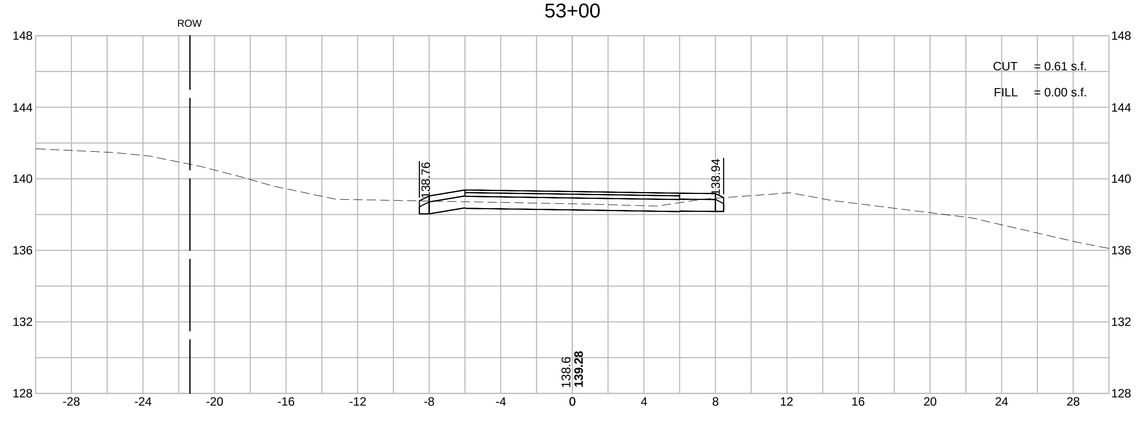
53+50



52+00



53+00



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

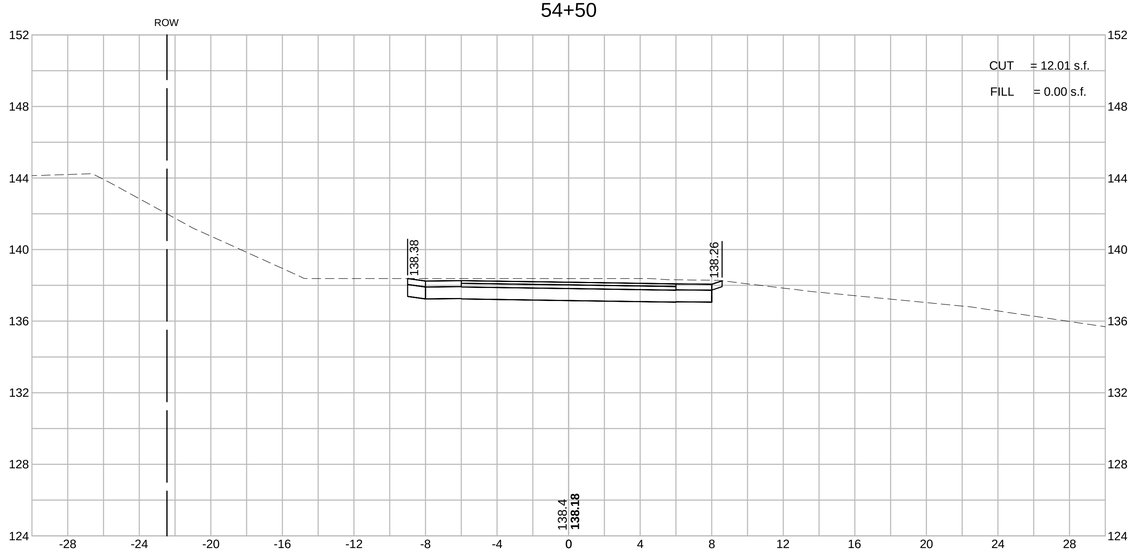
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	149	158
PROJECT FILE NO.	606223		

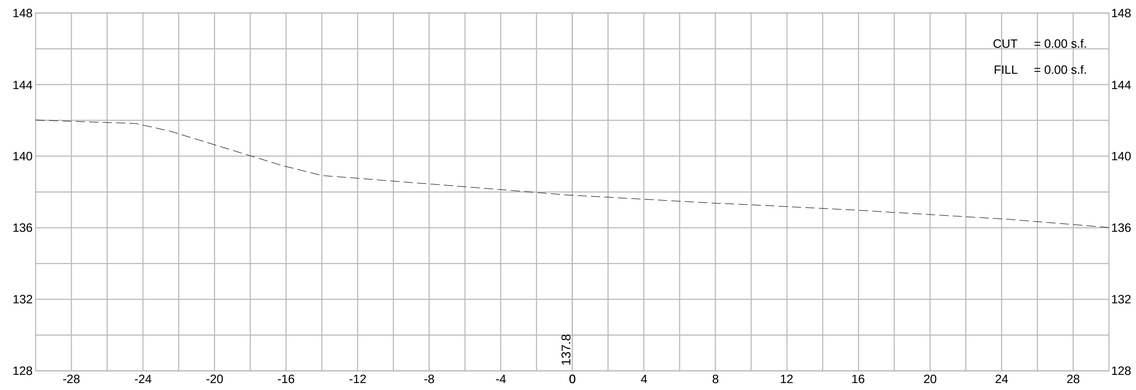
CROSS SECTIONS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:55 PM

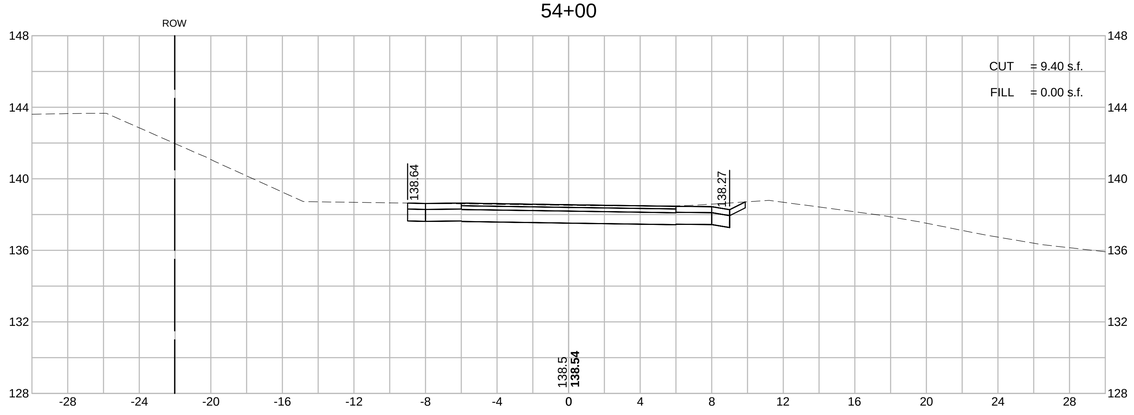
54+50



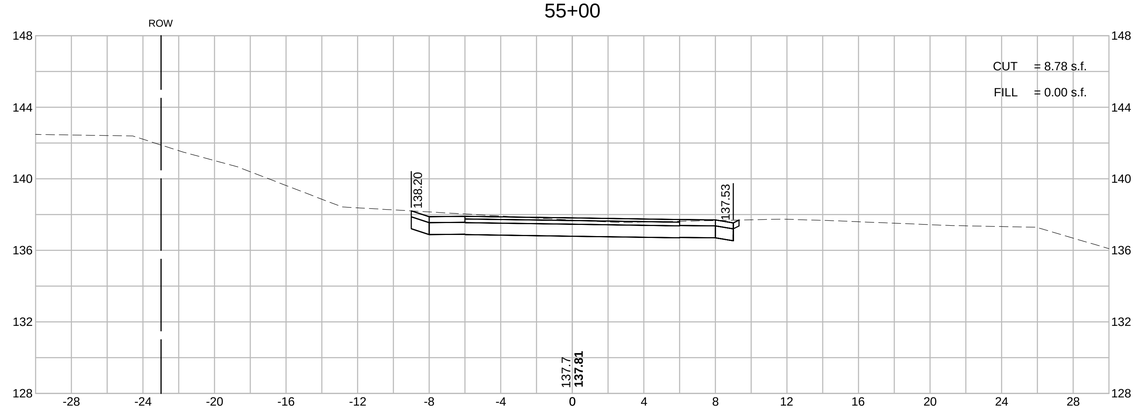
55+50



54+00



55+00



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

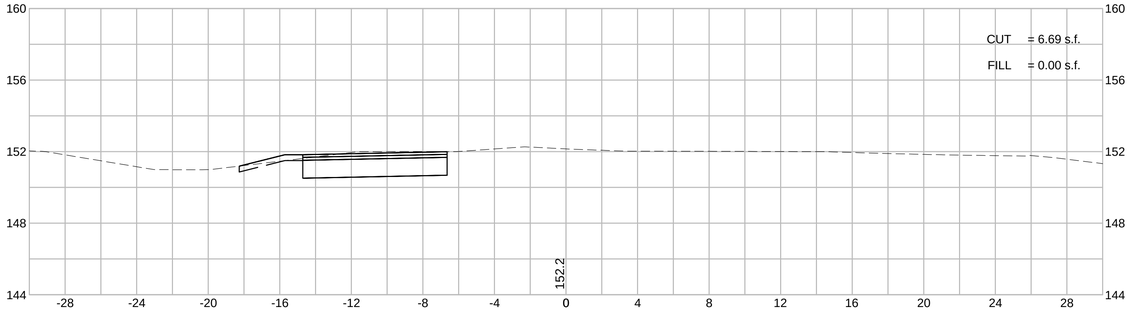
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	150	158
PROJECT FILE NO.	606223		

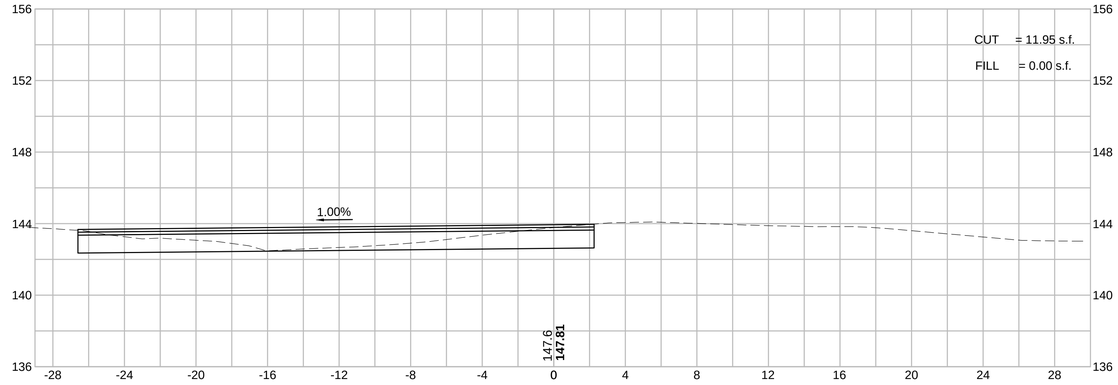
CROSS SECTIONS - MEDIAN CROSSOVERS

Plotted on 4-Feb-2019 3:55 PM
606223_HD_(XS).DWG

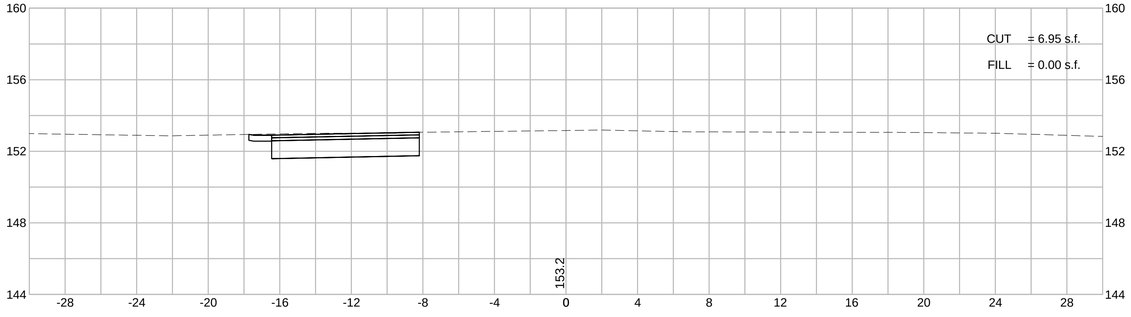
203+00
ROUTE 2 EB CROSSOVER ℄



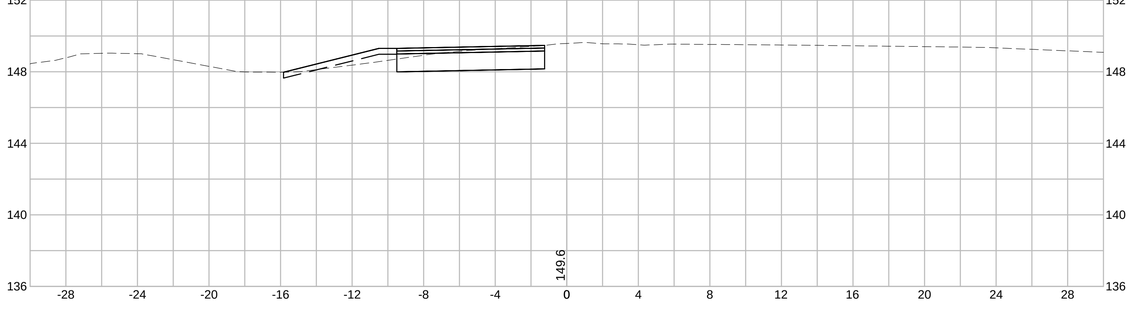
204+50
ROUTE 2 EB CROSSOVER ℄



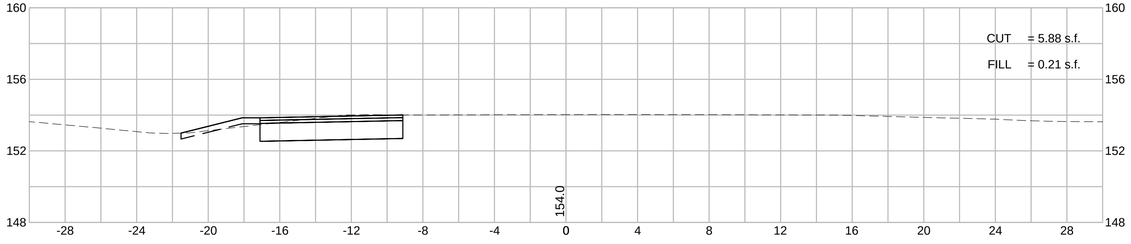
202+50
ROUTE 2 EB CROSSOVER ℄



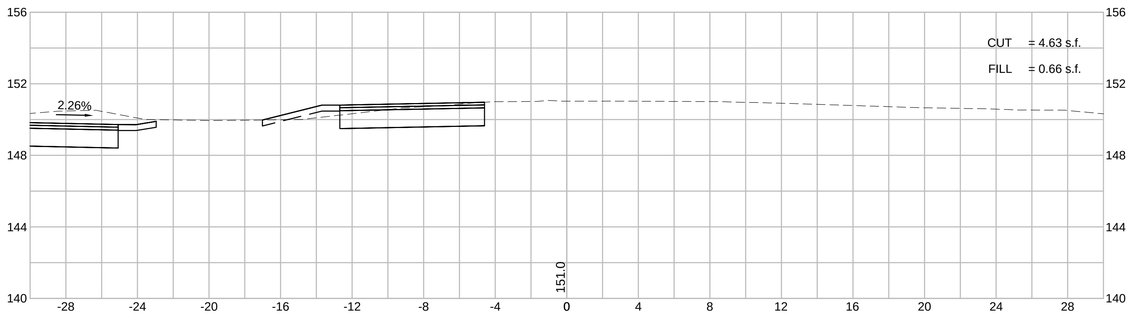
204+00
ROUTE 2 EB CROSSOVER ℄



202+00
ROUTE 2 EB CROSSOVER ℄



203+50
ROUTE 2 EB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

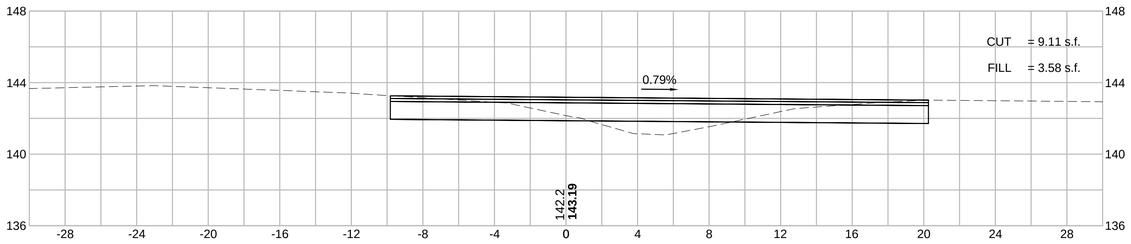
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	151	158
PROJECT FILE NO.	606223		

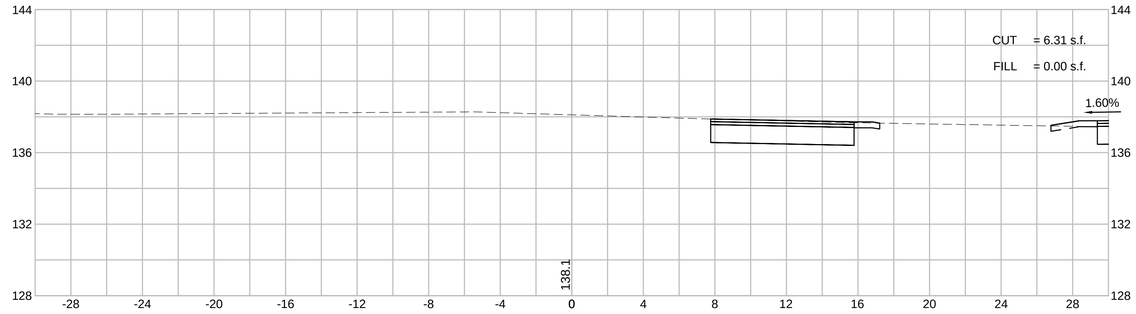
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:56 PM

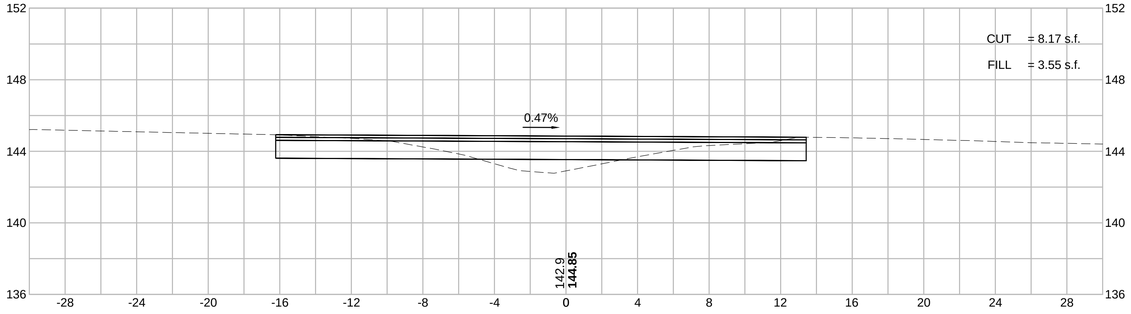
206+00
ROUTE 2 EB CROSSOVER ℄



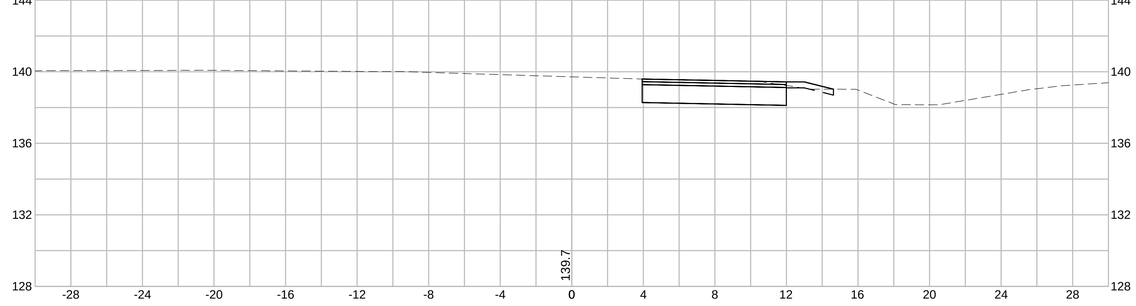
207+50
ROUTE 2 EB CROSSOVER ℄



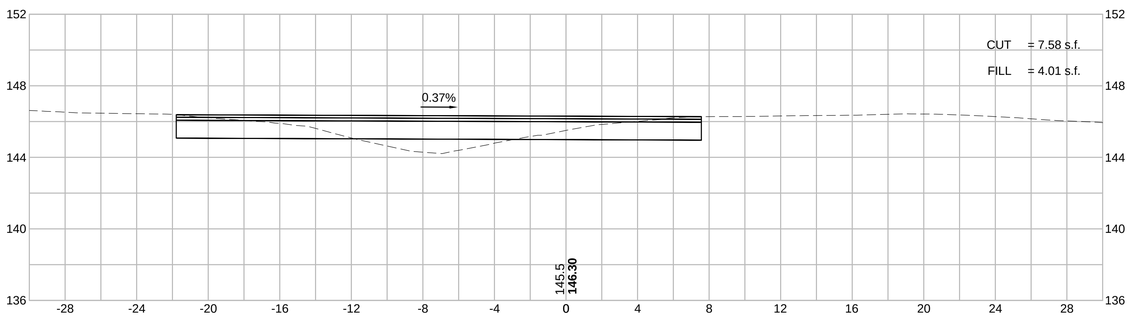
205+50
ROUTE 2 EB CROSSOVER ℄



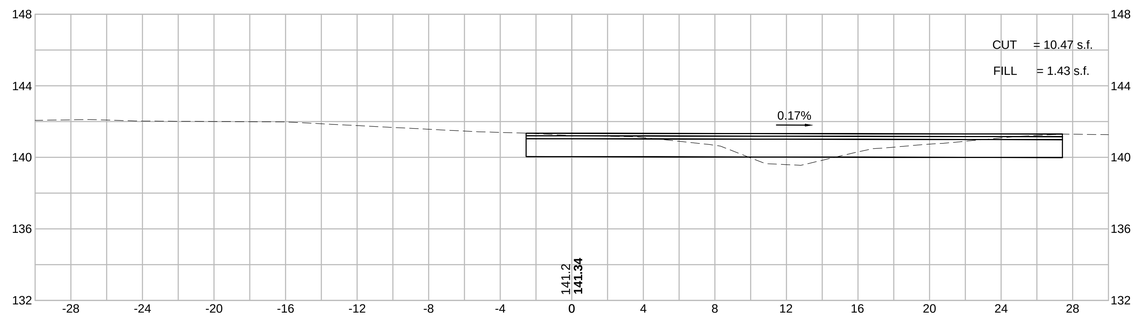
207+00
ROUTE 2 EB CROSSOVER ℄



205+00
ROUTE 2 EB CROSSOVER ℄



206+50
ROUTE 2 EB CROSSOVER ℄



HOR. SCALE IN FEET

4 0 4 8

4 0 4 8

VER. SCALE IN FEET

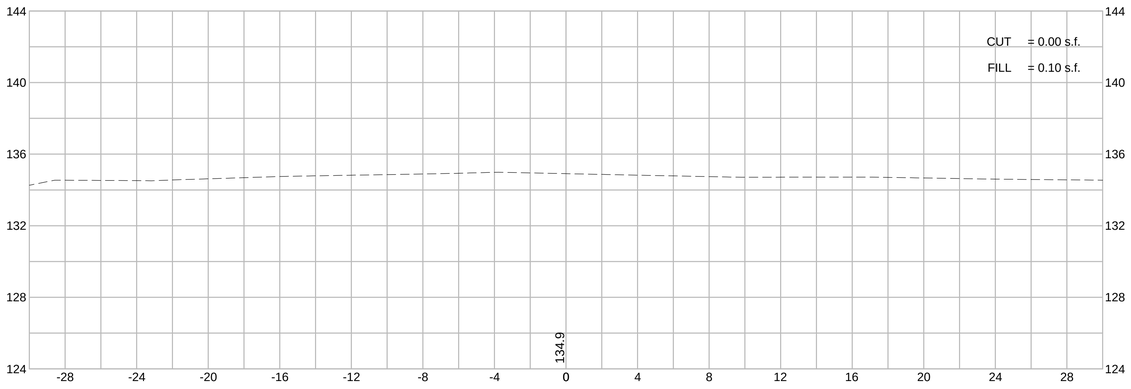
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	152	158
PROJECT FILE NO.	606223		

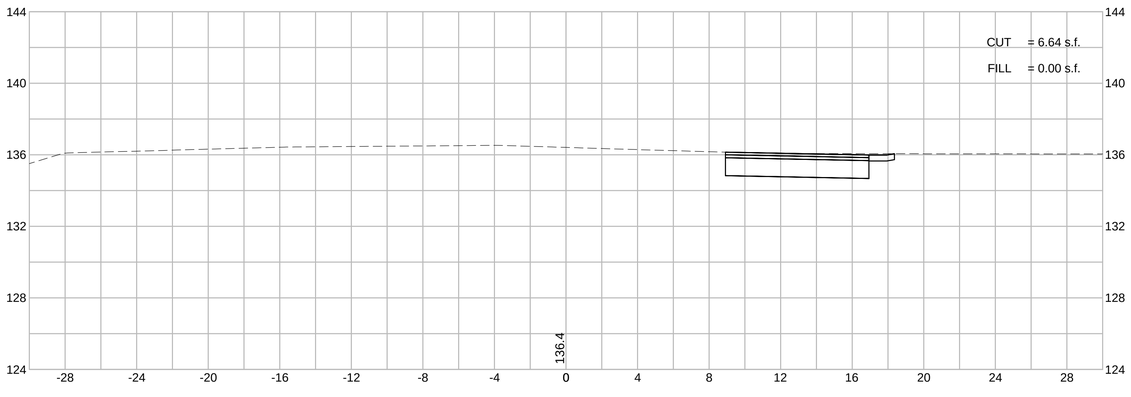
CROSS SECTIONS - MEDIAN CROSSOVERS

Plotted on 4-Feb-2019 3:56 PM
606223_HD_(XS).DWG

208+50
ROUTE 2 EB CROSSOVER ℄



208+00
ROUTE 2 EB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

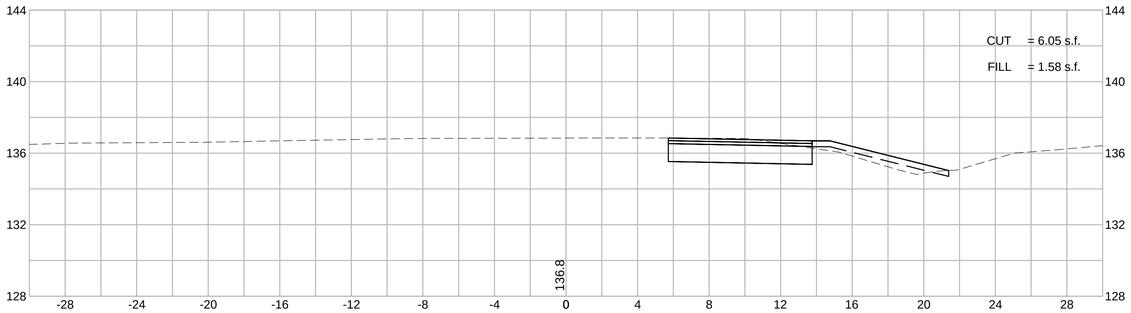
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	153	158
PROJECT FILE NO.	606223		

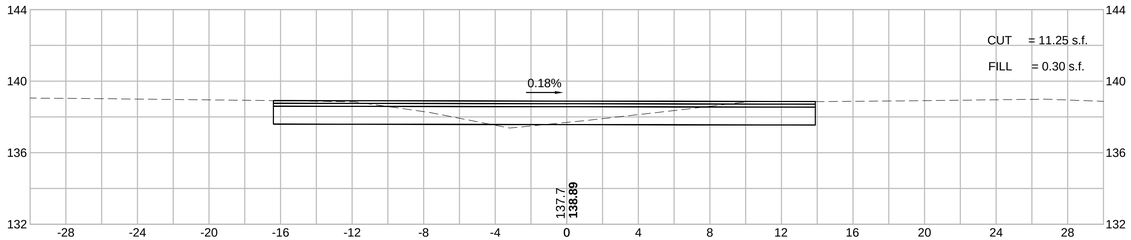
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 4:38 PM

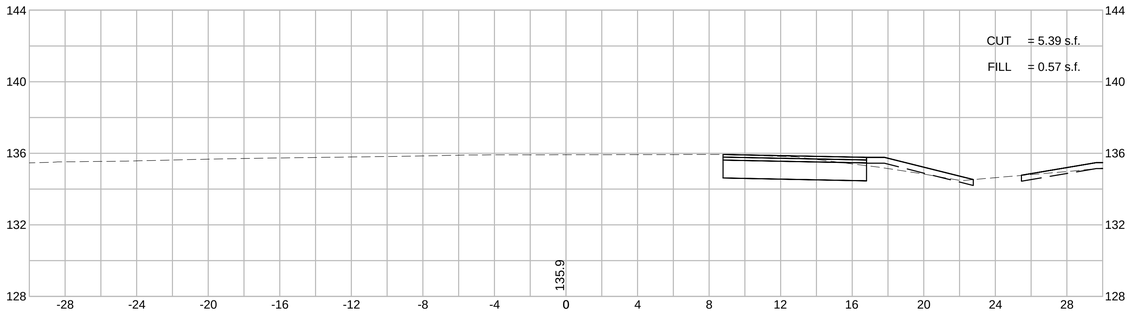
216+50
ROUTE 2 EB CROSSOVER ℄



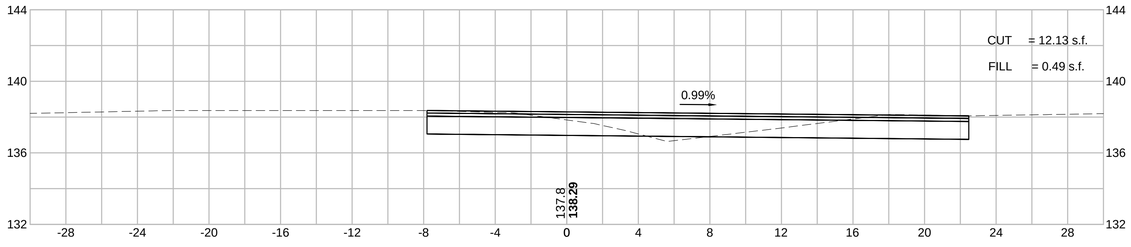
218+00
ROUTE 2 EB CROSSOVER ℄



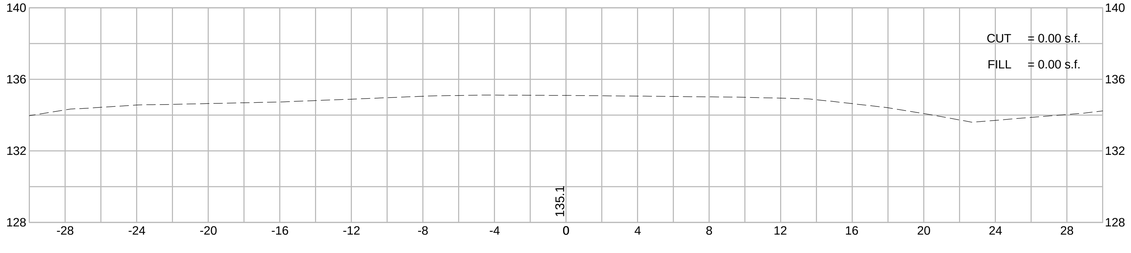
216+00
ROUTE 2 EB CROSSOVER ℄



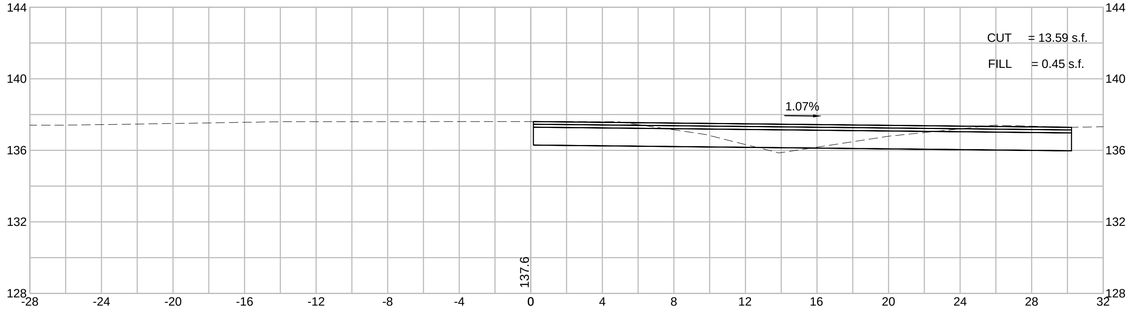
217+50
ROUTE 2 EB CROSSOVER ℄



215+50
ROUTE 2 EB CROSSOVER ℄



217+00
ROUTE 2 EB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

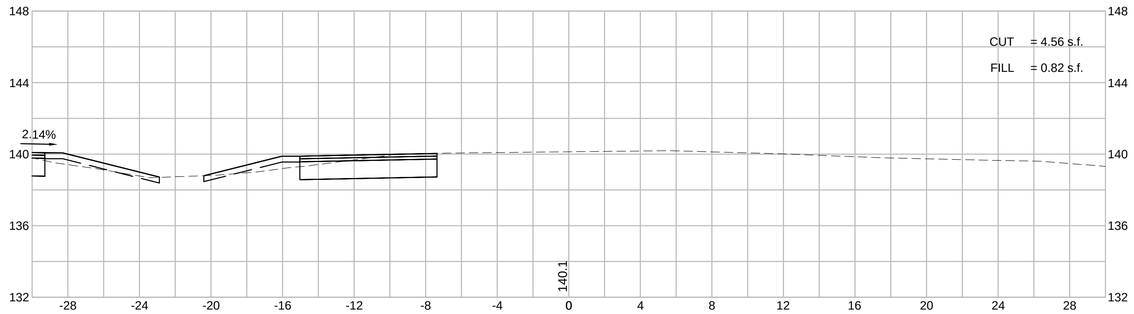
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	154	158
PROJECT FILE NO.	606223		

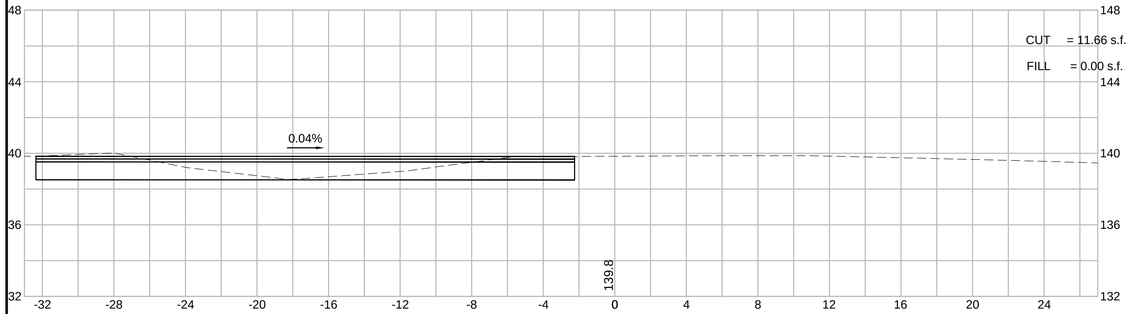
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 4:38 PM

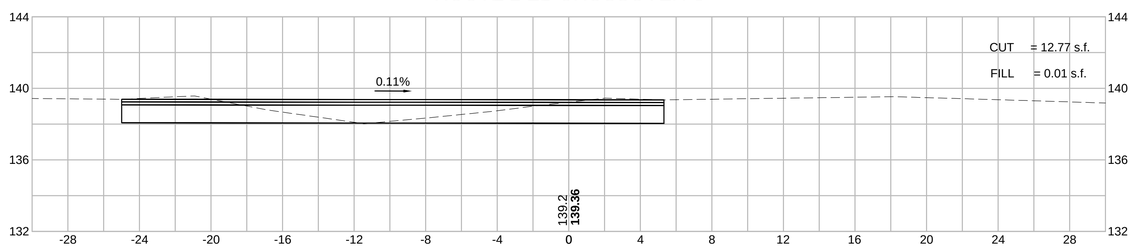
219+50
ROUTE 2 EB CROSSOVER ℄



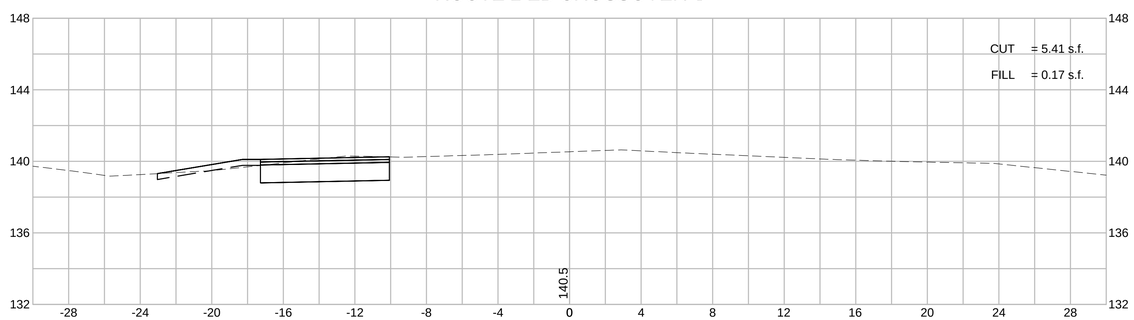
219+00
ROUTE 2 EB CROSSOVER ℄



218+50
ROUTE 2 EB CROSSOVER ℄



220+00
ROUTE 2 EB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

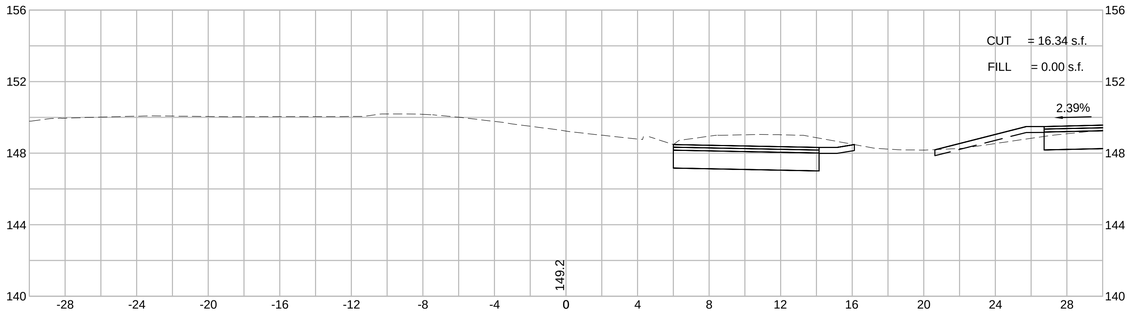
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	155	158
PROJECT FILE NO.	606223		

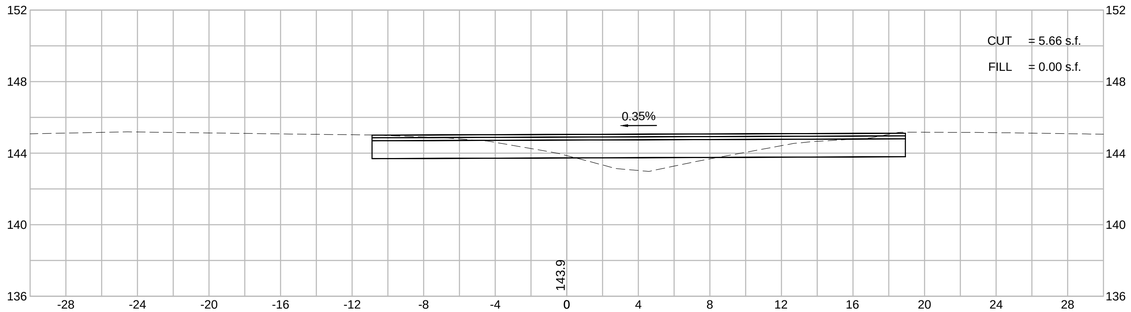
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:57 PM

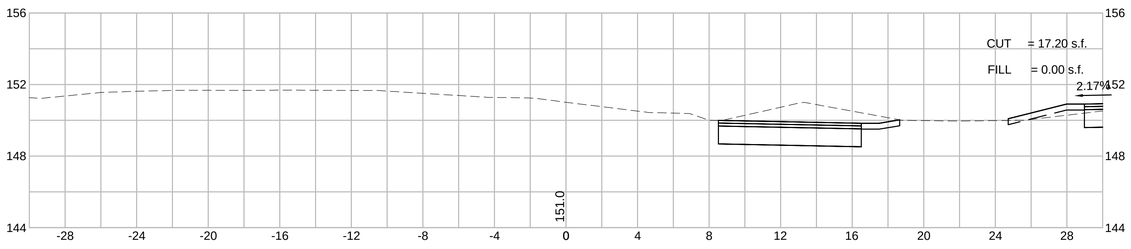
104+00
ROUTE 2 WB CROSSOVER ℄



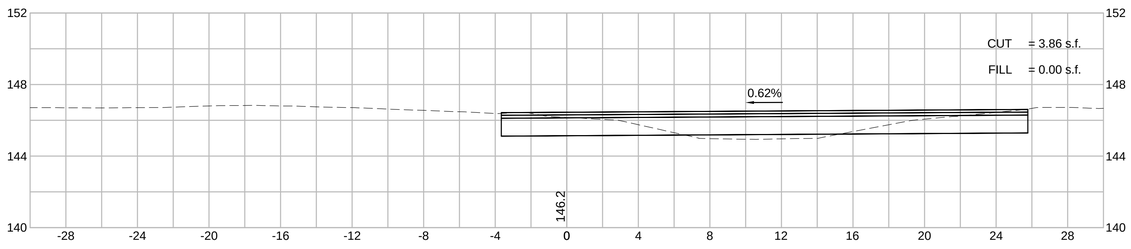
105+50
ROUTE 2 WB CROSSOVER ℄



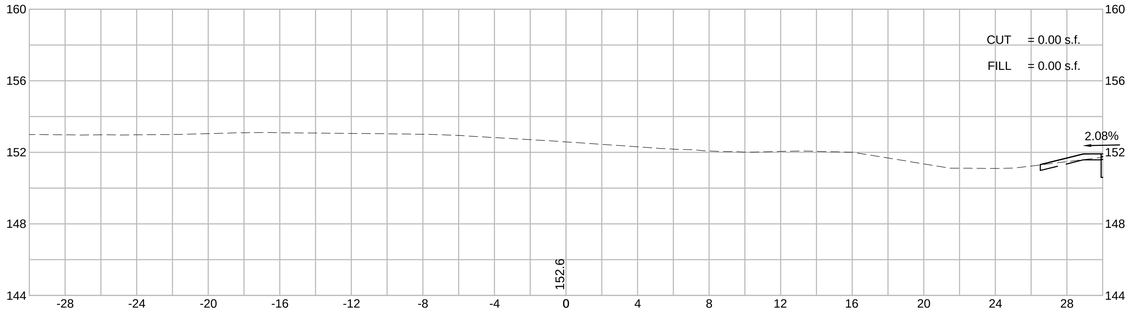
103+50
ROUTE 2 WB CROSSOVER ℄



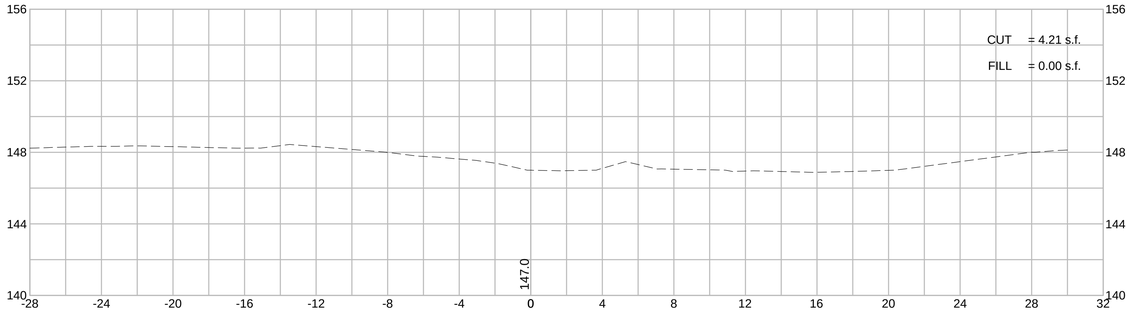
105+00
ROUTE 2 WB CROSSOVER ℄



103+00
ROUTE 2 WB CROSSOVER ℄



104+50
ROUTE 2 WB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

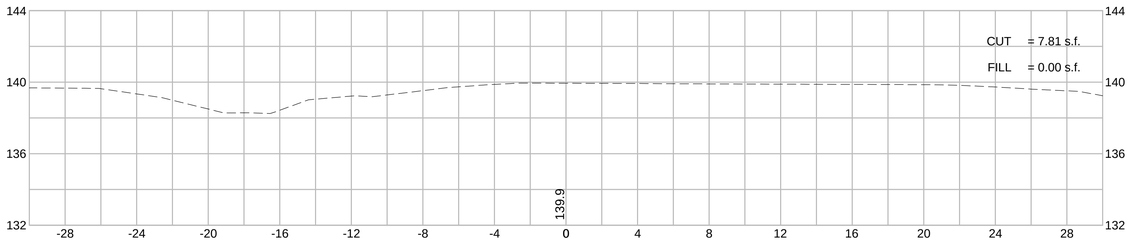
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	156	158
PROJECT FILE NO.	606223		

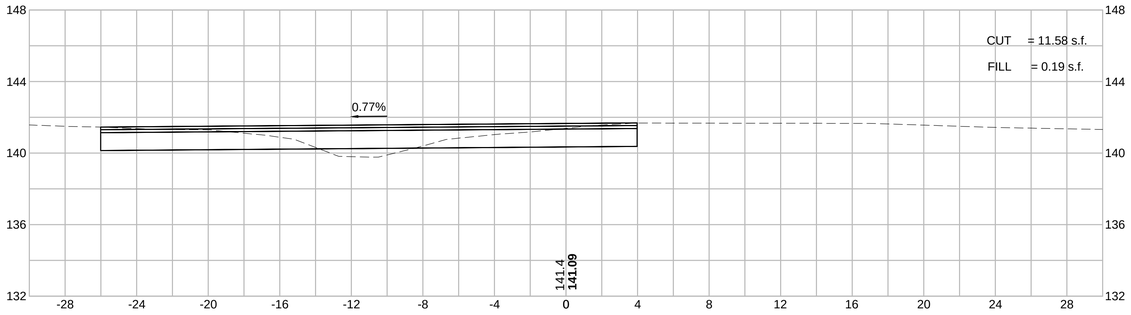
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:57 PM

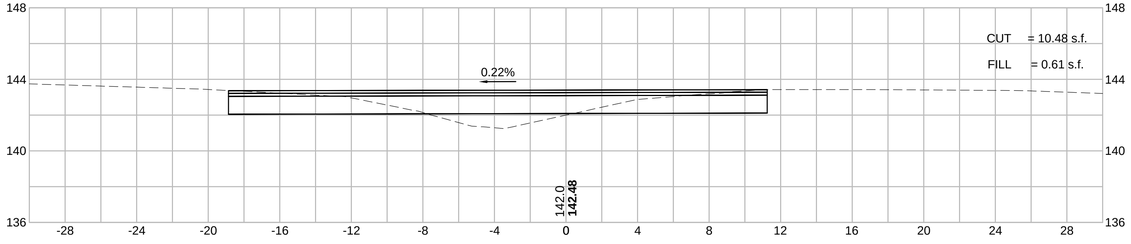
107+00
ROUTE 2 WB CROSSOVER ℄



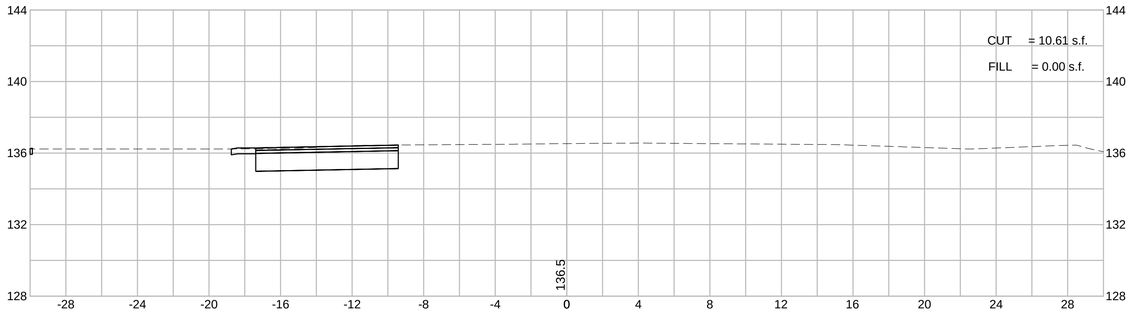
106+50
ROUTE 2 WB CROSSOVER ℄



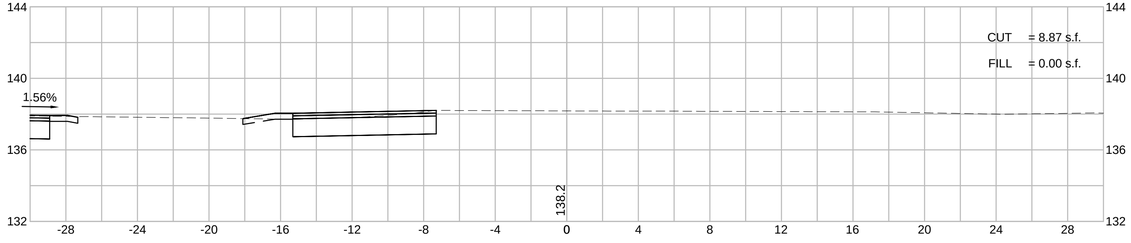
106+00
ROUTE 2 WB CROSSOVER ℄



108+00
ROUTE 2 WB CROSSOVER ℄



107+50
ROUTE 2 WB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

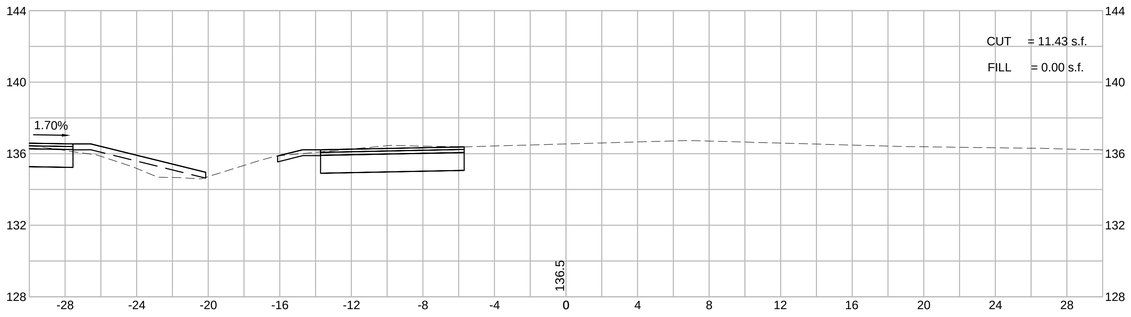
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	157	158
PROJECT FILE NO.	606223		

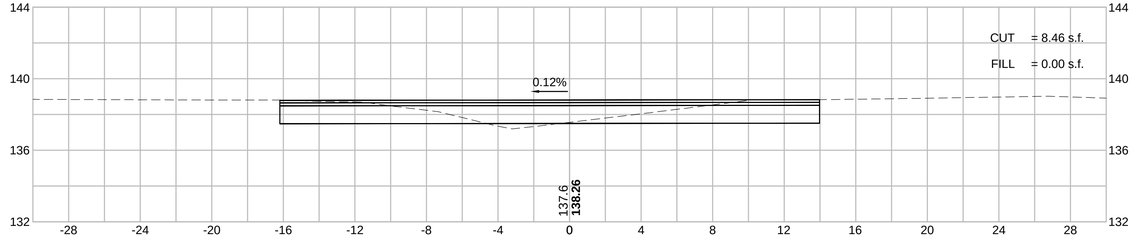
CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:59 PM

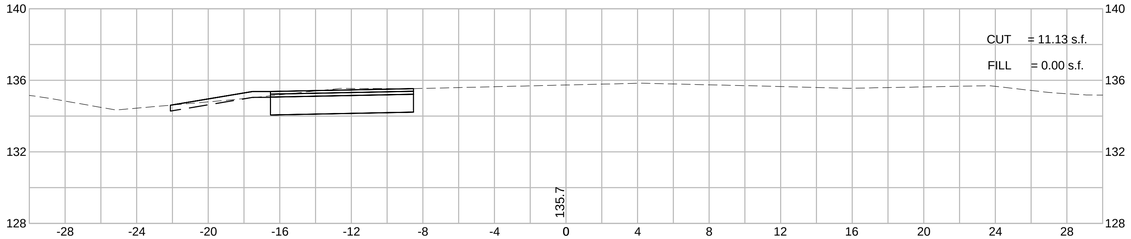
116+50
ROUTE 2 WB CROSSOVER ℄



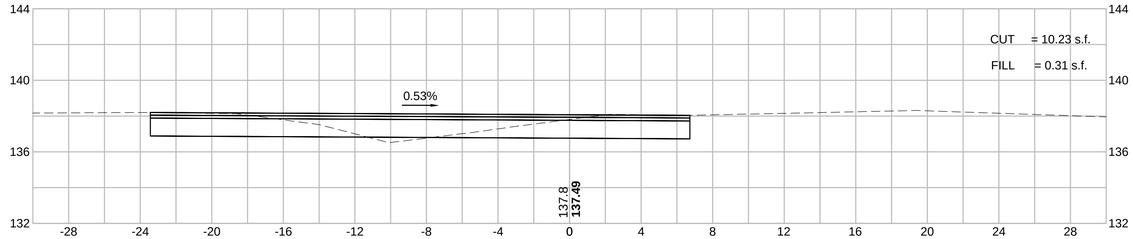
118+00
ROUTE 2 WB CROSSOVER ℄



116+00
ROUTE 2 WB CROSSOVER ℄



117+50
ROUTE 2 WB CROSSOVER ℄



115+50
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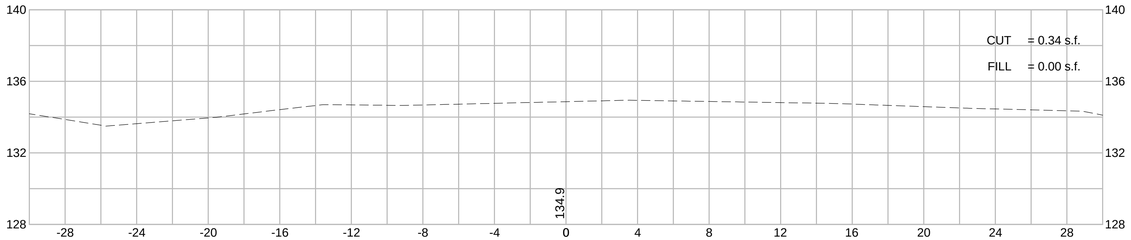
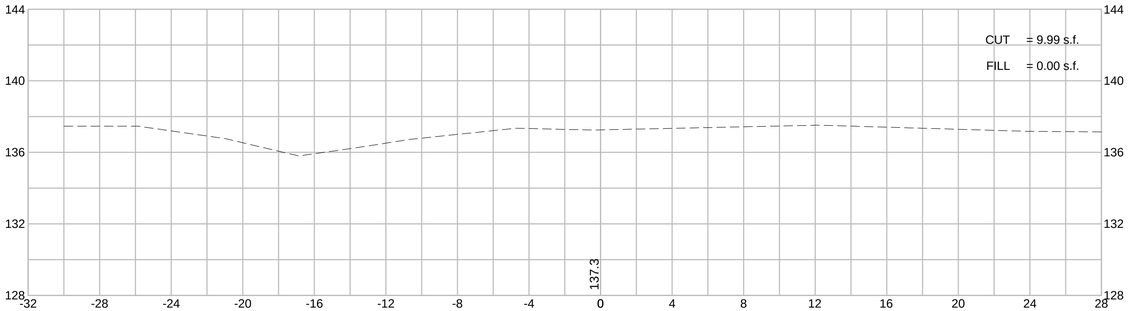


117+00
ROUTE 2 WB CROSSOVER ℄



HOR. SCALE IN FEET
4 0 4 8
4 0 4 8
VER. SCALE IN FEET

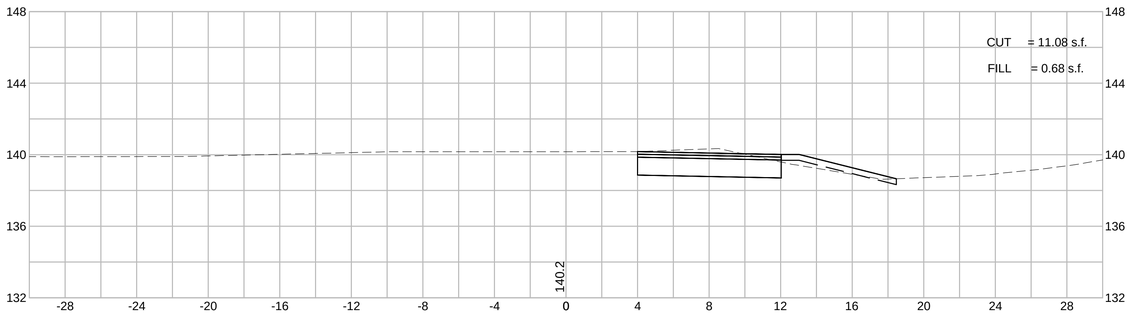
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	158	158
PROJECT FILE NO.	606223		

CROSS SECTIONS - MEDIAN CROSSOVERS

606223_HD_(XS).DWG Plotted on 4-Feb-2019 3:58 PM

119+50
ROUTE 2 WB CROSSOVER ℄



119+00
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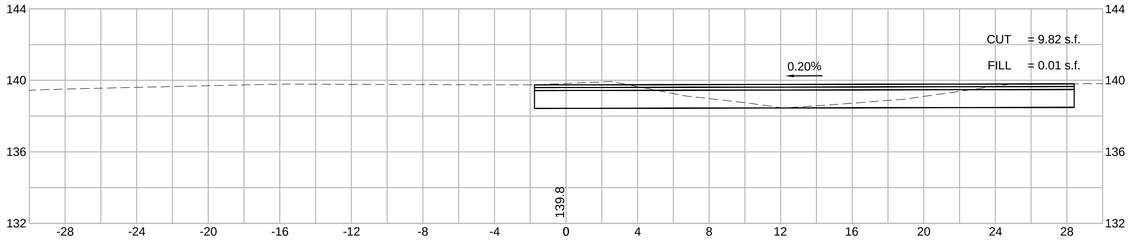

118+50
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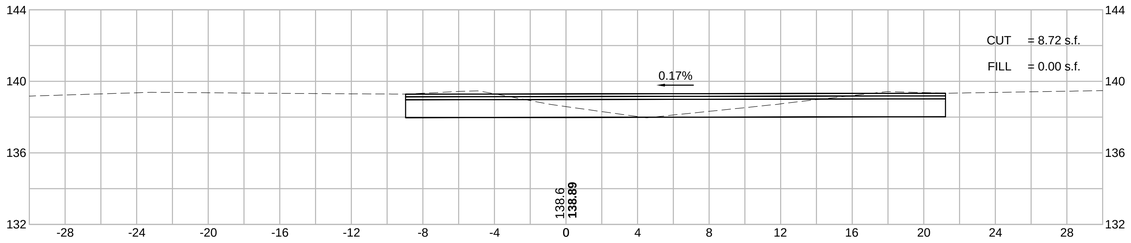

120+00
ROUTE 2 WB CROSSOVER ℄