MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

LOWELL - ROUTE 38 ROADWAY & INTERSECTION IMPROVEMENTS			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	1	96
PROJECT FILE NO.	606189		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

ROUTE 38 ROADWAY AND INTERSECTION IMPROVEMENTS

IN THE CITY OF

LOWELL - ROUTE 38

MIDDLESEX COUNTY

FEDERAL AID PROJECT NO. TAP/STP-0034(201)X

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 WTH 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.

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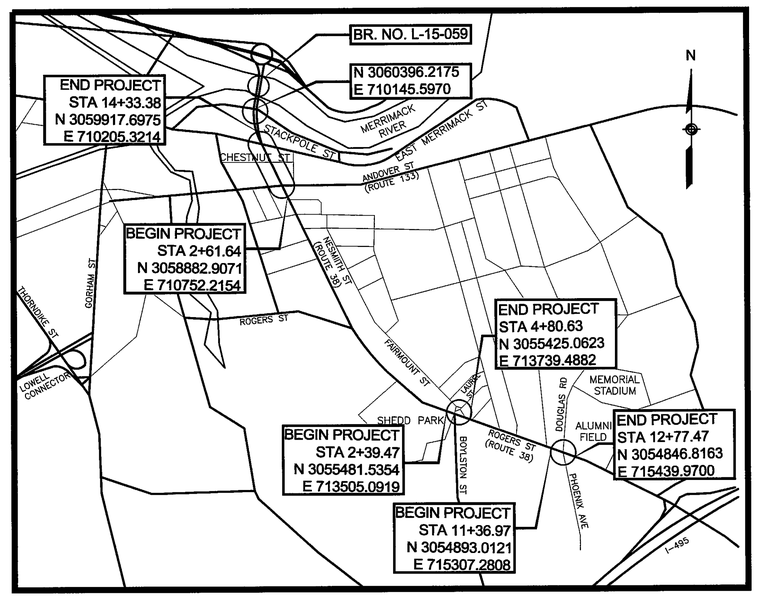


0 1,300 2,600 3,900 5,200

SCALE: 1" = 1,300'

LENGTH OF PROJECT = 1,171.74 FEET = 0.221 MILES
LENGTH OF PROJECT = 280.53 FEET = 0.053 MILES
LENGTH OF PROJECT = 223.26 FEET = 0.042 MILES

DESIGN DESIGNATION (ROUTE 38)

	NESMITH STREET	ROGERS STREET
DESIGN SPEED	30 MPH	40 MPH
ADT (2014)	29,600	26,000
ADT (2024)	31,100	27,300
K	7.4%	7.8%
D	56.0%	58%
T (PEAK HOUR)	2%	2%
T (AVERAGE DAY)	2%	2%
DHV	2,300	2,130
DDHV	1,290	1,236
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ATERIAL	URBAN PRINCIPAL ARTERIAL

DATE	DESCRIPTION	REV #

COMMONWEALTH OF MASSACHUSETTS
NORMAN H. BROWN
CIVIL
No. 38531
REGISTERED PROFESSIONAL ENGINEER

Norman H. Brown
8/30/18

BAYSIDE ENGINEERING
600 Unicorn Park Drive ▲ Woburn, MA 01801
Phone: 781.932.3201 ▲ Fax: 781.932.3413
www.baysideengineering.com

massDOT
Massachusetts Department of Transportation
Highway Division

RECOMMENDED FOR APPROVAL

Thomas A. DiPaolo, P.E. 10/15/18
for CHIEF ENGINEER DATE

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR DATE

APPROVED

10-15-18
HIGHWAY ADMINISTRATOR DATE

606189HD2(TITLE SHEET).DWG Plotted on 3-Oct-18 11:38 AM

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER ON BRIDGE OR JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
SP		STEEL POLE
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	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
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
		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)
		BALANCE STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		HAY BALES/SILT FENCE
		TREE LINE OR LIMIT OF CLEARING AND GRUBBING
		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 SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE - 12"
	CW 8'	CROSSWALK - 12" LINES SPACED 8' APART
	SWL	SOLID WHITE LINE - 6"
	SWSHL	SOLID WHITE SHOULDER LINE - 6"
	SYL	SOLID YELLOW LINE - 6"
	BWL	BROKEN WHITE LINE - 6"
	BYL	BROKEN YELLOW LINE - 6"
	DWL	DOTTED WHITE LINE - 6"
	DYL	DOTTED YELLOW LINE - 6"
	DWLEx	DOTTED WHITE LINE EXTENSION - 6"
	DYLEx	DOTTED YELLOW LINE EXTENSION - 6"
	DBWL	DOUBLE WHITE LINE - 2 - 6" LINES
	DYCL	DOUBLE YELLOW CENTERLINE - 2 - 6" LINES

GENERAL NOTES:

1. 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 EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

2. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.

3. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.

4. 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.

5. THE TERM "PROPOSED" (PROP.) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, REUSING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).

6. JOINTS BETWEEN NEW BITUMINOUS CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED IN ACCORDANCE WITH ITEM 453 OF THE SPECIAL PROVISIONS.

7. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.

8. ALL PROPOSED PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.

9. 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.

10. FIELD SURVEY CONDUCTED IN JUNE 2014 AND PROVIDED BY BAYSIDE ENGINEERING, INC., 600 UNICORN PARK DRIVE, WOBURN, MA 01801. HORIZONTAL DATUM IS BASED ON MASS GRID SYSTEM NAD 1983. ELEVATIONS SHOWN ON THIS PLAN REFER TO THE NAVD OF 1988.

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
DICL	DUCTILE IRON CEMENT LINED
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
GAR	GARAGE
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
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
PVMT	PAVEMENT

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	2	96
PROJECT FILE NO.	606189		

LEGEND, ABBREVIATIONS & GENERAL NOTES

ABBREVIATIONS (cont.)

GENERAL

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
ROW	RIGHT OF WAY
RR	RAILROAD
R&D	REMOVE AND DISCARD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
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

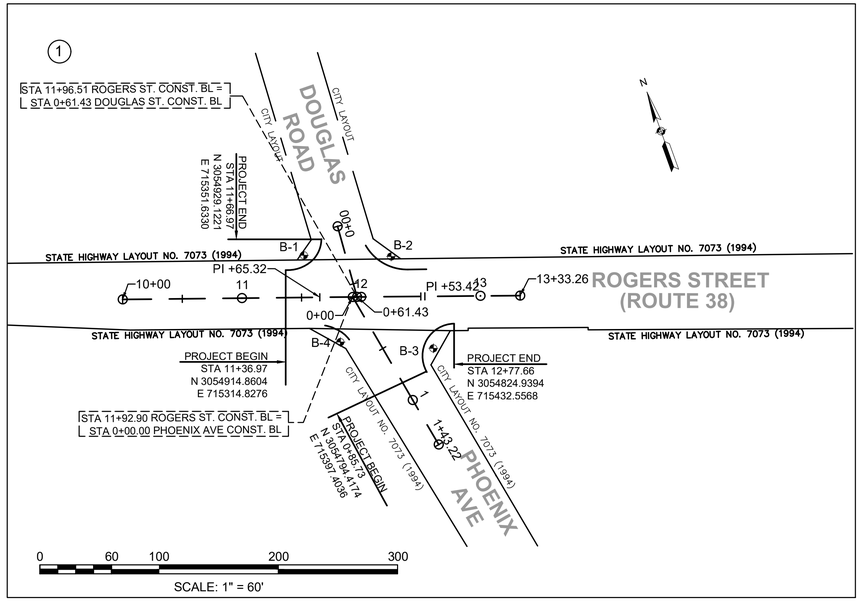
CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
EHH	ELECTRIC HAND HOLE
EMH	ELECTRIC MANHOLE
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT 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
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

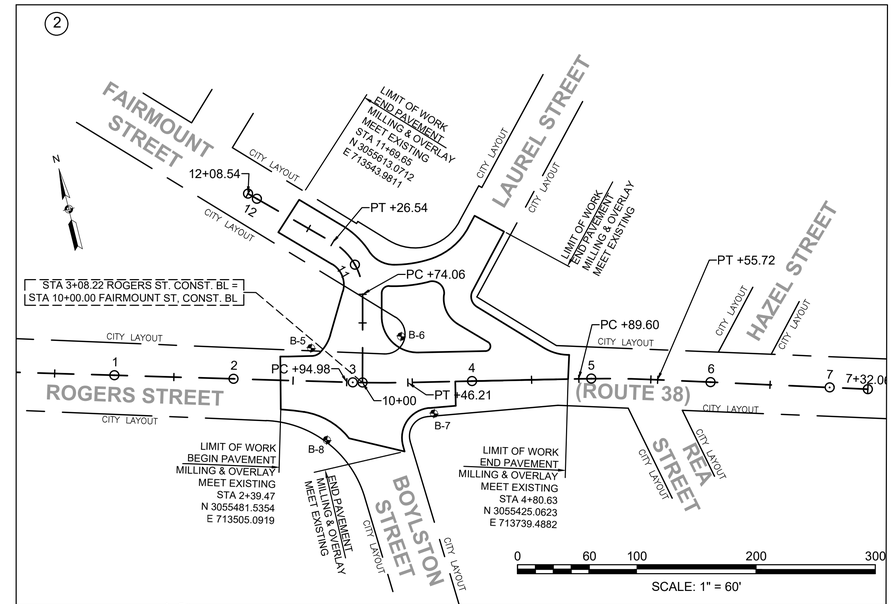
606189HD3(LEGEND).DWG 7-Aug-18

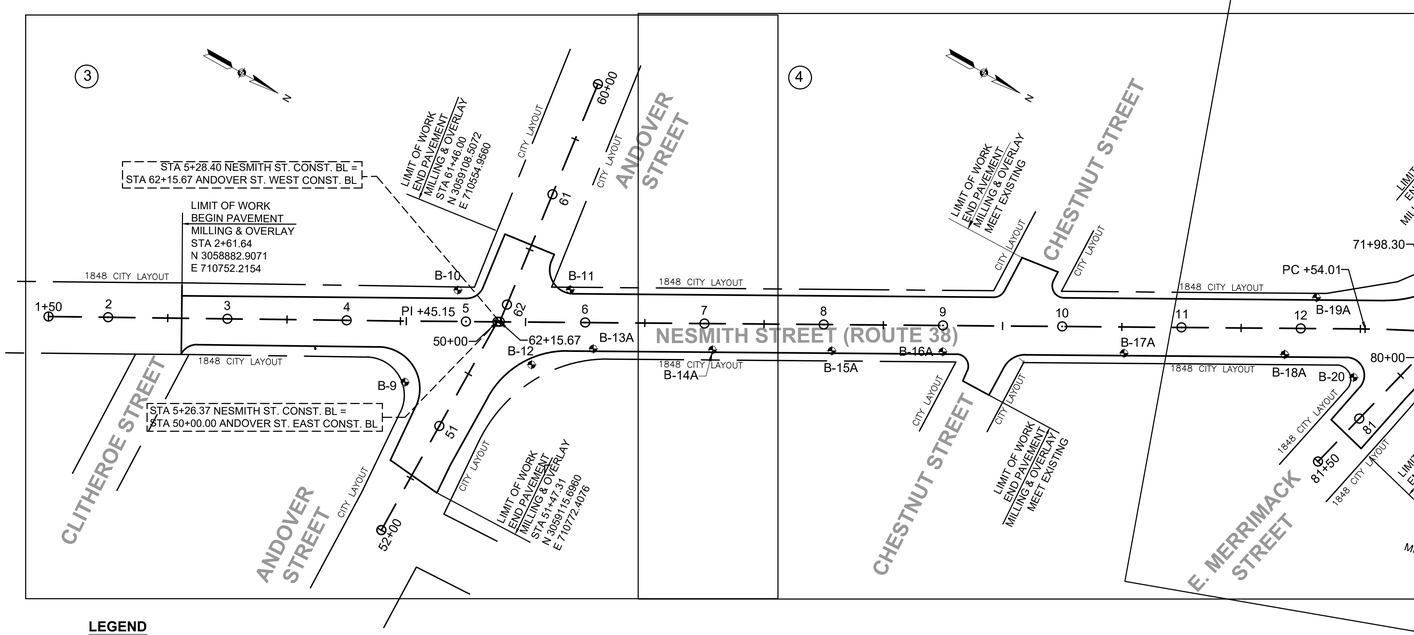
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	3	96
PROJECT FILE NO.	606189		

KEY PLAN & SOIL BORING LOCATION PLAN







LEGEND

BORING

SHEET REFERENCE:	1	2	3	4	5	6
Drawing Title:	Drawing Number:					
Construction Plans	5	6	7	8	9	10
Profiles	-	-	11,14,15	12	13,16,17	-
Curb Tie Plans	18	19	20	21	22	23
Grading Plan	24	25	26	27	28	-
Drainage Plans	-	29	30	31	32	-
Traffic Signals, Signs & Pavement Marking Plan	33	35	37	39	40	42

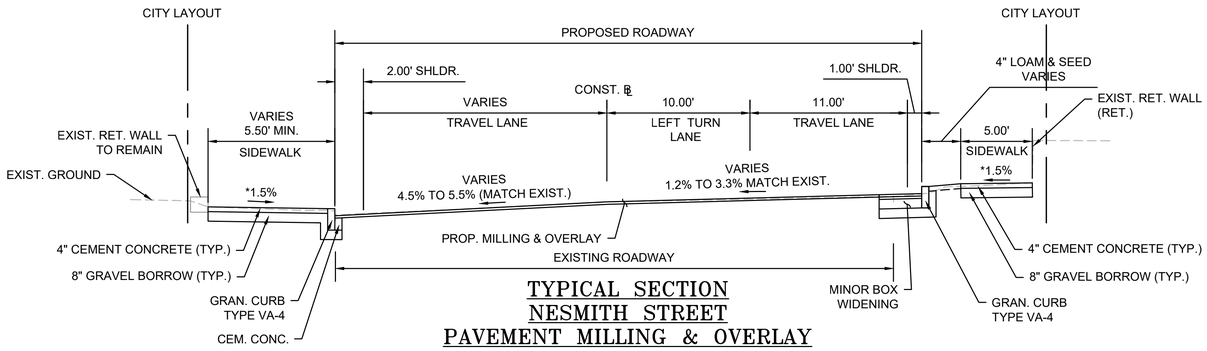
NOTE:

TEST BORING LOG SHEETS ARE INCLUDED IN THE CONTRACT SPECIAL PROVISIONS.

606189HD11(KEYPLAN).DWG Plotted on 9 November 2018 3:05 PM

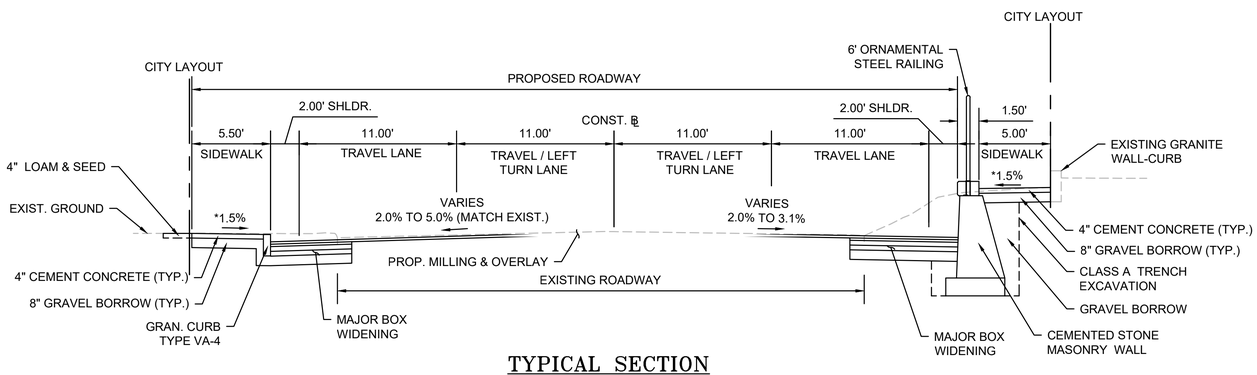
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	4	96
PROJECT FILE NO.	606189		

TYPICAL SECTIONS & PAVEMENT NOTES



TYPICAL SECTION
NESMITH STREET
PAVEMENT MILLING & OVERLAY
W/ MINOR BOX WIDENING
N.T.S
STA. 2+61.56 TO STA. 4+45.15

* CONSTRUCTION TOLERANCE ± 0.5%



TYPICAL SECTION
NESMITH STREET
PAVEMENT MILLING & OVERLAY
W/ MAJOR BOX WIDENING
N.T.S
STA. 5+88.07 TO STA. 12+54.01

* CONSTRUCTION TOLERANCE ± 0.5%

PAVEMENT NOTES:

PROPOSED PAVEMENT MILLING AND OVERLAY:
2" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER
0.07 GAL/SY TACK COAT OVER
VARIABLE DEPTH PAVEMENT MICROMILLING

PROPOSED FULL DEPTH MAJOR BOX WIDENING (GREATER THAN 4' WIDE):
2" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER
2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER
4" SUPERPAVE BASE COURSE - 37.5 (SBC-37.5) OVER
4" DENSE GRADED CRUSHED STONE OVER
8" GRAVEL BORROW.

PROPOSED FULL DEPTH MINOR BOX WIDENING (LESS THAN 4' WIDE):
2" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER
2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER
0.07 GAL/SY TACK COAT OVER
6" H.E.S. CEMENT CONCRETE BASE OVER
8" GRAVEL BORROW.

PROPOSED CEMENT CONCRETE SIDEWALK / WALK / WHEELCHAIR RAMP
4" CEMENT CONCRETE
AIR ENTRAINED 4000 PSI, 3/4", 610 OVER
8" GRAVEL BORROW.

PROPOSED CEMENT CONCRETE SIDEWALK AT DRIVEWAY
6" CEMENT CONCRETE
AIR ENTRAINED 4000 PSI, 3/4", 610 OVER
8" GRAVEL BORROW.

PROPOSED HMA DRIVEWAY
1 1/2 " SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER
2" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC-12.5) OVER
8" GRAVEL BORROW.

PROPOSED HMA WALK SURFACE
1" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER
1.5" SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC-12.5) OVER
8" GRAVEL BORROW.

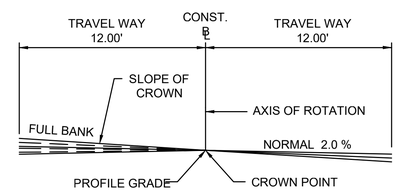
PROPOSED LAWNS AND SLOPES
4" LOAM AND SEED

PROPOSED MULCH AREAS
4" AGED PINE BARK

PROPOSED PERMANENT PATCH
2" SUPERPAVE SURFACE COURSE -12.5 (SSC-12.5) OVER
2" SUPERPAVE INTERMEDIATE COURSE - 19 (SIC-19) OVER
4" SUPERPAVE BASE COURSE - 37.5 (SBC-37.5) OVER
12" GRAVEL BORROW .

NOTES:

1.) PREPARATION OF UNDERLYING SURFACE, ASPHALT EMULSION RS-1H FOR TACK COAT, HMA PATCHING, AND HMA JOINT SEALANT SHALL BE IN ACCORDANCE WITH SECTION 450.



NORMAL CROWN
FULL BANK= 4.0 % MAX.

METHOD OF BANKING
N.T.S.

606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	5	96
PROJECT FILE NO.	606189		

CONSTRUCTION PLANS

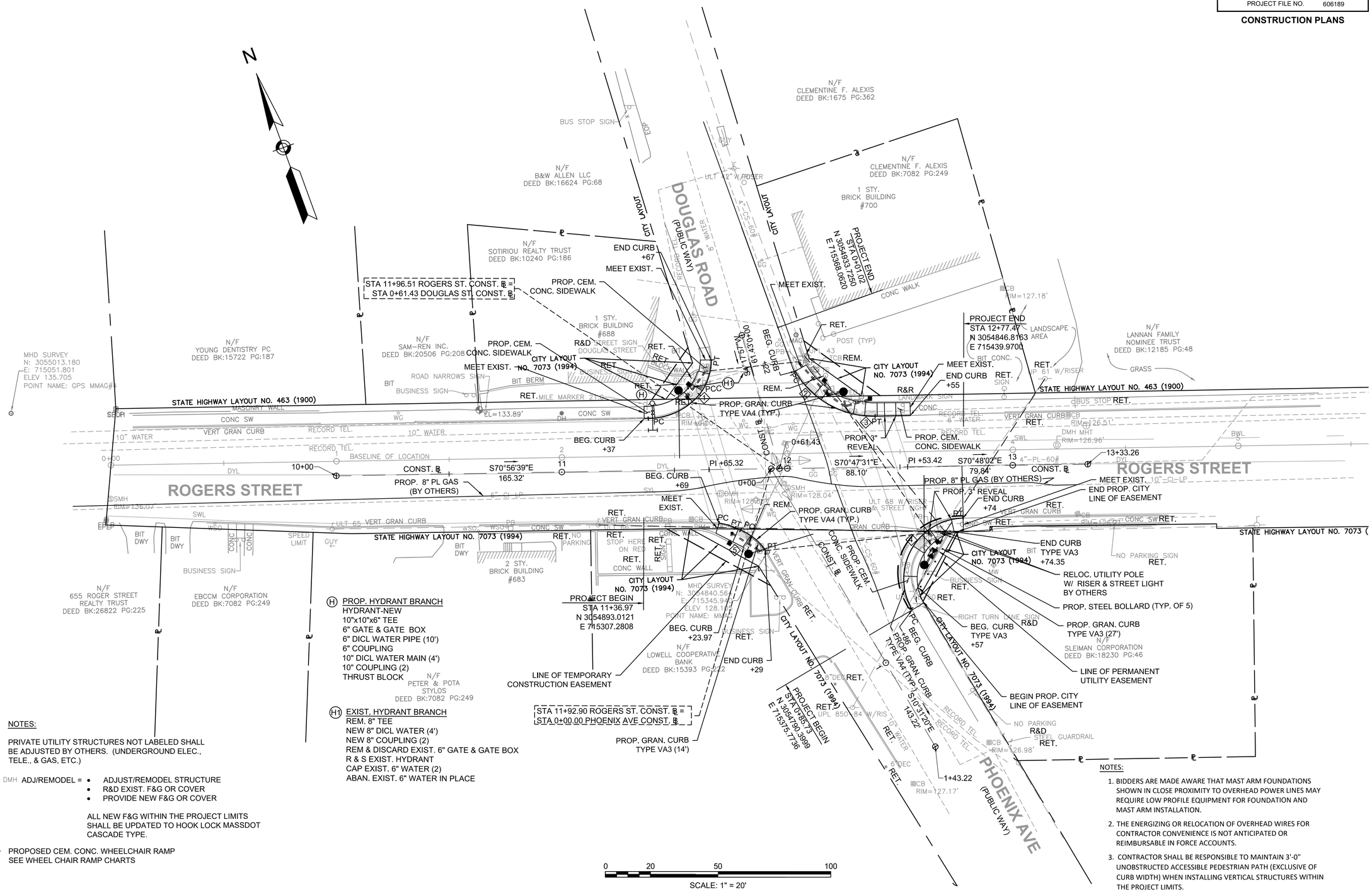
606189HD5(CON PLANS).DWG Plotted on 17-Sep-2019 9:04 AM

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE DRAINAGE PLANS



NOTES:

PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.)

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

ALL NEW F&G WITHIN THE PROJECT LIMITS SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

PROPOSED CEM. CONC. WHEELCHAIR RAMP
SEE WHEEL CHAIR RAMP CHARTS

(H) PROP. HYDRANT BRANCH
HYDRANT-NEW
10"x10"x6" TEE
6" GATE & GATE BOX
6" DICL WATER PIPE (10')
6" COUPLING
10" DICL WATER MAIN (4')
10" COUPLING (2)
THRUST BLOCK

(H1) EXIST. HYDRANT BRANCH
REM. 8" TEE
NEW 8" DICL WATER (4')
NEW 8" COUPLING (2)
REM & DISCARD EXIST. 6" GATE & GATE BOX
R & S EXIST. HYDRANT
CAP EXIST. 6" WATER (2)
ABAN. EXIST. 6" WATER IN PLACE

NOTES:

1. BIDDERS ARE MADE AWARE THAT MAST ARM FOUNDATIONS SHOWN IN CLOSE PROXIMITY TO OVERHEAD POWER LINES MAY REQUIRE LOW PROFILE EQUIPMENT FOR FOUNDATION AND MAST ARM INSTALLATION.
2. THE ENERGIZING OR RELOCATION OF OVERHEAD WIRES FOR CONTRACTOR CONVENIENCE IS NOT ANTICIPATED OR REIMBURSABLE IN FORCE ACCOUNTS.
3. CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN 3'-0" UNOBSTRUCTED ACCESSIBLE PEDESTRIAN PATH (EXCLUSIVE OF CURB WIDTH) WHEN INSTALLING VERTICAL STRUCTURES WITHIN THE PROJECT LIMITS.

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

WATER SUPPLY ALTERATIONS
SEE BELOW

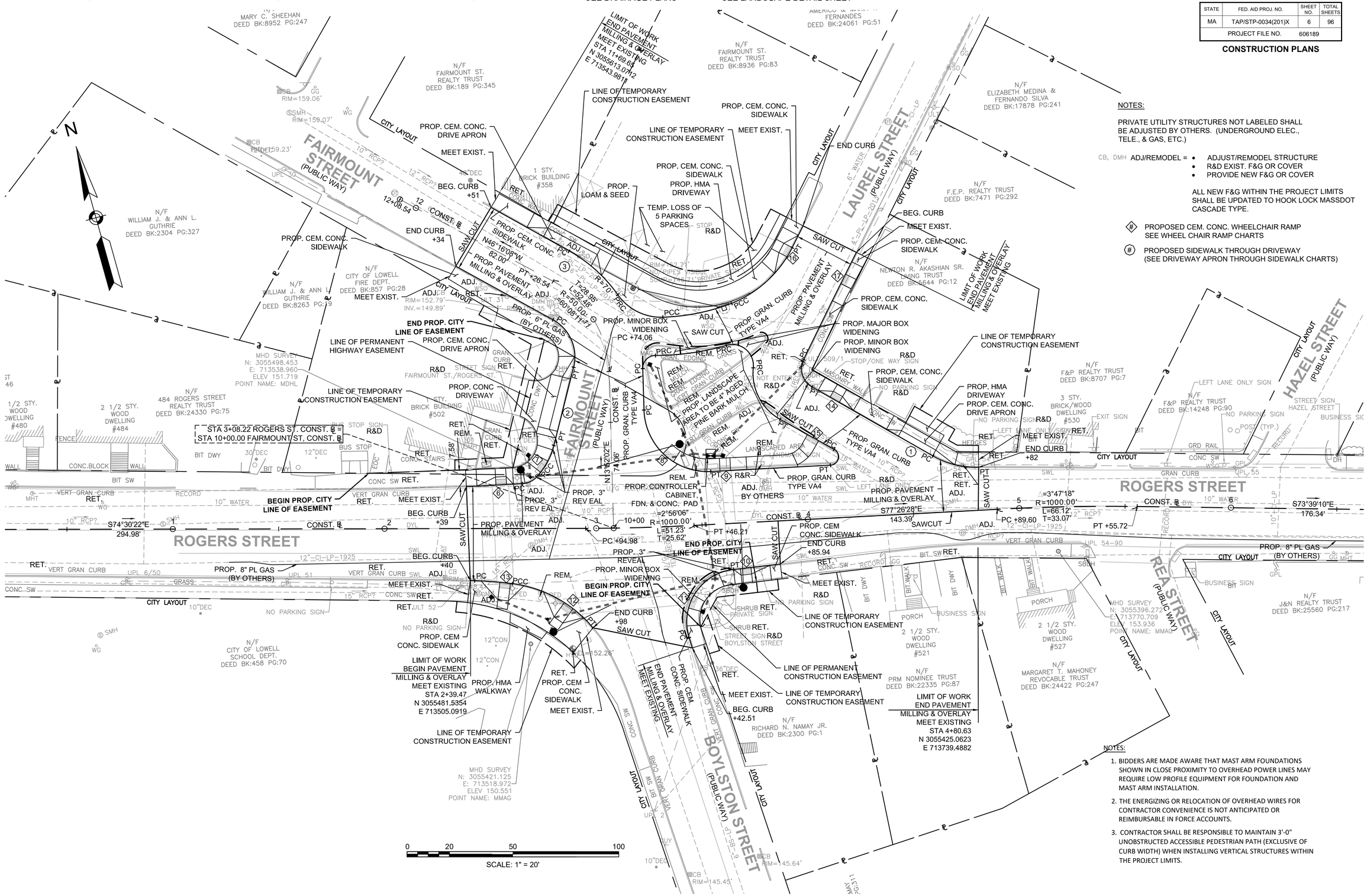
DRAINAGE DETAILS
SEE DRAINAGE PLANS

LANDSCAPE DRETAILS
SEE LANDSCAPE DETAIL SHEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	6	96
PROJECT FILE NO.	606189		

CONSTRUCTION PLANS



NOTES:

PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.)

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

ALL NEW F&G WITHIN THE PROJECT LIMITS SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

(#) PROPOSED CEM. CONC. WHEELCHAIR RAMP SEE WHEEL CHAIR RAMP CHARTS

(#) PROPOSED SIDEWALK THROUGH DRIVEWAY (SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

NOTES:

1. BIDDERS ARE MADE AWARE THAT MAST ARM FOUNDATIONS SHOWN IN CLOSE PROXIMITY TO OVERHEAD POWER LINES MAY REQUIRE LOW PROFILE EQUIPMENT FOR FOUNDATION AND MAST ARM INSTALLATION.
2. THE ENERGIZING OR RELOCATION OF OVERHEAD WIRES FOR CONTRACTOR CONVENIENCE IS NOT ANTICIPATED OR REIMBURSABLE IN FORCE ACCOUNTS.
3. CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN 3'-0" UNOBSTRUCTED ACCESSIBLE PEDESTRIAN PATH (EXCLUSIVE OF CURB WIDTH) WHEN INSTALLING VERTICAL STRUCTURES WITHIN THE PROJECT LIMITS.

606189HDS(CON PLANS).DWG Plotted on 17-Sep-2019 9:04 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	7	96
PROJECT FILE NO.	606189		

CONSTRUCTION PLANS

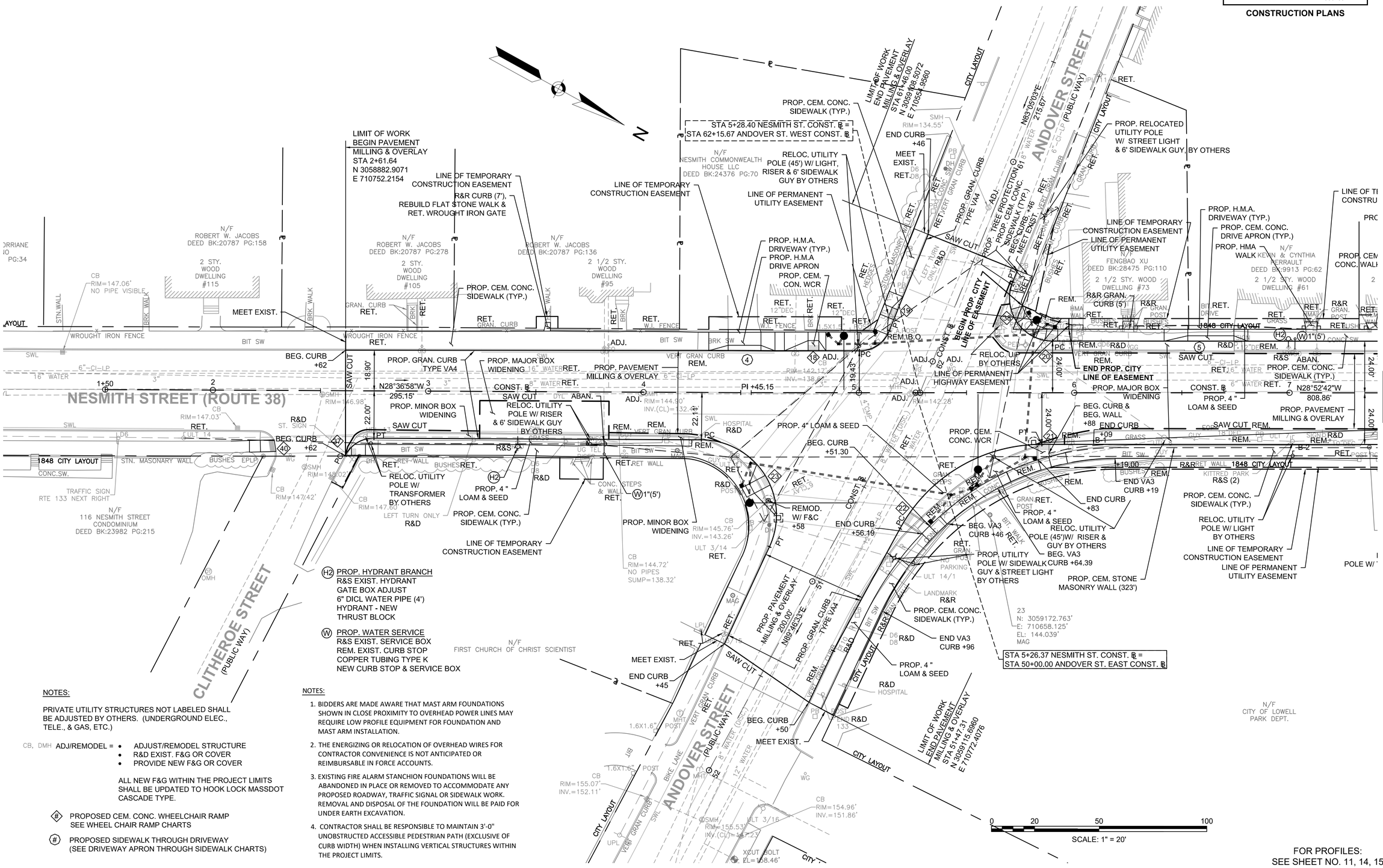
606189HDS(CON PLANS).DWG Plotted on 17-Sep-2019 9:04 AM

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE DRAINAGE PLANS



NOTES:

PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.)

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
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- PROVIDE NEW F&G OR COVER

ALL NEW F&G WITHIN THE PROJECT LIMITS SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

(#) PROPOSED CEM. CONC. WHEELCHAIR RAMP SEE WHEEL CHAIR RAMP CHARTS

(#) PROPOSED SIDEWALK THROUGH DRIVEWAY (SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

NOTES:

1. BIDDERS ARE MADE AWARE THAT MAST ARM FOUNDATIONS SHOWN IN CLOSE PROXIMITY TO OVERHEAD POWER LINES MAY REQUIRE LOW PROFILE EQUIPMENT FOR FOUNDATION AND MAST ARM INSTALLATION.
2. THE ENERGIZING OR RELOCATION OF OVERHEAD WIRES FOR CONTRACTOR CONVENIENCE IS NOT ANTICIPATED OR REIMBURSABLE IN FORCE ACCOUNTS.
3. EXISTING FIRE ALARM STANCHION FOUNDATIONS WILL BE ABANDONED IN PLACE OR REMOVED TO ACCOMMODATE ANY PROPOSED ROADWAY, TRAFFIC SIGNAL OR SIDEWALK WORK. REMOVAL AND DISPOSAL OF THE FOUNDATION WILL BE PAID FOR UNDER EARTH EXCAVATION.
4. CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN 3'-0" UNOBSTRUCTED ACCESSIBLE PEDESTRIAN PATH (EXCLUSIVE OF CURB WIDTH) WHEN INSTALLING VERTICAL STRUCTURES WITHIN THE PROJECT LIMITS.

CONTINUED ON SHEET NO. 8

FOR PROFILES: SEE SHEET NO. 11, 14, 15

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE DRAINAGE PLANS

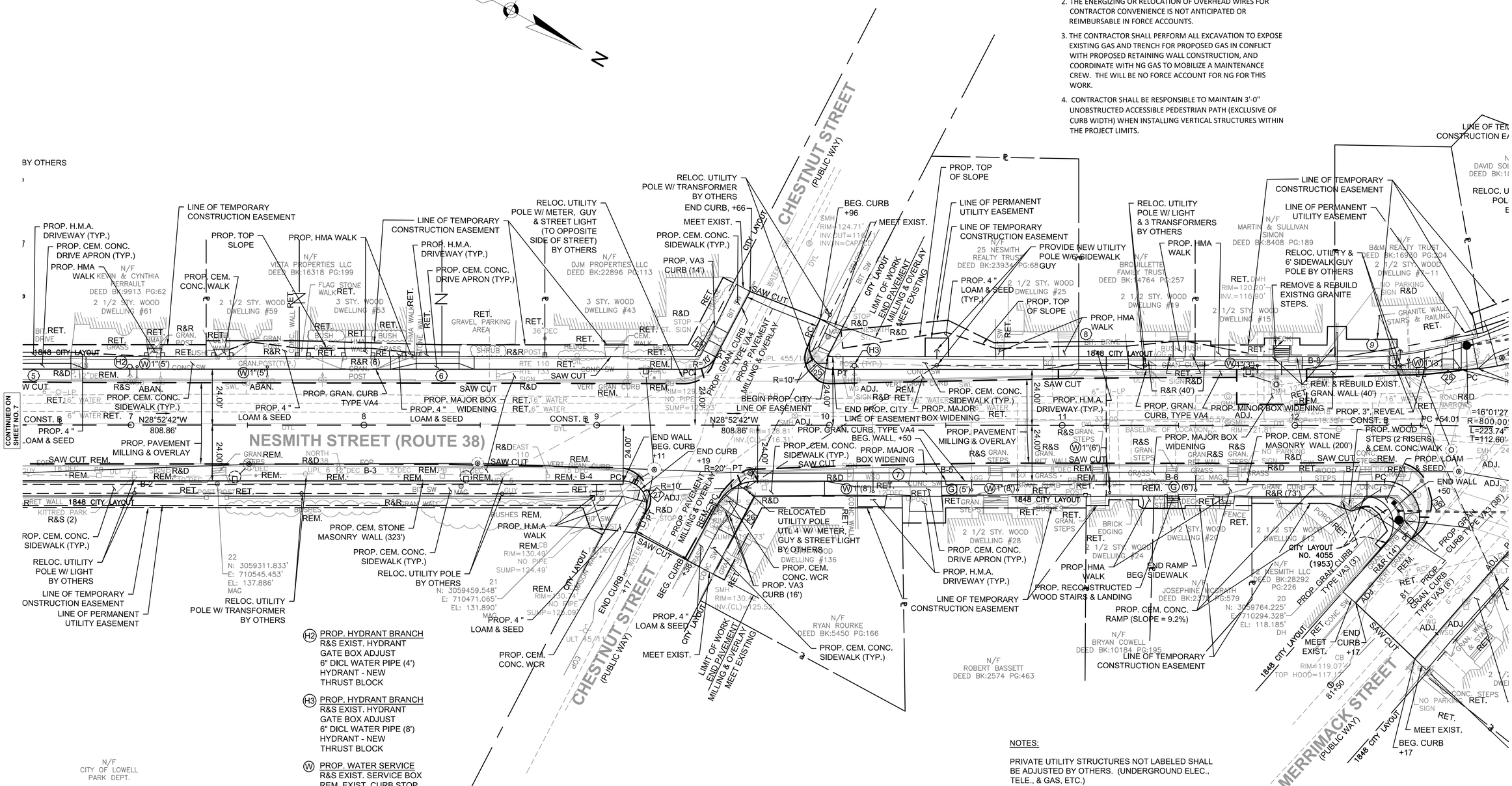
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	8	96
PROJECT FILE NO.	606189		

CONSTRUCTION PLANS

NOTES:

1. BIDDERS ARE MADE AWARE THAT MAST ARM FOUNDATIONS SHOWN IN CLOSE PROXIMITY TO OVERHEAD POWER LINES MAY REQUIRE LOW PROFILE EQUIPMENT FOR FOUNDATION AND MAST ARM INSTALLATION.
2. THE ENERGIZING OR RELOCATION OF OVERHEAD WIRES FOR CONTRACTOR CONVENIENCE IS NOT ANTICIPATED OR REIMBURSABLE IN FORCE ACCOUNTS.
3. THE CONTRACTOR SHALL PERFORM ALL EXCAVATION TO EXPOSE EXISTING GAS AND TRENCH FOR PROPOSED GAS IN CONFLICT WITH PROPOSED RETAINING WALL CONSTRUCTION, AND COORDINATE WITH NG GAS TO MOBILIZE A MAINTENANCE CREW. THE WILL BE NO FORCE ACCOUNT FOR NG FOR THIS WORK.
4. CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN 3'-0" UNOBSTRUCTED ACCESSIBLE PEDESTRIAN PATH (EXCLUSIVE OF CURB WIDTH) WHEN INSTALLING VERTICAL STRUCTURES WITHIN THE PROJECT LIMITS.



(H2) PROP. HYDRANT BRANCH
R&S EXIST. HYDRANT
GATE BOX ADJUST
6" DICL WATER PIPE (4')
HYDRANT - NEW
THRUST BLOCK

(H3) PROP. HYDRANT BRANCH
R&S EXIST. HYDRANT
GATE BOX ADJUST
6" DICL WATER PIPE (8')
HYDRANT - NEW
THRUST BLOCK

(W) PROP. WATER SERVICE
R&S EXIST. SERVICE BOX
REM. EXIST. CURB STOP
NEW CURB STOP & SERVICE BOX

(G) PROP. GAS SERVICE (BY OTHERS)
REM. EXIST. SERVICE BOX
REM. EXIST. GAS GATE
NEW GAS GATE & SERVICE BOX
PROVIDE NEW GAS SERVICE LINE
(SEE NOTE 3 THIS SHEET)

NOTES:

PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.)

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

ALL NEW F&G WITHIN THE PROJECT LIMITS SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

(#) PROPOSED CEM. CONC. WHEELCHAIR RAMP
SEE WHEEL CHAIR RAMP CHARTS

(#) PROPOSED SIDEWALK THROUGH DRIVEWAY
(SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

FOR PROFILES:
SEE SHEET NO. 12

606189HDS(CON PLANS).DWG Plotted on 17-Sep-2019 9:04 AM

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

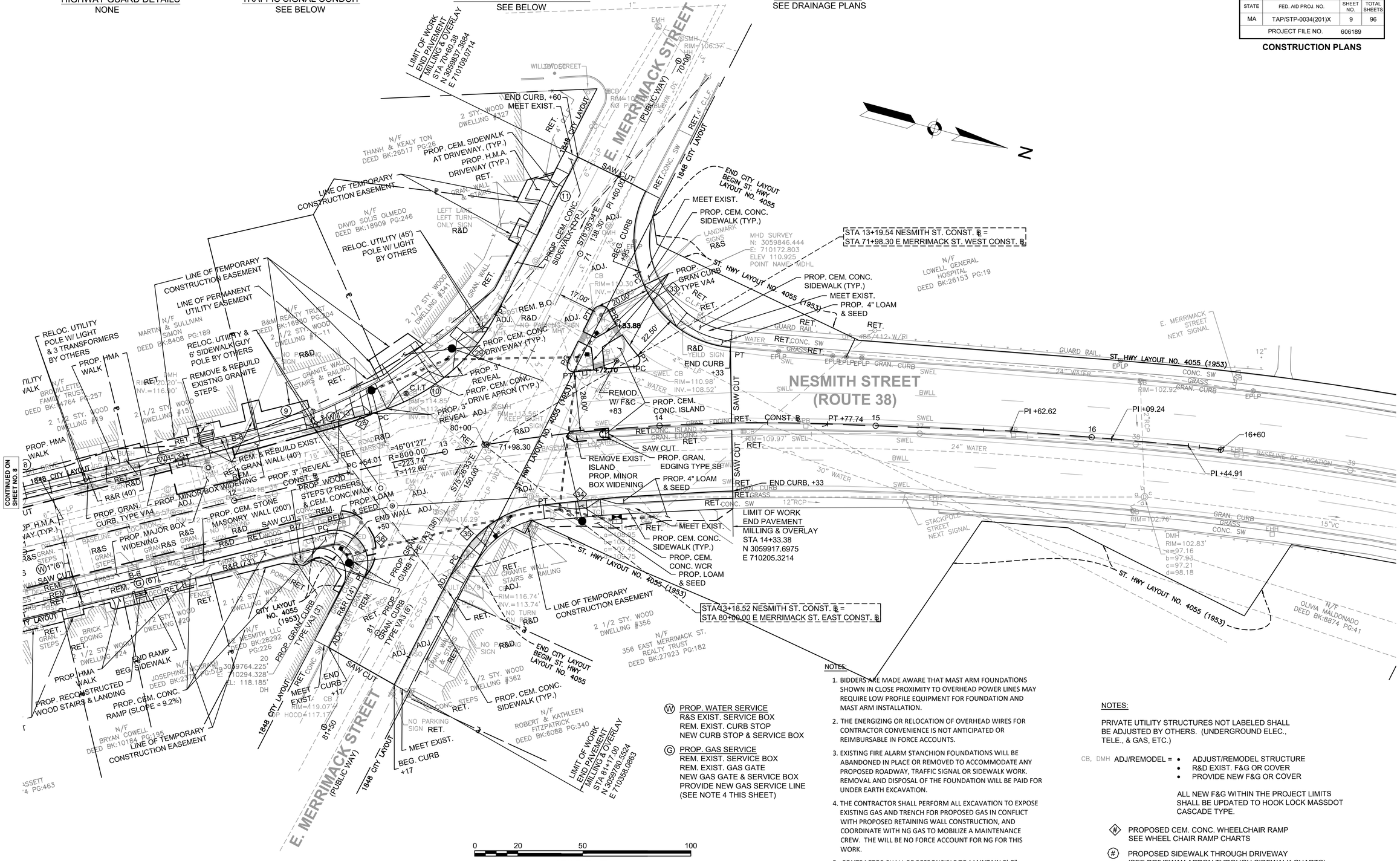
WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE DRAINAGE PLANS

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	9	96
PROJECT FILE NO.	606189		

CONSTRUCTION PLANS



NOTES:

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5. CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN 3'-0" UNOBSTRUCTED ACCESSIBLE PEDESTRIAN PATH (EXCLUSIVE OF CURB WIDTH) WHEN INSTALLING VERTICAL STRUCTURES WITHIN THE PROJECT LIMITS.

Ⓦ PROP. WATER SERVICE
R&S EXIST. SERVICE BOX
REM. EXIST. CURB STOP
NEW CURB STOP & SERVICE BOX

Ⓖ PROP. GAS SERVICE
REM. EXIST. SERVICE BOX
REM. EXIST. GAS GATE
NEW GAS GATE & SERVICE BOX
PROVIDE NEW GAS SERVICE LINE
(SEE NOTE 4 THIS SHEET)

NOTES:

PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.)

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

ALL NEW F&G WITHIN THE PROJECT LIMITS SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

◇# PROPOSED CEM. CONC. WHEELCHAIR RAMP
SEE WHEEL CHAIR RAMP CHARTS

(#) PROPOSED SIDEWALK THROUGH DRIVEWAY
(SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

FOR PROFILES:
SEE SHEET NO. 13, 16, 17

606189HDS(CON PLANS).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	10	96
PROJECT FILE NO.	606189		

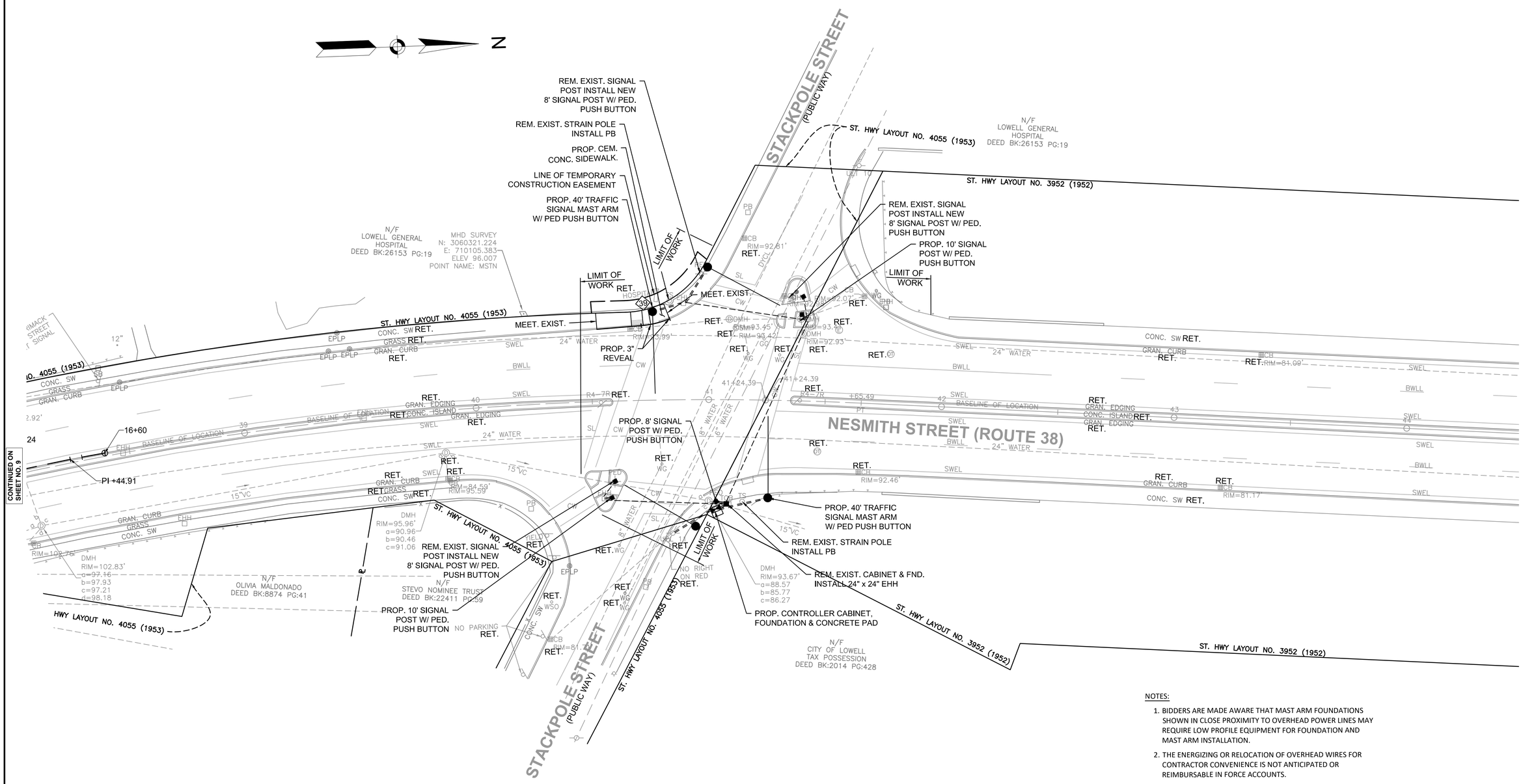
CONSTRUCTION PLANS

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
SEE BELOW

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE DRAINAGE PLANS



NOTES:

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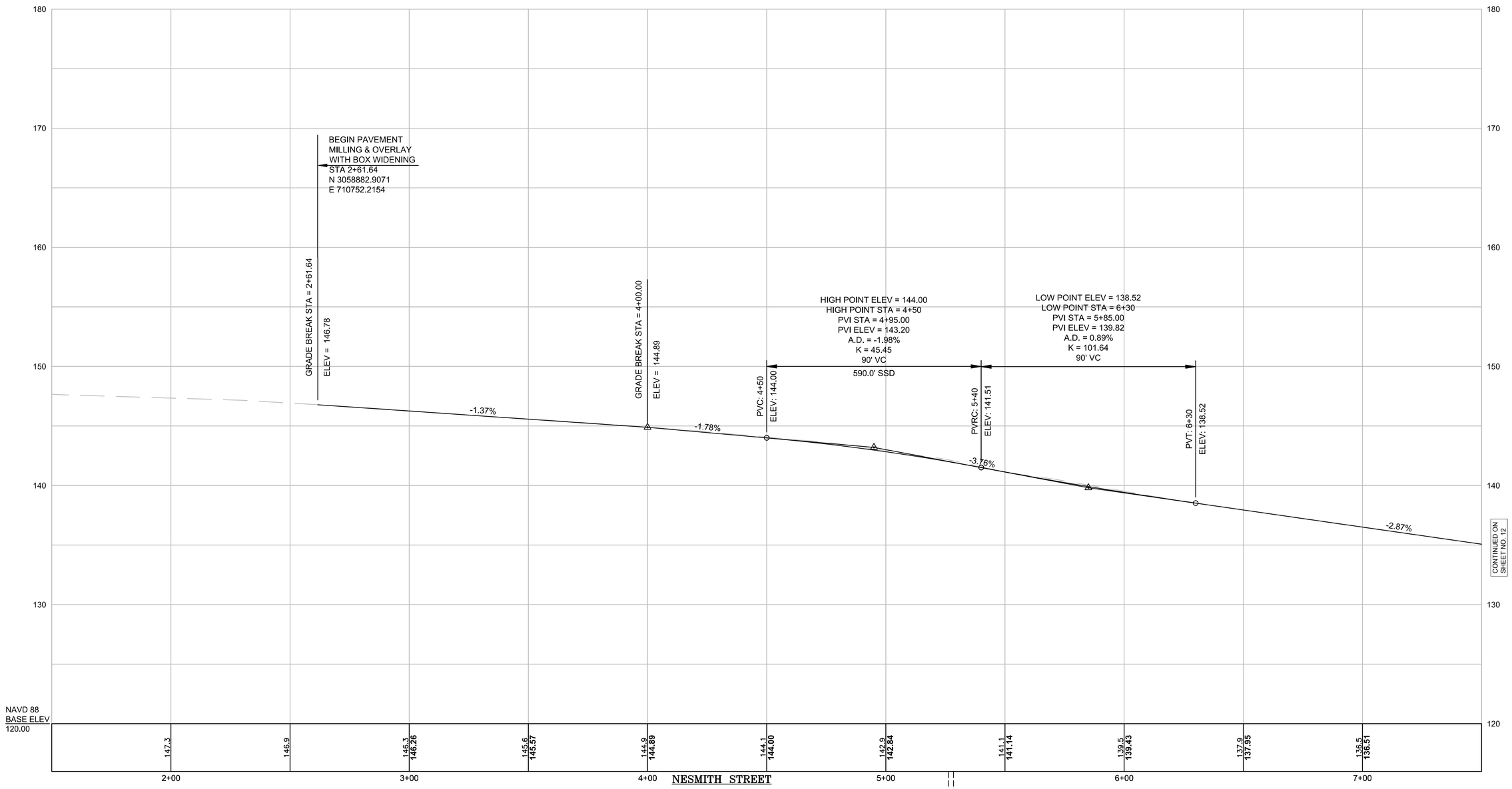
PROPOSED CEM. CONC. WHEELCHAIR RAMPS
SEE WHEEL CHAIR RAMP CHARTS

606189HD5(CON PLANS).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	11	96
PROJECT FILE NO.	606189		

PROFILES



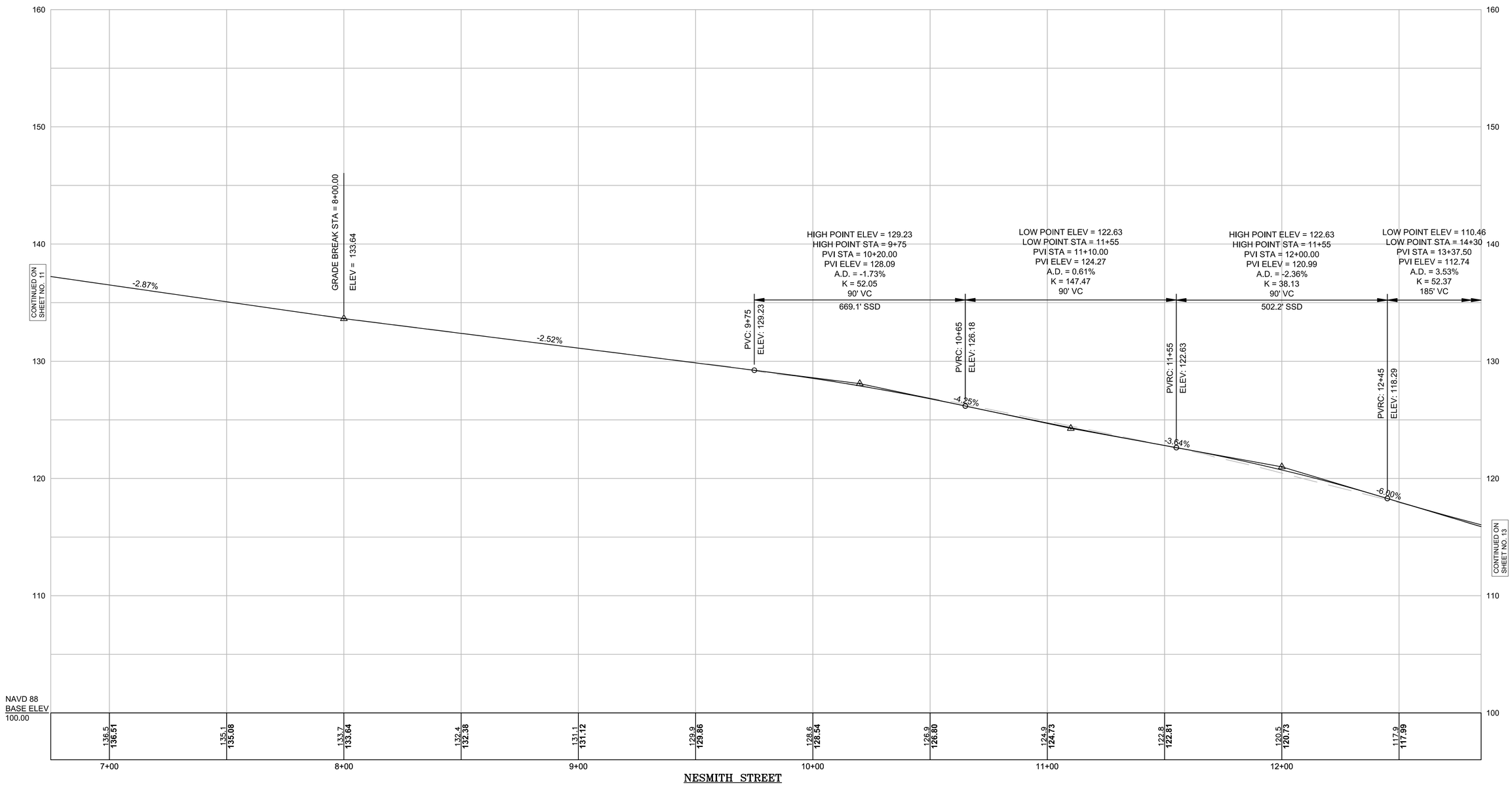
FOR CONSTRUCTION PLANS:
SEE SHEET NO. 7

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	12	96
PROJECT FILE NO.	606189		

PROFILES



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

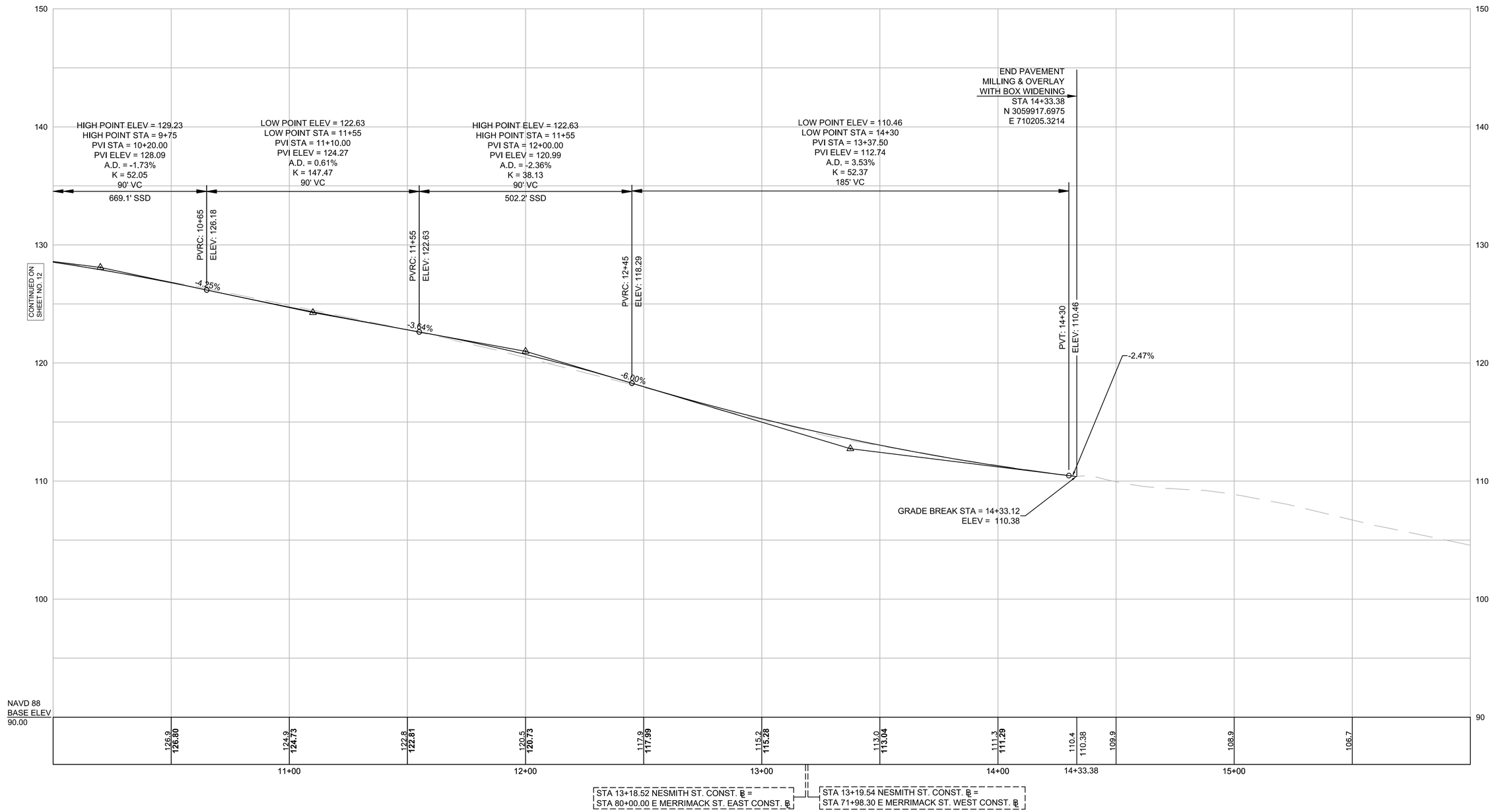
FOR CONSTRUCTION PLANS:
SEE SHEET NO. 8

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	13	96
PROJECT FILE NO.	606189		

PROFILES



NESMITH STREET

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

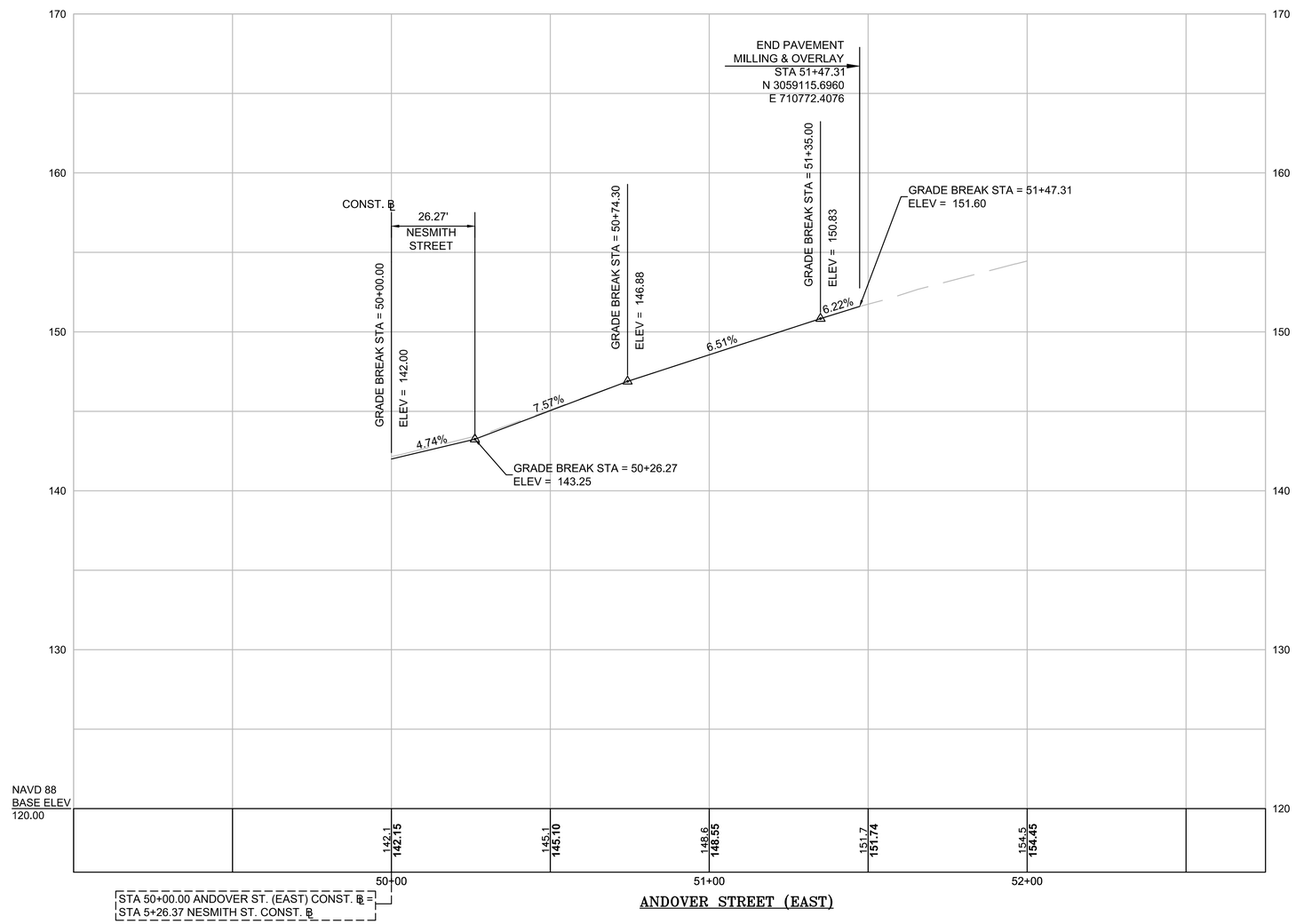
FOR CONSTRUCTION PLANS:
SEE SHEET NO. 9

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	14	96
PROJECT FILE NO.	606189		

PROFILE
SIDE STREETS



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

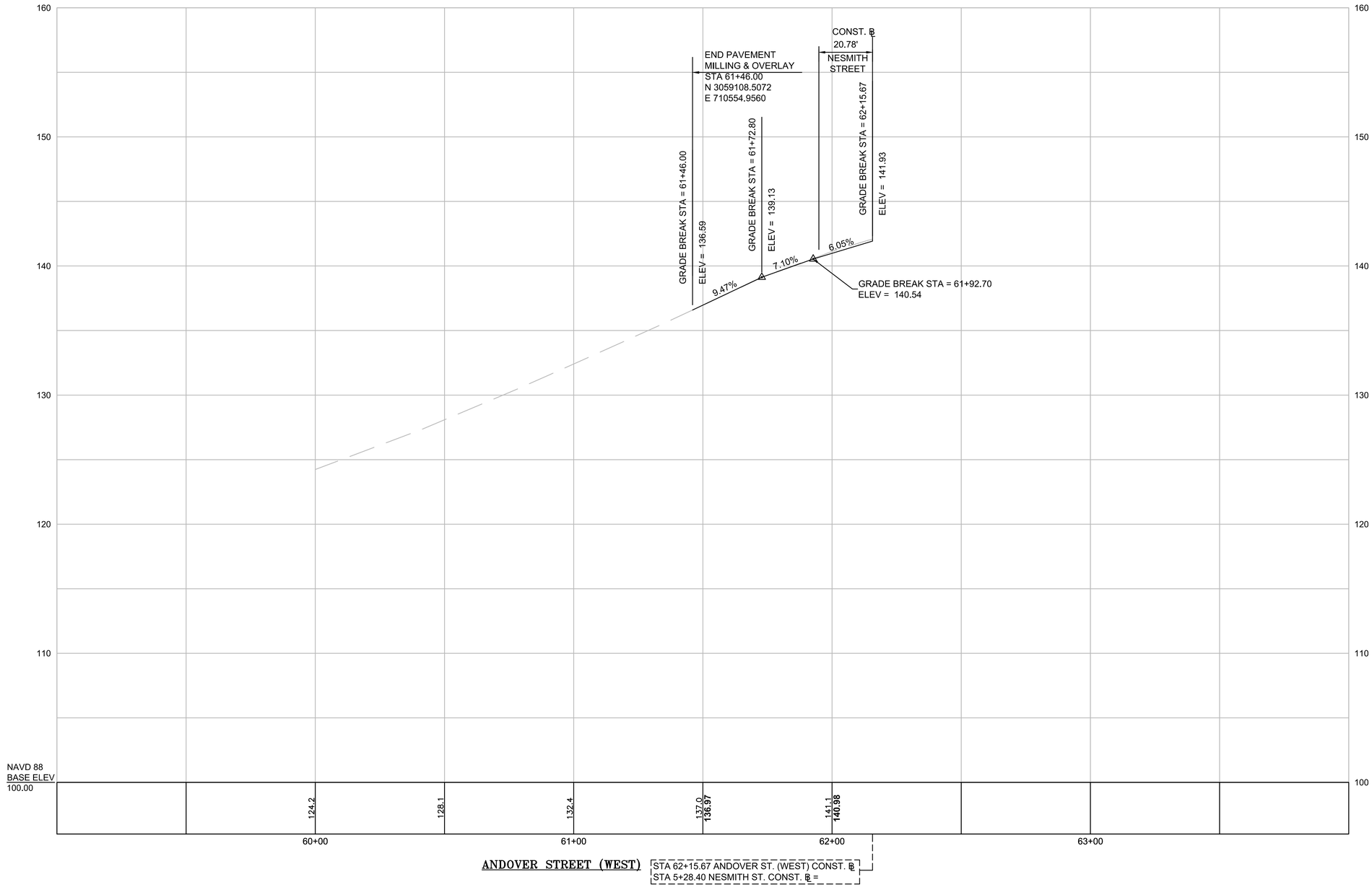
FOR CONSTRUCTION PLAN:
SEE SHEET NOS. 7

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	15	96
PROJECT FILE NO.	606189		

PROFILE
SIDE STREETS



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

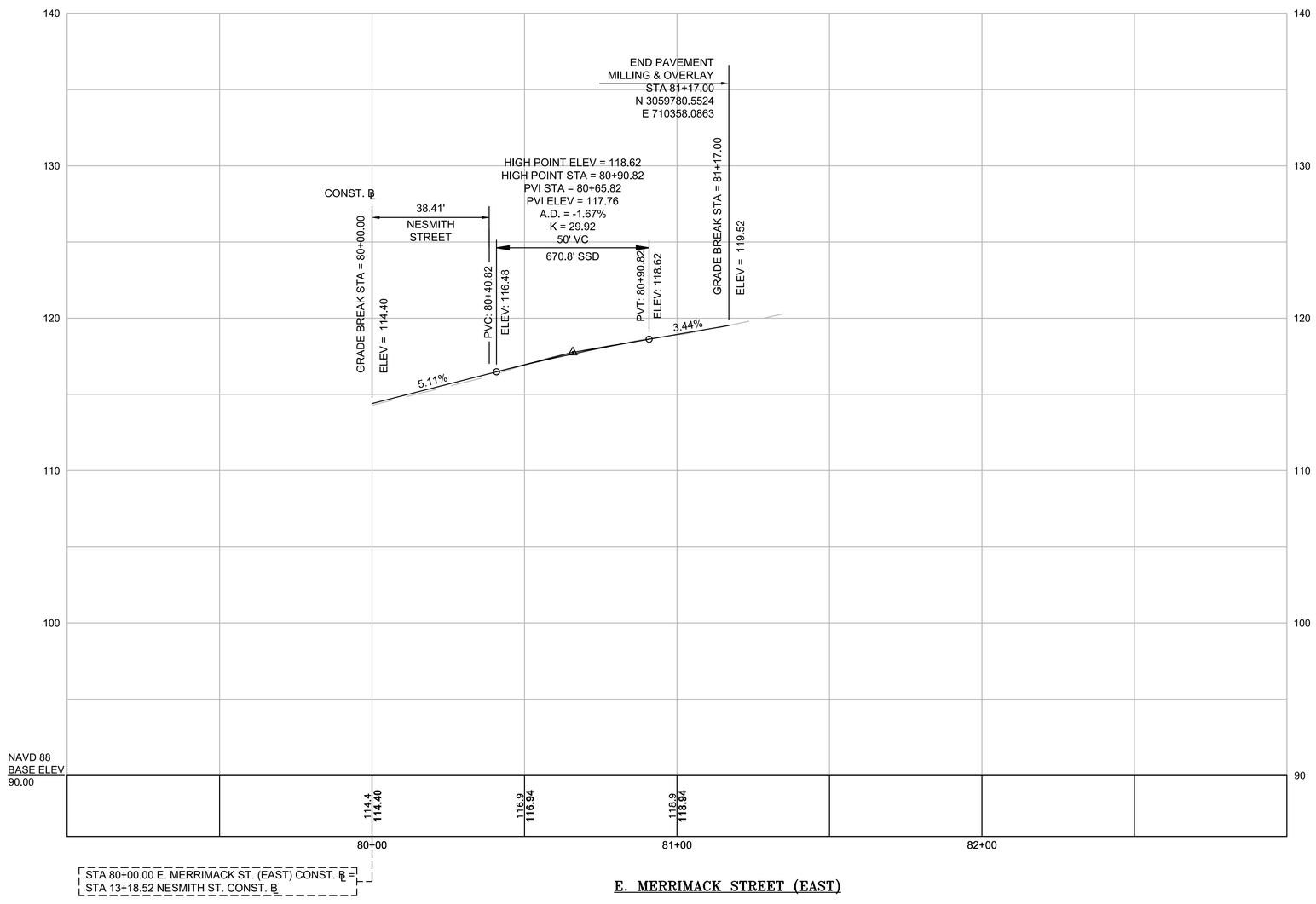
FOR CONSTRUCTION PLAN:
SEE SHEET NOS. 7

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	16	96
PROJECT FILE NO.	606189		

PROFILE
SIDE STREETS



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

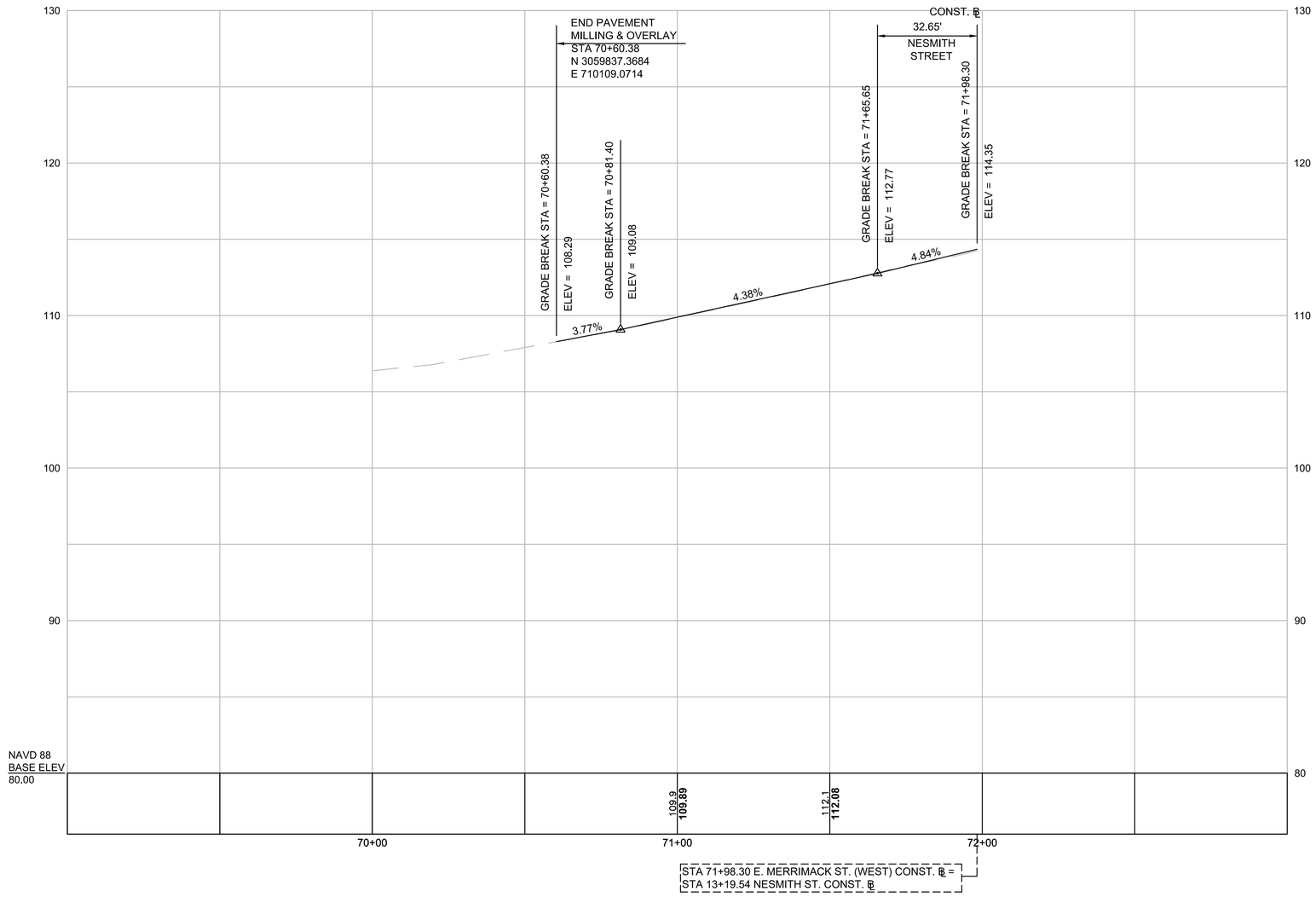
FOR CONSTRUCTION PLANS:
SEE SHEET NOS. 9

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	17	96
PROJECT FILE NO.	606189		

PROFILE
SIDE STREETS



E. MERRIMACK STREET (WEST)

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

FOR CONSTRUCTION PLANS:
SEE SHEET NOS. 9

606189HD7(PROFILES).DWG Plotted on 17-Sep-2019 9:05 AM

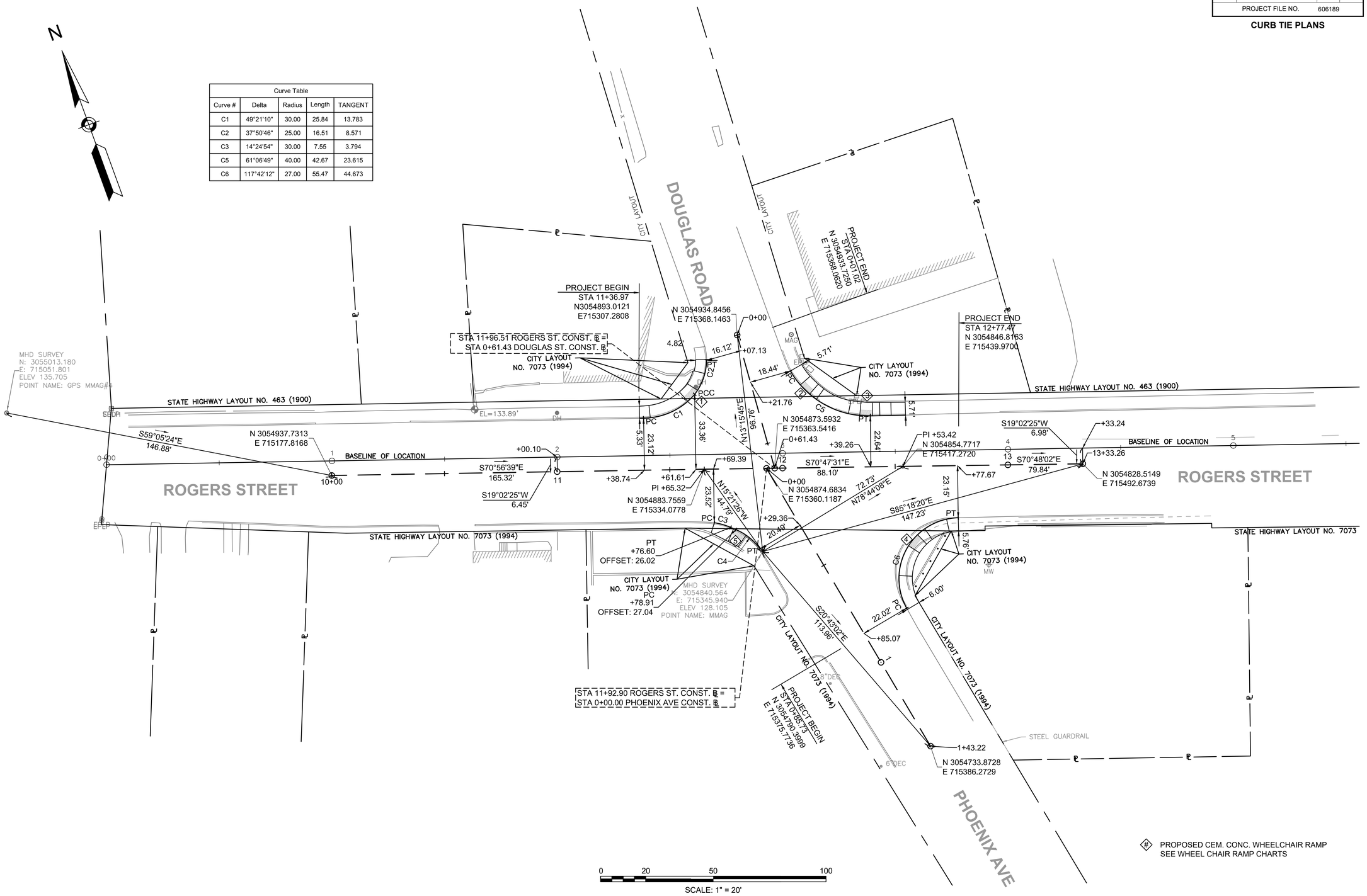
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	18	96
PROJECT FILE NO.	606189		

CURB TIE PLANS

606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

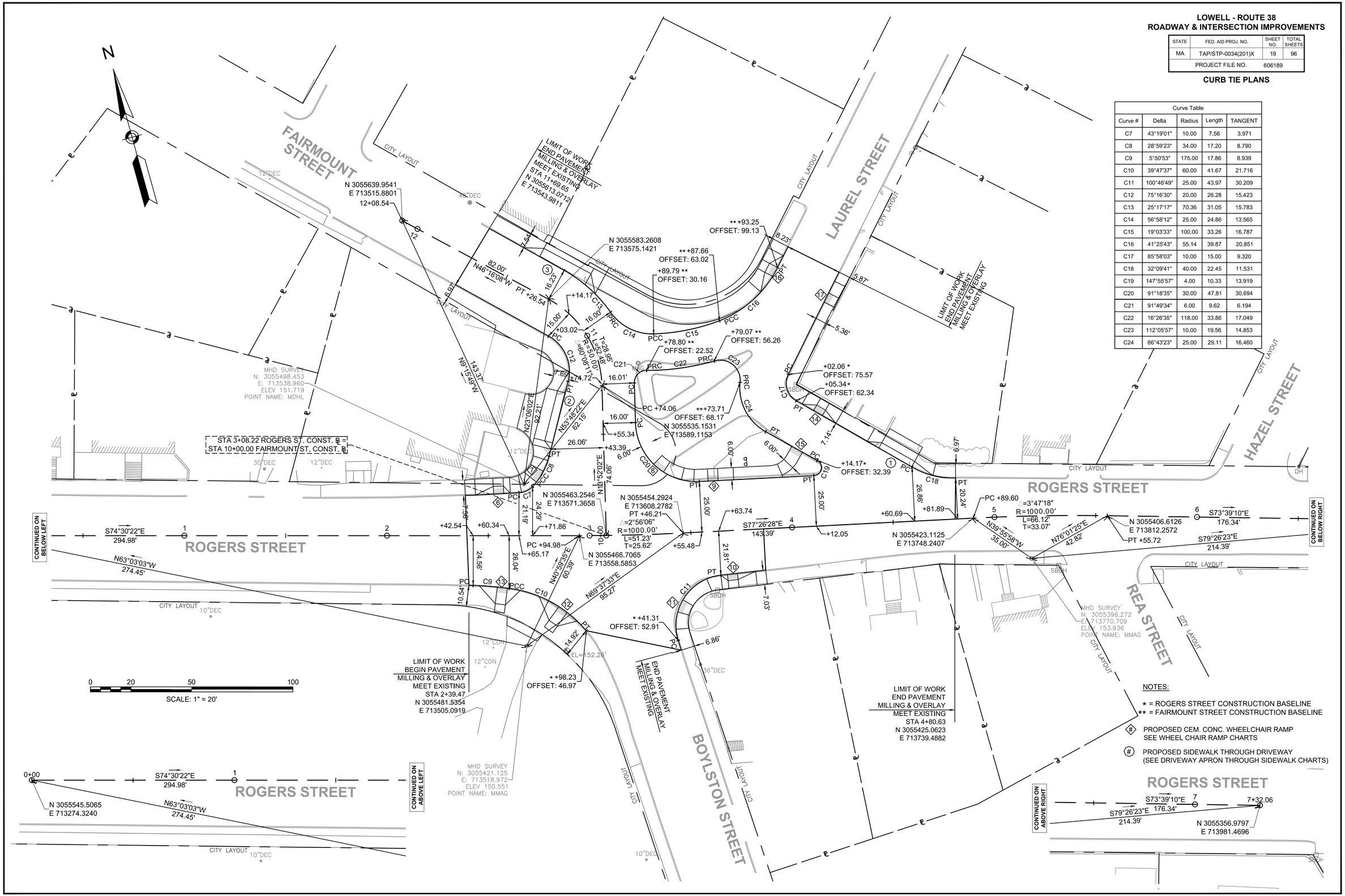
Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C1	49°21'10"	30.00	25.84	13.783
C2	37°50'46"	25.00	16.51	8.571
C3	14°24'54"	30.00	7.55	3.794
C5	61°06'49"	40.00	42.67	23.615
C6	117°42'12"	27.00	55.47	44.673



LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	19	96
PROJECT FILE NO.	606189		

CURB TIE PLANS



Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C7	43°19'01"	10.00	7.56	3.971
C8	28°59'23"	34.00	17.20	8.790
C9	5°50'53"	175.00	17.86	8.939
C10	39°47'37"	60.00	41.67	21.716
C11	100°46'49"	25.00	43.97	30.209
C12	75°16'30"	20.00	26.28	15.423
C13	25°17'17"	70.36	31.05	15.783
C14	56°58'12"	25.00	24.86	13.565
C15	19°03'33"	100.00	33.26	16.787
C16	41°25'43"	55.14	39.87	20.851
C17	85°58'03"	10.00	15.00	9.320
C18	32°09'41"	40.00	22.45	11.531
C19	147°55'57"	4.00	10.33	13.919
C20	91°18'35"	30.00	47.81	30.694
C21	91°49'34"	6.00	9.62	6.194
C22	16°26'35"	118.00	33.86	17.049
C23	112°05'57"	10.00	19.56	14.853
C24	66°43'23"	25.00	29.11	16.460

NOTES:

* = ROGERS STREET CONSTRUCTION BASELINE
** = FAIRMOUNT STREET CONSTRUCTION BASELINE

(#) PROPOSED CEM. CONC. WHEELCHAIR RAMP SEE WHEEL CHAIR RAMP CHARTS

(#) PROPOSED SIDEWALK THROUGH DRIVEWAY (SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

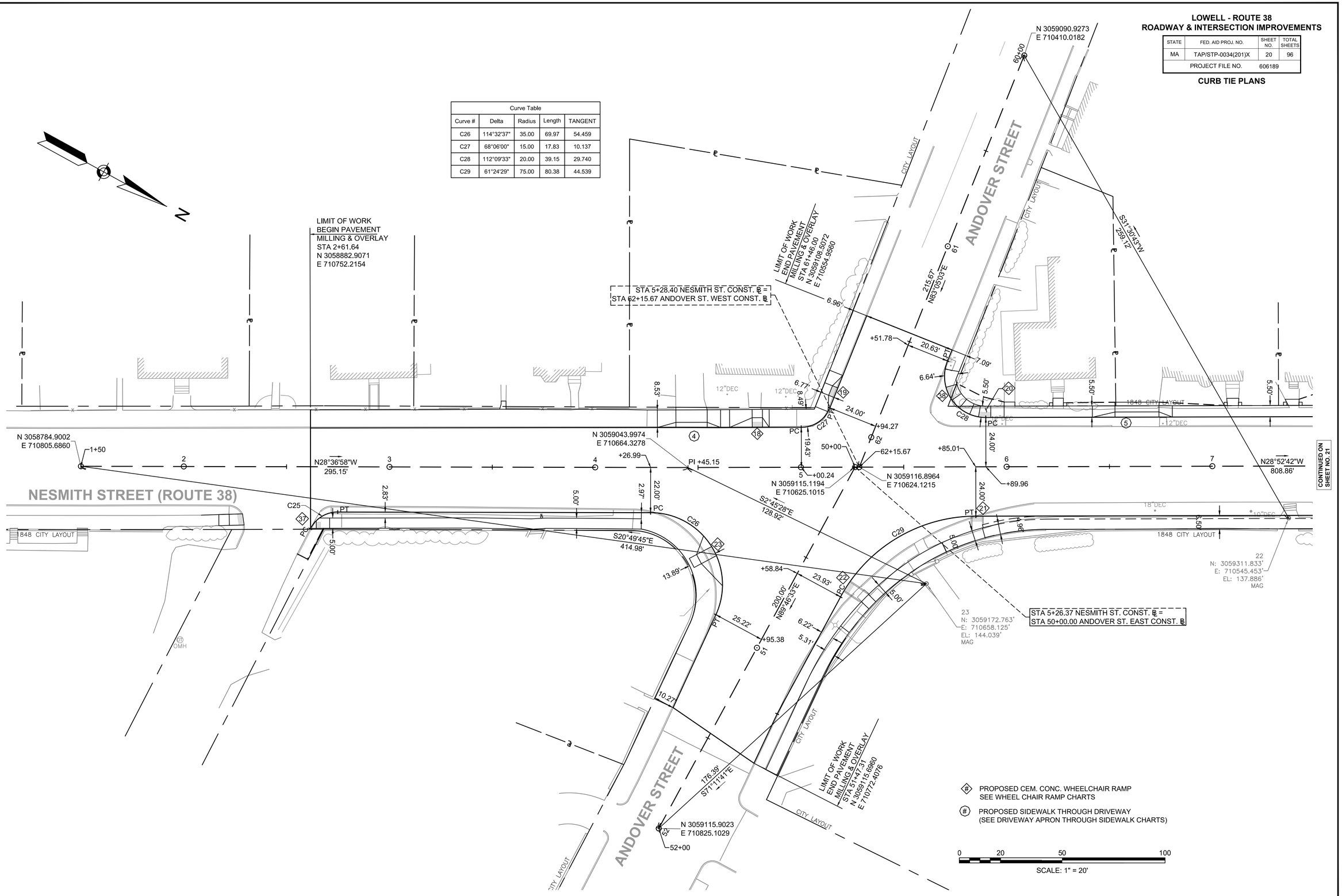
606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	20	96
PROJECT FILE NO.	606189		

CURB TIE PLANS

Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C26	114°32'37"	35.00	69.97	54.459
C27	68°06'00"	15.00	17.83	10.137
C28	112°09'33"	20.00	39.15	29.740
C29	61°24'29"	75.00	80.38	44.539



CONTINUED ON SHEET NO. 21

606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

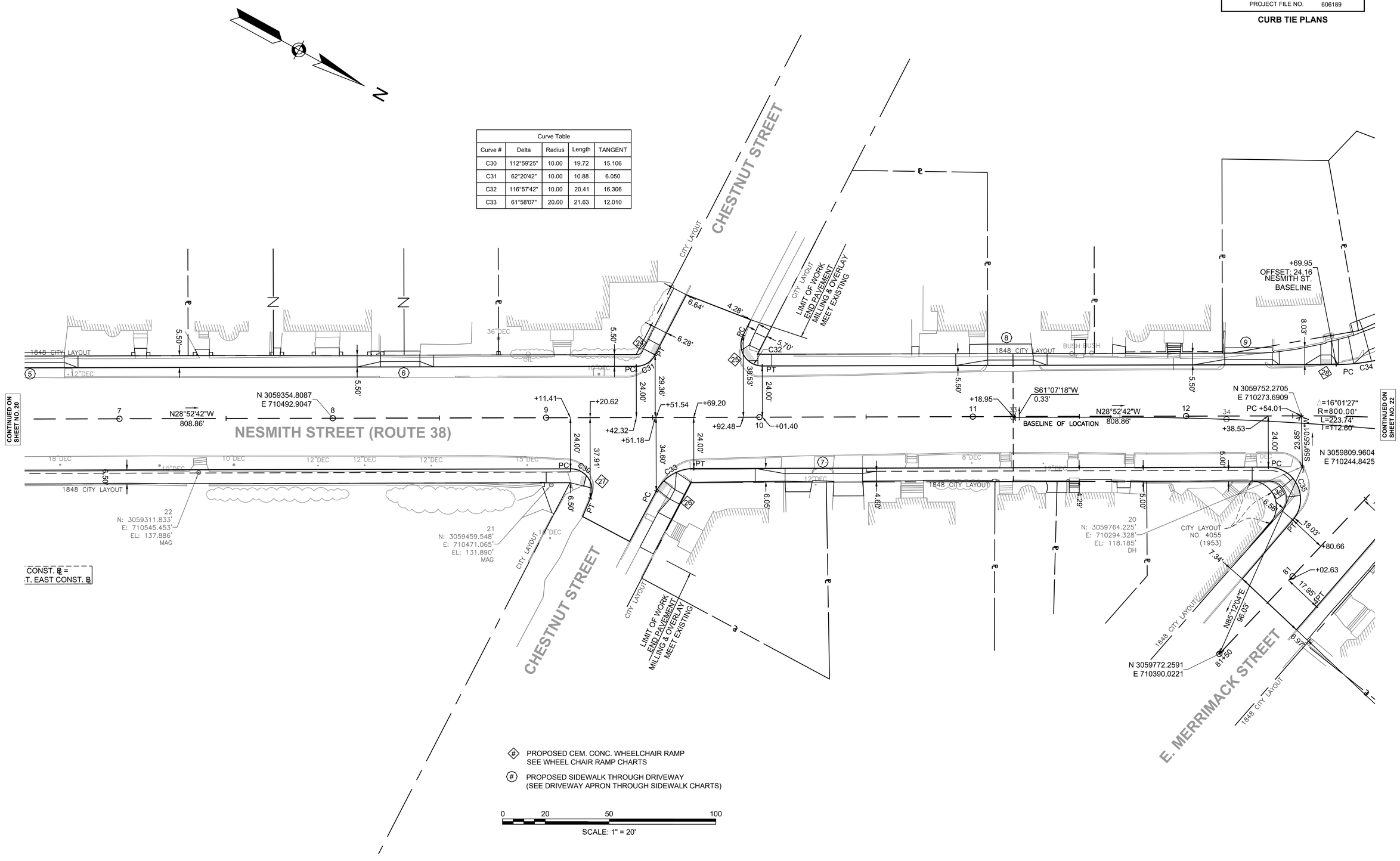
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	21	96
PROJECT FILE NO.	606189		

CURB TIE PLANS

606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

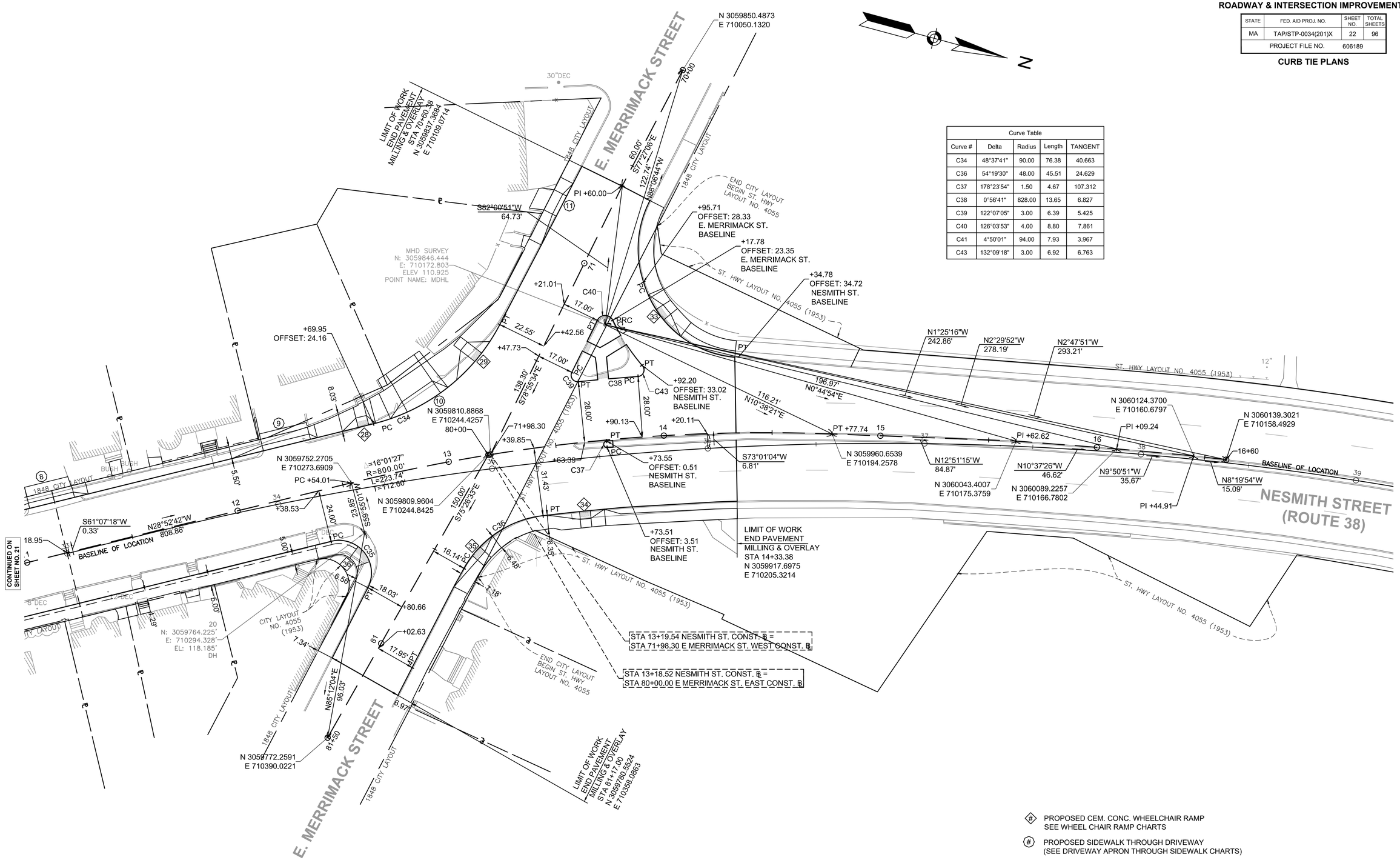
Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C30	112°59'25"	10.00	19.72	15.106
C31	62°20'42"	10.00	10.88	6.050
C32	116°57'42"	10.00	20.41	16.306
C33	61°58'07"	20.00	21.63	12.010



LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	22	96
PROJECT FILE NO.	606189		

CURB TIE PLANS



Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C34	48°37'41"	90.00	76.38	40.663
C36	54°19'30"	48.00	45.51	24.629
C37	178°23'54"	1.50	4.67	107.312
C38	0°56'41"	828.00	13.65	6.827
C39	122°07'05"	3.00	6.39	5.425
C40	126°03'53"	4.00	8.80	7.861
C41	4°50'01"	94.00	7.93	3.967
C43	132°09'18"	3.00	6.92	6.763

PROPOSED CEM. CONC. WHEELCHAIR RAMP SEE WHEEL CHAIR RAMP CHARTS

PROPOSED SIDEWALK THROUGH DRIVEWAY (SEE DRIVEWAY APRON THROUGH SIDEWALK CHARTS)

606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

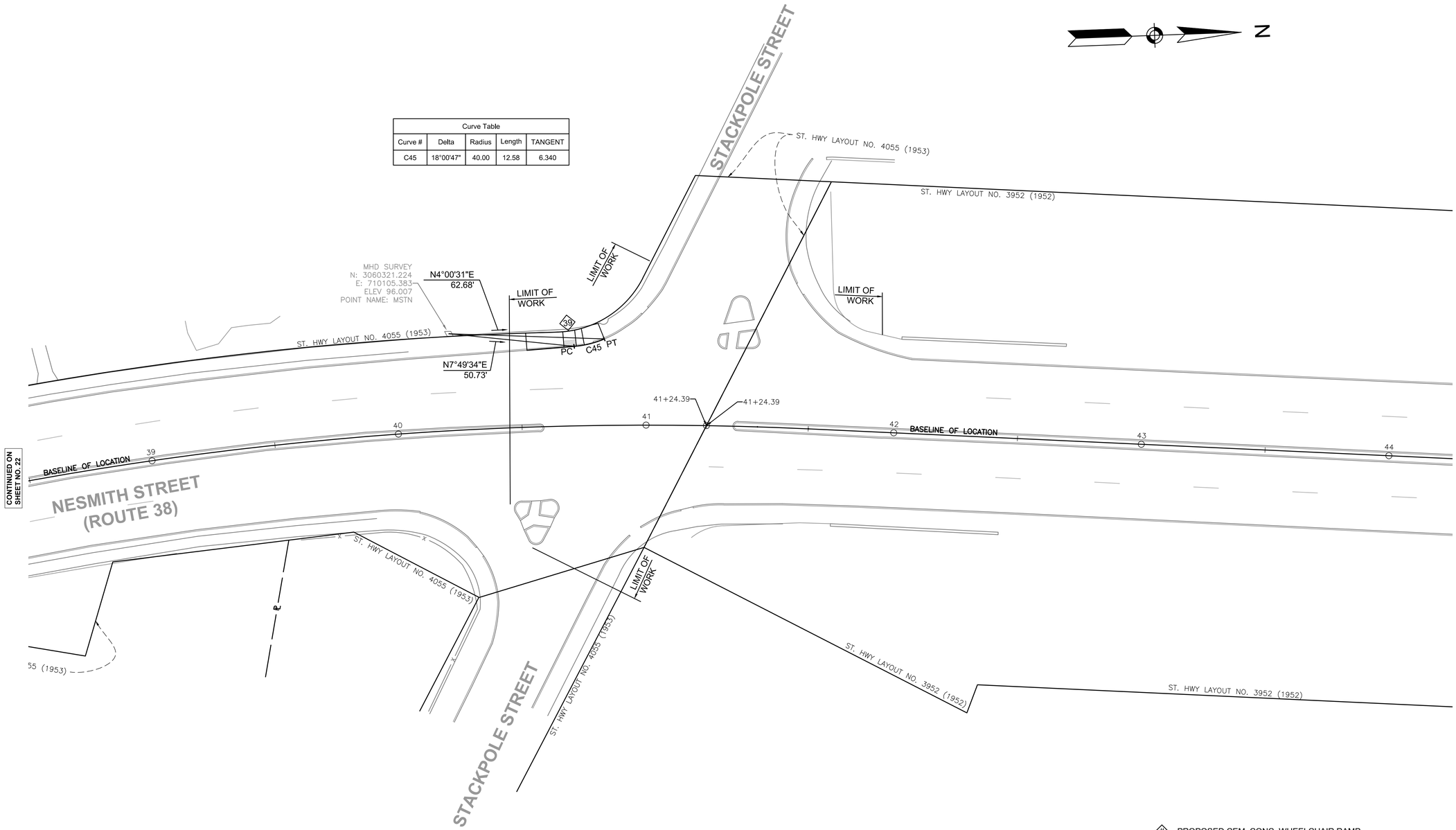
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	23	96
PROJECT FILE NO.	606189		

CURB TIE PLANS

606189HD8(CURB TIE).DWG Plotted on 17-Sep-2019 9:05 AM

Curve Table				
Curve #	Delta	Radius	Length	TANGENT
C45	18°00'47"	40.00	12.58	6.340



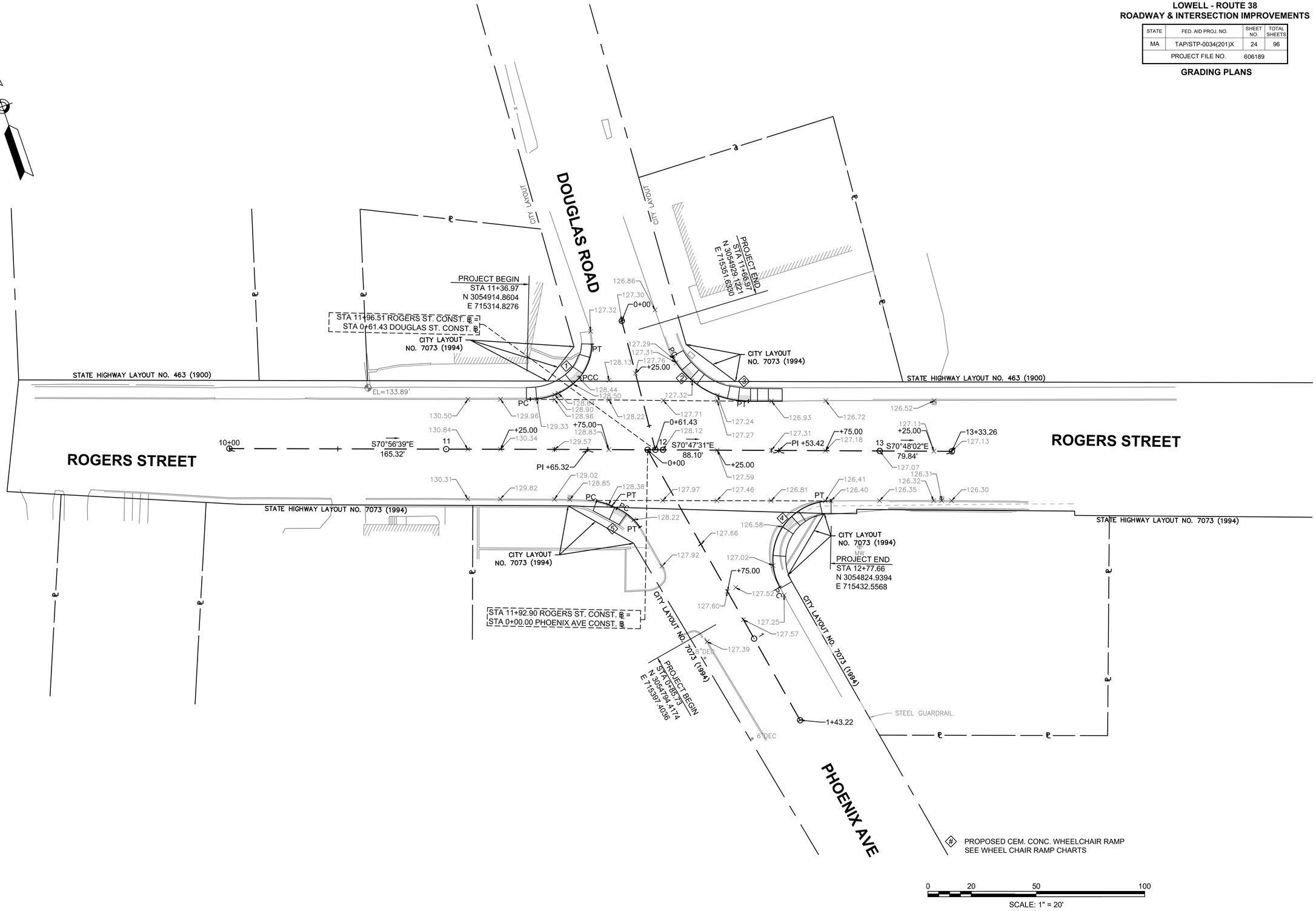
PROPOSED CEM. CONC. WHEELCHAIR RAMP
SEE WHEEL CHAIR RAMP CHARTS

0 20 50 100
SCALE: 1" = 20'

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	24	96
PROJECT FILE NO.	606189		

GRADING PLANS

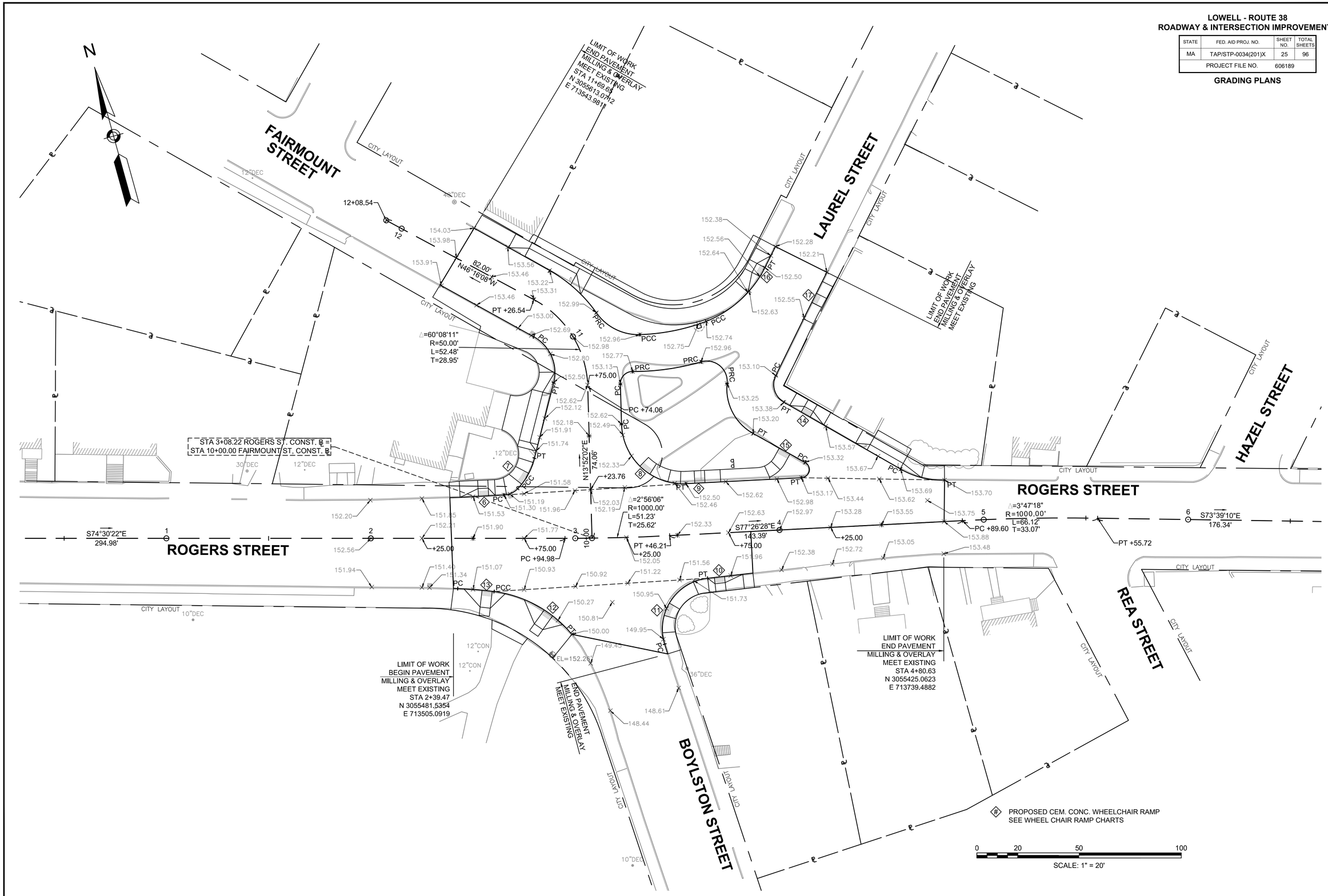


606189HD9(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	25	96
PROJECT FILE NO.	606189		

GRADING PLANS

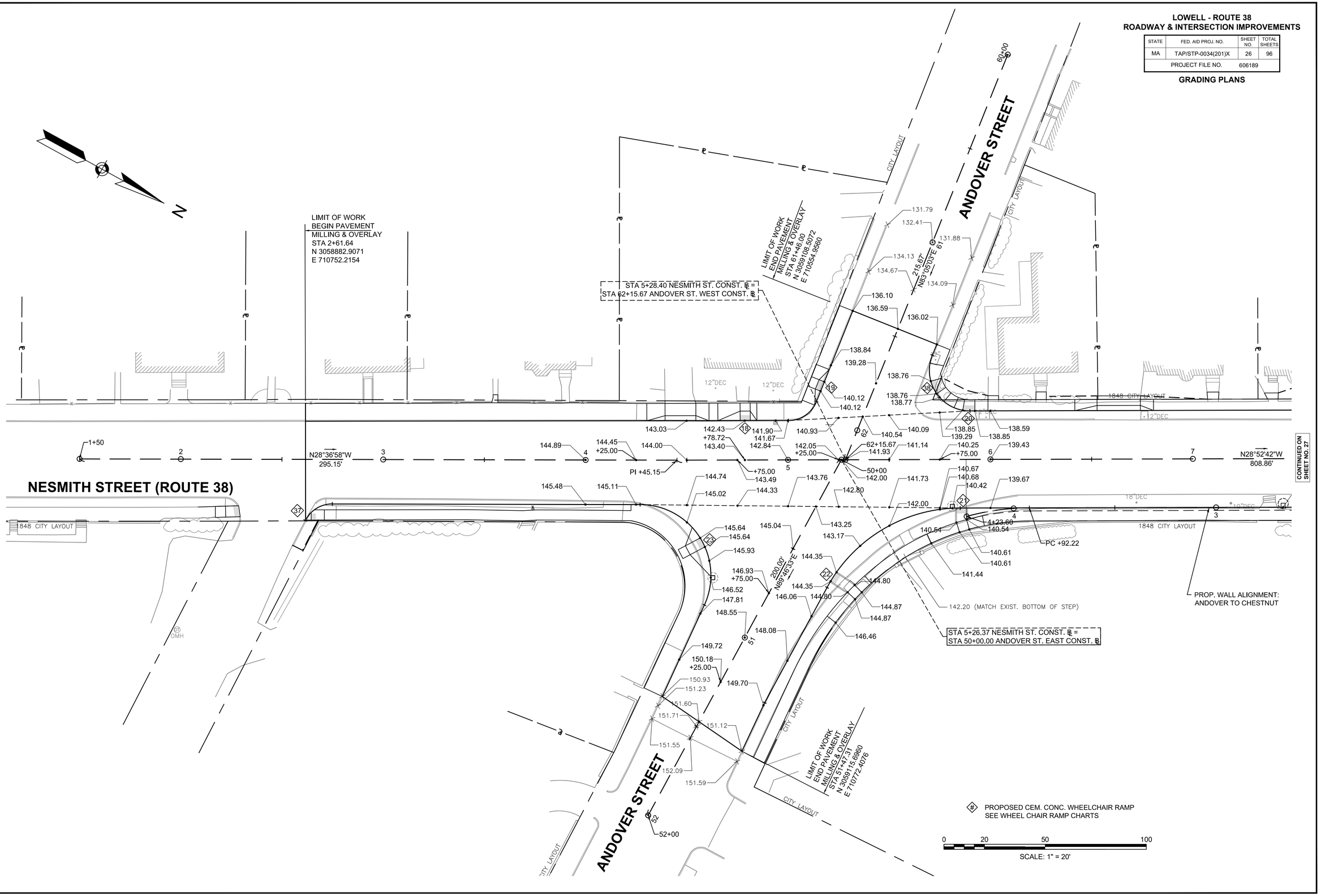


606189HD9(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	26	96
PROJECT FILE NO.	606189		

GRADING PLANS

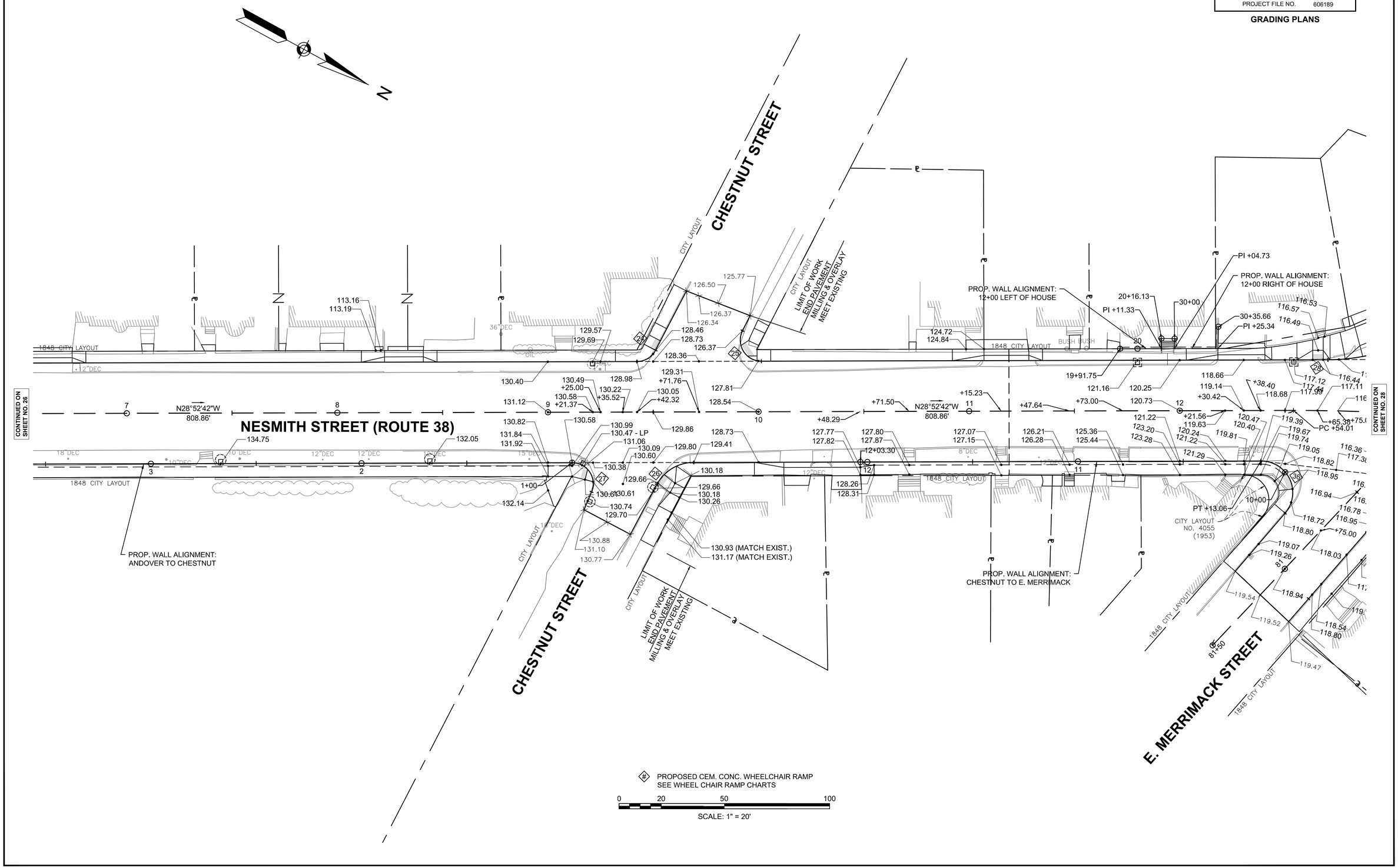


606189HD9(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	27	96
PROJECT FILE NO.	606189		

GRADING PLANS

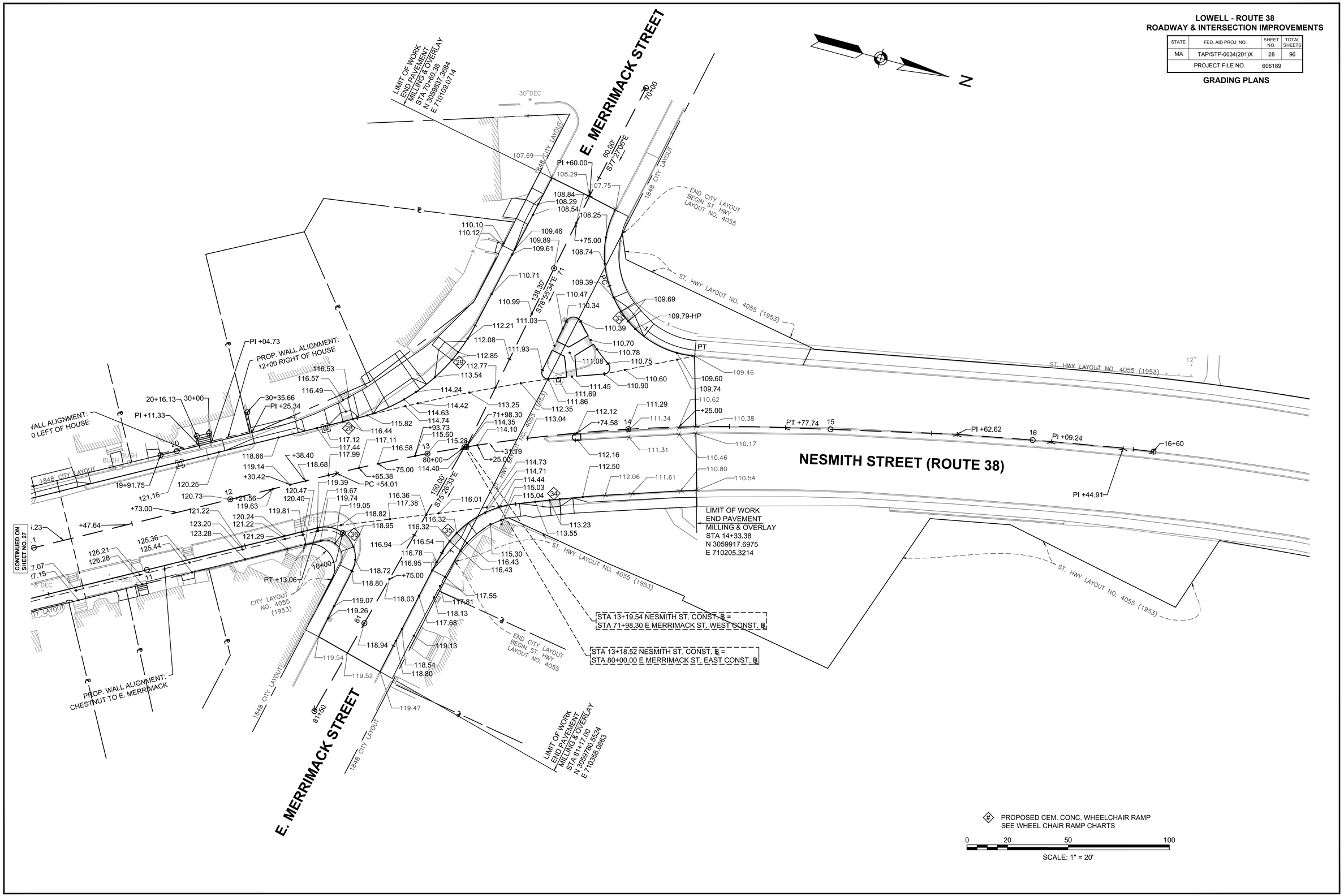


606189H09(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	28	96
PROJECT FILE NO.	606189		

GRADING PLANS

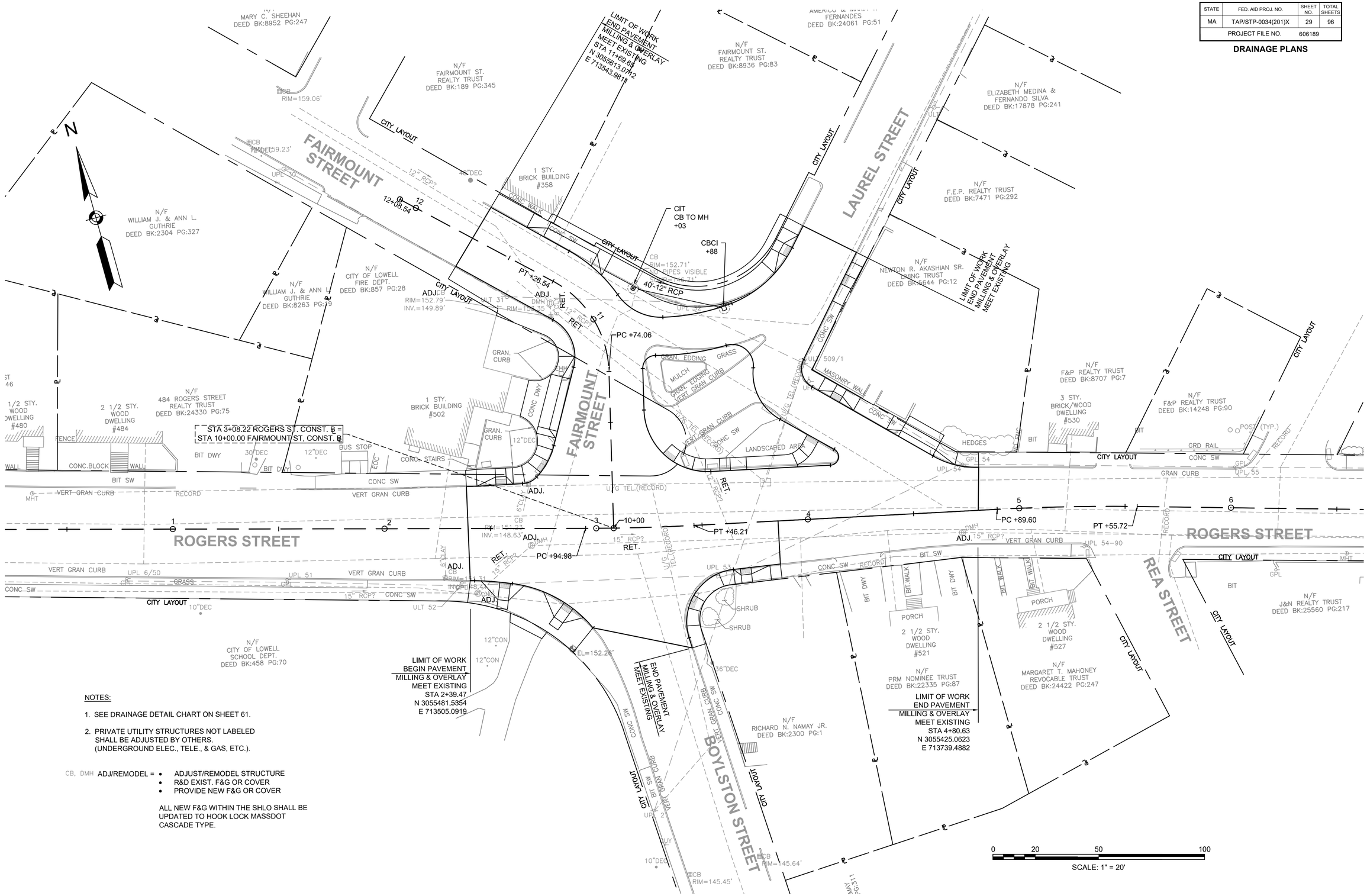


606189HD0(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	29	96
PROJECT FILE NO.	606189		

DRAINAGE PLANS



NOTES:

1. SEE DRAINAGE DETAIL CHART ON SHEET 61.
2. PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.).

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

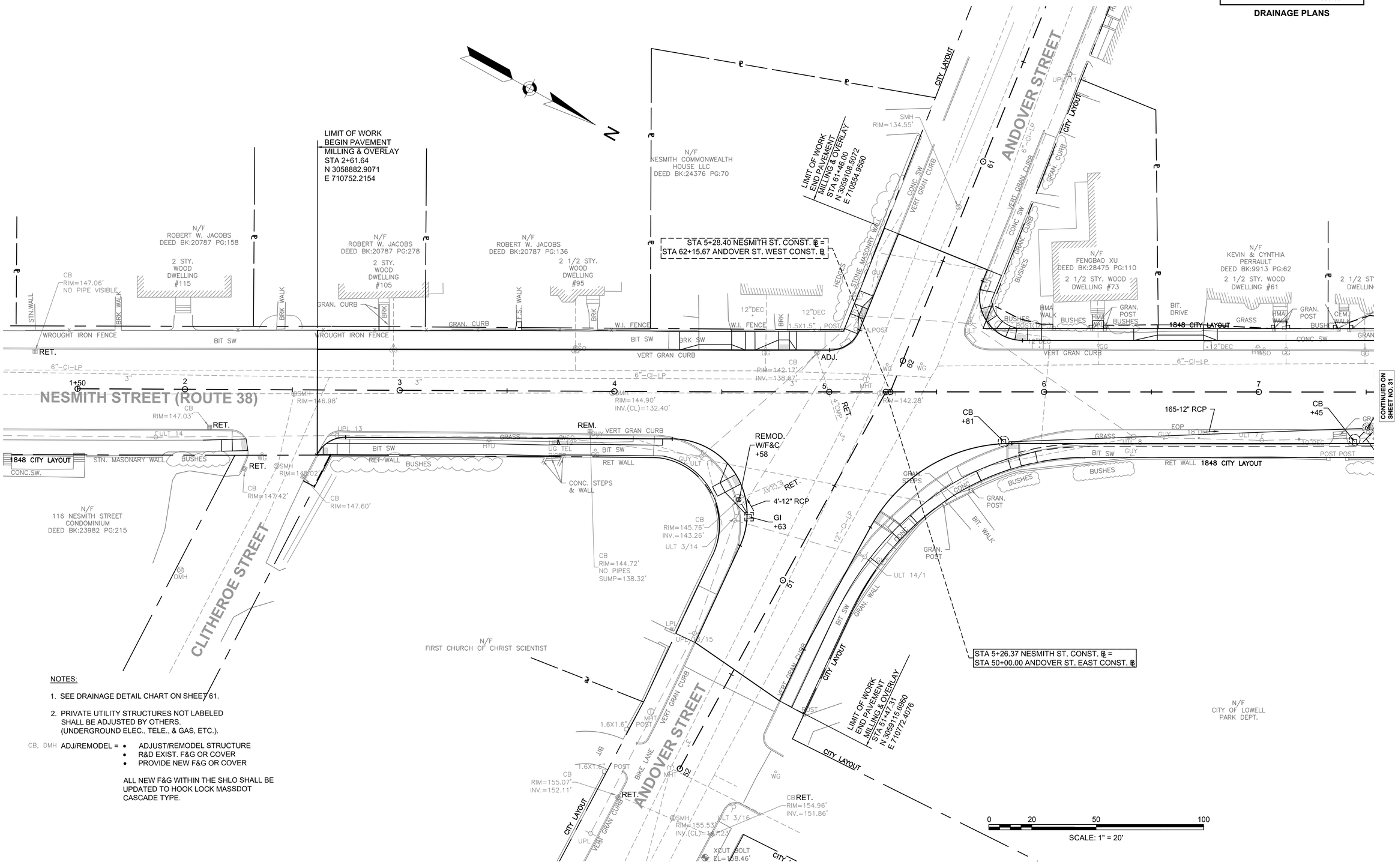
ALL NEW F&G WITHIN THE SHLO SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

606189HD14(DRAINAGE PLANS).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	30	96
PROJECT FILE NO.	606189		

DRAINAGE PLANS



NOTES:

1. SEE DRAINAGE DETAIL CHART ON SHEET 61.
2. PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.).

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

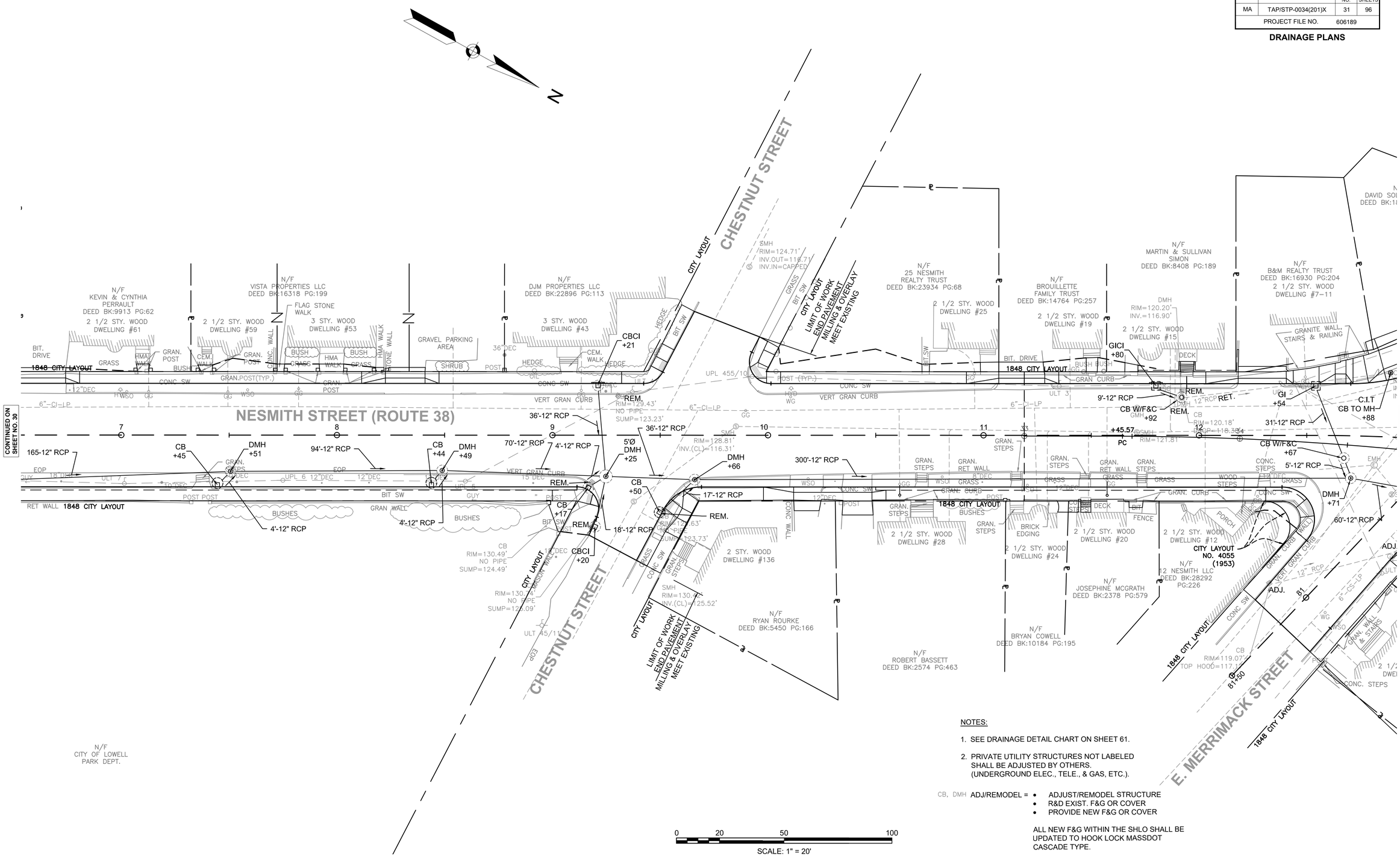
ALL NEW F&G WITHIN THE SHLO SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

606189HD14(DRAINAGE PLANS).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	31	96
PROJECT FILE NO.	606189		

DRAINAGE PLANS



NOTES:

1. SEE DRAINAGE DETAIL CHART ON SHEET 61.
2. PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.).

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

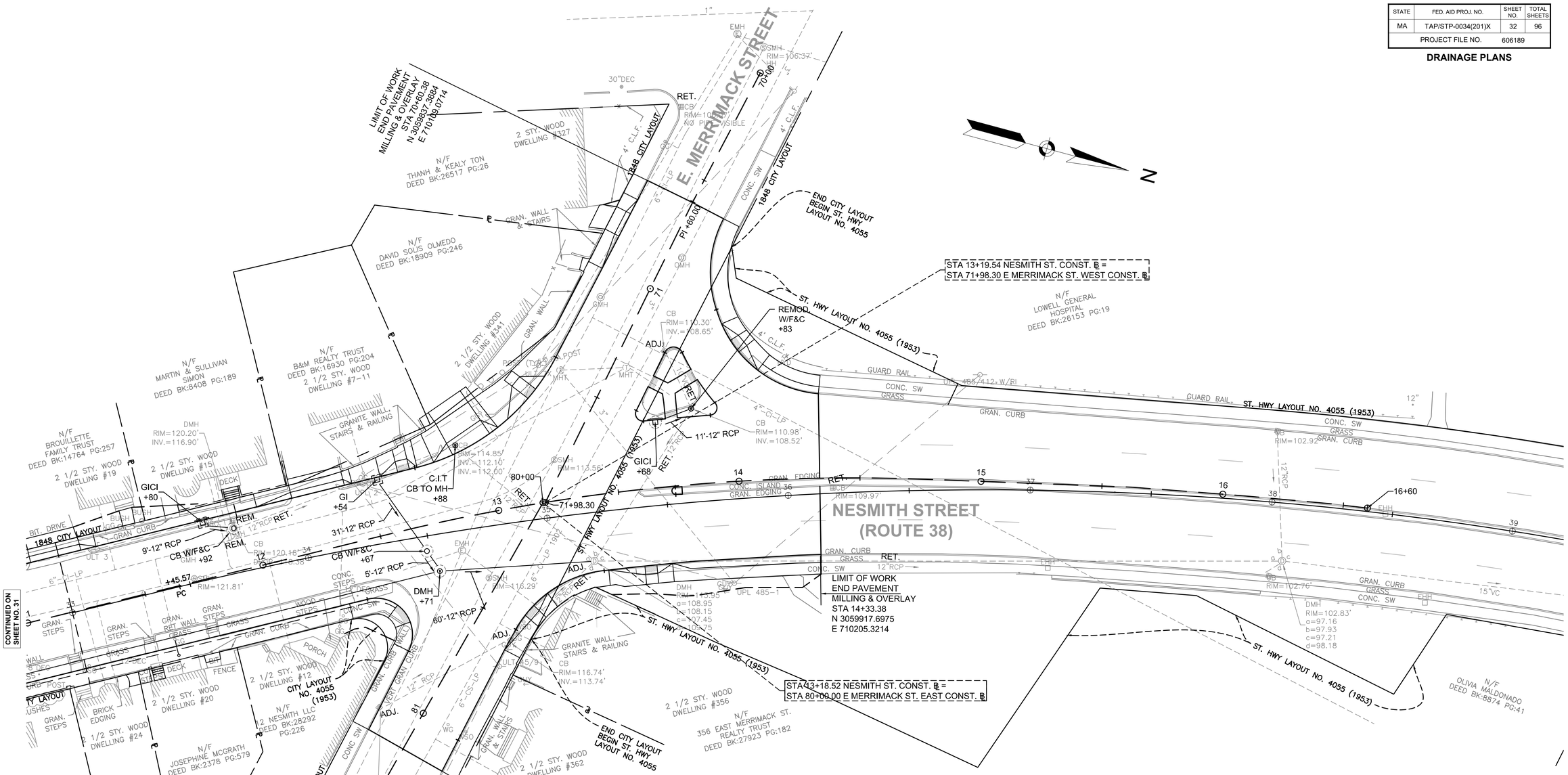
ALL NEW F&G WITHIN THE SHLO SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

606189HD14(DRAINAGE PLANS).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	32	96
PROJECT FILE NO.	606189		

DRAINAGE PLANS



NOTES:

1. SEE DRAINAGE DETAIL CHART ON SHEET 61.
2. PRIVATE UTILITY STRUCTURES NOT LABELED SHALL BE ADJUSTED BY OTHERS. (UNDERGROUND ELEC., TELE., & GAS, ETC.).

CB, DMH ADJ/REMODEL =
- ADJUST/REMODEL STRUCTURE
- R&D EXIST. F&G OR COVER
- PROVIDE NEW F&G OR COVER

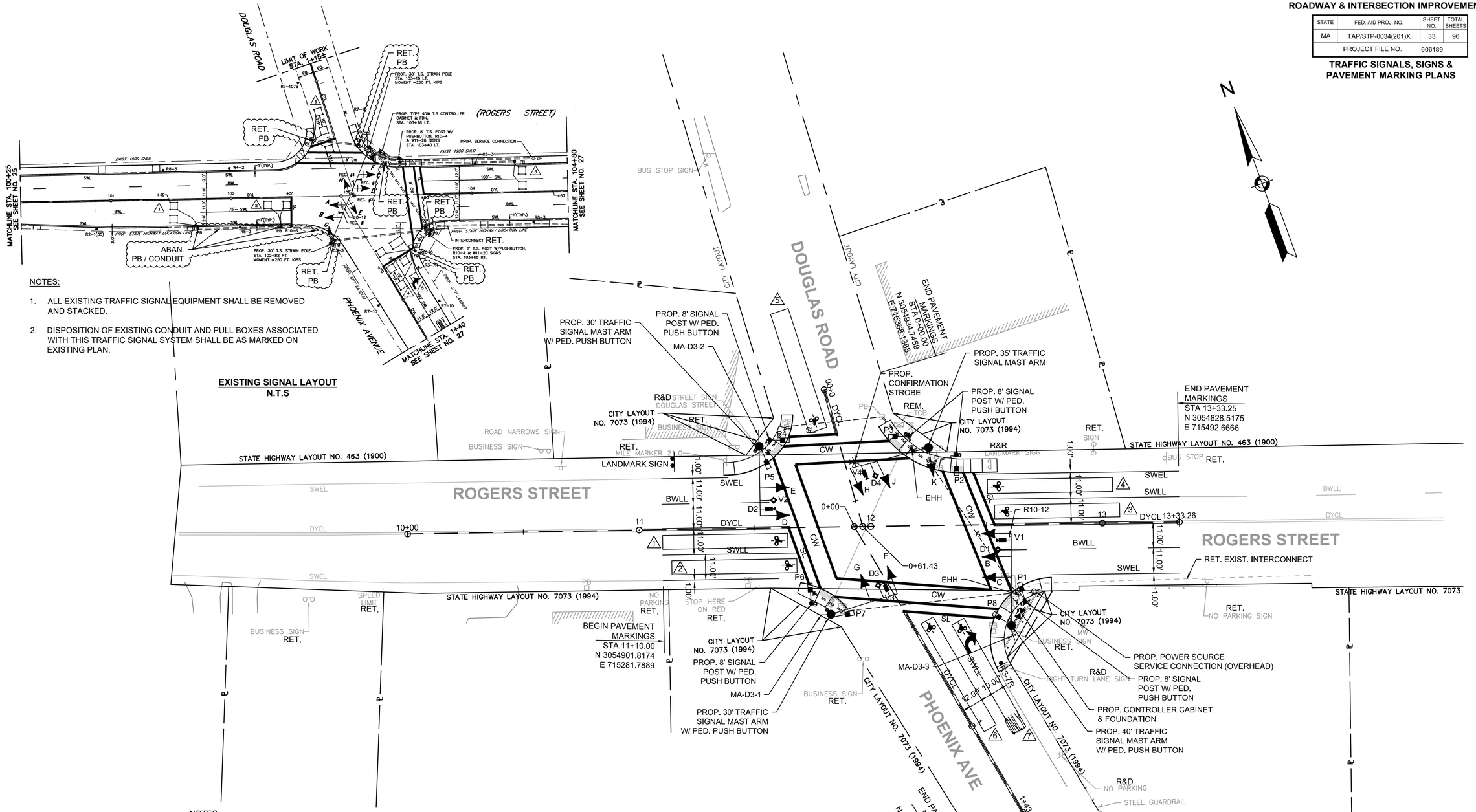
ALL NEW F&G WITHIN THE SHLO SHALL BE UPDATED TO HOOK LOCK MASSDOT CASCADE TYPE.

606189HD14(DRAINAGE PLANS).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	33	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS



NOTES:

1. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED.
2. DISPOSITION OF EXISTING CONDUIT AND PULL BOXES ASSOCIATED WITH THIS TRAFFIC SIGNAL SYSTEM SHALL BE AS MARKED ON EXISTING PLAN.

EXISTING SIGNAL LAYOUT
N.T.S

NOTES:

1. PROPOSED PAVEMENT MARKING MATERIAL SHALL BE WET REFLECTIVE THERMOPLASTIC.
2. PROPOSED PAVEMENT MARKINGS SHALL NOT BE PLACED ON TOP OF PAVEMENT JOINTS. PROPOSED PAVEMENT MARKINGS SHALL BE OFFSET A DISTANCE OF 4 INCHES FROM ANY JOINT.
3. ALL SIGNS ARE TO BE LOCATED / INSTALLED AT BACK OF SIDEWALK WHEREVER POSSIBLE.
4. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK.
5. PULL ALL NEW CABLE THROUGH EXISTING CONDUIT AS SHOWN (- - - - - INDICATES NEW CABLE)

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:06 AM

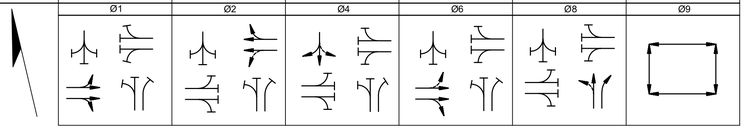
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	34	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNAL DATA

SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	FLASHING OPERATION
MINIMUM GREEN (INITIAL)			5			8			6			8			6						
PASSAGE TIME (VEHICLE)			2			3			3			3			3						EMERGENCY ONLY
MAXIMUM 1			10			40			20			40			20						
MAXIMUM 2																					
YELLOW CLEARANCE				4			4			4			4			4					
RED CLEARANCE					1			2			2			2			2				
PEDESTRIAN WALK																		7			
PEDESTRIAN CLEARANCE																			16	3	
ROGERS STREET	SB	A	<G G	<Y G	G	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
ROGERS STREET	SB	B, C	G	G	G	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
ROGERS STREET	NB	D, E	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
DOUGLAS ROAD	WB	F, G	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
PHOENIX AVENUE	EB	H, J, K	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR MEM.			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			-			
RECALL			OFF			MIN.			OFF			MIN.			OFF			OFF			
			Ø1			Ø2			Ø4			Ø6			Ø8			Ø9			



NOTE:

THIS INTERSECTION (ROGERS ST. / PHOENIX AVE. / DOUGLAS RD. OPERATES IN COORDINATED SYSTEM WITH NEXT SIX (6) TRAFFIC SIGNALIZED INTERSECTIONS EASTERLY ALONG ROGERS ST. (ROUTE 38).

TRAFFIC CONTROL SIGNAL, MAJOR ITEMS LIST

PAY ITEM	QUANTITY	ITEM
816.01	1	CONTROLLER NEMA 8 PHASE TS2-TYPE 1, CABINET & FDN.
	1	SERVICE CONNECTION (OVERHEAD)
	1	40 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	35 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	2	30 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	5	8 FT SIGNAL POLE, BASE & FDN.
	9	1 WAY, 3 SECTION SIGNAL HOUSING (12" L.E.D.)
	1	1 WAY, 5 SECTION SIGNAL HOUSING (12" L.E.D.)
	8	COUNTDOWN PEDESTRIAN SIGNAL HOUSING (16" L.E.D.)
	8	PEDESTRIAN PUSH BUTTON, SIGN & SADDLE (APS) W/ R10-3e (L, R) CROSSING SIGN
	1	VIDEO DETECTION SYSTEM (W/4 CAMERAS)
	4	OPTICAL RECEIVER - SINGLE CHANNEL
	2	PHASE SELECTOR MODULE - DUAL CHANNEL
	1	PHASE SELECTOR CARD RACK
	1	CONFIRMATION STROBE (CLEAR)
	10	5 IN. NON - LOUVERED BACK PLATES W/ 3 IN. RETROREFLECTIVE YELLOW BORDER
	1	R&S ALL EXISTING TRAFFIC SIGNAL EQUIPMENT
		MALFUNCTION MANAGEMENT UNIT (MMU) SHALL BE CAPABLE OF PROVIDING FLASHING YELLOW ARROW OPERATION
804.3		3 IN. ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)
811.22	1	ELECTRIC HAND HOLE 24"x13" - SD2.022
811.31	2	PULL BOX 12"X12" -SD2.031
		Plus all necessary duct, cable, labor, miscellaneous material and equipment to complete the installation

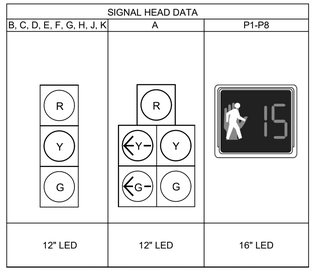
EMERGENCY PREEMPTION SCHEDULE

DETECTOR & PRIORITY	VEHICLULAR PHASE ASSIGNMENT	MOVEMENTS
D1	Ø1	
D2	Ø2	
D3	Ø4	
D4	Ø8	

EMERGENCY VEHICLE PREEMPTION OPERATION:

1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY AN OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED) OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. PREEMPTION MINIMUM GREENS SHALL BE TEN SECONDS.
5. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TERMINATED BY PREEMPTION DEMAND.
6. ACTUAL TIMING FOR PREEMPTION SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE FIRE DEPARTMENT AND SHALL BE APPROVED BY MHD PRIOR TO OPERATION.

SIGNAL HEAD DATA

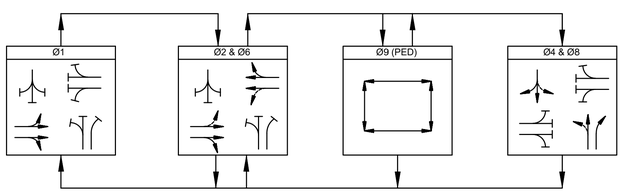


ALL OVERHEAD SIGNAL HEADS SHALL BE FIXED MOUNTED AND HAVE LOUVERED BACKPLATES WITH 2" RETROREFLECTIVE YELLOW BORDER.

DETECTOR DATA

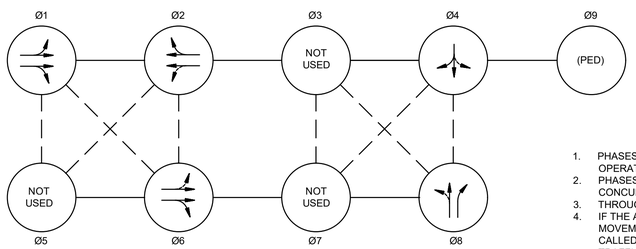
DET. NO.	APPROX. ZONE SIZE	CAMERA	CALL DELAY	CALL PHASE	EXTEND PHASE	OPERATION MODE
1	6' X 54'	V1	-	Ø1	Ø1	PRESENCE
2	6' X 54'	V1	-	Ø6	Ø6	PRESENCE
3	6' X 54'	V2	-	Ø2	Ø2	PRESENCE
4	6' X 54'	V2	-	Ø2	Ø2	PRESENCE
5	8' X 54'	V3	5 SEC	Ø4	Ø4	PRESENCE
6	6' X 54'	V4	-	Ø8	Ø8	PRESENCE
7	6' X 54'	V4	-	Ø8	Ø8	PRESENCE

*NOTE: ALL DETECTORS SHALL BE CAPABLE OF BICYCLE DETECTION



PREFERENTIAL PHASE SEQUENCE DIAGRAM

NEMA DUAL RING PHASING NOTES



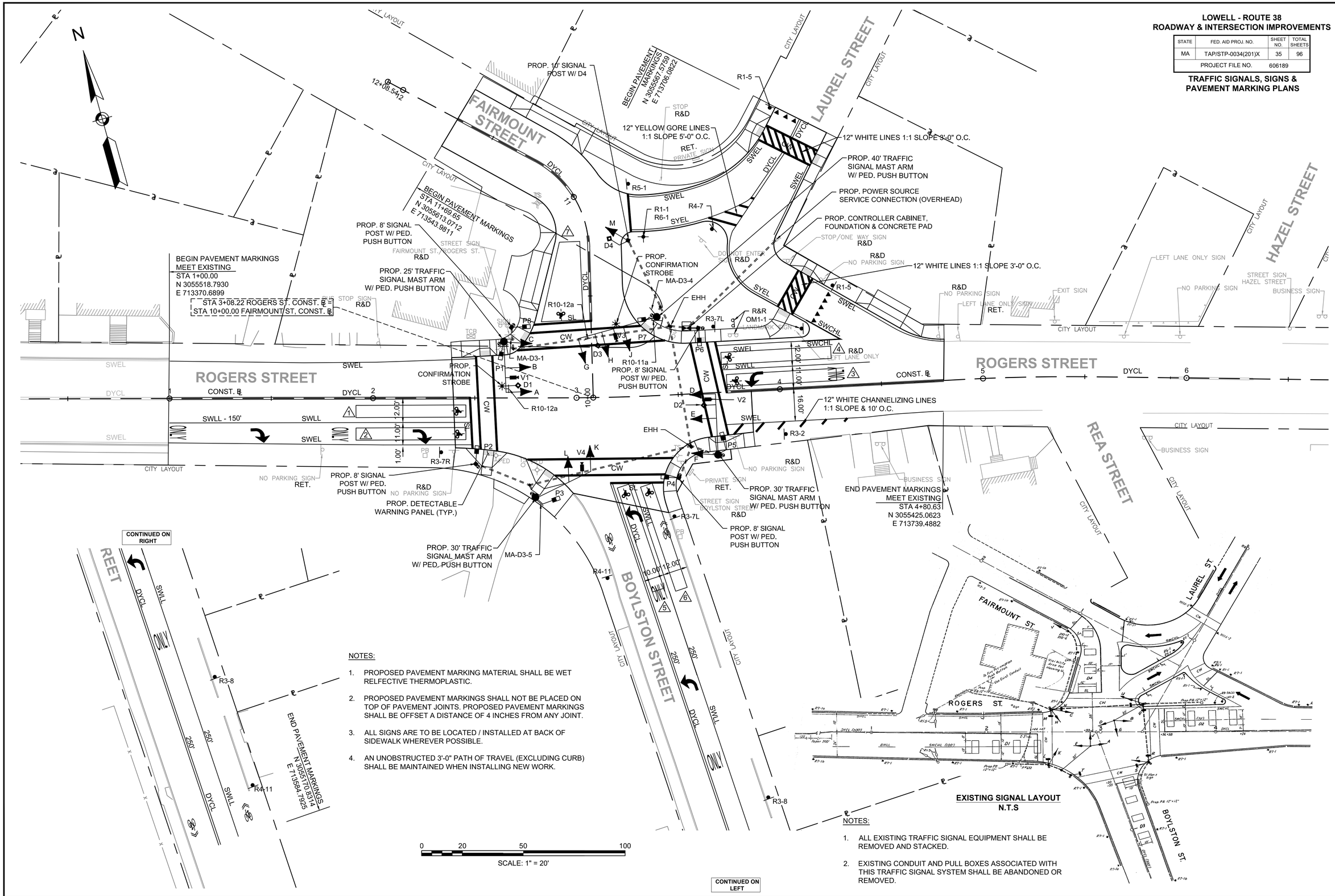
1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.
3. THROUGH MOVEMENTS MAY INCLUDE RIGHT TURNS.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S) UNLESS OTHERWISE NOTED.

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	35	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS



NOTES:

1. PROPOSED PAVEMENT MARKING MATERIAL SHALL BE WET RELFECTIVE THERMOPLASTIC.
2. PROPOSED PAVEMENT MARKINGS SHALL NOT BE PLACED ON TOP OF PAVEMENT JOINTS. PROPOSED PAVEMENT MARKINGS SHALL BE OFFSET A DISTANCE OF 4 INCHES FROM ANY JOINT.
3. ALL SIGNS ARE TO BE LOCATED / INSTALLED AT BACK OF SIDEWALK WHEREVER POSSIBLE.
4. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK.

EXISTING SIGNAL LAYOUT
N.T.S

NOTES:

1. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED.
2. EXISTING CONDUIT AND PULL BOXES ASSOCIATED WITH THIS TRAFFIC SIGNAL SYSTEM SHALL BE ABANDONED OR REMOVED.

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:06 AM

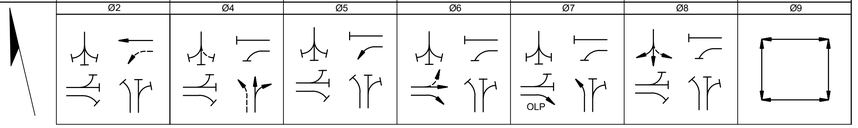
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	36	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNAL DATA

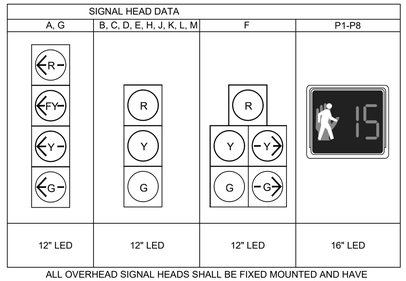
SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	FLASHING OPERATION
MINIMUM GREEN (INITIAL)			10			8			5			10			5			8						EMERGENCY ONLY
PASSAGE TIME (VEHICLE)			4			2			2			4			2			2						
MAXIMUM 1			42			12			10			42			10			12						
MAXIMUM 2			62			16			10			62			15			16						
YELLOW CLEARANCE				4			4			3			4			3			4					
RED CLEARANCE					2			2			0			2			0			2				
PEDESTRIAN WALK																					7			
PEDESTRIAN CLEARANCE																						15	3	
ROGERS STREET	NB	A	FY	Y	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
ROGERS STREET	NB	B, C	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
ROGERS STREET	SB	D, E	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FY
ROGERS STREET	SB	F	R	R	R	R	R	R	R	R	R	G	Y	R	G	Y	R	R	R	R	R	R	R	FY
BOYLSTON STREET	EB	G	R	R	R	FY	Y	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FR
BOYSLTON STREET	EB	H, J	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
FAIRMOUNT STREET	WB	K, L, M	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR MEM.			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			-			
RECALL			MIN.			OFF			OFF			MIN.			OFF			OFF			OFF			
			Ø2			Ø4			Ø5			Ø6			Ø7			Ø8			Ø9			



MAX. 2 TO OPERATE 3:00 PM TO 6:00 AM MONDAY THRU FRIDAY
MAX. 1 TO OPERATE ALL OTHER TIMES

SIGNAL HEAD DATA



ALL OVERHEAD SIGNAL HEADS SHALL BE FIXED MOUNTED AND HAVE LOUVERED BACKPLATES WITH 2" RETROREFLECTIVE YELLOW BORDER.

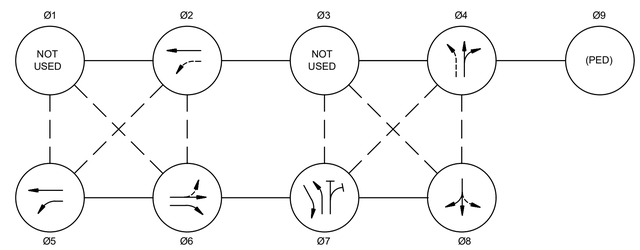
EMERGENCY PREEMPTION SCHEDULE

DETECTOR & PRIORITY	VEHICLULAR PHASE ASSIGNMENT	MOVEMENTS
D1	Ø2 & Ø5	
D2	Ø6	
D3	Ø4 & Ø7	
D4	Ø8	

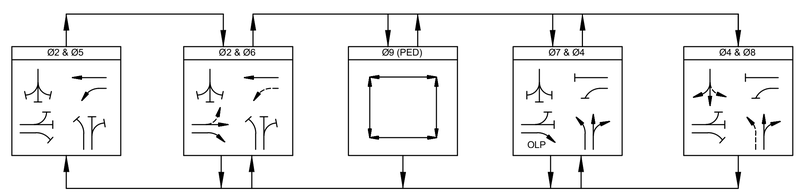
EMERGENCY VEHICLE PREEMPTION OPERATION:

1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY AN OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED) OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. PREEMPTION MINIMUM GREENS SHALL BE TEN SECONDS.
5. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TERMINATED BY PREEMPTION DEMAND.
6. ACTUAL TIMING FOR PREEMPTION SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE FIRE DEPARTMENT AND SHALL BE APPROVED BY MHD PRIOR TO OPERATION.

NEMA DUAL RING PHASING NOTES



1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.
3. THROUGH MOVEMENTS MAY INCLUDE RIGHT TURNS.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S) UNLESS OTHERWISE NOTED.



PREFERENTIAL PHASE SEQUENCE DIAGRAM

TRAFFIC CONTROL SIGNAL, MAJOR ITEMS LIST

PAY ITEM	QUANTITY	ITEM
816.02	1	8 DW CONTROLLER NEMA TS2-TYPE 1, BASE MOUNTED CABINET, FDN & CONC. PAD
	1	SERVICE CONNECTION (OVERHEAD)
	1	25 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	2	30 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	40 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	4	8 FT SIGNAL POLE, BASE & FDN.
	1	10 FT SIGNAL POLE, BASE & FDN.
	9	1 WAY, 3 SECTION SIGNAL HOUSING (12" L.E.D.)
	2	1 WAY, 4 SECTION SIGNAL HOUSING (12" L.E.D.)
	1	1 WAY, 5 SECTION SIGNAL HOUSING (12" L.E.D.)
	8	COUNTDOWN PEDESTRIAN SIGNAL HOUSING (16" L.E.D.)
	8	PEDESTRIAN PUSH BUTTON, SIGN & SADDLE (APS) W/ R10-3e (L, R) CROSSING SIGN
	1	VIDEO DETECTION SYSTEM (W/4 CAMERAS)
	4	OPTICAL RECEIVER - SINGLE CHANNEL
	2	PHASE SELECTOR MODULE - DUAL CHANNEL
	1	PHASE SELECTOR CARD RACK
	2	CONFIRMATION STROBE (CLEAR)
	12	5 IN. NON - LOUVERED BACK PLATES W/ 3 IN. RETROREFLECTIVE YELLOW BORDER
		MALFUNCTION MANAGEMENT UNIT (MMU) SHALL BE CAPABLE OF PROVIDING FLASHING YELLOW ARROW OPERATION
	1	R&S ALL EXISTING TRAFFIC SIGNAL EQUIPMENT
804.3		3 IN. ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)
811.22	2	ELECTRIC HAND HOLE 24"x13" - SD2.022
811.31	4	PULL BOX 12"X12" -SD2.031
		Plus all necessary duct, cable, labor, miscellaneous material and equipment to complete the installation

DETECTOR DATA

DET. NO.	APPROX. ZONE SIZE	CAMERA	CALL DELAY	CALL PHASE	EXTEND PHASE	OPERATION MODE
1	6' X 54'	V2	-	Ø6	Ø6	PRESENCE
2	6' X 54'	V2	-	Ø6	Ø6	PRESENCE
3	6' X 54'	V1	-	Ø5	Ø5	PRESENCE
4	6' X 54'	V1	-	Ø2	Ø2	PRESENCE
5	6' X 54'	V3	-	Ø7	Ø7	PRESENCE
6	6' X 54'	V3	-	Ø4	Ø4	PRESENCE
7	10'/20' X 40'	V4	-	Ø8	Ø8	PRESENCE

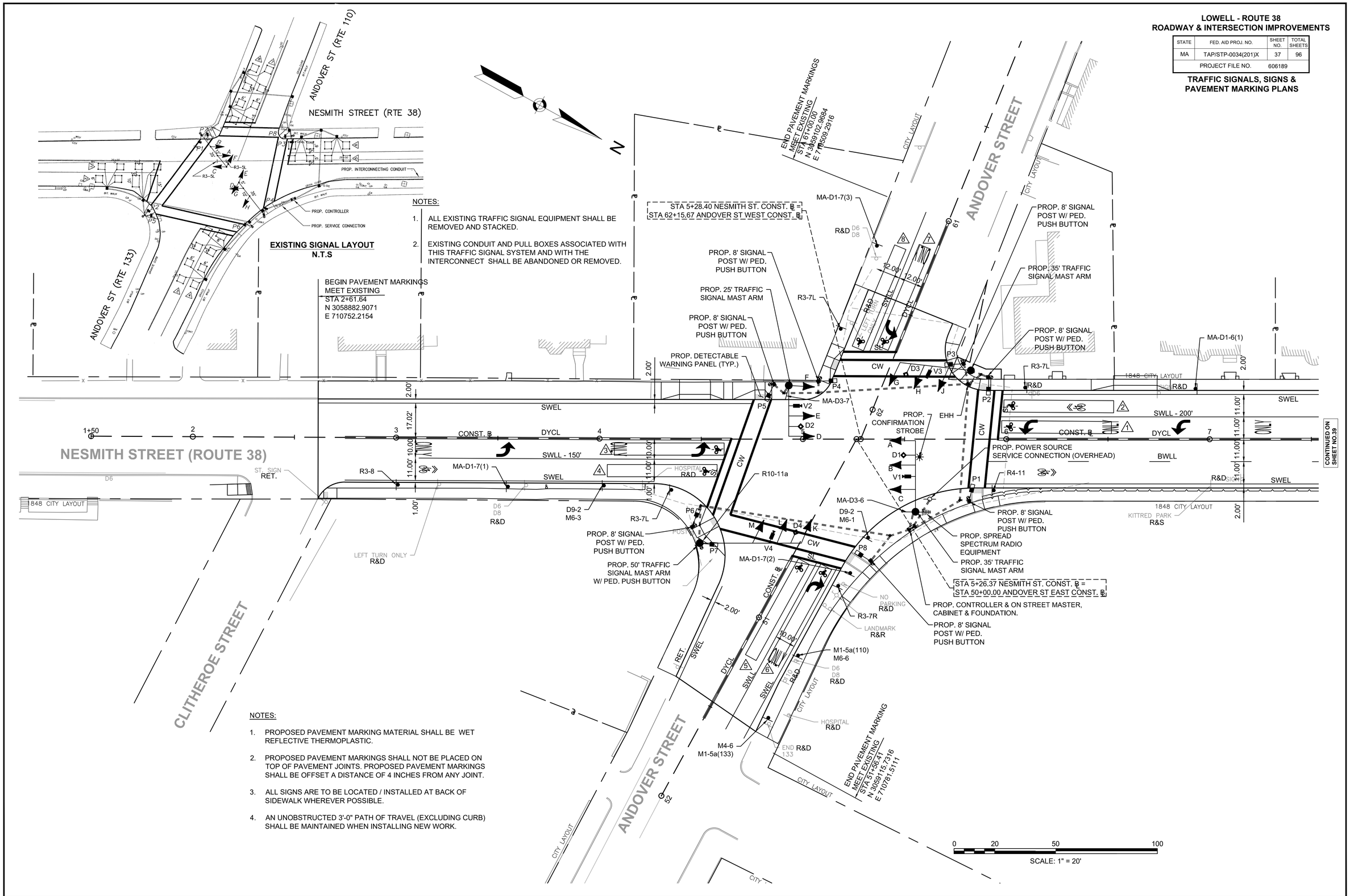
*NOTE: ALL DETECTORS SHALL BE CAPABLE OF BICYCLE DETECTION

606189HD8(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:06 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	37	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS



NOTES:

1. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED.
2. EXISTING CONDUIT AND PULL BOXES ASSOCIATED WITH THIS TRAFFIC SIGNAL SYSTEM AND WITH THE INTERCONNECT SHALL BE ABANDONED OR REMOVED.

NOTES:

1. PROPOSED PAVEMENT MARKING MATERIAL SHALL BE WET REFLECTIVE THERMOPLASTIC.
2. PROPOSED PAVEMENT MARKINGS SHALL NOT BE PLACED ON TOP OF PAVEMENT JOINTS. PROPOSED PAVEMENT MARKINGS SHALL BE OFFSET A DISTANCE OF 4 INCHES FROM ANY JOINT.
3. ALL SIGNS ARE TO BE LOCATED / INSTALLED AT BACK OF SIDEWALK WHEREVER POSSIBLE.
4. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK.

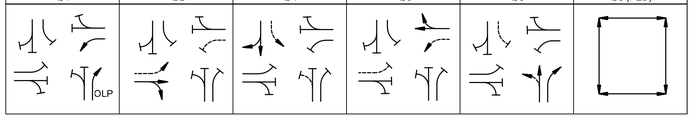
606189HD8(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	38	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNAL DATA

SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	FLASHING OPERATION
MINIMUM GREEN (INITIAL)			6			10			10			10			10						
PASSAGE TIME (VEHICLE)			2			4			4			4			4						
MAXIMUM 1 (FREE OPERATION)			18			37			28			37			28						EMERGENCY ONLY
MAXIMUM 2 (COORDINATED)			*			*			*			*			*						
YELLOW CLEARANCE				3			4			4			4			4					
RED CLEARANCE					0			2			2			2			2				
PEDESTRIAN WALK																		7			
PEDESTRIAN CLEARANCE																			15	3	
NESMITH STREET	NB	A	R	R	R	←FY–	←Y–	←R–	R	R	R	R	R	R	R	R	R	R	R	R	←FR–
NESMITH STREET	NB	B, C	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
NESMITH STREET	SB	D	←G–	←Y–	←R–	R	R	R	R	R	R	←FY–	←Y–	←R–	R	R	R	R	R	R	←FR–
NESMITH STREET	SB	E, F	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
ANDOVER STREET	WB	G, H	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
ANDOVER STREET	WB	J	–G→	–Y→	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
ANDOVER STREET	EB	K	R	R	R	R	R	R	←FY–	←Y–	←R–	R	R	R	R	R	R	R	R	R	←FR–
ANDOVER STREET	EB	L, M	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR MEM.			NON - LOCK			NON - LOCK			NON - LOCK			NON - LOCK			NON - LOCK			-			
RECALL			OFF			MIN.			OFF			MIN.			OFF			OFF			
* SEE TIMING PROGRAM CHART FOR VALUES			Ø1			Ø2			Ø4			Ø6			Ø8			Ø9 (PED)			



NOTE:

THIS INTERSECTION (NESMITH ST. / ANDOVER ST.) OPERATES IN COORDINATED SYSTEM WITH TRAFFIC SIGNALS AT NESMITH ST. / E. MERRIMACK ST. AND NESMITH ST. / STACKPOLE ST.

MASTER PROGRAM DATA

FUNCTION	MON - FRI	SAT / SUN / HOLIDAYS
FREE OPERATION FULLY ACTUATED	12:00 AM - 5:00 AM	12:00 AM - 6:00 AM
TIMING PROGRAM 1	5:00 AM - 12:00 PM	6:00 AM - 11:00 AM
TIMING PROGRAM 2	12:00 PM - 12:00 AM	11:00 AM - 12:00 AM

COORDINATION DATA
(ALL ENTRIES IN SECONDS)

CYCLE	TIME PERIOD (SEE MASTER PROG. DATA)	OFFSET	CYCLE LENGTH
1	TIMING PROGRAM 1	0	100
2	TIMING PROGRAM 2	0	100

	TIMMING PROGRAM	
	1	2
CYCLE LENGTH / PHASE SPLITS	100 SEC	100 SEC
Ø1	27(16)	23(13)
Ø2	45(32)	43(32)
Ø4	28(27)	34(30)
Ø6	72(48)	66(45)
Ø8	28(27)	34(30)
PED	- (25)	- (25)

TRAFFIC CONTROL SIGNAL, MAJOR ITEMS LIST

PAY ITEM	QUANTITY	ITEM
816.03	1	8 DW CONTROLLER NEMA TS2-TYPE 1, BASE MOUNTED CABINET & FDN.
	1	ON STREET MASTER CONTROLLER UNIT
	1	SPREAD SPECTRUM RADIO COMMUNICATION SYSTEM
	1	SERVICE CONNECTION (OVERHEAD)
	1	25 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	2	35 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	50 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	7	8 FT SIGNAL POLE, BASE & FDN.
	10	1 WAY, 3 SECTION SIGNAL HOUSING (12" L.E.D.)
	1	1 WAY, 4 SECTION SIGNAL HOUSING (12" L.E.D.)
	1	1 WAY, 5 SECTION SIGNAL HOUSING (12" L.E.D.)
	8	COUNTDOWN PEDESTRIAN SIGNAL HOUSING (16" L.E.D.)
	8	PEDESTRIAN PUSH BUTTON, SIGN & SADDLE (APS) W/ R10-3e (L, R) CROSSING SIGN
	1	VIDEO DETECTION SYSTEM (W/4 CAMERAS)
	4	OPTICAL RECEIVER - SINGLE CHANNEL
	2	PHASE SELECTOR MODULE - DUAL CHANNEL
	1	PHASE SELECTOR CARD RACK
	1	CONFIRMATION STROBE (CLEAR)
	12	5 IN. NON - LOUVERED BACK PLATES W/ 3 IN. RETROREFLECTIVE YELLOW BORDER
		MALFUNCTION MANAGEMENT UNIT (MMU) SHALL BE CAPABLE OF PROVIDING FLASHING YELLOW ARROW OPERATION
	1	R&S ALL EXISTING TRAFFIC SIGNAL EQUIPMENT
804.3		3 IN. ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)
811.22	1	ELECTRIC HAND HOLE 24"x13" - SD2.022
811.31	6	PULL BOX 12"X12" -SD2.031
		Plus all necessary duct, cable, labor, miscellaneous material and equipment to complete the installation

EMERGENCY PREEMPTION SCHEDULE

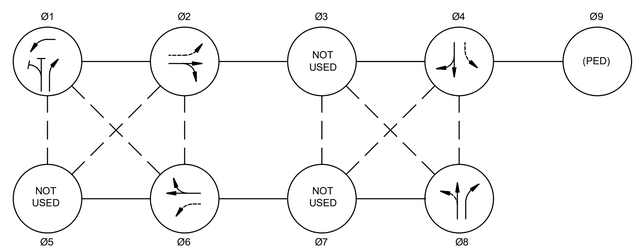
DETECTOR & PRIORITY	VEHICLULAR PHASE ASSIGNMENT	MOVEMENTS
D1	Ø2	
D2	Ø6	
D3	Ø8	
D4	Ø4	

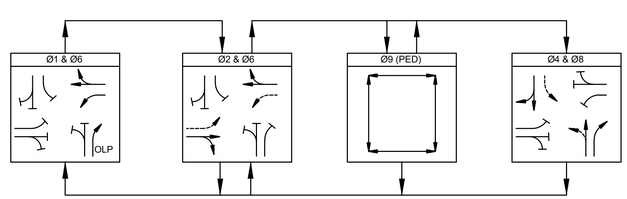
EMERGENCY VEHICLE PREEMPTION OPERATION:

1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY AN OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED) OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. PREEMPTION MINIMUM GREENS SHALL BE TEN SECONDS.
5. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TERMINATED BY PREEMPTION DEMAND.
6. ACTUAL TIMING FOR PREEMPTION SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE FIRE DEPARTMENT AND SHALL BE APPROVED BY MHD PRIOR TO OPERATION.

1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.
3. THROUGH MOVEMENTS MAY INCLUDE RIGHT TURNS.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S) UNLESS OTHERWISE NOTED.

NEMA DUAL RING PHASING NOTES





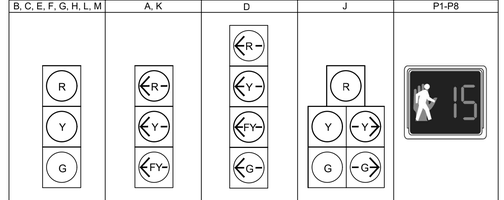
PREFERENTIAL PHASE SEQUENCE DIAGRAM

DETECTOR DATA

DET. NO.	APPROX. ZONE SIZE	CAMERA	CALL DELAY	CALL PHASE	EXTEND PHASE	OPERATION MODE
1	6' X 54'	V2	-	Ø1	Ø1	PRESENCE
2	6' X 54'	V2	-	Ø6	Ø6	PRESENCE
3	6' X 54'	V1	-	Ø2	Ø2	PRESENCE
4	6' X 54'	V1	-	Ø2	Ø2	PRESENCE
5	6' X 54'	V3	-	Ø8	Ø8	PRESENCE
6	6' X 54'	V3	-	Ø8	Ø8	PRESENCE
7	6' X 54'	V4	-	Ø4	Ø4	PRESENCE
8	6' X 54'	V4	-	Ø4	Ø4	PRESENCE

*NOTE: ALL DETECTORS SHALL BE CAPABLE OF BICYCLE DETECTION

SIGNAL HEAD DATA

B, C, E, F, G, H, L, M	A, K	D	J	P1-P8
				
12" LED	12" LED	12" LED	12" LED	16" LED

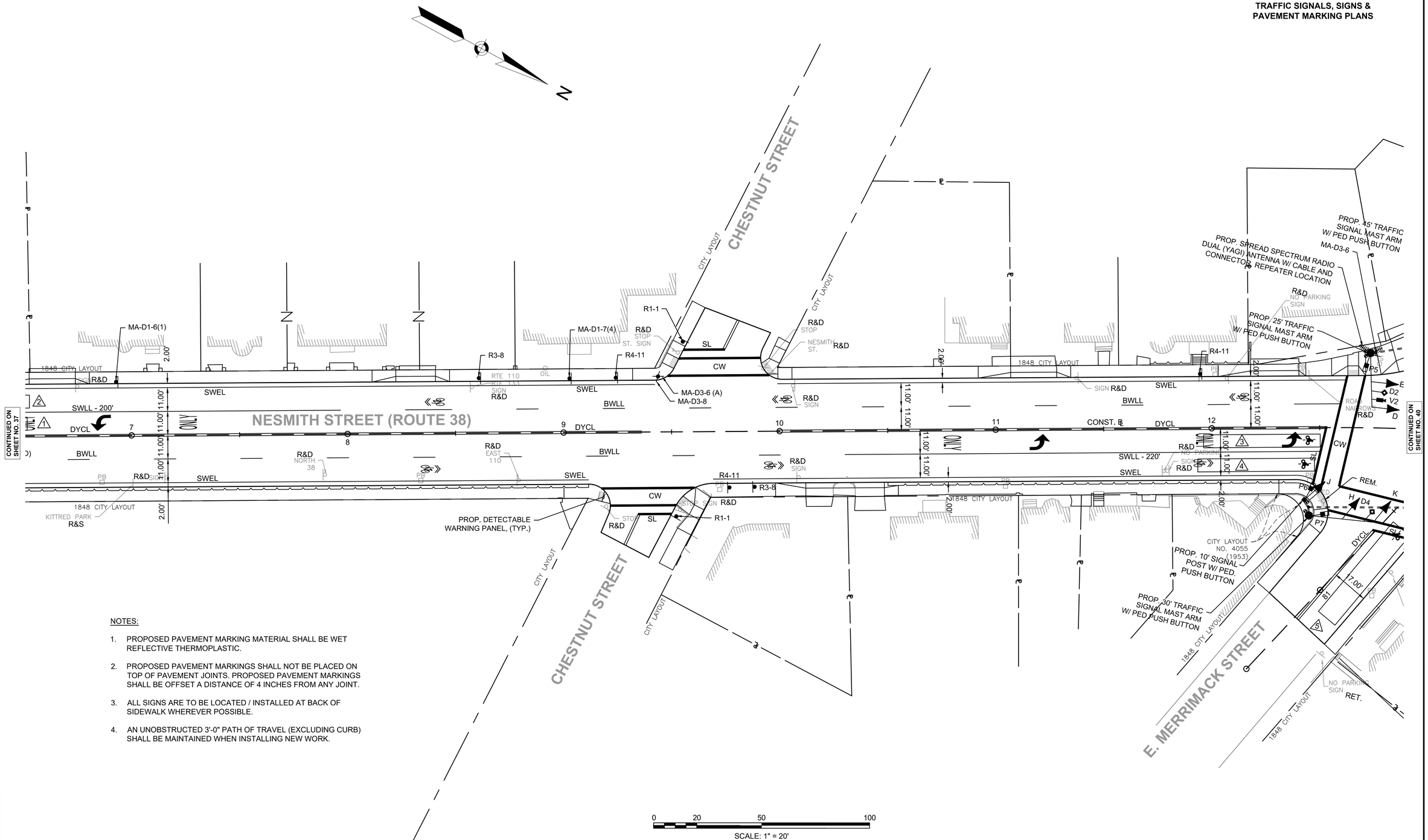
ALL OVERHEAD SIGNAL HEADS SHALL BE FIXED MOUNTED AND HAVE LOUVERED BACKPLATES WITH 2" RETROREFLECTIVE YELLOW BORDER.

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	39	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS



NOTES:

1. PROPOSED PAVEMENT MARKING MATERIAL SHALL BE WET REFLECTIVE THERMOPLASTIC.
2. PROPOSED PAVEMENT MARKINGS SHALL NOT BE PLACED ON TOP OF PAVEMENT JOINTS. PROPOSED PAVEMENT MARKINGS SHALL BE OFFSET A DISTANCE OF 4 INCHES FROM ANY JOINT.
3. ALL SIGNS ARE TO BE LOCATED / INSTALLED AT BACK OF SIDEWALK WHEREVER POSSIBLE.
4. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK.

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

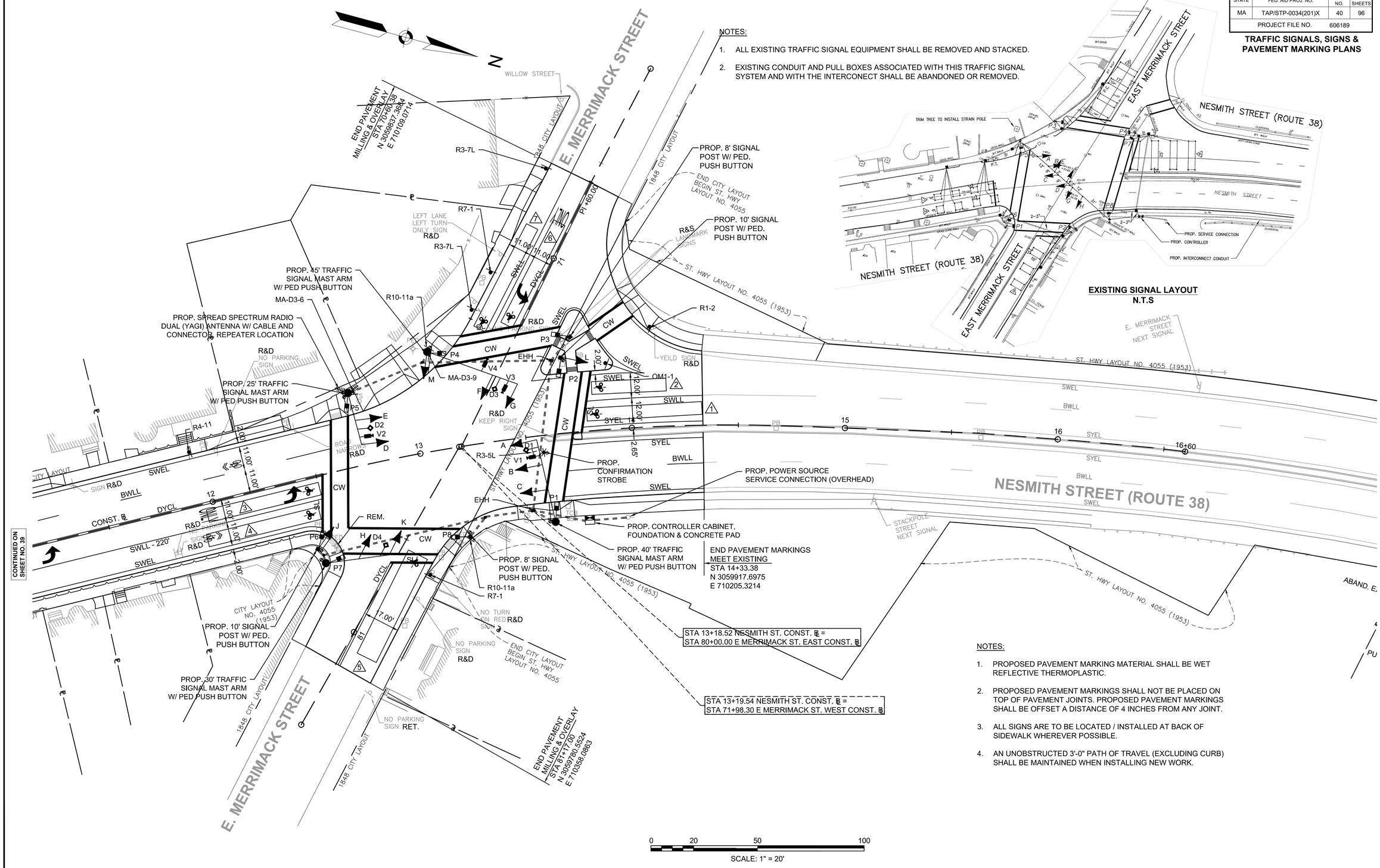
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	40	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS

NOTES:

1. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED.
2. EXISTING CONDUIT AND PULL BOXES ASSOCIATED WITH THIS TRAFFIC SIGNAL SYSTEM AND WITH THE INTERCONECT SHALL BE ABANDONED OR REMOVED.



EXISTING SIGNAL LAYOUT
N.T.S

NOTES:

1. PROPOSED PAVEMENT MARKING MATERIAL SHALL BE WET REFLECTIVE THERMOPLASTIC.
2. PROPOSED PAVEMENT MARKINGS SHALL NOT BE PLACED ON TOP OF PAVEMENT JOINTS. PROPOSED PAVEMENT MARKINGS SHALL BE OFFSET A DISTANCE OF 4 INCHES FROM ANY JOINT.
3. ALL SIGNS ARE TO BE LOCATED / INSTALLED AT BACK OF SIDEWALK WHEREVER POSSIBLE.
4. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK.

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

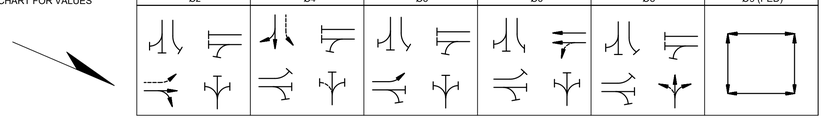
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	41	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNAL DATA

SEQUENCE AND TIMING																					
APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	FLASHING OPERATION
MINIMUM GREEN (INITIAL)			10			10			5			10			10						
PASSAGE TIME (VEHICLE)			4			4			2			4			4						
MAXIMUM 1 (FREE OPERATION)			49			29			10			49			29						EMERGENCY ONLY
MAXIMUM 2 (COORDINATED)			*			*			*			*			*						
YELLOW CLEARANCE				4			4			3			4			4					
RED CLEARANCE					2			2			0			2			2				
PEDESTRIAN WALK																		7			
PEDESTRIAN CLEARANCE																			15	3	
NESMITH STREET	NB	A	←FY–	←Y–	←R–	R	R	R	←G–	←Y–	←R–	R	R	R	R	R	R	R	R	R	←FR–
NESMITH STREET	NB	B, C	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
NESMITH STREET	SB	D, E, L	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
E. MERRIMACK STREET	WB	F, G, M	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
E. MERRIMACK STREET	EB	H, J,	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
E. MERRIMACK STREET	EB	K	R	R	R	←FY–	←Y–	←R–	R	R	R	R	R	R	R	R	R	R	R	R	←FR–
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR MEM.			NON - LOCK			NON - LOCK			NON - LOCK			NON - LOCK			NON - LOCK			-			
RECALL			MIN.			OFF			OFF			MIN.			OFF			OFF			
			Ø2			Ø4			Ø5			Ø6			Ø8			Ø9 (PED)			

* SEE TIMING PROGRAM CHART FOR VALUES



NOTE:

THIS INTERSECTION (NESMITH ST. / E. MERRIMACK ST.) OPERATES IN COORDINATED SYSTEM WITH TRAFFIC SIGNALS AT NESMITH / ANDOVER ST. AND NESMITH ST. / STACKPOLE ST.

EMERGENCY PREEMPTION SCHEDULE

DETECTOR & PRIORITY	VEHICLULAR PHASE ASSIGNMENT	MOVEMENTS
D1	Ø2 & Ø5	
D2	Ø6	
D3	Ø8	
D4	Ø4	

COORDINATION DATA (ALL ENTRIES IN SECONDS)			
CYCLE	TIME PERIOD (SEE MASTER PROG. DATA)	OFFSET	CYCLE LENGTH
1	TIMING PROGRAM 1	88	100
2	TIMING PROGRAM 2	28	100

TRAFFIC CONTROL SIGNAL, MAJOR ITEMS LIST		
PAY ITEM	QUANTITY	ITEM
816.04	1	8DW CONTROLLER NEMA TS2-TYPE 1, BASE MOUNTED CABINET & FDN. & CONC. PAD
	1	SPREAD SPECTRUM RADIO COMMUNICATION SYSTEM
	1	DUAL (YAGI) ANTENNA W/ CABLE & CONNECTOR
	1	SERVICE CONNECTION (OVERHEAD)
	1	40 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	45 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	30 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	1	25 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	2	10 FT SIGNAL POLE BASE & FDN.
	2	8 FT SIGNAL POLE, BASE & FDN.
	11	1 WAY, 3 SECTION SIGNAL HOUSING (12" L.E.D.)
	1	1 WAY, 4 SECTION SIGNAL HOUSING (12" L.E.D.)
	8	COUNTDOWN PEDESTRIAN SIGNAL HOUSING (16" L.E.D.)
	8	PEDESTRIAN PUSH BUTTON, SIGN & SADDLE (APS) W/ R10-3e (L, R) CROSSING SIGN
	1	VIDEO DETECTION SYSTEM (W/4 CAMERAS)
	4	OPTICAL RECEIVER - SINGLE CHANNEL
	2	PHASE SELECTOR MODULE - DUAL CHANNEL
	1	PHASE SELECTOR CARD RACK
	1	CONFIRMATION STROBE (CLEAR)
	12	5 IN. NON - LOUVERED BACK PLATES W/ 3 IN. RETROREFLECTIVE YELLOW BORDER
		MALFUNCTION MANAGEMENT UNIT (MMU) SHALL BE CAPABLE OF PROVIDING FLASHING YELLOW ARROW OPERATION
	1	R&S ALL EXISTING TRAFFIC SIGNAL EQUIPMENT
804.3		3 IN. ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)
811.22	2	ELECTRIC HAND HOLE 24"x13" - SD2.022
811.31	3	PULL BOX 12"X12" -SD2.031
		Plus all necessary duct, cable, labor, miscellaneous material and equipment to complete the installation

EMERGENCY VEHICLE PREEMPTION OPERATION:

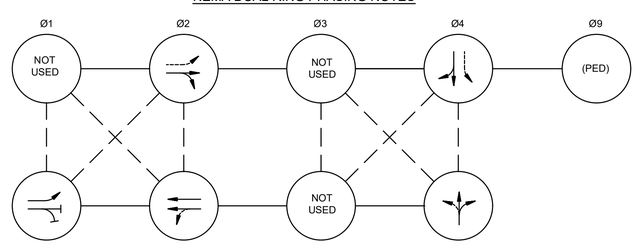
1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY AN OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED) OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. PREEMPTION MINIMUM GREENS SHALL BE TEN SECONDS.
5. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TERMINATED BY PREEMPTION DEMAND.
6. ACTUAL TIMING FOR PREEMPTION SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE FIRE DEPARTMENT AND SHALL BE APPROVED BY MHD PRIOR TO OPERATION.

	TIMMING PROGRAM	
	1	2
CYCLE LENGTH / PHASE SPLITS	100 SEC	100 SEC
Ø2	78(54)	68(45)
Ø4	22(21)	32(30)
Ø5	20(21)	9(10)
Ø6	58(33)	59(35)
Ø8	22(21)	32(30)
PED	- (25)	- (25)

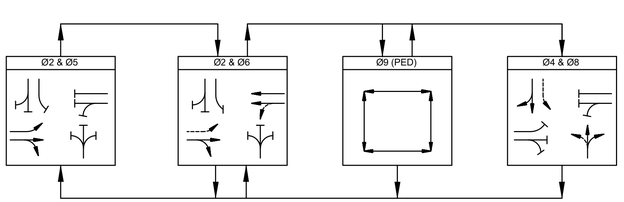
DETECTOR DATA						
DET. NO.	APPROX. ZONE SIZE	CAMERA	CALL DELAY	CALL PHASE	EXTEND PHASE	OPERATION MODE
1	6' X 54'	V2	-	Ø6	Ø6	PRESENCE
2	6' X 35'	V2	-	Ø6	Ø6	PRESENCE
3	6' X 35'	V1	-	Ø5	Ø5	PRESENCE
4	6' X 54'	V1	-	Ø2	Ø2	PRESENCE
5	10' X 54'	V3	-	Ø8	Ø8	PRESENCE
6	6' X 54'	V4	-	Ø4	Ø4	PRESENCE
7	6' X 54'	V4	-	Ø4	Ø4	PRESENCE

*NOTE: ALL DETECTORS SHALL BE CAPABLE OF BICYCLE DETECTION

NEMA DUAL RING PHASING NOTES



1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.
3. THROUGH MOVEMENTS MAY INCLUDE RIGHT TURNS.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S) UNLESS OTHERWISE NOTED.



PREFERENTIAL PHASE SEQUENCE DIAGRAM

SIGNAL HEAD DATA			
A	K	B, C, D, E, F, G, H, J, L, M	P1-P8
←R– ←Y– ←FY– ←G–	←R– ←Y– ←FY–	R Y G	15
12" LED	12" LED	12" LED	16" LED

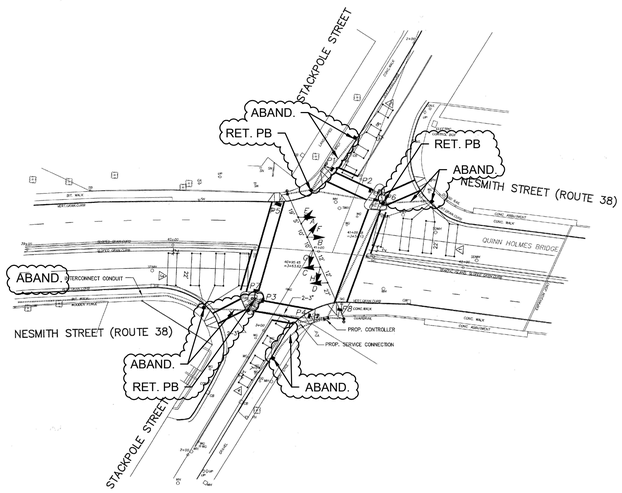
ALL OVERHEAD SIGNAL HEADS SHALL BE FIXED MOUNTED AND HAVE LOUVERED BACKPLATES WITH 2" RETROREFLECTIVE YELLOW BORDER.

606189HD8(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	42	96
PROJECT FILE NO.	606189		

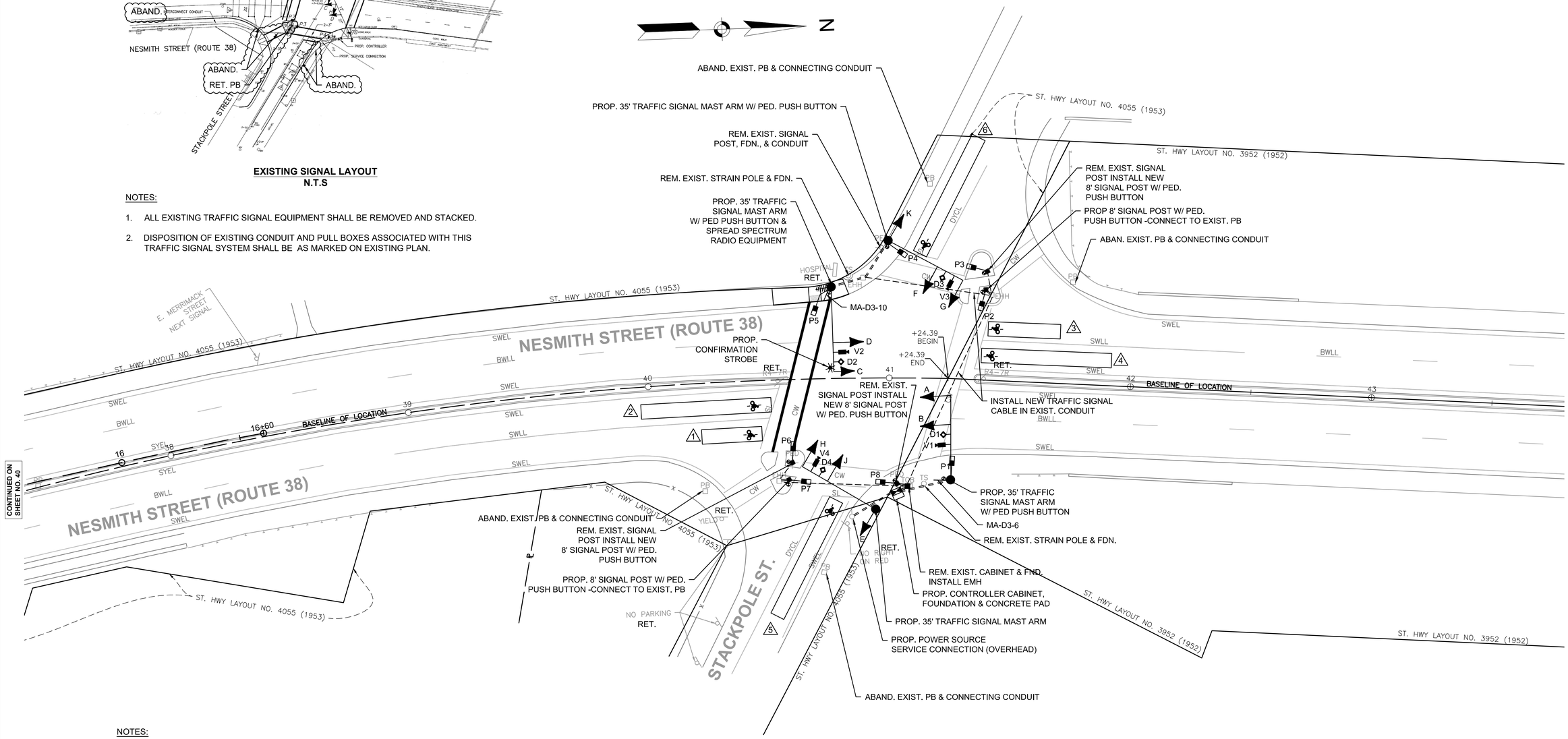
TRAFFIC SIGNALS, SIGNS & PAVEMENT MARKING PLANS



EXISTING SIGNAL LAYOUT
N.T.S

NOTES:

1. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED.
2. DISPOSITION OF EXISTING CONDUIT AND PULL BOXES ASSOCIATED WITH THIS TRAFFIC SIGNAL SYSTEM SHALL BE AS MARKED ON EXISTING PLAN.



NOTES:

1. ALL EXISTING PAVEMENT MARKINGS TO BE RETAINED UNLESS SHOWN OTHERWISE.
2. AN UNOBSTRUCTED 3'-0" PATH OF TRAVEL (EXCLUDING CURB) SHALL BE MAINTAINED WHEN INSTALLING NEW WORK
3. PULL ALL NEW CABLE THROUGH EXISTING CONDUIT AS SHOWN (- - - INDICATES NEW CABLE)

0 20 50 100
SCALE: 1" = 20'

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

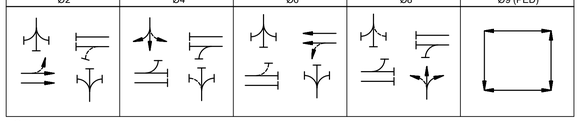
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	43	96
PROJECT FILE NO.	606189		

TRAFFIC SIGNAL DATA

SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	FLASHING OPERATION
MINIMUM GREEN (INITIAL)			10			10			10			10						
PASSAGE TIME (VEHICLE)			4			4			4			4						EMERGENCY ONLY
MAXIMUM 1 (FREE OPERATION)			37			21			37			21						
MAXIMUM 2 (COORDINATED)			*			*			*			*						
YELLOW CLEARANCE				4			4			4			4					
RED CLEARANCE					2			2			2			2				
PEDESTRIAN WALK															7			
PEDESTRIAN CLEARANCE																15	3	
NESMITH STREET	NB	A, B	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
NESMITH STREET	SB	C, D	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FY
STACKPOLE STREET	EB	H, J, K	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
STACKPOLE STREET	WB	E, F, G	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
DETECTOR MEM.			NON - LOCK			NON - LOCK			NON - LOCK			NON - LOCK			-			
RECALL			MIN.			OFF			MIN.			OFF			OFF			
			Ø2			Ø4			Ø6			Ø8			Ø9 (PED)			

* SEE COORDINATION DATA FOR VALUES



NOTE:

THIS INTERSECTION (NESMITH ST. / STACKPOLE ST.) OPERATES IN COORDINATED SYSTEM WITH TRAFFIC SIGNALS AT NESMITH ST. / ANDOVER ST. AND NESMITH / E. MERRIMACK ST.

COORDINATION DATA
(ALL ENTRIES IN SECONDS)

CYCLE	TIME PERIOD (SEE MASTER PROG. DATA)	OFFSET	CYCLE LENGTH
1	TIMING PROGRAM 1	79	100
2	TIMING PROGRAM 2	22	100

PHASE SPLITS \ CYCLE LENGTH	TIMMING PROGRAM 1 (100 SEC)	TIMMING PROGRAM 2 (100 SEC)
Ø2	77(54)	65(45)
Ø4	23(21)	35(30)
Ø6	77(54)	65(45)
Ø8	23(21)	35(30)
PED	- (25)	- (25)

TRAFFIC CONTROL SIGNAL, MAJOR ITEMS LIST

PAY ITEM	QUANTITY	ITEM
816.05	1	8DW CONTROLLER NEMA TS2-TYPE 1, BASE MOUNTED CABINET & FDN. & CONC. PAD
	1	SPREAD SPECTRUM RADIO COMMUNICATION SYSTEM
	1	SERVICE CONNECTION (OVERHEAD)
	4	35 FT TYPE II, GALV. STEEL MAST ARM ASSEMBLY & FDN.
	5	8 FT SIGNAL POLE, BASE & FDN.
	10	1 WAY, 3 SECTION SIGNAL HOUSING (12" L.E.D.)
	8	COUNTDOWN PEDESTRIAN SIGNAL HOUSING (16" L.E.D.)
	8	PEDESTRIAN PUSH BUTTON, SIGN & SADDLE (APS) W/ R10-3e (L, R) CROSSING SIGN
	1	VIDEO DETECTION SYSTEM (W/4 CAMERAS)
	4	OPTICAL RECEIVER - SINGLE CHANNEL
	2	PHASE SELECTOR MODULE - DUAL CHANNEL
	1	PHASE SELECTOR CARD RACK
	1	CONFIRMATION STROBE (CLEAR)
	10	5 IN. NON - LOUVERED BACK PLATES W/ 3 IN. RETROREFLECTIVE YELLOW BORDER
		MALFUNCTION MANAGEMENT UNIT (MMU) SHALL BE CAPABLE OF PROVIDING FLASHING YELLOW ARROW OPERATION
	1	R&S ALL EXISTING TRAFFIC SIGNAL EQUIPMENT
804.3		3 IN. ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)
811.10	1	ELECTRIC MANHOLE - SD2.010
		Plus all necessary duct, cable, labor, miscellaneous material and equipment to complete the installation

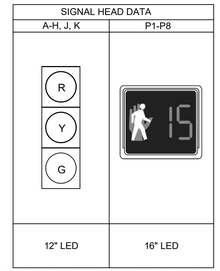
EMERGENCY PREEMPTION SCHEDULE

DETECTOR & PRIORITY	VEHICLULAR PHASE ASSIGNMENT	MOVEMENTS
D1	Ø2	
D2	Ø6	
D3	Ø8	
D4	Ø4	

EMERGENCY VEHICLE PREEMPTION OPERATION:

1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY AN OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED) OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. PREEMPTION MINIMUM GREENS SHALL BE TEN SECONDS.
5. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TERMINATED BY PREEMPTION DEMAND.
6. ACTUAL TIMING FOR PREEMPTION SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE FIRE DEPARTMENT AND SHALL BE APPROVED BY MHD PRIOR TO OPERATION.

SIGNAL HEAD DATA

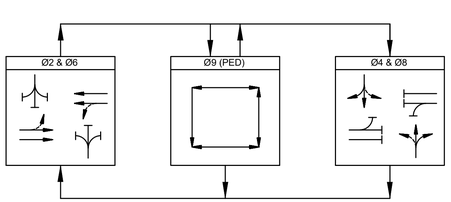


ALL OVERHEAD SIGNAL HEADS SHALL BE FIXED MOUNTED AND HAVE LOUVERED BACKPLATES WITH 2" RETROREFLECTIVE YELLOW BORDER.

DETECTOR DATA

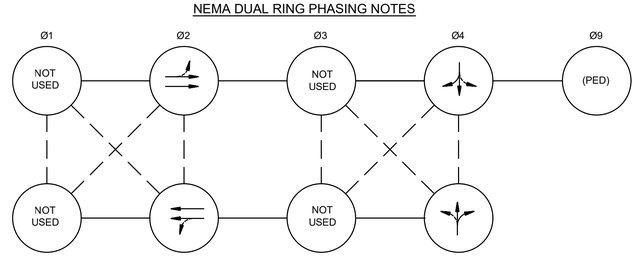
DET. NO.	APPROX. ZONE SIZE	CAMERA	CALL DELAY	CALL PHASE	EXTEND PHASE	OPERATION MODE
1	6' X 25'	V1	8 SEC	Ø2	Ø2	PRESENCE
2	6' X 54'	V1	-	Ø2	Ø2	PRESENCE
3	6' X 30'	V2	8 SEC	Ø6	Ø6	PRESENCE
4	6' X 54'	V2	-	Ø6	Ø6	PRESENCE
5	6' X 54'	V3	-	Ø8	Ø8	PRESENCE
6	6' X 54'	V4	-	Ø4	Ø4	PRESENCE

*NOTE: ALL DETECTORS SHALL BE CAPABLE OF BICYCLE DETECTION



PREFERENTIAL PHASE SEQUENCE DIAGRAM

NEMA DUAL RING PHASING NOTES



1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.
3. THROUGH MOVEMENTS MAY INCLUDE RIGHT TURNS.
4. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S) UNLESS OTHERWISE NOTED.

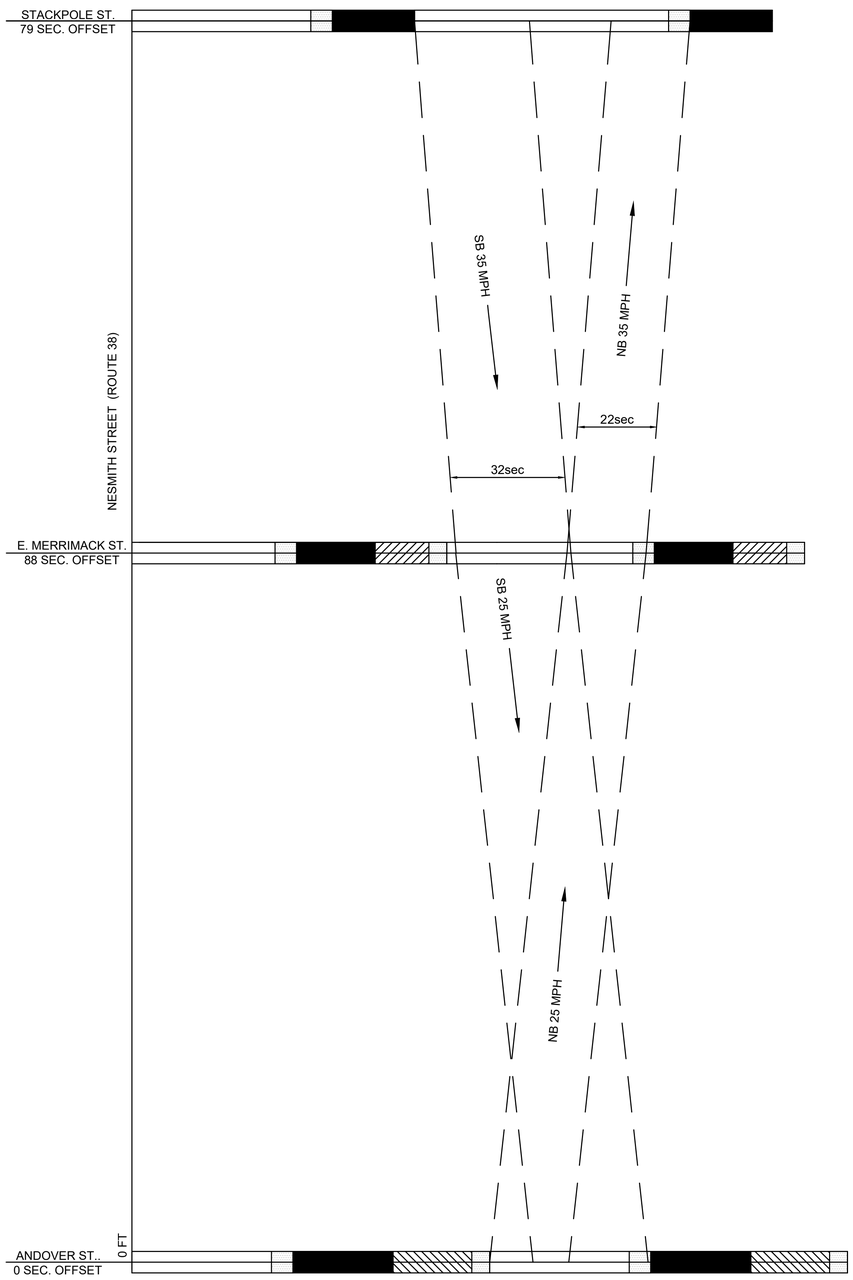
606189HD8(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	44	96
PROJECT FILE NO.	606189		

TIMING & PROGRESSION CHARTS

NESMITH STREET (ROUTE 38)
PROGRAM 1- WEEKDAY MORNING PEAK PERIOD (100 SECOND CYCLE)



NESMITH ST. (RTE. 38) @ STACKPOLE ST.

	TIMMING PROGRAM	
	1	2
CYCLE LENGTH / PHASE SPLITS	100 SEC	100 SEC
Ø2	77 (54)	65 (45)
Ø4	23 (21)	35 (30)
Ø6	77 (54)	65 (45)
Ø8	23 (21)	35 (30)
PED	- (25)	- (25)

(X) = PHASE TIMING WITH PEDESTRIAN PUSH BUTTON ACTUATION

LEGEND

- NORTHBOUND & SOUTHBOUND THRU RED
- NORTHBOUND & SOUTHBOUND THRU GREEN
- CLEARANCE
- NORTHBOUND & SOUTHBOUND LEFT GREEN
- NORTHBOUND LEFT THRU GREEN
- SOUTHBOUND LEFT THRU GREEN
- COORDINATION BAND
- LINK SPEED — PHASE VEHICULAR MOVEMENT

NESMITH ST. (RTE. 38) @ E. MERRIMACK ST.

	TIMMING PROGRAM	
	1	2
CYCLE LENGTH / PHASE SPLITS	100 SEC	100 SEC
Ø2	78 (54)	68 (45)
Ø4	22 (21)	32 (30)
Ø5	20 (21)	9 (10)
Ø6	58 (33)	59 (35)
Ø8	22 (21)	32 (30)
PED	- (25)	- (25)

(X) = PHASE TIMING WITH PEDESTRIAN PUSH BUTTON ACTUATION

NOTES:

1. Ø2 & Ø6 TO BE ON CALL NOT ACTUATED DURING COORDINATION.
2. OFFSET: BEGINNING OF Ø2 & Ø6 GREEN.
3. PLAN FORCE OFF SHALL BE IN EFFECT.
4. SPLIT TIMES EQUAL GREEN PLUS CLEARANCES.
5. INHIBIT MAX TERMINATION SHALL BE IN EFFECT DURING COORDINATION.
6. TIME IN (X) IS SPLIT TIME WITH PED. ACTUATION.

NESMITH ST. (RTE. 38) @ ANDOVER ST.

	TIMMING PROGRAM	
	1	2
CYCLE LENGTH / PHASE SPLITS	100 SEC	100 SEC
Ø1	27 (16)	23 (13)
Ø2	45 (32)	43 (32)
Ø4	28 (27)	34 (30)
Ø6	72 (48)	66 (45)
Ø8	28 (27)	34 (30)
PED	- (25)	- (25)

(X) = PHASE TIMING WITH PEDESTRIAN PUSH BUTTON ACTUATION

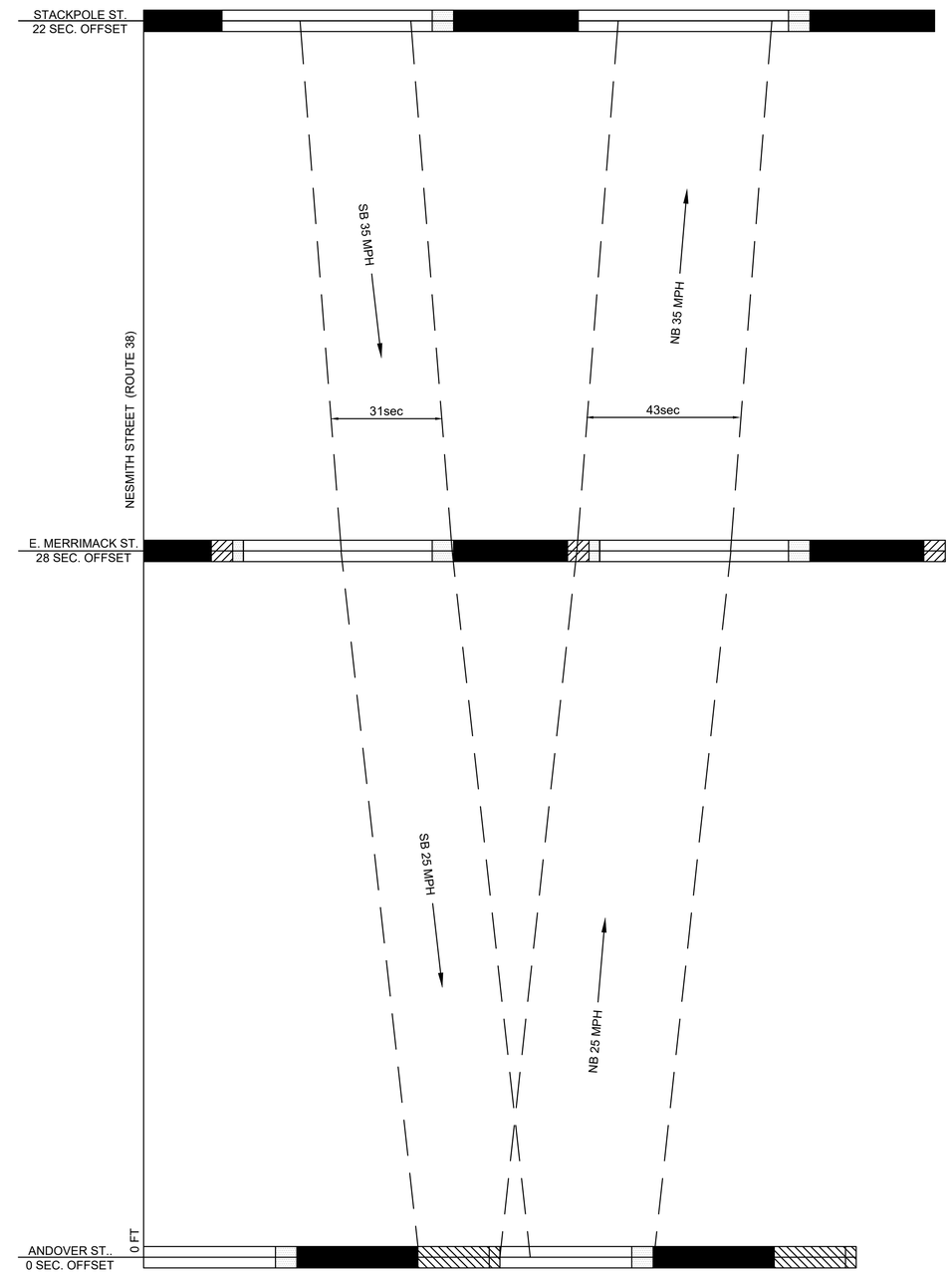
HORIZONTAL SCALE: 1"=20'

0 20 50 100

0 100 250 500

VERTICAL SCALE: 1"=80 SECS

NESMITH STREET (ROUTE 38)
PROGRAM 2- WEEKDAY EVENING PEAK PERIOD (100 SECOND CYCLE)

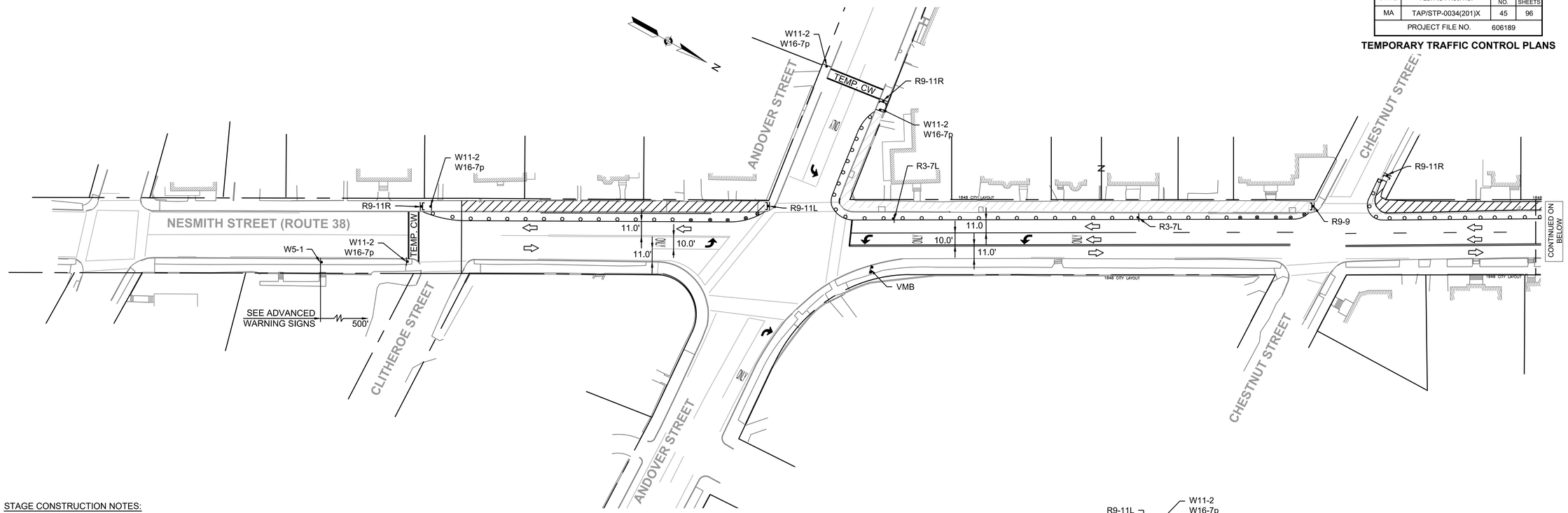


606189HD15(TIMING PROGRESSION).DWG Plotted on 5-Oct-18 10:52 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	45	96
PROJECT FILE NO.	606189		

TEMPORARY TRAFFIC CONTROL PLANS



STAGE 1 CONSTRUCTION
N.T.S.

STAGE CONSTRUCTION NOTES:

1. THESE TEMPORARY TRAFFIC MANAGEMENT STAGE 1 AND STAGE 2 CONSTRUCTION SET-UPS ARE INTENDED TO SHOW THE FUNDAMENTAL REQUIREMENTS TO CONTROL TRAFFIC FLOW FOR THE PROPOSED ROADWAY CONSTRUCTION. OTHER SET-UPS OF SHORTER DURATION MAY BE REQUIRED WITHIN EACH STAGE IN ORDER TO CONSTRUCT CERTAIN PORTIONS OF THE PROJECT.

2. THE TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE IS NOT INTENDED TO DIRECT THE CONTRACTOR IN METHOD OF OPERATION. THE CONTRACTOR MAY ELECT TO PROPOSE AND USE OTHER TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE WITH PRIOR APPROVAL OF THE ENGINEER.

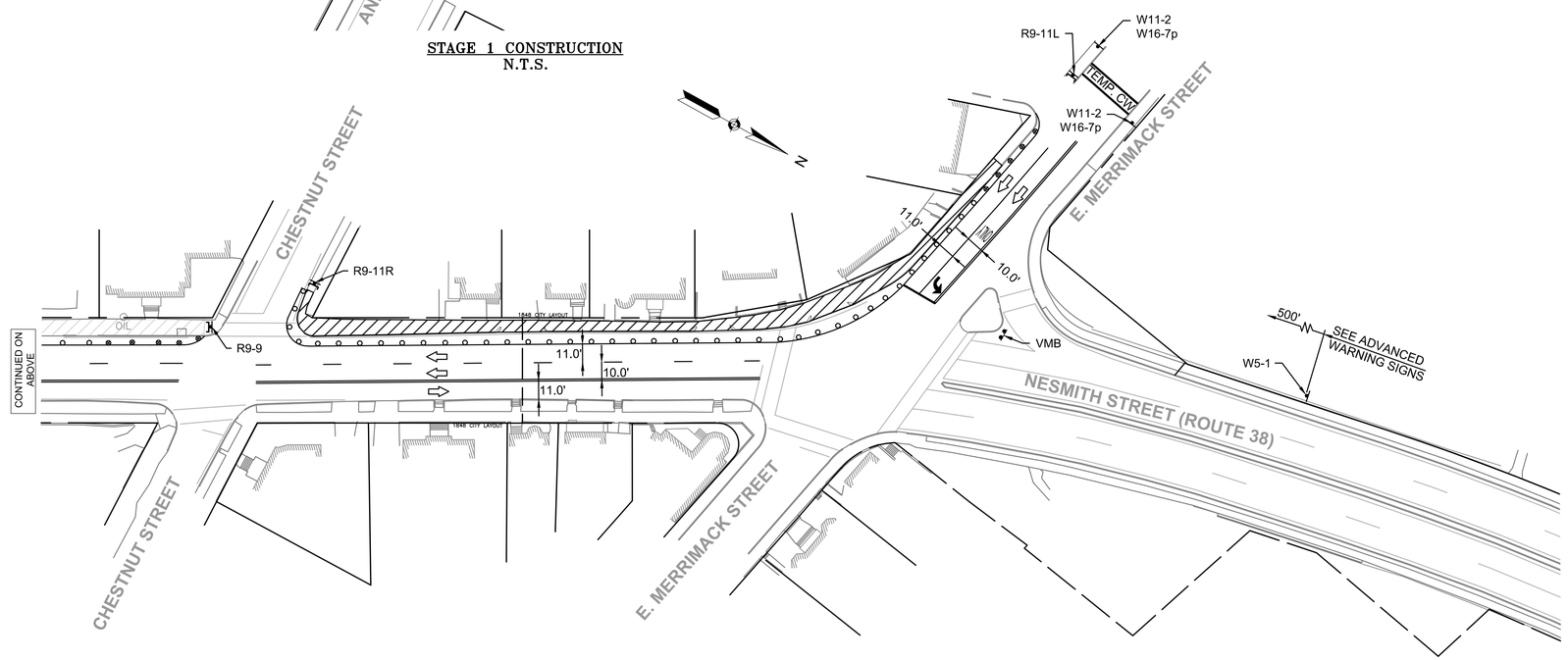
3. THE WORK OCCURRING DURING THE STAGE 1 CONSTRUCTION SHALL TAKE PLACE ON THE WESTERLY SIDE OF ROUTE 38 AND INCLUDE:

   A. CONSTRUCT CURB, SIDEWALK, DRAINAGE, PAVEMENT ETC. TO RENDER NEW EDGE OF ROAD USEABLE FOR STAGE 2 CONSTRUCTION.

   B. CONSTRUCTION ALONG SIDE STREETS (ANDOVER ST., CHESTNUT ST., AND E. MERRIMACK ST.) SHALL BE COMPLETED AS ALTERNATING SUB-PHASES SUCH THAT PEDESTRIAN ACCESS ON ONE SIDE OF THE STREET IS SAFELY MAINTAINED AT ALL TIMES.

LEGEND

- WORK AREA
- REFLECTIVE DRUM W/ LIGHT
- REFLECTIVE DRUM W/ FLASHER
- DIRECTION OF TRAVEL
- TEMPORARY SIGN
- PORTABLE BREAKAWAY BARRICADE TYPE III
- VARIABLE MESSAGE BOARD (VMB)



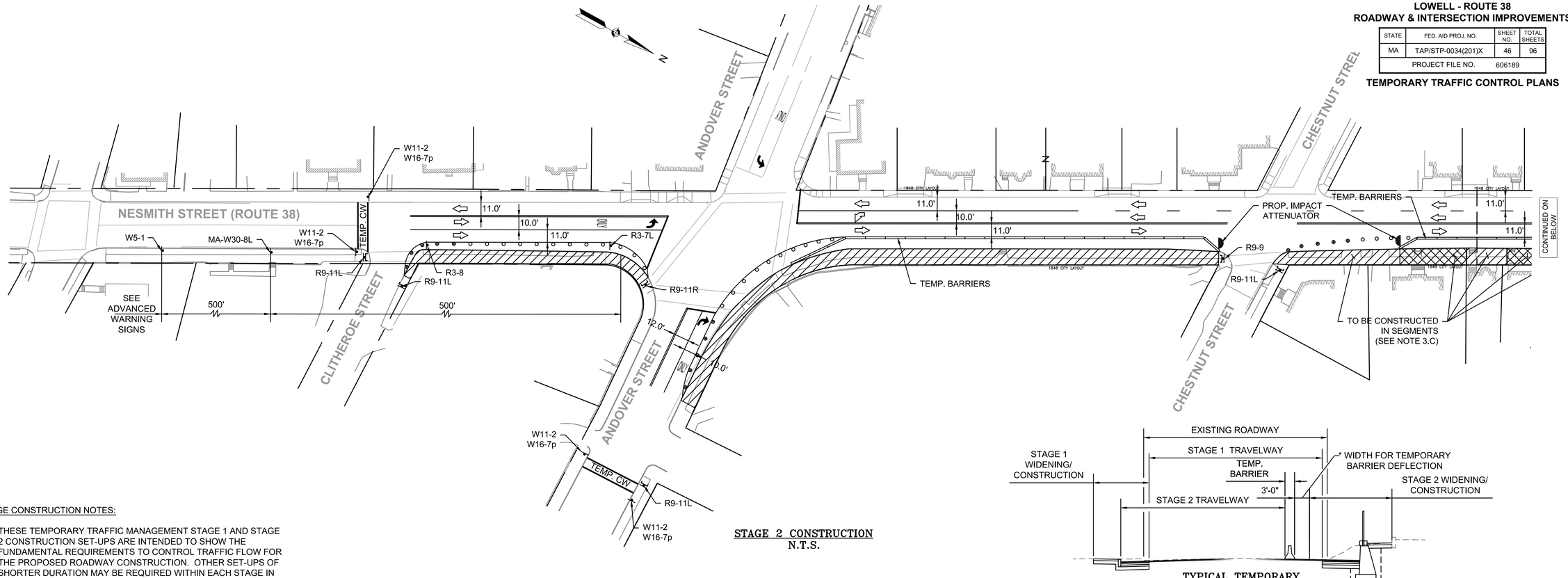
STAGE 1 CONSTRUCTION
N.T.S.

606189HD12(TTCP).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	46	96
PROJECT FILE NO.	606189		

TEMPORARY TRAFFIC CONTROL PLANS



STAGE 2 CONSTRUCTION
N.T.S.

TYPICAL TEMPORARY BARRIER SECTION
N.T.S.

* NOTE: THE CONTRACTOR SHALL NOT USE THE WIDTH FOR TEMPORARY BARRIER DEFLECTION FOR STORAGE NOR FOR ANY LONG TERM WORK

STAGE CONSTRUCTION NOTES:

1. THESE TEMPORARY TRAFFIC MANAGEMENT STAGE 1 AND STAGE 2 CONSTRUCTION SET-UPS ARE INTENDED TO SHOW THE FUNDAMENTAL REQUIREMENTS TO CONTROL TRAFFIC FLOW FOR THE PROPOSED ROADWAY CONSTRUCTION. OTHER SET-UPS OF SHORTER DURATION MAY BE REQUIRED WITHIN EACH STAGE IN ORDER TO CONSTRUCT CERTAIN PORTIONS OF THE PROJECT.

2. THE TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE IS NOT INTENDED TO DIRECT THE CONTRACTOR IN METHOD OF OPERATION. THE CONTRACTOR MAY ELECT TO PROPOSE AND USE OTHER TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE WITH PRIOR APPROVAL OF THE ENGINEER.

3. THE WORK OCCURRING DURING THE STAGE 2 CONSTRUCTION SHALL TAKE PLACE ON THE EASTERLY SIDE OF ROUTE 38 AND INCLUDE:

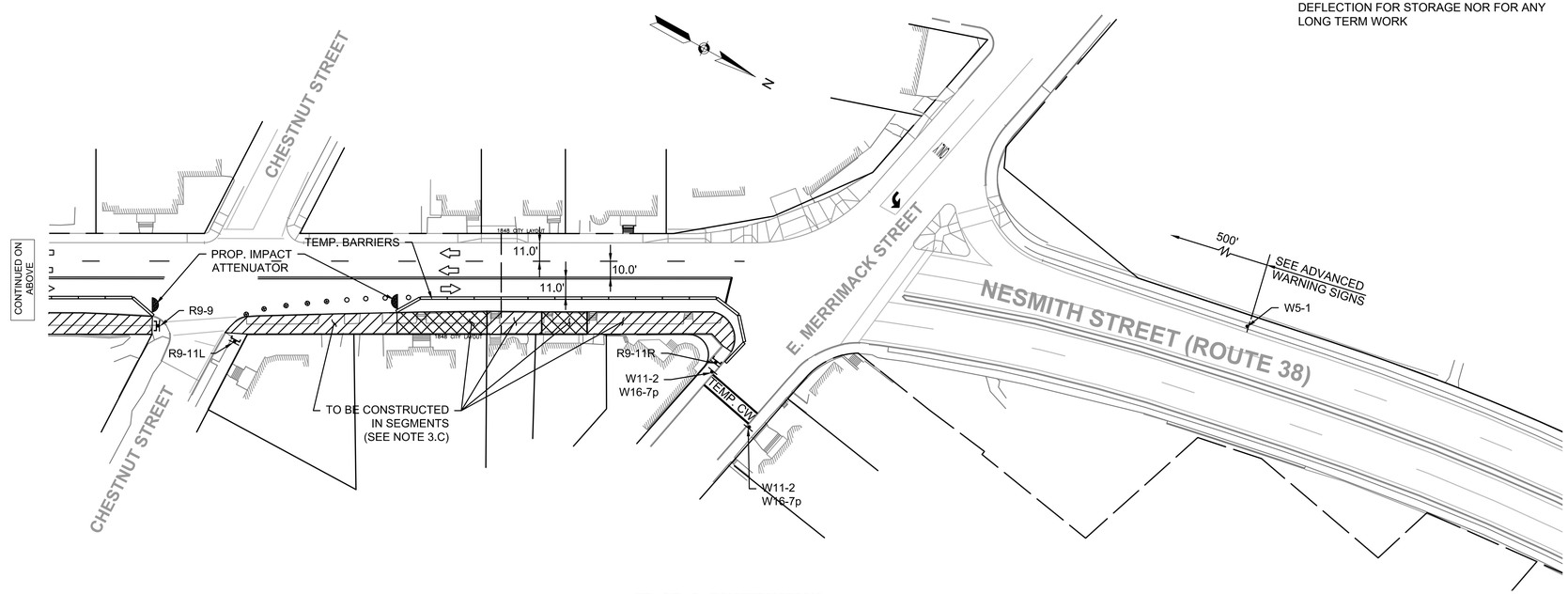
   A. CONSTRUCT RETAINING WALL, CURB, SIDEWALK, DRAINAGE, PAVEMENT ETC.

   B. CONSTRUCTION ALONG SIDE STREETS (ANDOVER ST., CHESTNUT ST., AND E. MERRIMACK ST.) SHALL BE COMPLETED AS ALTERNATING SUB-PHASES SUCH THAT PEDESTRIAN ACCESS ON ONE SIDE OF THE STREET IS SAFELY MAINTAINED AT ALL TIMES.

   C. THE RETAINING WALL AND SIDEWALK BETWEEN CHESTNUT ST. AND E. MERRIMACK ST. IS SHOWN TO BE CONSTRUCTED AS SEPARATE SEGMENTS. THE APPROXIMATE LIMIT OF EACH SEGMENT IS SHOWN. THE WALL AND SIDEWALK OF EACH SEGMENT IS TO BE COMPLETED BEFORE STARTING WORK ON THE NEXT SEGMENT IN ORDER TO MAINTAIN ACCESS FOR ALL ABUTTERS DURING CONSTRUCTION.

LEGEND

- WORK AREA
- REFLECTIVE DRUM W/ LIGHT
- REFLECTIVE DRUM W/ FLASHER
- DIRECTION OF TRAVEL
- TEMPORARY SIGN
- PORTABLE BREAKAWAY BARRICADE TYPE III
- CEMENT CONCRETE BARRIER



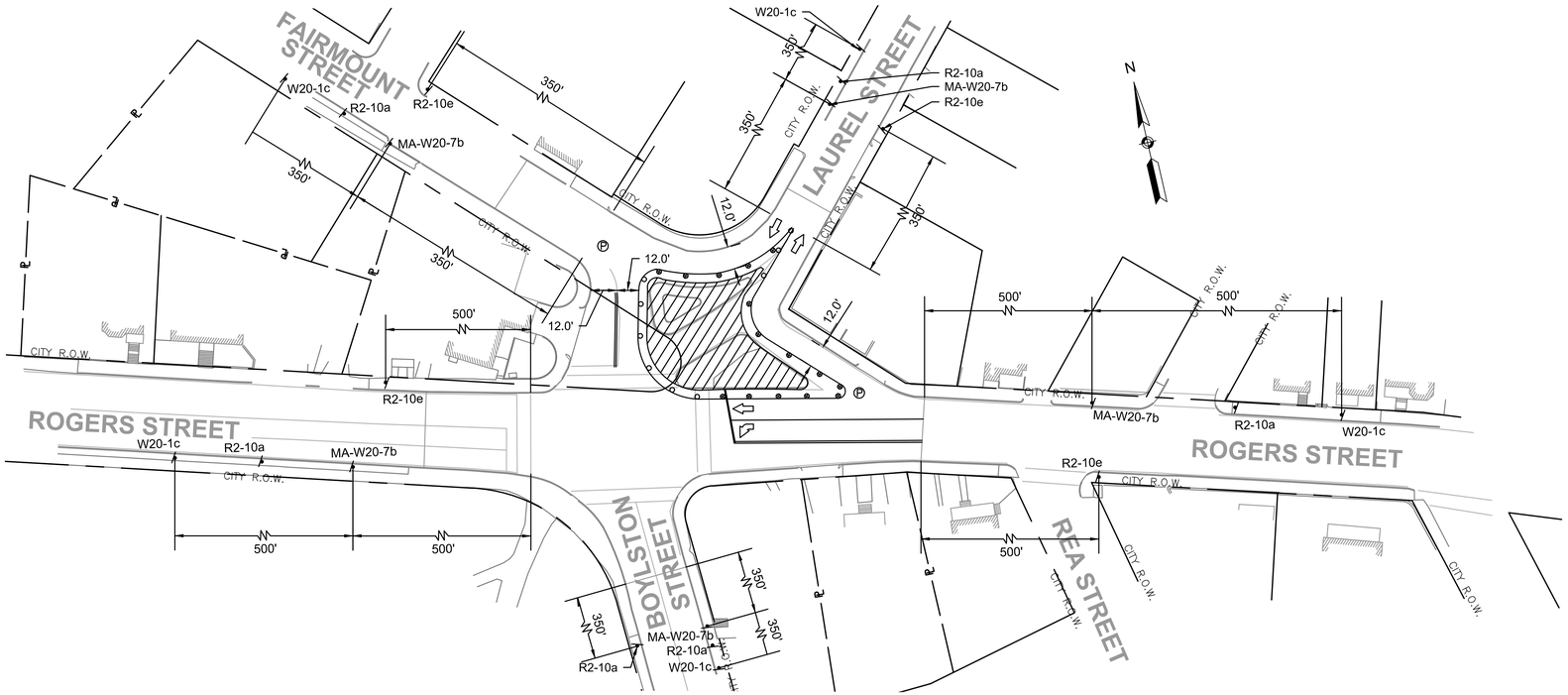
STAGE 2 CONSTRUCTION
N.T.S.

606189HD12(TTCP).DWG Plotted on 17-Sep-2019 9:07 AM

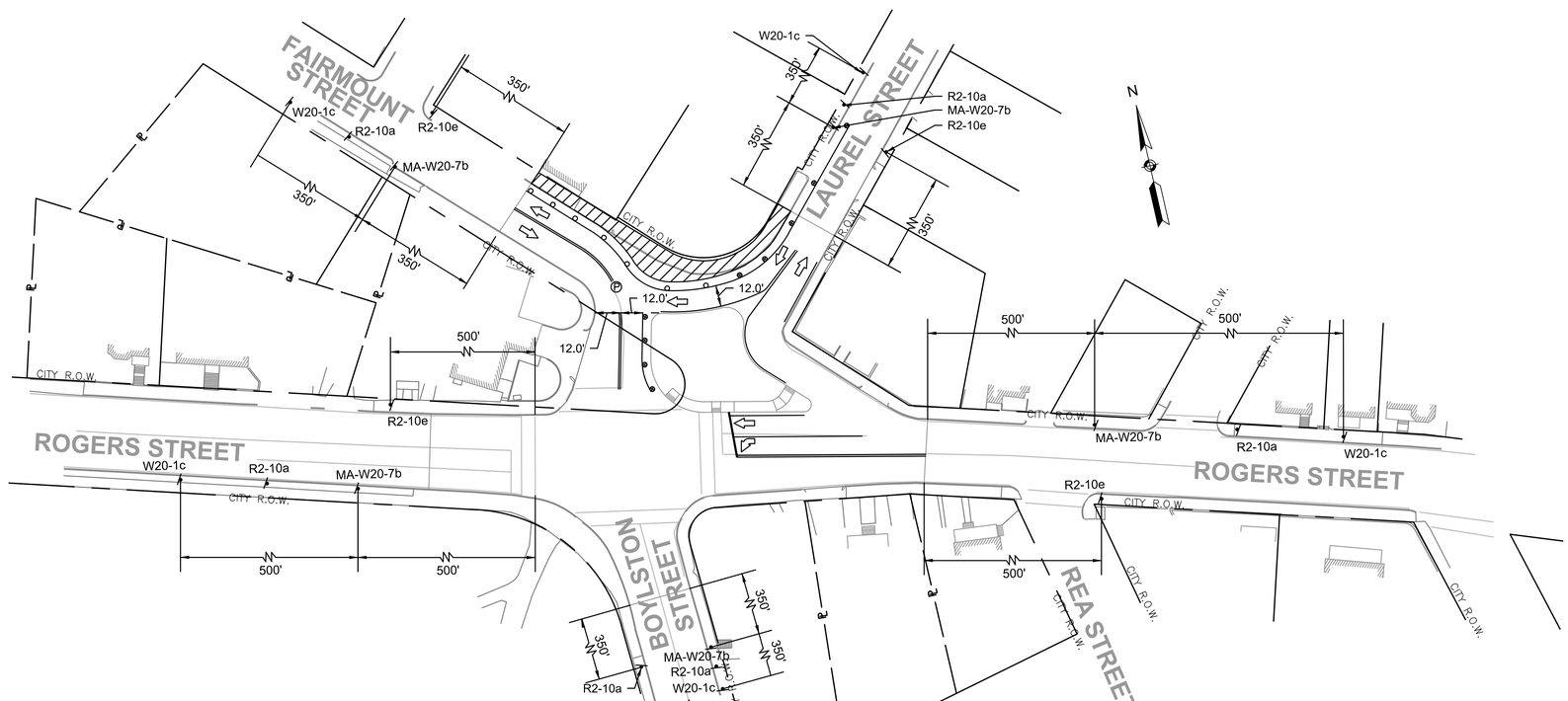
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	47	96
PROJECT FILE NO.	606189		

TEMPORARY TRAFFIC CONTROL PLANS



STAGE 1 CONSTRUCTION
N.T.S.



STAGE 2 CONSTRUCTION
N.T.S.

STAGE CONSTRUCTION NOTES:

1. THESE TEMPORARY TRAFFIC MANAGEMENT STAGE 1 AND STAGE 2 CONSTRUCTION SET-UPS ARE INTENDED TO SHOW THE FUNDAMENTAL REQUIREMENTS TO CONTROL TRAFFIC FLOW FOR THE PROPOSED ROADWAY CONSTRUCTION. OTHER SET-UPS OF SHORTER DURATION MAY BE REQUIRED WITHIN EACH STAGE IN ORDER TO CONSTRUCT CERTAIN PORTIONS OF THE PROJECT.
2. THE TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE IS NOT INTENDED TO DIRECT THE CONTRACTOR IN METHOD OF OPERATION. THE CONTRACTOR MAY ELECT TO PROPOSE AND USE OTHER TEMPORARY TRAFFIC MANAGEMENT STAGE CONSTRUCTION SEQUENCE WITH PRIOR APPROVAL OF THE ENGINEER.
3. THE WORK OCCURRING DURING STAGE 1 CONSTRUCTION SHALL INCLUDE, REALIGNMENT OF THE TWO ISLANDS INTO ONE, INSTALLING NEW CURBING CONSTRUCTION OF WALKWAY AND WHEELCHAIR RAMPS, AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE WORK SHOWN ON THE PLAN.
4. THE WORK OCCURRING DURING STAGE 2 CONSTRUCTION SHALL INCLUDE, REALIGNMENT OF THE NORTHERLY CORNER BETWEEN LAUREL STREET AND FAIRMOUNT STREET INCLUDING NEW SIDEWALK AND WHEELCHAIR RAMPS.

LEGEND

- WORK AREA
- REFLECTIVE DRUM W/ LIGHT
- REFLECTIVE DRUM W/ FLASHER
- DIRECTION OF TRAVEL
- TEMPORARY SIGN
- PORTABLE BREAKAWAY BARRICADE TYPE III
- CEMENT CONCRETE BARRIER

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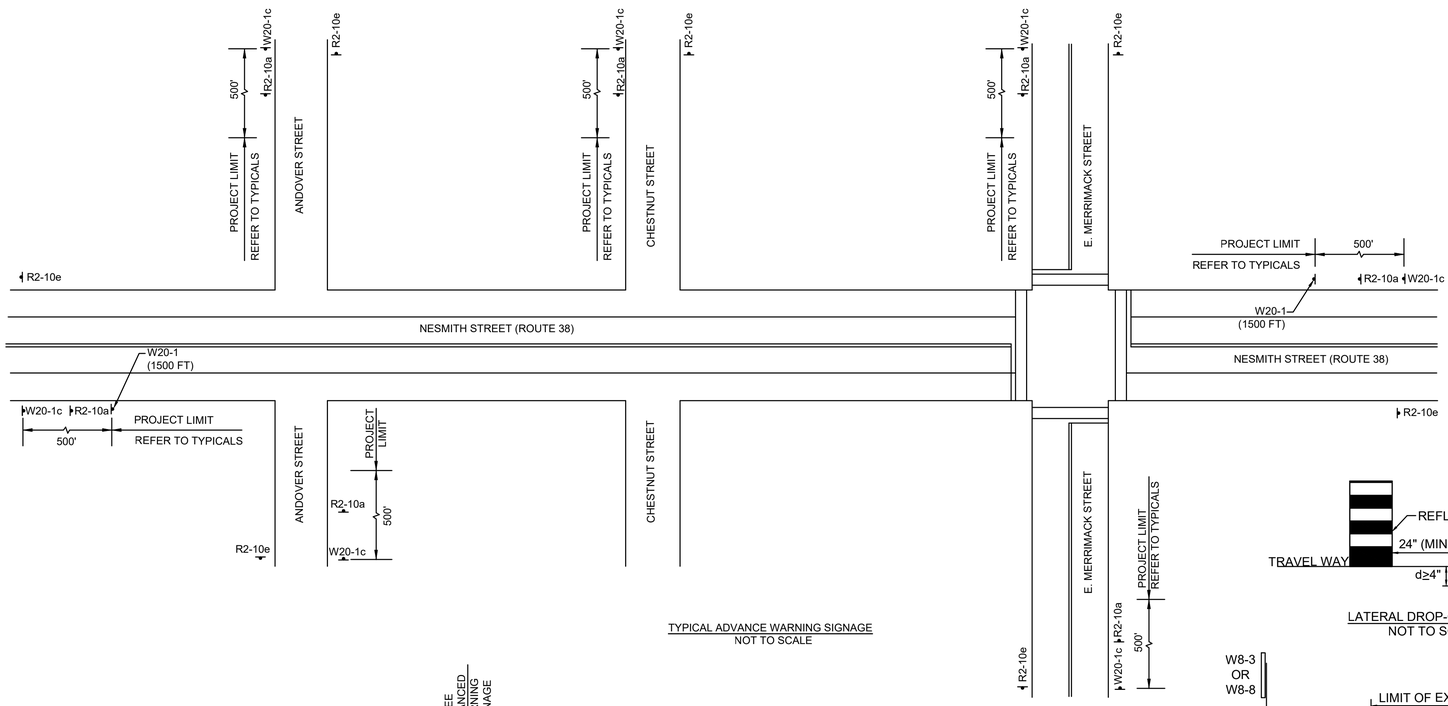
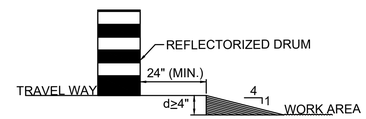
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	48	96
PROJECT FILE NO.	606189		

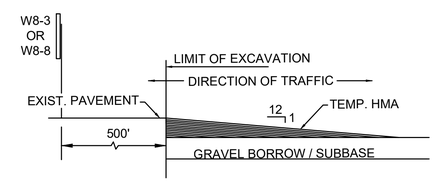
TEMPORARY TRAFFIC CONTROL PLANS



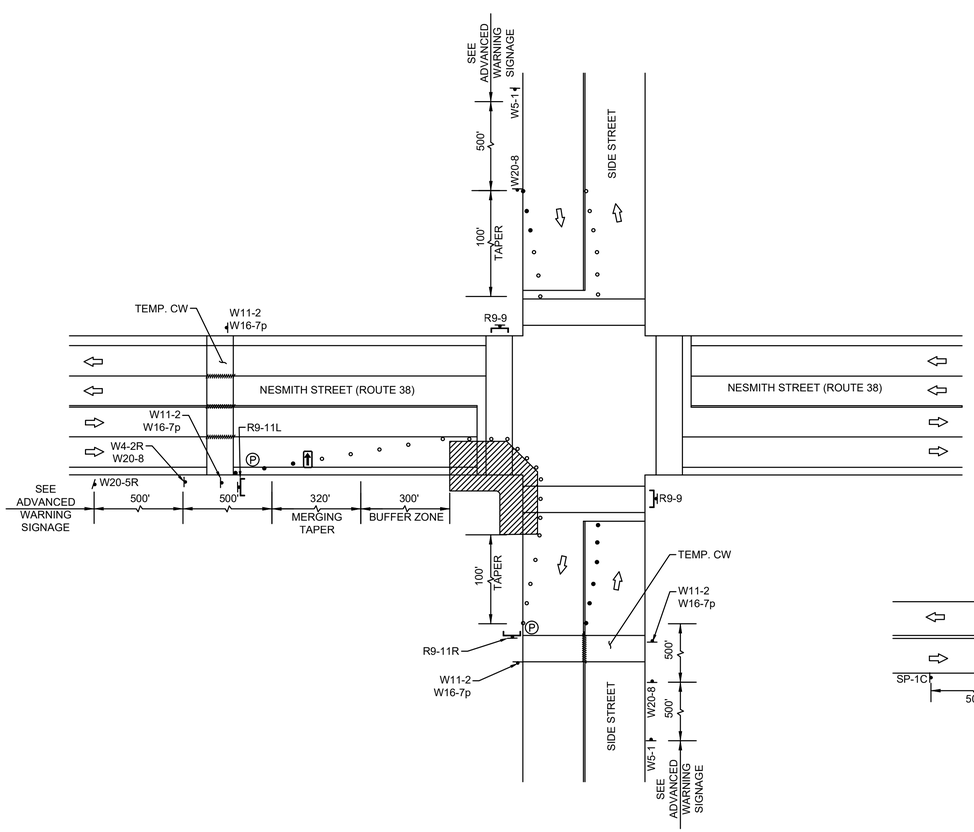
TYPICAL ADVANCE WARNING SIGNAGE
NOT TO SCALE



LATERAL DROP-OFF DETAIL
NOT TO SCALE



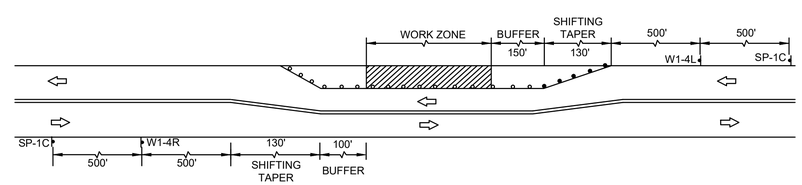
LONGITUDINAL DROP-OFF DETAIL
NOT TO SCALE



TYPICAL QUADRANT CLOSURE WITH PEDESTRIAN CROSSINGS
NOT TO SCALE

LEGEND

- WORK AREA
- REFLECTIVE DRUM W/ LIGHT
- REFLECTIVE DRUM W/ FLASHER
- DIRECTION OF TRAVEL
- TEMPORARY SIGN
- TRAFFIC OFFICER
- PORTABLE BREAKAWAY BARRICADE TYPE III
- ARROW BOARD



TYPICAL LANE SHIFT
NOT TO SCALE

TRAFFIC MANAGEMENT NOTES:

1. INSTALL AND/OR RELOCATE TEMPORARY SIGNS, DRUMS, CONES AND OTHER TRAFFIC MAINTENANCE DEVICES AS REQUIRED.
2. ALL CONSTRUCTION SIGNING AND OTHER TRAFFIC MAINTENANCE DEVICES SHALL CONFORM WITH THE 2009 MUTCD AS AMENDED.
3. REMOVE OR COVER ALL TEMPORARY SIGNS, DRUMS, CONES AND OTHER TRAFFIC MAINTENANCE DEVICES THAT ARE NOT REQUIRED ON THE COMPLETION OF THE WORK, EACH DAY. THIS PARTICULARLY APPLIES TO THE MA-W20-7b SIGNS, WHICH SHALL BE COMPLETELY COVERED OR REMOVED AT THE END OF EACH DAY.
4. CONTRACTOR SHALL USE TEMPORARY PATCHING OR BEVELED STEEL PLATES TO COVER TRENCHES NOT COMPLETED IN A DAYS WORK.
5. ALL DISTANCES MAY BE ADJUSTED TO FIT FIELD CONDITIONS, AS DIRECTED BY THE ENGINEER.
6. ACCESS TO ABUTTERS SHALL REMAIN OPEN AT ALL TIMES. IF A SHORT TERM TEMPORARY CLOSURE OF ACCESS TO ABUTTERS BECOME NECESSARY, THE CONTRACTOR SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE.
7. NO SIGNS SHALL BE ATTACHED TO DRUMS OR CONES. ALL TEMPORARY TRAFFIC CONTROL EQUIPMENT SHALL BE ATTACHED TO THEIR OWN INDEPENDENT SUPPORTS AND MEET NCHRP 350 STANDARDS AND/OR MASH.
8. ALL TEMPORARY BARRIER SYSTEMS DEPLOYED ON THIS PROJECT SHALL MEET MASH REQUIREMENTS AND ARE INSTALLED AND MAINTAINED IN ACCORDANCE WITH ALL RELEVANT MASSDOT AND MANUFACTURERS REQUIREMENTS.
9. NO SIGNS SHALL BE VISIBLE TO TRAFFIC THAT MAY CONFLICT WITH ACTUAL CONDITIONS.
10. PAVEMENT MARKINGS NO LONGER APPLICABLE WHICH MIGHT CREATE CONFUSION SHALL BE OBLITERATED. TEMPORARY PAVEMENT MARKINGS SHALL BE USED AS NECESSARY AND SHALL BE IN PLACE BEFORE WORK IS COMPLETED EACH NIGHT.
11. THE MAXIMUM SPACING BETWEEN REFLECTIVE DRUMS IN A TAPER (IN FEET) SHOULD BE APPROXIMATELY EQUAL TO THE SPEED LIMIT (IN MPH). THE FIRST FIVE REFLECTIVE DRUMS SHALL BE MOUNTED WITH "TYPE A" FLASHER LIGHTS.
12. PEDESTRIANS SHALL BE PROVIDED WITH A SAFE CONVENIENT TRAVEL PATH THROUGH THE CONSTRUCTION ZONE FOR THE DURATION OF CONSTRUCTION BY USE OF APPROPRIATE TRAFFIC SIGNS, MAINTENANCE DEVICES AND/OR A POLICE OFFICER (DURING WORK HOURS). IF THE AREAS OF SIDEWALK NEED TO BE CLOSED OVERNIGHT, THE CONTRACTOR, AS DIRECTED BY THE ENGINEER, SHALL MAKE ALL REASONABLE PROVISIONS TO KEEP A SAFE PATHWAY OPEN FOR PEDESTRIANS.
13. LOCATION OF W11-2, W16-7P, AND R9-11 SIGNS TO BE APPROVED BY THE ENGINEER WHO WILL DETERMINE THE NECESSITY FOR PROVIDING TEMPORARY CROSSWALKS WITH TEMPORARY CURB RAMP.
14. ADA COMPLIANT PEDESTRIAN ACCESS SHALL BE MAINTAINED AT ALL TIMES. TEMPORARY PEDESTRIAN CURB RAMPS AT TEMPORARY CROSSWALKS SHALL BE CONSTRUCTED AND INSTALLED PER MOST RECENT MASSDOTS STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TEMPORARY TRAFFIC CONTROL PLANS.
15. DURING EACH PHASE, EDGES OF WORK MUST BE DELINEATED WITH REFLECTORIZED DRUMS OR CONES.
16. THE MINIMUM ALLOWABLE LANE WIDTH SHALL BE 11'-0" (10'-0" FOR TURN LANES), USE WIDER LANES WHENEVER POSSIBLE.
17. IF NECESSARY, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN AND/OR ADJUST TRAFFIC SIGNAL OPERATIONS WHILE CONSTRUCTION IS IN PROGRESS. THE CONTRACTOR SHALL OBTAIN THE WRITTEN APPROVAL OF THE ENGINEER PRIOR TO MAKING ADJUSTMENTS TO TRAFFIC SIGNAL OPERATIONS.
18. THE TEMPORARY TRAFFIC MANAGEMENT SET-UPS PROVIDED ARE INTENDED TO SHOW THE FUNDAMENTAL REQUIREMENTS TO CONTROL TRAFFIC FLOW DURING THE PROPOSED CONSTRUCTION. OTHER STANDARDIZED TRAFFIC MANAGEMENT TYPICAL SET-UPS MAY BE USED BY THE CONTRACTOR TO CONSTRUCT CERTAIN ELEMENTS OF THE PROJECT, IF APPROVED BY THE ENGINEER.
19. THE TEMPORARY TRAFFIC MANAGEMENT PLANS/TYPICALS ARE NOT INTENDED TO DIRECT THE CONTRACTOR IN METHOD OF OPERATION. THE CONTRACTOR MAY ELECT TO PROPOSE AND USE OTHER TEMPORARY TRAFFIC MANAGEMENT SET-UPS WITH PRIOR APPROVAL OF THE ENGINEER.

606189HD12(TTCP).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	49	96
PROJECT FILE NO.	606189		

TRAFFIC SIGN SUMMARY

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R1-1	30	30	STOP	1	1	1	3	1	1	1	P5 (3)	6.25	18.75
R1-2	36 X 36 X 36		YIELD				1				P5 (1)	9.0	9.0
R1-5	18	18	YIELD HERE TO				2				P5 (2)	2.25	4.5
R3-2	24	24					1				P5 (1)	4.0	4.0
R3-5L	30	36	ONLY				1				MOUNT ON MAST ARM	7.5	7.5
R3-7L	30	30	LEFT LANE MUST TURN LEFT				7				P5 (7)	6.25	43.75
R3-7R	30	30	RIGHT LANE MUST TURN RIGHT				4				P5 (4)	6.25	25.0
R3-8	30	30	ONLY				4				P5 (4)	6.25	25.0
R4-7	24	30					1				P5 (1)	5.0	5.0
R4-11	30	30	MAY USE FULL LANE				6				P5 (6)	6.25	37.5
R5-1	30	30	DO NOT ENTER				1				P5 (1)	6.25	6.25

(1) SEE LATEST EDITION TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR SPECIFICATIONS ON TEXT DIMENSIONS AND COLOR (ALSO SEE SECTION M9.30.0 TYPE III MHD 1988 STANDARD SPECIFICATION).

TRAFFIC SIGN SUMMARY

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
R6-1 (*PBS)	36	12	ONE WAY	1	1	1	1	1	1	1	MOUNT W/ R1-1	3.0	3.0
R7-1	12	18	NO PARKING ANY TIME				2				P5 (2)	1.5	1.5
R10-11a	24	30	NO TURN ON RED				4				MOUNT ON T.S. (2) MOUNT ON M.A. (2)	5.0	20.0
MA-R10-12a	30	36	LEFT TURN YEILD ON FLASHING	2	2	2	2	2	2	2	MOUNT ON T.S. (2)	7.5	15.0
MA-W16-19P	24	18	ON ROADWAY				4				MOUNT W/ W11-1	3.0	12.0
OM1-1	36	36		1	1	1	2	1	1	1	P5 (2)	9.0	18.0
D9-2	18	18	H				2				P5 (2)	2.25	4.5
M1-5a (110)	30	24	110				1				P5 (1)	5.0	5.0
M1-5a (133)	30	24	133				1				P5 (1)	5.0	5.0
M6-6	21	15					1				MOUNT W/ M1-5a (110)	2.19	2.19
M4-6	24	12	END				1				MOUNT W/ M1-5a (133)	5.0	5.0
M6-3	21	15					1				P5 (1)	2.19	2.19
M6-1R	15	21					1				P5 (1)	2.19	2.19

*(PBS) – PAINTED BOTH SIDES

(1) SEE LATEST EDITION TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR SPECIFICATIONS ON TEXT DIMENSIONS AND COLOR (ALSO SEE SECTION M9.30.0 TYPE III MHD 1988 STANDARD SPECIFICATION).

(2) SEE MASSDOT STANDARD SIGNS DATED NOVEMBER 2016 FOR SPECIFICATIONS ON TEXT DIMENSIONS AND COLOR (A SUPPLEMENT TO FHWA'S STANDARD HIGHWAY SIGNS AND MARKINGS AND THE MASSACHUSETTS AMENDMENTS TO THE MUTCD)

606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

CONSTRUCTION SIGN SUMMARY

IDENTIFI–CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK–GROUND	LEGEND	BORDER			
R2–10a	48	36	WORK ZONE / SPEEDING FINES / DOUBLED	1	1	1	7	1	1	1	–	12.0	84.0
R2–10e	36	48	END ROAD WORK / DOUBLE FINES END				7				–	12.0	84.0
R9–11L	48	36	SIDEWALK CLOSED AHEAD / ← / CROSS HERE				2				–	12.0	24.0
R9–11R	48	36	SIDEWALK CLOSED AHEAD / → / CROSS HERE				2				–	12.0	24.0
R3–7L	30	30	LEFT LANE MUST TURN LEFT				2				–	6.25	12.5
R3–8	30	30	ONLY				1				–	6.25	6.25
R9–9	30	18	SIDEWALK CLOSED				1				–	3.75	3.75
W1–4L	30	30					1				–	6.25	6.25
W1–4R	30	30					1				–	6.25	6.25
W4–2R	36	36					1				–	6.0	6.0

CONSTRUCTION SIGN SUMMARY

IDENTIFI–CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK–GROUND	LEGEND	BORDER			
W5–1	36	36	ROAD NARROWS	1	1	1	2	1	1	1	–	9.0	18.0
W8–3	30	30	PAVEMENT ENDS				4				–	6.25	25.0
W8–8	30	30	ROUGH ROAD				4				–	6.25	25.0
W11–2	30	30					6				–	6.25	37.5
W16–7pL	24	12					6				–	2.0	12.0
W20–1	36	36	ROAD WORK 1500 FT				2				–	9.0	18.0
W20–1c	36	36	ROAD WORK AHEAD				7				–	9.0	63.0
W20–5R	36	36	RIGHT LANE CLOSED 1000 FT				1				–	9.0	9.0
MA–W20–7b	36	36	POLICE OFFICER AHEAD	2	2	2	8	2	2	2	–	9.0	72.0
MA–W24–2	36	36	LANE SHIFT AHEAD				2				–	9.0	18.0
MA–W30–8L	36	36	SQUEEZE LEFT				2				–	9.0	18.0

1 SEE LATEST EDITION TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR SPECIFICATIONS ON TEXT DIMENSIONS AND COLOR (ALSO SEE SECTION M9.30.0 TYPE III MHD 1988 STANDARD SPECIFICATION).

2 SEE MASSDOT STANDARD SIGNS DATED NOVEMBER 2016 FOR SPECIFICATIONS ON TEXT DIMENSIONS AND COLOR (A SUPPLEMENT TO FHWA'S STANDARD HIGHWAY SIGNS AND MARKINGS AND THE MASSACHUSETTS AMENDMENTS TO THE MUTCD)

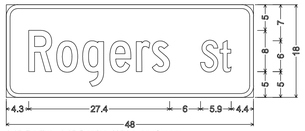
606189HD6(PAVEMENT MARKING).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	51	96
PROJECT FILE NO.	606189		

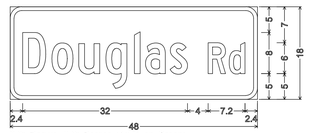
STREET SIGN SUMMARY

MA-D3-1		
4.0'	1.5'	6.00 SF
SIGNS REQUIRED		2
TOTAL AREA		12.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT



2.3" Radius, 0.8" Border, White on Green;
"Rogers St" C 2K;

MA-D3-2		
4.0'	1.5'	6.00 SF
SIGNS REQUIRED		1
TOTAL AREA		6.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

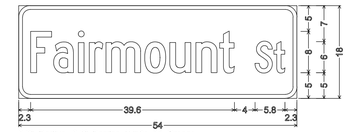


2.3" Radius, 0.8" Border, White on Green;
"Douglas Rd" C 2K;

MA-D3-3		
4.5'	1.5'	6.75 SF
SIGNS REQUIRED		1
TOTAL AREA		6.75 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

2.3" Radius, 0.8" Border, White on Green;
"Phoenix Ave" C 2K 85% spacing;

MA-D3-4		
4.5'	1.5'	6.75 SF
SIGNS REQUIRED		1
TOTAL AREA		6.75 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

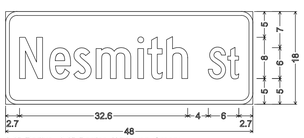


2.3" Radius, 0.8" Border, White on Green;
"Fairmount St" C 2K 70% spacing;

MA-D3-5		
4.0'	1.5'	6.00 SF
SIGNS REQUIRED		1
TOTAL AREA		6.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

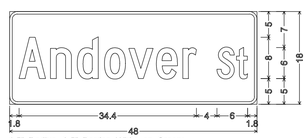
2.3" Radius, 0.8" Border, White on Green;
"Boylston St" C 2K 70% spacing;

MA-D3-6		
4.0'	1.5'	6.00 SF
SIGNS REQUIRED		3
TOTAL AREA		18.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT



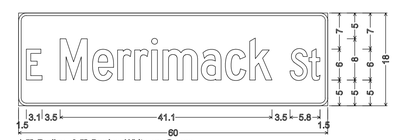
2.3" Radius, 0.8" Border, White on Green;
"Nesmith St" C 2K;

MA-D3-7		
4.0'	1.5'	6.00 SF
SIGNS REQUIRED		1
TOTAL AREA		6.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT



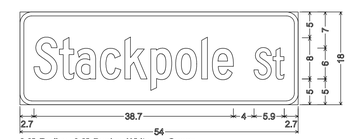
1.5" Radius, 0.5" Border, White on Green;
"Andover St" C 2K;

MA-D3-9		
5.0'	1.5'	7.50 SF
SIGNS REQUIRED		1
TOTAL AREA		7.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT



1.5" Radius, 0.5" Border, White on Green;
"E Merrimack St" C 2K 75% spacing;

MA-D3-10		
4.5'	1.5'	6.75 SF
SIGNS REQUIRED		1
TOTAL AREA		6.75 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT



2.3" Radius, 0.8" Border, White on Green;
"Stackpole St" C 2K 80% spacing;

MA-D3-6 (A)		
3.5'	1.0'	3.50 SF
SIGNS REQUIRED		1
TOTAL AREA		3.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

1.5" Radius, 0.5" Border, White on Green;
[Nesmith] C 2K [ ] E Mod 2K [St] C 2K;

MA-D3-8		
3.5'	1.0'	3.50 SF
SIGNS REQUIRED		1
TOTAL AREA		3.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		MOUNT ON M.A. SHAFT

1.5" Radius, 0.5" Border, White on Green;
[Chestnut] C 2K [ ] E Mod 2K [St] C 2K;

SHEET SUMMARY
TOTAL AREA OF SIGNS
95.5 SF

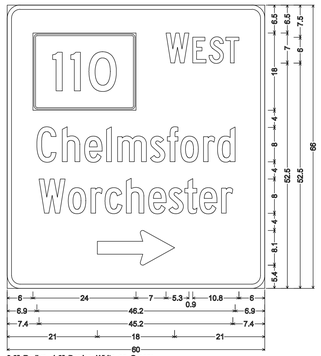
606189HD18(STREET SIGNS).DWG Plotted on 17-Sep-2019 9:07 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	52	96
PROJECT FILE NO.	606189		

DIRECTIONAL SIGN SUMMARY

MA-D1-6(1)		
5.0'	5.5'	27.50 SF
SIGNS REQUIRED		1
TOTAL AREA		27.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		5" TUBULAR STEEL POST

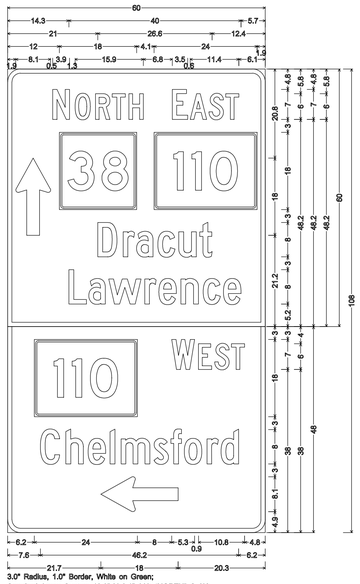


3.0" Radius, 1.0" Border, White on Green;
State Highway 110 M1-5; "WEST" C 2K; "Chelmsford" C 2K;
"Worchester" C 2K; Standard Arrow Custom 18.0" X 8.1" 0";

MA-D1-7(4)		
5.0'	9.0'	45.00 SF
SIGNS REQUIRED		1
TOTAL AREA		45.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		5" TUBULAR STEEL POST

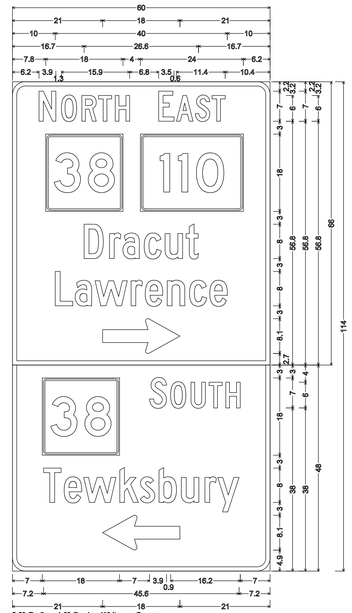
3.0" Radius, 1.0" Border, White on Green;
State Highway 110 M1-5; "WEST" C 2K; "Chelmsford" C 2K;
"Worchester" C 2K; "NEXT RIGHT" C 2K;
3.0" Radius, 1.0" Border, White on Green;
State Highway 113 M1-5; "EAST" C 2K; "Andover" C 2K;
"NEXT LEFT" C 2K;

MA-D1-7(1)		
5.0'	9.0'	45.00 SF
SIGNS REQUIRED		1
TOTAL AREA		45.00 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		5" TUBULAR STEEL POST



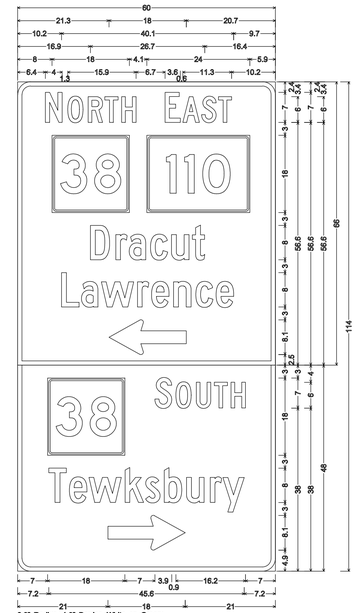
3.0" Radius, 1.0" Border, White on Green;
Standard Arrow Custom 18.0" X 8.1" 90"; "NORTH" C 2K;
State Highway 38 M1-5; "EAST" C 2K; State Highway 110 M1-5;
"Dracut" C 2K; "Lawrence" C 2K;
3.0" Radius, 1.0" Border, White on Green;
State Highway 110 M1-5; "WEST" C 2K; "Chelmsford" C 2K;
Standard Arrow Custom 18.0" X 8.1" 180";

MA-D1-7(2)		
5.0'	9.5'	47.50 SF
SIGNS REQUIRED		1
TOTAL AREA		47.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		5" TUBULAR STEEL POST



3.0" Radius, 1.0" Border, White on Green;
"NORTH" C 2K; State Highway 38 M1-5; "EAST" C 2K;
State Highway 110 M1-5; "Dracut" C 2K; "Lawrence" C 2K;
Standard Arrow Custom 18.0" X 8.1" 0";
3.0" Radius, 1.0" Border, White on Green;
State Highway 38 M1-5; "SOUTH" C 2K; "Tewksbury" C 2K;
Standard Arrow Custom 18.0" X 8.1" 180";

MA-DA-7(3)		
5.0'	9.5'	47.50 SF
SIGNS REQUIRED		1
TOTAL AREA		47.50 SF
BACKGROUND	LEGEND	BORDER
GREEN REFL.	SILVER WHITE	SILVER WHITE
POST SIZE / NO. REQ'D		5" TUBULAR STEEL POST



3.0" Radius, 1.0" Border, White on Green;
"NORTH" C 2K; State Highway 38 M1-5; "EAST" C 2K;
State Highway 110 M1-5; "Dracut" C 2K; "Lawrence" C 2K;
Standard Arrow Custom 18.0" X 8.1" 180";
3.0" Radius, 1.0" Border, White on Green;
State Highway 38 M1-5; "SOUTH" C 2K; "Tewksbury" C 2K;
Standard Arrow Custom 18.0" X 8.1" 0";

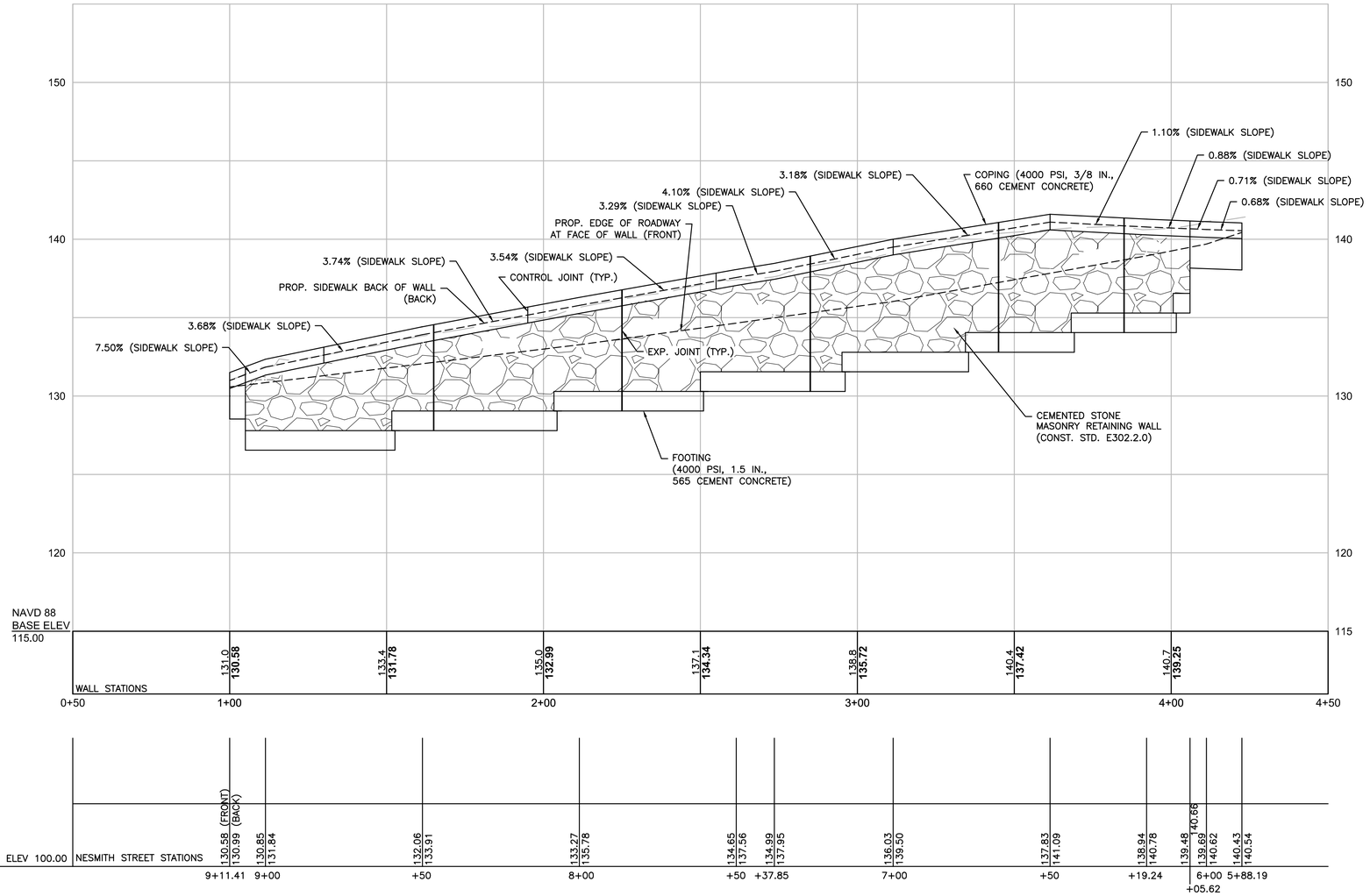
SHEET SUMMARY
TOTAL AREA OF SIGNS
212.5 SF

606189HD18(STREET SIGNS).DWG Plotted on 17-Sep-2019 9:07 AM

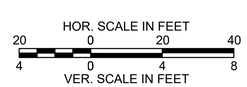
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	53	96
PROJECT FILE NO.	606189		

RETAINING WALL DETAILS



RETAINING WALL ANDOVER ST. TO CHESTNUT ST.

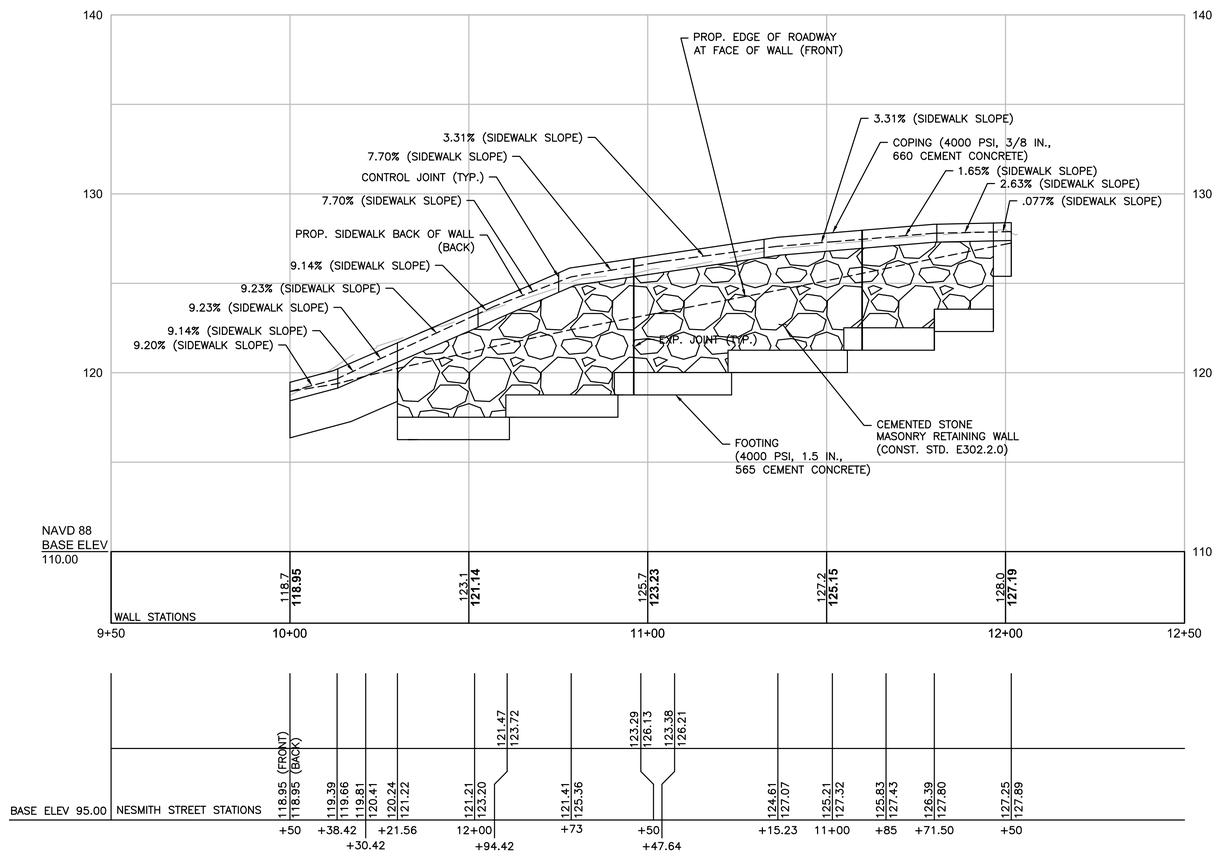


STA. 5+88.16 TO 9+11.41						
STA.	ELEV. TOP OF WALL	H	ELEV. TOP OF FOOTING	ELEV. BOT OF FOOTING	WIDTH OF FOOTING	OFFSET FROM NESMITH ST. BL
5+88.19	141.04	-	-	-	-	29.611 *
6+00.00	141.12	-	-	-	-	27.154 *
6+05.62	141.16	4.62	135.29	134.04	3.64	26.296 *
6+19.24	141.28	5.99	135.29	134.04	3.64	25.500 *
6+50.00	141.59	7.55	134.04	132.79	4.50	25.500 *
7+00.00	140.00	6.75	132.79	131.54	4.12	25.500 *
7+37.85	138.45	6.91	131.54	130.29	4.25	25.500 *
7+50.00	138.06	6.53	131.54	130.29	4.00	25.500 *
8+00.00	136.28	5.99	130.29	129.04	3.86	25.500 *
8+50.00	134.41	5.37	129.04	127.79	3.68	25.500 *
9+00.00	132.35	4.55	127.79	126.54	3.48	25.500 *
9+11.41	131.49	-	-	-	-	25.500 *

* OFFSET FROM NESMITH ST. BL TAKEN FROM BACK OF COPING AT FRONT OF SIDEWALK

606189HD9(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:07 AM

606189HD9(GRADING AND WALL PROFILES).DWG Plotted on 17-Sep-2019 9:08 AM



STA. 10+50.00 TO 12+50.00						
STA.	ELEV. TOP OF WALL	H	ELEV. TOP OF FOOTING	ELEV. BOT OF FOOTING	WIDTH OF FOOTING	OFFSET FROM NESMITH ST. BL
10+50.00	128.39	-	-	-	-	25.50 *
10+71.50	128.30	4.74	123.56	122.31	3.08	25.50 *
10+85.00	128.08	5.57	122.51	121.26	3.25	25.50 *
11+00.00	127.82	6.56	121.26	120.01	4.00	25.50 *
11+15.23	127.57	6.31	121.26	120.01	4.00	25.50 *
11+47.64	126.61	6.60	120.01	118.76	4.08	25.50 *
11+50.00	126.54	6.53	120.01	118.76	4.00	25.50 *
11+73.00	125.87	7.11	118.76	117.51	4.25	25.50 *
11+94.42	124.03	6.52	117.51	116.26	4.00	25.50 *
12+00.00	123.54	6.03	117.51	116.26	3.75	25.50 *
12+21.56	121.67	4.17	117.51	116.26	3.50	25.50 *
12+30.42	120.90	4.64	-	-	-	25.50 *
12+38.42	120.20	-	-	-	-	25.50 *
12+50.00						
* OFFSET FROM NESMITH ST. BL TAKEN FROM BACK OF COPING AT FRONT OF SIDEWALK						

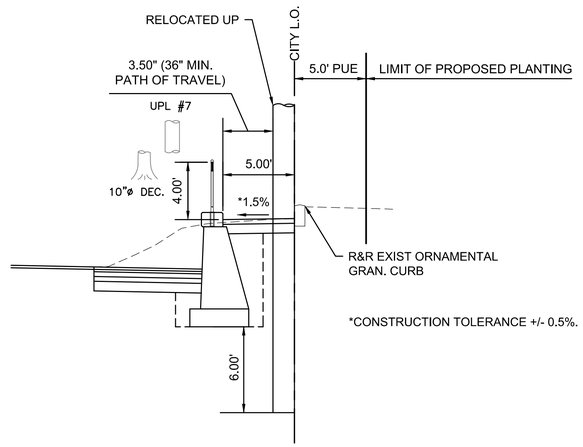
RETAINING WALL CHESTNUT ST. TO E. MERRIMACK

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

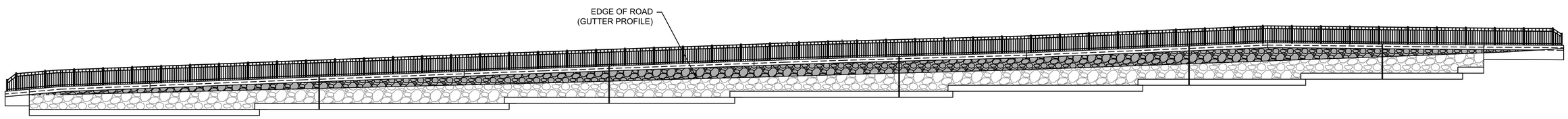
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	55	96
PROJECT FILE NO.	606189		

RETAINING WALL PLAN & ELEVATION

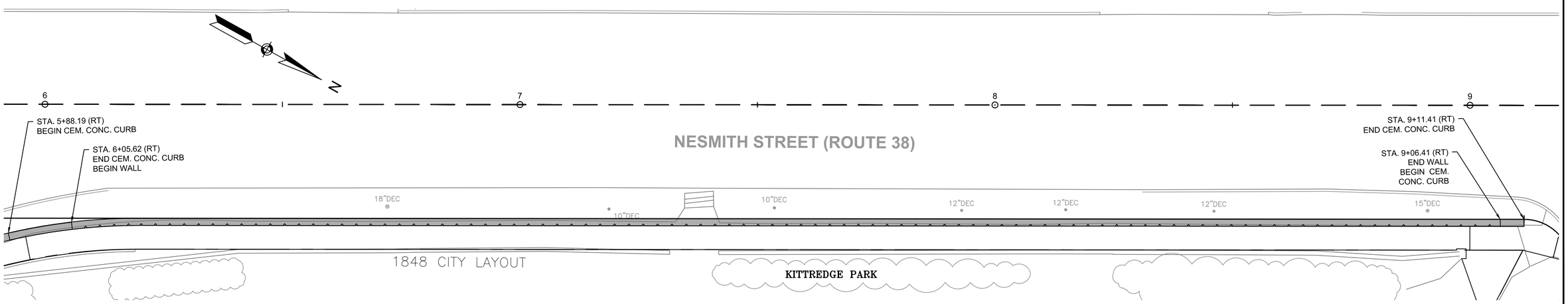


SECTION
ORNAMENTAL STEEL RAILING
SCALE 1"= 5.00'
STA. 5+88.19 (RT) TO STA. 9+11.41 (RT)



WALL AND FENCE ELEVATION (LOOKING EAST)
RETAINING WALL ANDOVER ST. TO CHESTNUT ST.
STATION 5+88.19 RT TO STATION 9+11.41 RT

0 10 20 30 40
SCALE: 1" = 10'



PLAN VIEW
RETAINING WALL ANDOVER ST. TO CHESTNUT ST.
STATION 5+88.19 RT TO STATION 9+11.41 RT

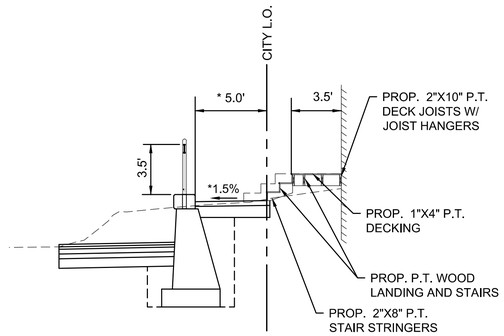
0 10 20 30 40
SCALE: 1" = 10'

606189HD9(WALL RENDERING).DWG Plotted on 17-Sep-2019 9:08 AM

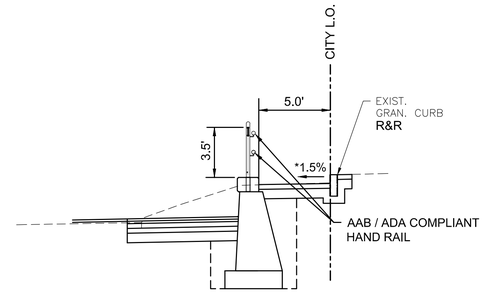
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	56	96
PROJECT FILE NO.	606189		

RETAINING WALL PLAN & ELEVATION

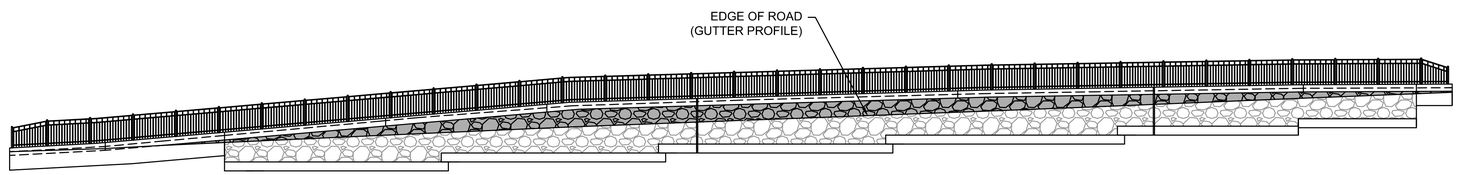


SECTION
ORNAMENTAL STEEL RAILING
SCALE 1"= 5.00'
STA. 11+12.27 (RT) TO STA. 11+73.00 (RT)
* SIDEWALK VARIES 4.4' TO 5.0'
STA. 10+50 (RT) TO STA. 11+12.27 (RT)
STA. 11+44.08 TO STA. 11+65.13 (RT)



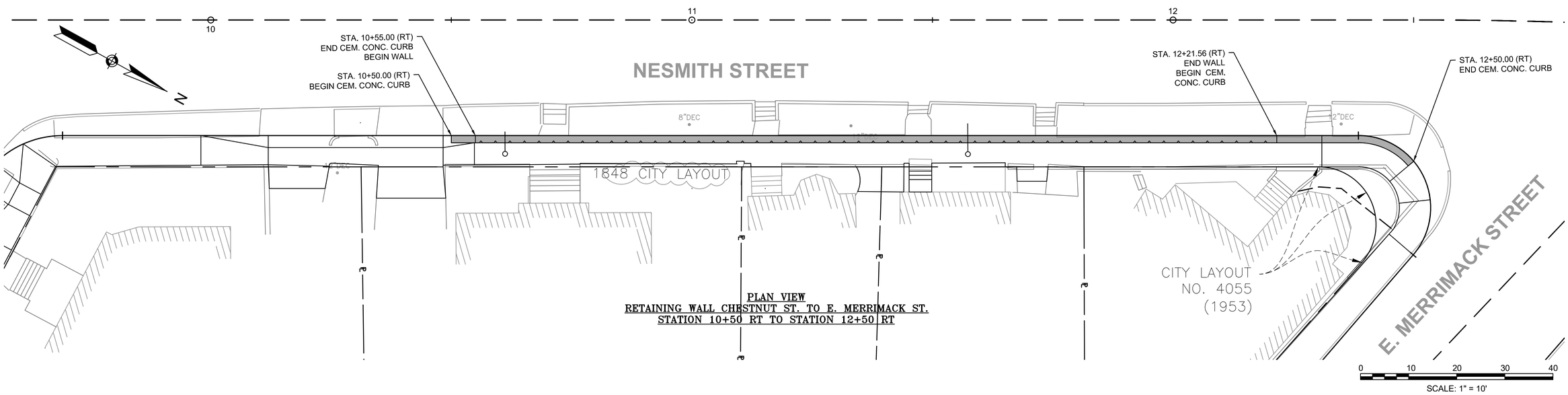
SECTION
ORNAMENTAL STEEL RAILING
(AAB/ADA COMPLIANT)
SCALE 1" = 5.00'
STA. 11+73.00 TO STA. 12+50.00

* CONSTRUCTION TOLERANCE ± 0.5%



WALL AND FENCE ELEVATION (LOOKING EAST)
RETAINING WALL CHESTNUT ST. TO E. MERRIMACK ST.
STATION 10+50 RT TO STATION 12+50 RT

0 10 20 30 40
SCALE: 1" = 10'



PLAN VIEW
RETAINING WALL CHESTNUT ST. TO E. MERRIMACK ST.
STATION 10+50 RT TO STATION 12+50 RT

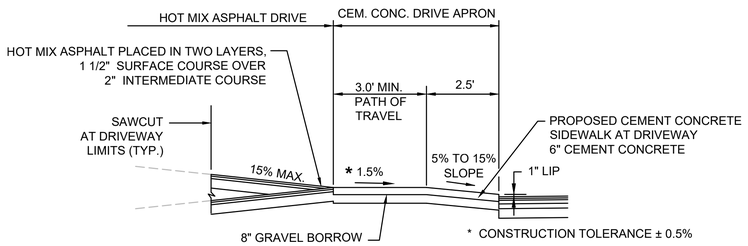
0 10 20 30 40
SCALE: 1" = 10'

606189HD9(WALL RENDERING).DWG Plotted on 17-Sep-2019 9:08 AM

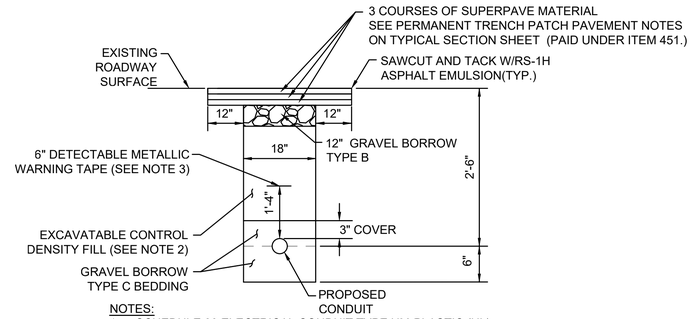
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	57	96
PROJECT FILE NO.	606189		

CONSTRUCTION DETAILS

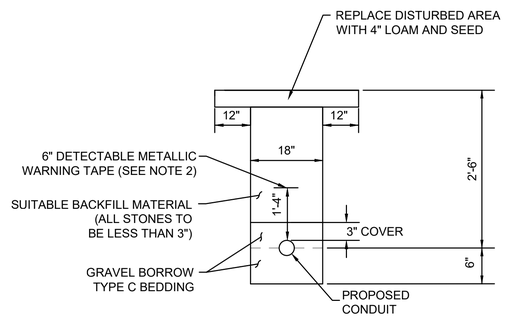


SECTION A–A
N.T.S.



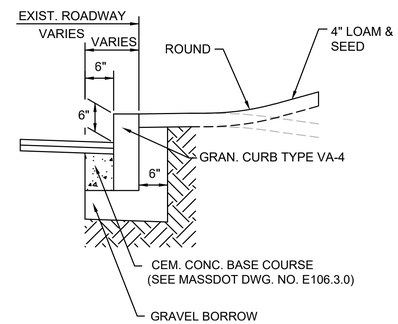
NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY MASSDOT.
2. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF SUBSECTION M4.08.0.
3. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.

CONDUIT CROSSING ROADWAY
N.T.S

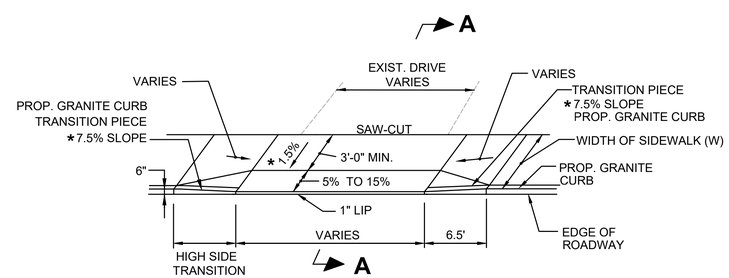


NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY MASSDOT.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARD.

CONDUIT UNDER GRASS AREAS
N.T.S



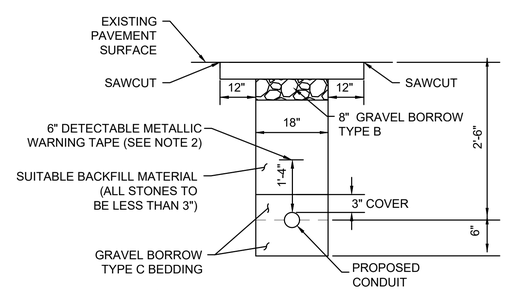
METHOD OF SETTING VERTICAL CURB
N.T.S



* CONSTRUCTION TOLERANCE ± 0.5%

NOTE: SEE MASSDOT DETAIL E 107.7.0

TYPICAL DRIVEWAY ENTRANCE (SIDEWALK SIDE)
N.T.S.



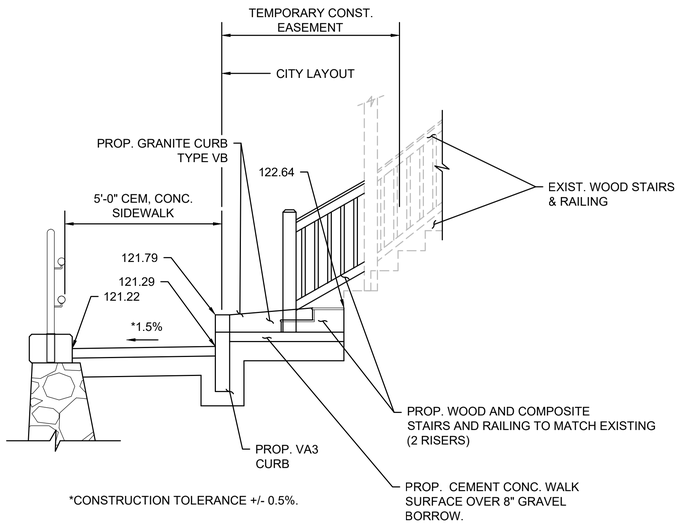
NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY MASSDOT.
2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARD.

CONDUIT UNDER SIDEWALK AREAS
N.T.S

606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18

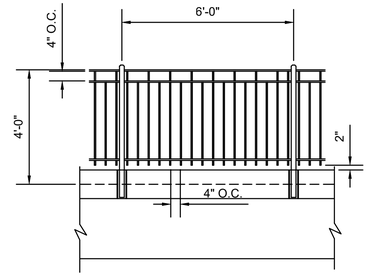
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	58	96
PROJECT FILE NO.	606189		

CONSTRUCTION DETAILS

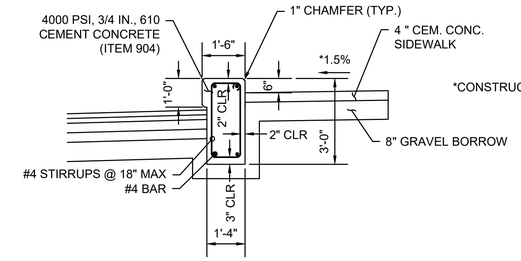


*CONSTRUCTION TOLERANCE +/- 0.5%.

STAIR AND RAILING DETAIL
STA. 12+21.56 (RT)
N.T.S

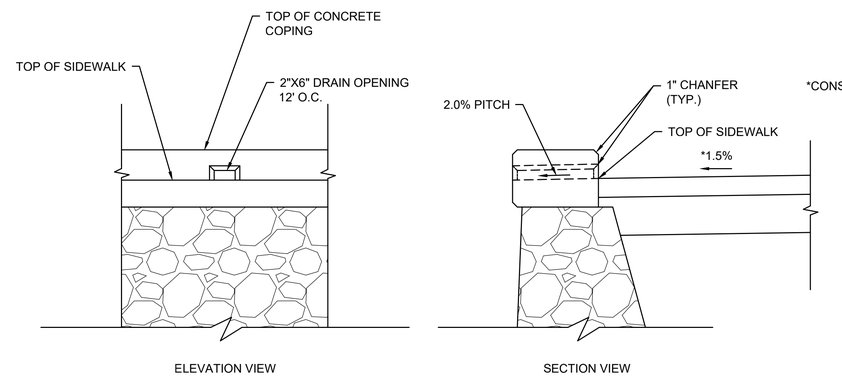


ORNAMENTAL STEEL RAILING ELEVATION
N.T.S



*CONSTRUCTION TOLERANCE +/- 0.5%.

CEMENT CONCRETE CURB
N.T.S.
STA. 5+88.19 (RT) TO STA. 6+05.62 (RT)
STA. 9+06.41 (RT) TO STA. 9+11.41 (RT)
STA. 10+50.00 (RT) TO STA. 10+55.00 (RT)
STA. 12+21.56 (RT) TO STA. 12+50.00 (RT)

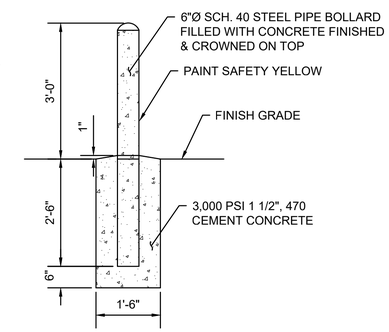


*CONSTRUCTION TOLERANCE +/- 0.5%.

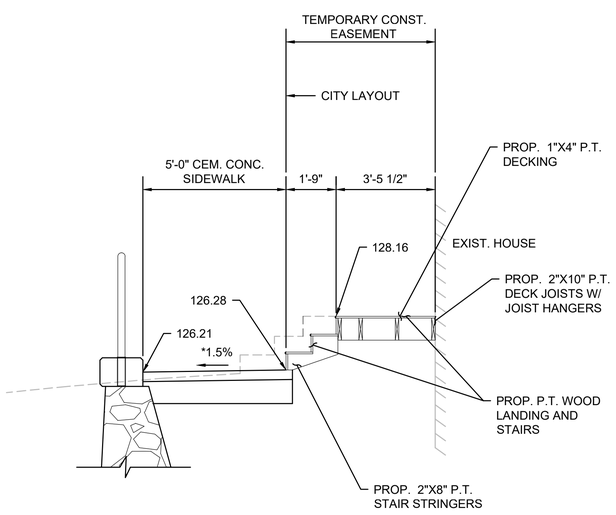
SIDEWALK DRAINAGE SCUPPER DETAIL
N.T.S.

NOTE:
FORMWORK AND CONSTRUCTION OF SIDWALK DRAINAGE SCUPPER SHALL BE CONSIDERED INCIDENTAL TO THE CONSTRUCTION OF THE RETAINING WALL AND CONCRETE COPING.

SIDEWALK DRAINAGE SCUPPER SPACING 12' O.C. SHALL BE CENTERED ABOUT THE ORNAMENTAL RAILING POST SPACING.

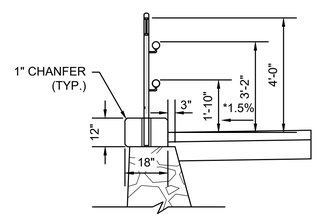


STEEL BOLLARD DETAIL
N.T.S



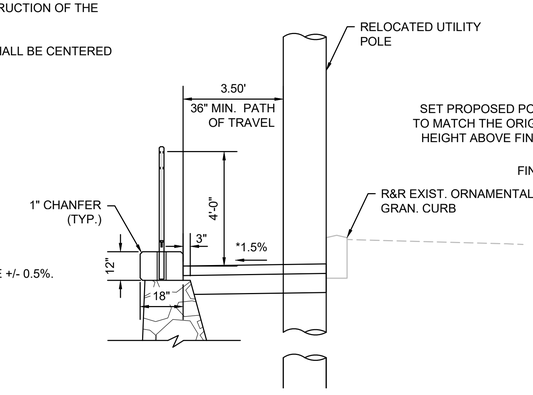
*CONSTRUCTION TOLERANCE +/- 0.5%.

STAIR AND DECK DETAIL
STA. 12+21.56 (RT)
N.T.S

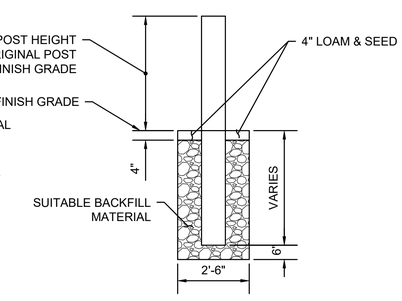


ORNAMENTAL STEEL RAILING DETAIL (AAB/ADA COMPLIANT)
N.T.S
STA. 11+73.00 TO STA. 12+38.53 (RT) (STRAIGHT)
STA. 12+38.53 (RT) TO STA. 12+50.00 (RT) (CURVED)

*CONSTRUCTION TOLERANCE +/- 0.5%.

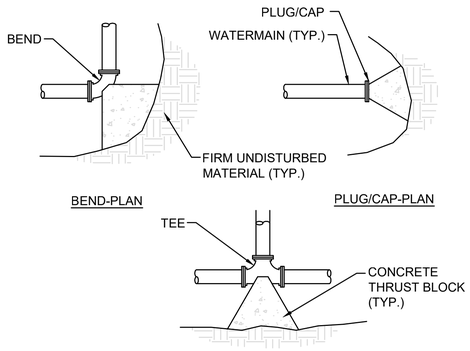


ORNAMENTAL STEEL RAILING DETAIL
N.T.S
STA. 5+88.00 (RT) TO STA. 9+11.41 (RT)
STA. 10+50.00 (RT) TO STA. 11+73.00 (RT)



ORNAMENTAL GRANITE POST REMOVED AND RESET
N.T.S

606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18

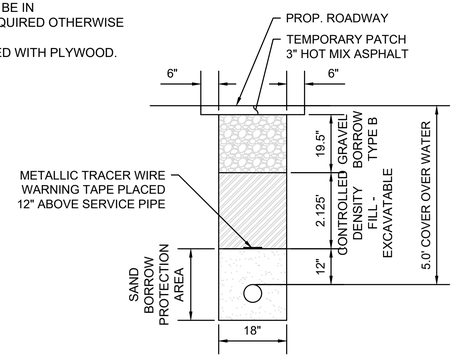


TEE-PLAN

TABLE OF BEARING AREAS (S.F.)			
SIZE OF MAIN	BENDS (90°)	BENDS (45° & UNDER)	TEES, CAPS OR PLUGS
15"	22	12	16
12"	12	6	9
≤8"	6	3	4

NOTES:
1. CONCRETE FOR THRUST BLOCKS SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS, UNLESS REQUIRED OTHERWISE BY THE ENGINEER OR OWNER.
2. THRUST BLOCK BEARING AREAS SHALL BE IN ACCORDANCE WITH TABLE, UNLESS REQUIRED OTHERWISE BY THE ENGINEER OR OWNER.
3. THRUST BLOCK SIDES SHALL BE FORMED WITH PLYWOOD.

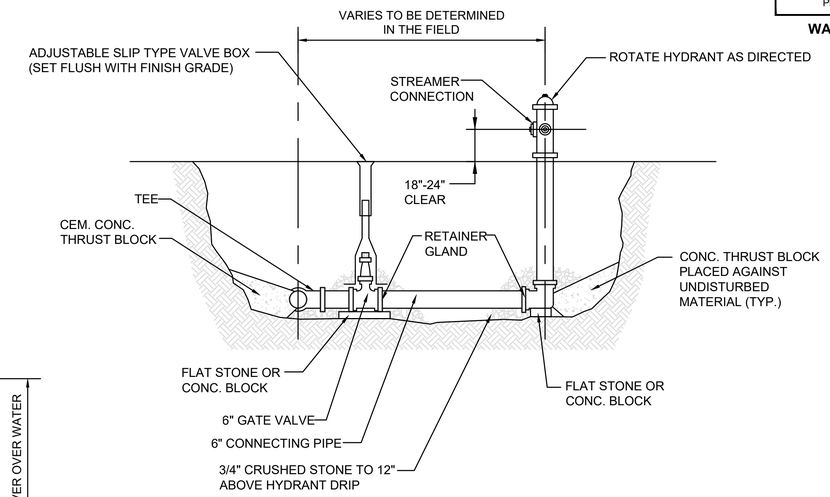
THRUST BLOCK DETAILS
N.T.S



PROPOSED WATER SERVICE TRENCH FULL DEPTH CONSTRUCTION
N.T.S

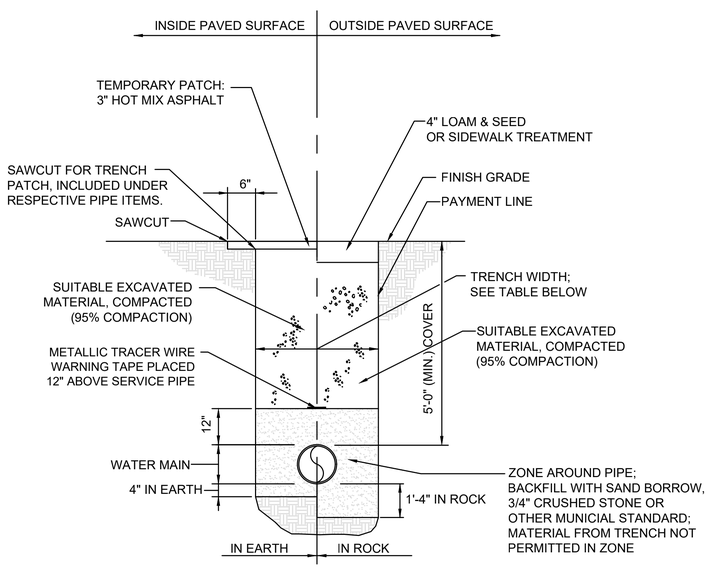
NOTE:
CONTROL DENSITY FILL (CDF) SHALL NOT BE USED OUTSIDE THE LIMITS OF MILL AND OVERLAY WITHOUT APPROVAL.

SILT SACK DETAIL
N.T.S



NOTE:
DEPTH OF HYDRANT BURY TO SUIT INSTALLED DEPTH OF COVER OVER WATER MAIN.

HYDRANT ASSEMBLY DETAIL
N.T.S



TRENCH WIDTH TABLE		
PIPE DIA.	12" & UNDER	15"
TRENCH WIDTH	3'-0"	3'-0"

NOTE:

PAYMENT FOR INITIAL PAVEMENT INSTALLED BEYOND PAYMENT LINE WILL BE MADE ONLY WHEN SUCH INSTALLATION IS APPROVED BY THE ENGINEER.

PAYMENT LIMIT FOR PAVEMENT OVERLAY SHALL EXTEND ONLY TO THE EXISTING PAVEMENT LIMITS. NO PAYMENT WILL BE MADE FOR WIDENING THE ROAD

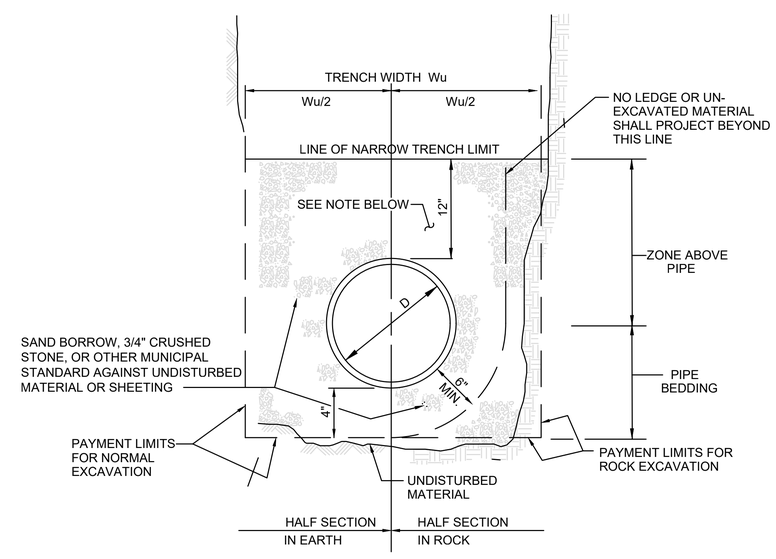
WATER MAIN TRENCH DETAIL
N.T.S

TRENCH WIDTH Ws OR Wu	
DIAMETER OF PIPE D	Wu UNSHEETED
12" AND SMALLER	3'-0"
15"	3'-2"
18"	3'-6"
21"	3'-10"
24"	4'-2"
27"	4'-6"
30"	4'-10"

GENERAL NOTES

1. PIPE TRENCHES MAY BE EXCAVATED WIDER THAN TRENCH WIDTH Ws ABOVE THE "LINE OF NARROW TRENCH LIMIT".
2. BELOW THE "LINE OF NARROW TRENCH LIMIT" THE TRENCH SHOULD NOT BE EXCAVATED BEYOND THE TRENCH WIDTH Ws.
3. IF EXCAVATION AND BACKFILL BELOW NORMAL DEPTH IS REQUIRED, SHEETING MAY BE ORDERED.

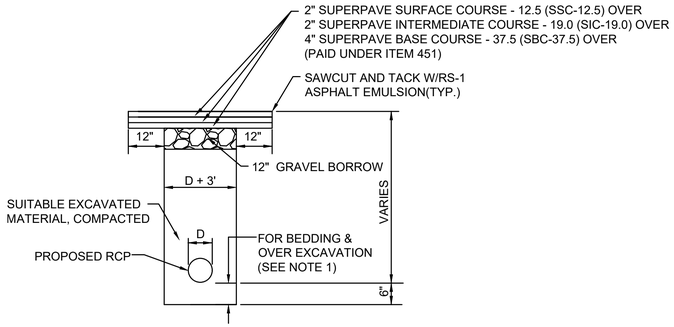
TRENCH DETAIL GENERAL NOTES
TRENCH DETAIL SCHEDULE
N.T.S



SCHEDULE OF MATERIALS		
LOCATION	IN EARTH	IN ROCK
BEDDING	----------CRUSHED STONE / SAND BORROW----------	
ZONE ABOVE PIPE	----------CRUSHED STONE / SAND BORROW----------	
BACKFILL	--COMPACTED ORDINARY FILL OR CONTROLLED DENSITY FILL IN PAVED AREAS--	

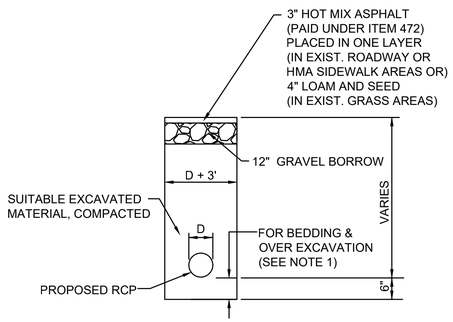
TRENCH DETAIL FOR WATER PIPING
N.T.S

606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18



PERMANENT TRENCH PATCH FOR DRAINAGE PIPE (WITHIN ROADWAY) DETAIL

N.T.S.



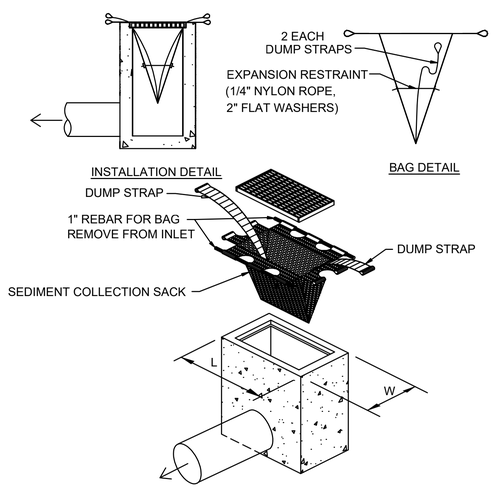
TEMPORARY TRENCH PATCH FOR DRAINAGE PIPE DETAIL

N.T.S.

NOTES:

1. IN CASES WHERE EXISTING PIPE BASE MATERIAL IS GOOD, THAT MATERIAL WILL BE RETAINED. OTHERWISE, SOFT OR UNSUITABLE MATERIAL EXISTING BELOW THE REQUIRED BEDDING GRADE SHALL BE REMOVED AS DIRECTED AND REPLACED WITH SAND, GRAVEL, CRUSHED STONE OR OTHER SUITABLE MATERIAL AND THOROUGHLY COMPACTED.

2. EXISTING MATERIAL OBTAINED FROM EXCAVATION THAT IS DETERMINED TO BE SUITABLE, AND APPROVED BY THE ENGINEER SHALL BE USED. BACKFILL SHALL BE PLACED IN LAYERS NO MORE THAN 6 INCHES IN DEPTH AND THOROUGHLY COMPACTED. BACKFILL TO A POINT 2 FEET OVER THE PIPE SHALL CONTAIN NO STONES LARGER THAN 3 INCHES.



SILT SACK

N.T.S

DRAINAGE STRUCTURES							
TYPE	STATION	OFFSET (FT.)		RIM ELEV.	INV. (IN)	INV. (OUT)	REMARKS
FAIRMOUNT STREET							
CBCI	10+88	58.8	RT	152.75		149.25	
CIT	11+03	24.9	RT	153.20	148.47	EXIST	
NESMITH STREET							
REMOD. CB	4+58	50.2	RT	SET IN FIELD	143.88	EXIST	
GI	4+63	58.2	RT	146.48		143.98	
CBCI	5+81	23.0	RT	140.42		135.42	
CB	7+45	24.0	RT	134.75		131.25	
DMH	7+51	16.9	RT	134.72	131.00	127.10	FROM CB 5+81
					130.94		FROM CB 7+45
CB	8+44	23.2	RT	132.05		128.55	
DMH	8+49	16.7	RT	132.08	125.20	125.10	FROM DMH 7+51
					128.31		FROM CB 8+44
CB	9+17	24.5	RT	130.47		126.97	
CBCI	9+20	42.6	RT	130.74		127.24	
CBCI	9+21	23.0	LT	129.69		123.69	
DMH	9+25	19.1	RT	130.34	123.60	122.80	5' DIAMETER MANHOLE
					122.90		FROM CBCI 9+21
					126.87		FROM CB 9+17
					126.88		FROM CBCI 9+20
CB	9+50	35.7	RT	129.66		126.16	
DMH	9+66	20.6	RT	129.47	122.10	122.00	
					125.82		FROM CBCI 9+50
GICI	11+80	23.0	LT	121.16		118.66	
CB	11+92	17.3	LT	120.76	118.05	116.90 (EX)	W/F&C; FROM GICI 11+80
GI	12+54	22.9	LT	117.16		114.66	
CB	12+67	10.4	RT	117.31	113.84	113.81	W/F&C; FROM GICI 12+54
DMH	12+71	19.7	RT	117.38	110.05	109.95 (EX)	
					113.64		FROM CB W/F&C 12+67
CIT	12+88	29.8	LT	SET IN FIELD			
DMH	13+36	27.0	RT	EXIST	107.55	107.45 (EX)	
					108.95 (EX)		FROM CIT 12+88
					108.15 (EX)		FROM CIT 13+83
					109.75 (EX)		FROM EX. CB
GICI	13+68	27.0	LT	111.69		108.19	
REMOD. CB	13+83	31.3	LT	SET IN FIELD	107.97	106.88 (EX)	FROM CBCI 13+68

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

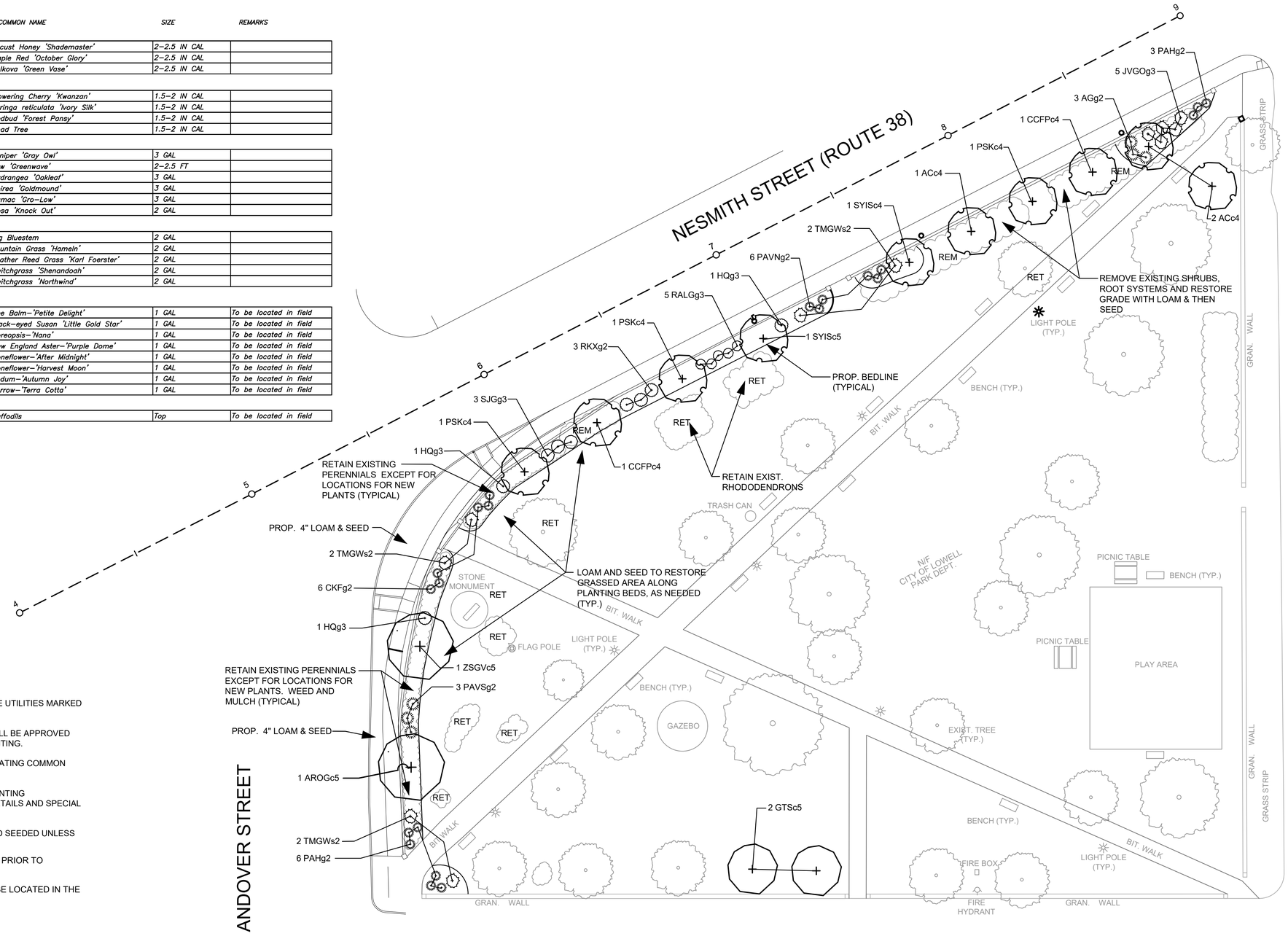
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	61	96
PROJECT FILE NO.	606189		

KITTREDGE PARK LANDSCAPE PLAN

606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18

PLANT LIST SUMMARY

SYM	QTY	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
TREES–SHADE					
GTSC5	2	Gletisia tri. iner. 'Shademaster'	Locust Honey 'Shademaster'	2–2.5 IN CAL	
AROGC5	1	Acer rubrum 'October Glory'	Maple Red 'October Glory'	2–2.5 IN CAL	
ZSGVC5	1	Zelkova serr. 'Green Vase'	Zelkova 'Green Vase'	2–2.5 IN CAL	
TREES–FLOWERING					
PSKc4	3	Prunus serrulata 'Kwanzan'	Flowering Cherry 'Kwanzan'	1.5–2 IN CAL	
SYISc4	2	Japanese Tree Lilac 'Ivory Silk'	Syringa reticulata 'Ivory Silk'	1.5–2 IN CAL	
CCFPc4	2	Cercis canadensis 'Forest Pansy'	Redbud 'Forest Pansy'	1.5–2 IN CAL	
ACc4	3	Amelanchier canadensis	Shad Tree	1.5–2 IN CAL	
SHRUBS					
JVGOg3	5	Juniper virginiana 'Gray Owl'	Juniper 'Gray Owl'	3 GAL	
TMGWs2	6	Taxus x media 'Greenwave'	Yew 'Greenwave'	2–2.5 FT	
HQg3	3	Hydrangea quercifolia	Hydrangea 'Oakleaf'	3 GAL	
SJGg3	3	Spirea 'Goldmound'	Spirea 'Goldmound'	3 GAL	
RALGg3	5	Rhus aromatica 'Gro–Low'	Sumac 'Gro–Low'	3 GAL	
RKXg2	3	Rose 'Knock Out'	Rosa 'Knock Out'	2 GAL	
ORNAMENTAL GRASSES					
ACg2	3	Andropogon gerardii	Big Bluestem	2 GAL	
PAHg2	9	Pennisetum alopecuroides 'Hameln'	Fountain Grass 'Hameln'	2 GAL	
CKFg2	6	Calamagrostis acut. 'Karl Foerster'	Feather Reed Grass 'Karl Foerster'	2 GAL	
PAVSg2	3	Panicum virgatum 'Shenandoah'	Switchgrass 'Shenandoah'	2 GAL	
PAVNg2	6	Panicum virgatum 'Northwind'	Switchgrass 'Northwind'	2 GAL	
PERENNIALS					
MPDg1	3	Modarda 'Petite Delight'	Bee Balm–'Petite Delight'	1 GAL	To be located in field
RFLGSg1	3	Rudbeckia fulgida 'Little Gold Star'	Black–eyed Susan 'Little Gold Star'	1 GAL	To be located in field
CANg1	3	Coreopsis auriculata 'Nana'	Coreopsis–'Nana'	1 GAL	To be located in field
ANAPDg1	3	Aster novae–angliae 'Purple Dome'	New England Aster–'Purple Dome'	1 GAL	To be located in field
EAMg1	5	Echinacea 'After Midnight'	Coneflower–'After Midnight'	1 GAL	To be located in field
EHMg1	5	Echinacea'Harvest Moon'	Coneflower–'Harvest Moon'	1 GAL	To be located in field
SAJg1	5	Sedum 'Autumn Joy'	Sedum–'Autumn Joy'	1 GAL	To be located in field
ATCg1	3	Achillea 'Terra Cotta'	Yarrow–'Terra Cotta'	1 GAL	To be located in field
BULBS					
	50	Narcissus	Daffodils	Top	To be located in field



PLANTING NOTES

CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.

FINAL LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER PRIOR TO PLANTING.

ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME & SIZE.

ALL PLANTS WILL BE MULCHED PER THE PLANTING SPECIFICATIONS AND DETAILS. PLANTING DETAILS AND SPECIAL PROVISIONS.

ALL DISTURBED AREAS WILL BE LOAMED AND SEEDED UNLESS NOTED OTHERWISE.

EXISTING PERENNIAL BEDS TO BE WEEDED PRIOR TO INSTALLATION OF MULCH

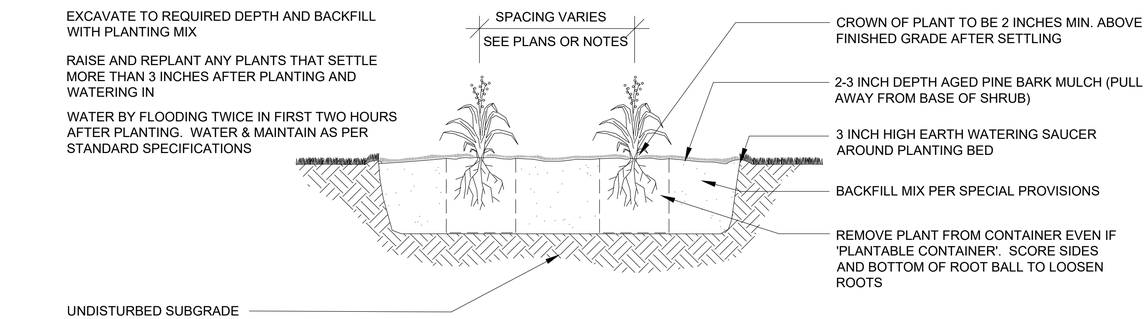
PROPOSED PERENNIALS & DAFFODILS TO BE LOCATED IN THE FIELD

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

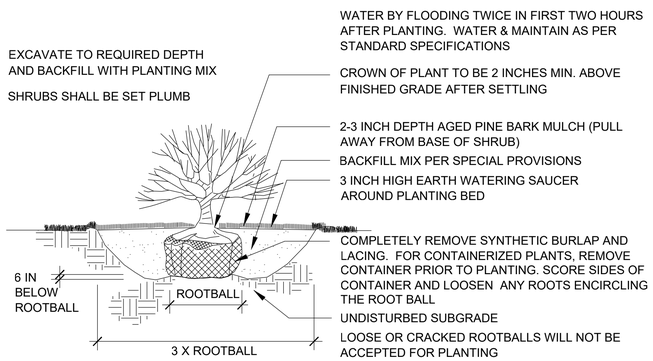
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	62	96
PROJECT FILE NO.	606189		

LANDSCAPE DETAILS

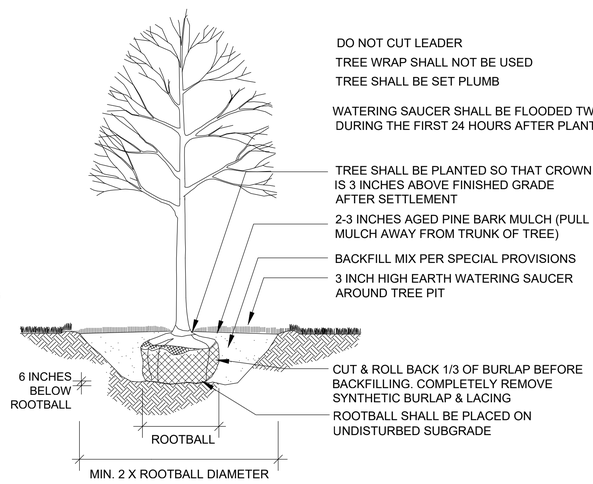
606189HD4(TYPICAL SECTIONS).DWG 23-Oct-18



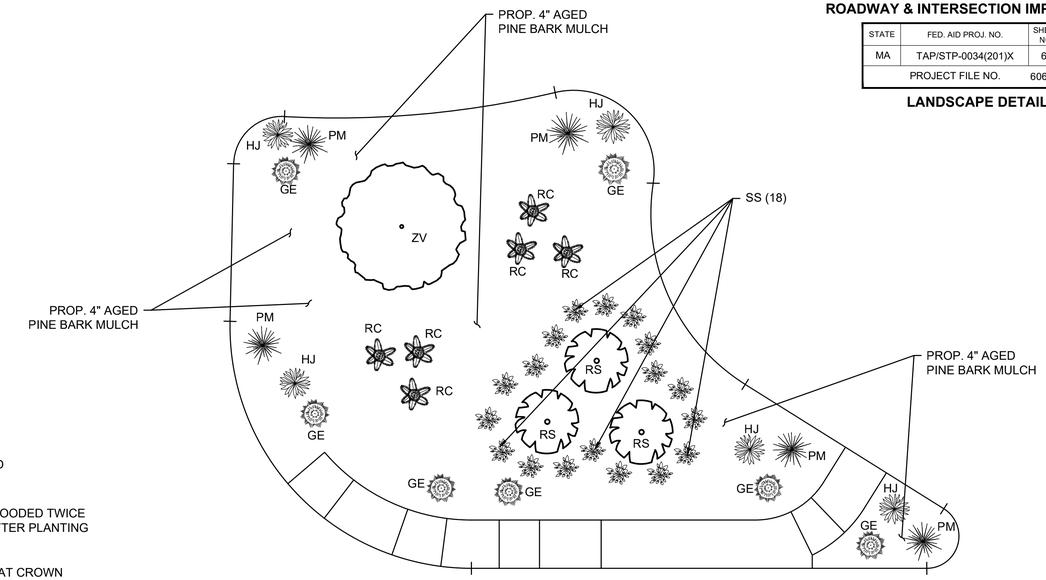
PERENNIAL PLANTING
N.T.S



SHRUB PLANTING
N.T.S



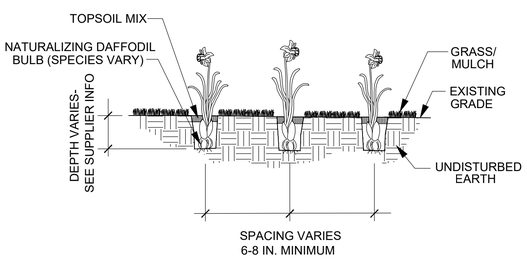
DECIDUOUS TREE PLANTING
N.T.S



LANDSCAPE PLAN
ROGERS STREET @ FAIRMOUNT STREET
N.T.S

PLANT LIST

SYMBOL	QUANTITY	COMMON NAME	BOTANICAL NAME	SIZE
ZV	1	ZELKOVA - "VILLAGE GREEN"	ZELKOVA SERRATA	2 - 2.5 IN. CALIPER
GE	6	GAIETY EMERALD	EUONYMUS FORTUNEI	1 GAL.
HJ	5	HOLLY - JAPANESE COMPACT	ILEX CRENATA "COMPACTA"	18 - 24 INCHES
PM	5	PINE - MUGO DWARF	PINUS MUGO PUMILO	12 - 15 INCHES
RC	6	ROSE - FLOWER CARPET	ROSA NOARA	1 GAL.
SS	18	SNOW - IN - SUMMER	CERASTIUM TOMENTOSUM	1 GAL.
RS	3	ROSE OF SHARON "LUCY"	HIBISCUS SYRIACUS	3 - 4 FEET



DAFFODIL BULB PLANTING
N.T.S

PLANTING DIRECTIONS

ARRANGE IN DRIFTS OR MASSES WITH OPEN AREAS OF GRASS OR PART OF PLANTING BEDS

ENSURE THAT PLANTINGS WILL BE VISIBLE FROM THE ROADSIDE AND NOT OBSTRUCTED BY GUARD RAIL, BARRIERS OR OTHER OBSTRUCTIONS

MAINTAIN 6-8" SPACING, MINIMUM.

LOOSEN SOIL TO A DEPTH OF APPROX. 12"

DEPTH OF TOP OF BULB SHOULD 2X AS DEEP AS THE BULB IS HIGH OTHERWISE, EXCAVATE HOLE TO DEPTH PRESCRIBED BY BULB SUPPLIER

PROVIDE DRAINAGE OR RELOCATE IF SUBSOIL IS HEAVY OR COMPACTED

SETTLE BULB FIRMLY IN HOLE WITH THE POINTED END UP

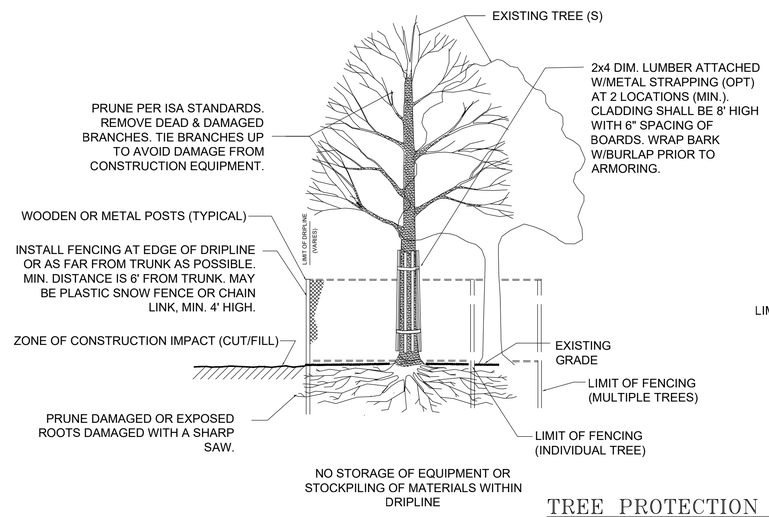
ADD BONE MEAL OR BULB FERTILIZER TO SOIL

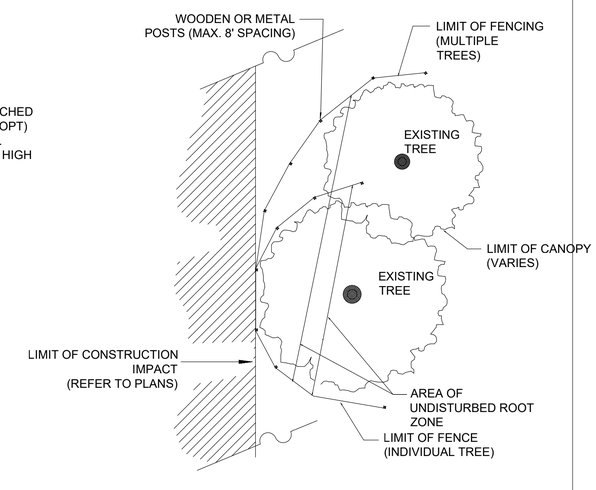
BACKFILL WITH TOPSOIL

WATER THOROUGHLY AFTER PLANTING
ADD MORE SOIL IF THERE IS SETTLEMENT

IF ENTIRE BED AREA IS EXCAVATED THEN COVER WITH ORGANIC MULCH OR OVERSEED

ALLOW FOLIAGE TO GROW & TURN YELLOW BEFORE MOWING

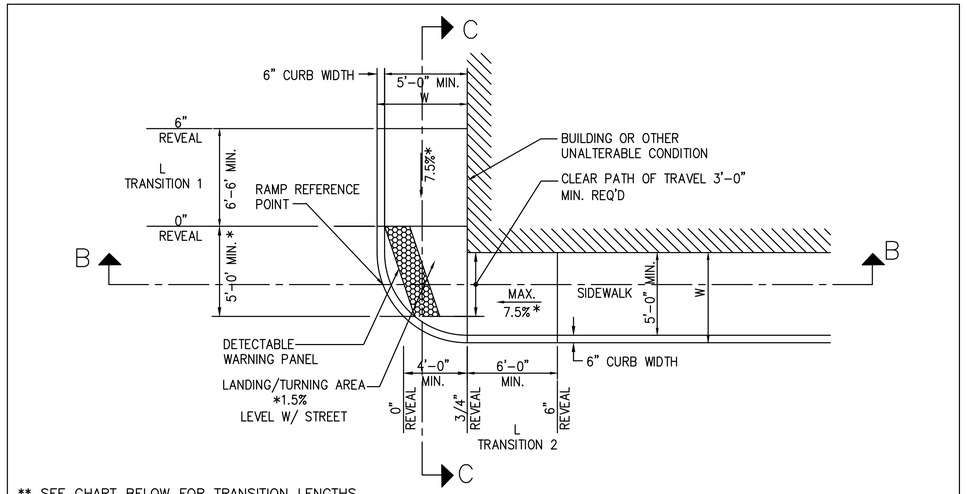




PLAN VIEW

TREE PROTECTION (EXISTING TREES)
N.T.S

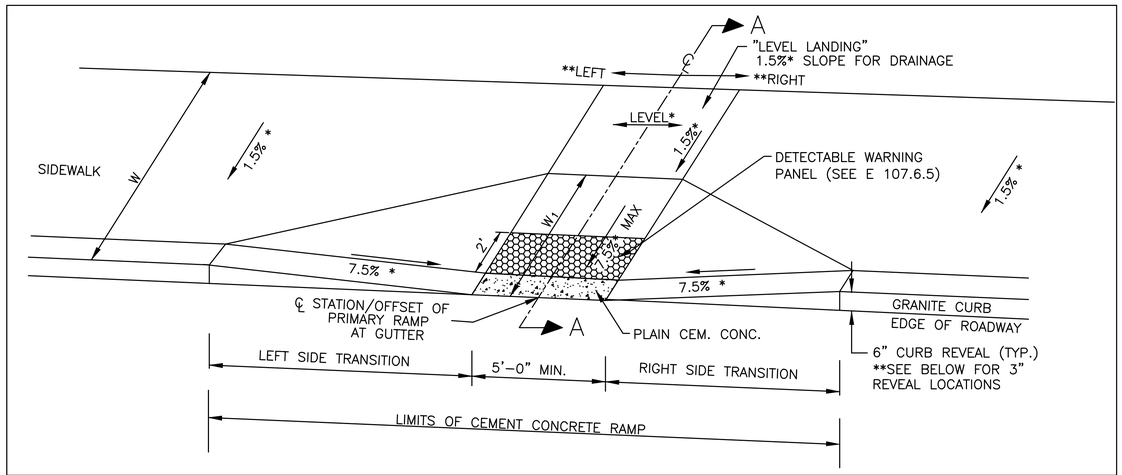
606189HD13(WCR AND DRIVEWAYS).DWG Plotted on 24 August 2018 10:31 AM



** SEE CHART BELOW FOR TRANSITION LENGTHS.

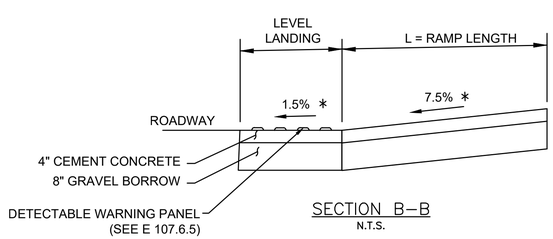
WCR #	℄ STATION/OFFSET OF PRIMARY RAMP AT GUTTER	WIDTH OF RAMP OPENING (MIN. 5.00')	WIDTH OF SIDEWALK 1 (W)	TRANSITION 1		WIDTH OF SIDEWALK 2 (INCL. CURB) (W)	TRANSITION 2	
				L	%		L	%
NESMITH STREET BASELINE								
25	9+93.40 / 28.00' LT	5.95'	5.38'	6.50'	+7.6%	5.50'	6.50'	−3.0%

"T" INTERSECTION
WHEELCHAIR RAMP



WCR #	℄ STATION/OFFSET OF PRIMARY RAMP AT GUTTER	LENGTH OF PRIMARY RAMP (W1)	DEPTH OF LEVEL LANDING (Min. 4.00')	WIDTH OF RAMP OPENING (MIN. 5.00')	WIDTH OF SIDEWALK (W)	TRANSITION LENGTH AND SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						LENGTH	%	LENGTH	%
ROGERS STREET BASELINE									
12	2+86.89 / 36.46' RT	8.33'	4.00'	5.00'	16.00'	6.50'	+2.8%	11.00'	+2.1%
13	2+56.93 / 25.62' RT	8.33'	4.00'	5.00'	13.13'	6.50'	+1.8%	9.00'	+1.3%
15	4+04.50 / 38.45' LT	8.33'	4.00'	6.00'	N/A	N/A	N/A	N/A	N/A
NESMITH STREET (ROUTE 38) BASELINE									
23	4+57.74 / 40.67' RT	8.33'	5.56'	5.00'	13.89'	15.00'	−5.6%	6.50'	−6.2%
E. MERRIMACK ST. (WEST) BASELINE									
29	71+60.49 / 24.80' RT	8.33'	4.76'	5.00'	13.09'	**12.00'	−5.8%	6.50'	−7.9%

WHEELCHAIR RAMP ON SIDEWALK WITH SIDEWALK WIDTH >12'−4"



SECTION B−B
N.T.S.

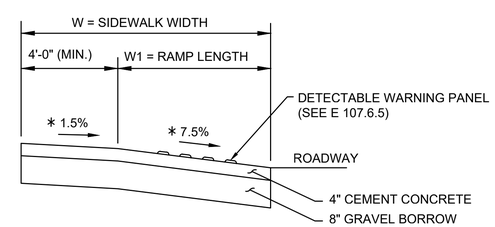
NOTES:
"LEFT" AND "RIGHT", AND "+" AND "−" DETERMINED BY STANDING IN ROAD, FACING RAMP/DRIVEWAY, AND READING LEFT TO RIGHT.

LENGTHS AND SLOPES PROVIDED NOT IN PARENTHESIS ARE AT THE GUTTER. LENGTHS AND SLOPES PROVIDED IN PARENTHESES ARE AT THE BACK OF PROPOSED SIDEWALK.

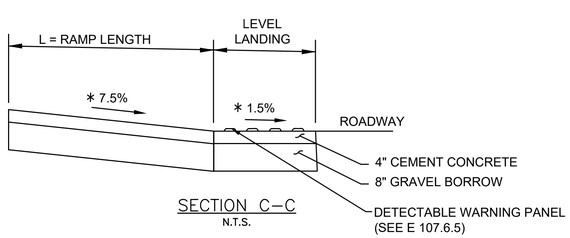
* CONSTRUCTION TOLERANCE ±0.5%.
** TRANSITIONS TO/FROM 3" REVEAL.

DETECTABLE WARNING PANELS SHALL BE INCLUDED ON ALL PROPOSED WHEELCHAIR RAMPS AS SHOWN IN THE MASSDOT CONSTRUCTION STANDARDS ISSUED IN 2017, DRAWING NOS. E 107.2.1 & E 107.6.9.

DETECTABLE WARNING PANELS ARE PAID AS AN INCIDENTAL PART OF THE WHEELCHAIR RAMP (ITEM 701.2).

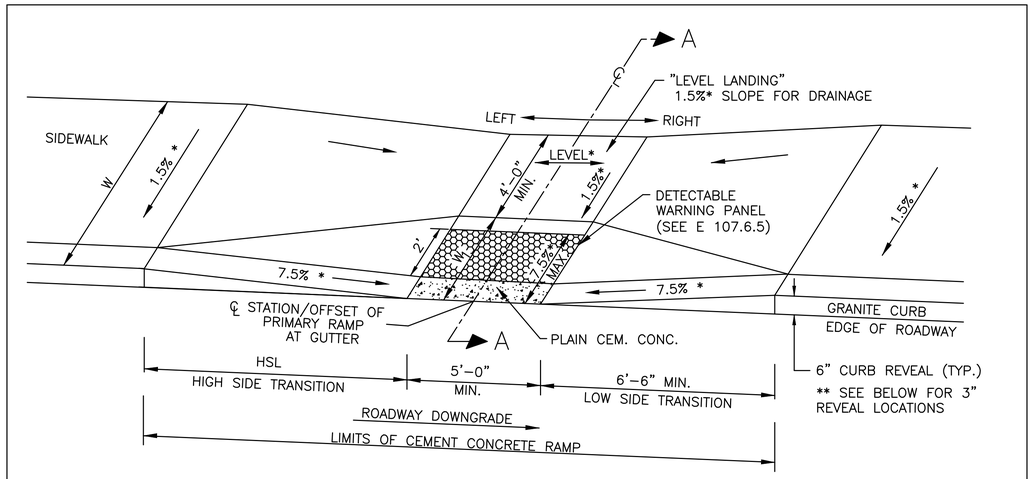


SECTION A−A
N.T.S.



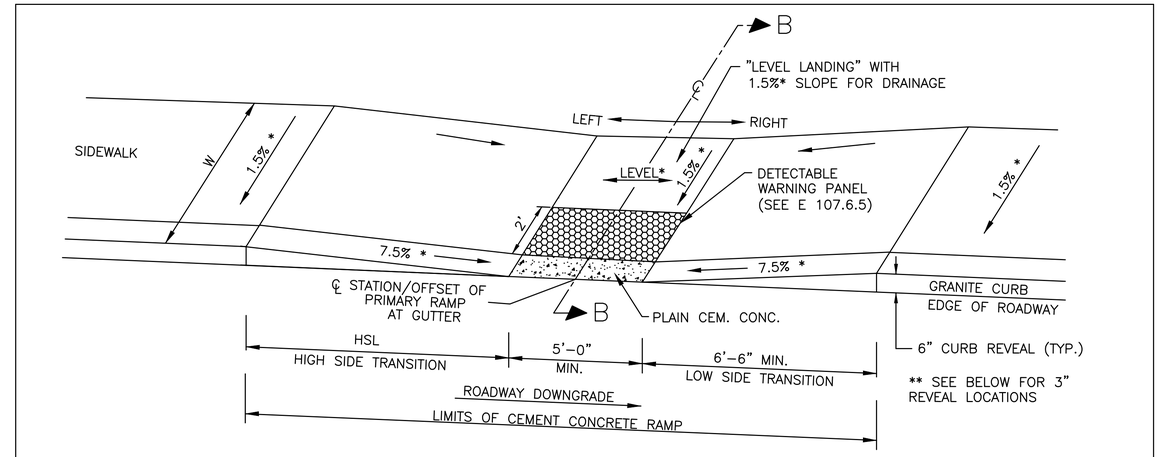
SECTION C−C
N.T.S.

606189HD13(WCR AND DRIVEWAYS).DWG Plotted on 24 August 2018 10:31 AM



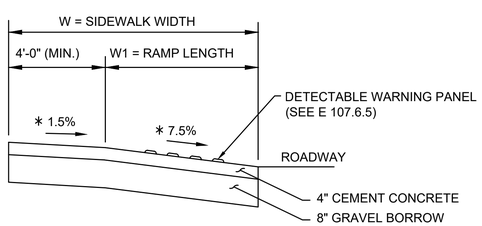
WCR #	℄ STATION/OFFSET OF PRIMARY RAMP AT GUTTER	WIDTH OF PRIMARY RAMP (W1)	WIDTH OF LEVEL LANDING (4'-0" MIN.)	WIDTH OF RAMP OPENING (MIN. 5'-0")	WIDTH OF SIDEWALK (W)	TRANSITION LENGTH AND SLOPE (%) LEFT SIDE L	LEFT SIDE %	RIGHT SIDE L	RIGHT SIDE %
ROGERS STREET BASELINE									
6	2+55.43 / 20.65' LT	3.82'	4.00'	5.00'	7.82'	9.00'	−1.3%	**3.25'	−1.5%
7	2+75.91 / 29.53' LT	3.44'	4.00'	6.35' (5.00')	7.44'	**9.22' (3.25')	+1.5%	**5.72' (4.50)'	+1.5%
10	3+69.47 / 21.41' RT	3.08'	4.00'	5.00'	7.08'	9.00'	−1.7%	**3.25'	−1.7%
14	4+15.65 / 55.71' LT	3.17'	4.00'	5.00'	7.17'	6.50'	+0.8%	7.67'	+0.8%
16	3+98.16 / 126.42' LT	4.46'	4.00'	5.00'	8.46'	9.74' (7.67')	−0.9%	6.50'	−1.9%
ANDOVER STREET (WEST) BASELINE									
19	61+86.27 / 24.00' RT	2.80'	4.00'	5.00'	6.80'	**7.50'	−6.5%	6.50'	−14.6%
NESMITH STREET (ROUTE 38) BASELINE									
18	4+78.94 / 19.46' LT	4.73'	4.00'	5.00'	8.73'	11.00'	−2.3%	**3.25'	−2.8%
26	9+53.46 / 31.66' RT	7.17'	5.00'	5.00'	12.17'	7.21' (6.55')	+1.1%	(SEE OTHER CHART)	
28	12+65.36 / 24.08' LT	4.50'	5.50'	5.00'	10.00'	**7.50'	−7.6%	**3.25'	−8.3%
33	14+01.29 / 55.72' LT	4.19'	4.00'	6.00' (5.00')	8.19'	7.71' (6.50')	+3.9%	10.86' (9.00')	+1.8%
34	13+60.07 / 31.63' RT	3.62'	4.00'	5.00'	7.62'	6.50'	+6.4%	15.00'	+4.4%
E. MERRIMACK ST. (EAST) BASELINE									
35	80+41.34 / 17.04' LT	3.18'	4.00'	5.41' (5.00')	7.18'	7.60' (6.50')	+9.3%	16.68' (15.00')	+3.8%

WHEELCHAIR RAMP ON SIDEWALK
(DEPTH BETWEEN 6'-6" AND 12'-3")



WCR #	℄ STATION/OFFSET OF PRIMARY RAMP AT GUTTER	WIDTH OF LEVEL LANDING (4'-0" MIN.)	WIDTH OF RAMP OPENING (MIN. 5'-0")	WIDTH OF SIDEWALK (W)	TRANSITION LENGTH AND SLOPE (%) LEFT SIDE L	LEFT SIDE %	RIGHT SIDE L	RIGHT SIDE %
ROGERS STREET BASELINE								
1	11+60.84 / 32.51' LT	5.60'	6.56' (5.00')	5.60'	18.43' (15.00')	−4.4%	8.18' (6.50')	−7.0%
2	12+10.43 / 34.66' LT	5.81'	5.78' (5.00')	5.81'	7.58' (6.50')	+0.2%	**3.25' (3.80')	−0.6%
3	12+37.44 / 22.67' LT	5.96'	5.70 (5.00')	5.96'	**5.08' (4.50')	−1.2%	**3.25'	−1.2%
4	12+57.33 / 32.73' RT	5.80'	6.33' (5.00')	5.80'	**4.15' (3.25')	+0.8%	14.06' (11.00')	+2.8%
5	11+80.74 / 27.94' RT	6.26'	6.23' (5.00')	6.26'	–	–	9.00'	+1.8%
NESMITH STREET (ROUTE 38) CONSTRUCTION BASELINE								
20	5+89.38 / 24.01' LT	5.50'	5.98' (5.00')	5.50'	**4.49' (3.25)'	+0.6%	6.50'	−3.4%
24	9+52.34 / 31.57' LT	6.12'	5.00'	6.12'	21.11' (15.00')	−6.0%	6.50'	−7.4%
NESMITH STREET (ROUTE 38) BASELINE OF LOCATION								
39	40+70.11 / 32.02' LT	6.30'	5.00'	6.30'	15.00'	−3.2%	**3.25'	−3.2%
ROGERS STREET BASELINE								
8	3+35.28 / 32.45' LT	6.00'	6.25' (5.00')	6.00'	–	–	9.59' (7.67')	+0.5%
9	3+62.30 / 25.00' LT	6.00'	5.00'	6.00'	7.05' (6.50')	+0.7%	7.67'	+0.7%
11	3+42.90 / 35.81' RT	5.88'	6.54' (5.00')	5.88'	**15.87' (12.00')	−3.9%	8.58' (6.50')	−6.5%
17	4+22.70 / 112.56' LT	5.42'	5.00'	5.42'	6.50'	+1.4%	9.00'	+1.4%
ANDOVER STREET (WEST) BASELINE								
38	61+66.50 / 27.02' LT	5.50'	6.90' (5.00')	5.50'	6.50'	+15.1%	**5.29' (3.83')	+0.5%
E. MERRIMACK ST. (EAST) BASELINE								
36	80+67.61 / 27.07' RT	6.50'	8.82' (5.00')	6.50'	12.32' (6.98')	+3.6%	20.66' (15.00')	+4.1%

WHEELCHAIR RAMP ON NARROW SIDEWALK
(WIDTH LESS THAN 6'-6")



SECTION A–A
N.T.S.

NOTES:
"LEFT" AND "RIGHT", AND "+" AND "–" DETERMINED BY STANDING IN ROAD, FACING RAMP/DRIVEWAY, AND READING LEFT TO RIGHT.

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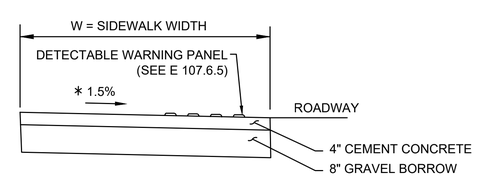
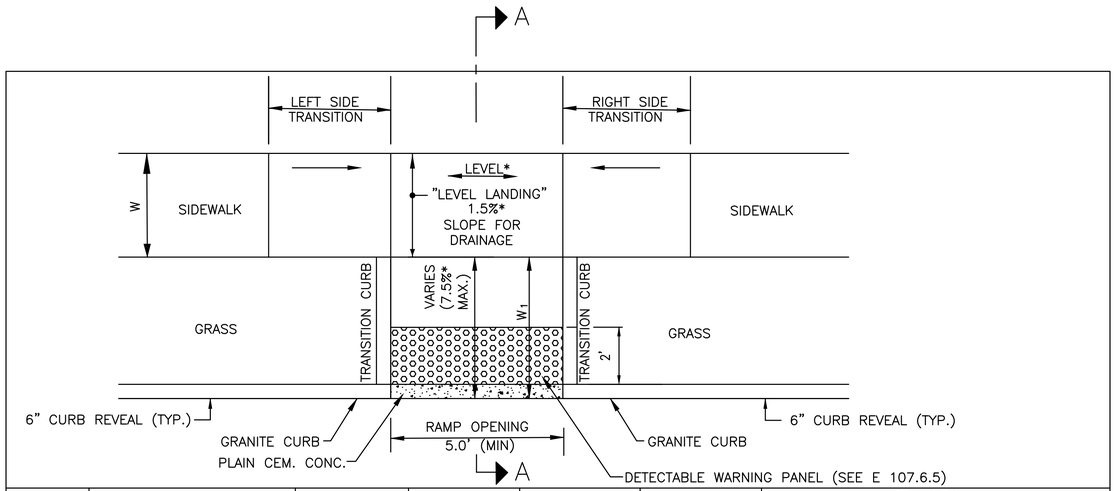
DETECTABLE WARNING PANELS ARE PAID AS AN INCIDENTAL PART OF THE WHEELCHAIR RAMP (ITEM 701.2).

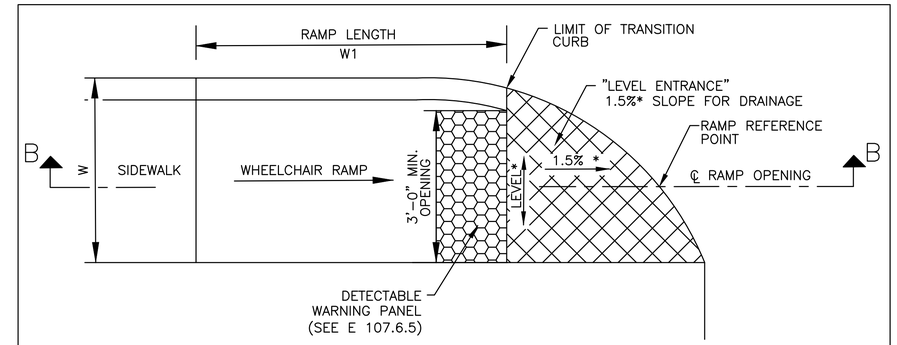


SECTION B–B
N.T.S.



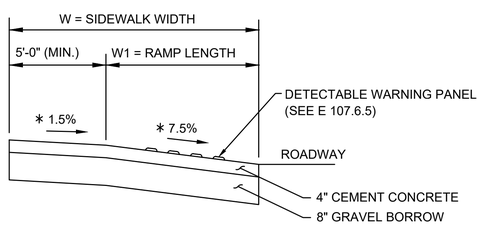
WCR #	RAMP REFERENCE POINT		LENGTH OF PRIMARY RAMP (W1)	WIDTH OF SIDEWALK (W)	WIDTH OF RAMP OPENING 5'–0" (MIN.)	DEPTH OF LEVEL LANDING 4–0" (MIN.)	TRANSITION LENGTH AND SLOPE (%)			
							LEFT SIDE		RIGHT SIDE	
	STATION	OFFSET					LENGTH	%	LENGTH	%
NESMITH STREET (ROUTE 38) BASELINE										
21	5+85.69	24.00' RT	6.41'	5.00'	5.00'	5.00'	(7.67')	+4.0%	(15.00')	+5.0%
26	9+53.46	31.66' RT	7.17'	5.00'	5.00'	5.00'	(SEE OTHER CHART)		8.08'	+4.6%
ANDOVER STREET (EAST) BASELINE										
22	50+52.77	24.17' LT	10.51'	5.00'	5.00'	5.00'	6.50'	(+8.99%)	15.00'	(+10.6%)

WHEELCHAIR RAMP WITH LANDSCAPING STRIP

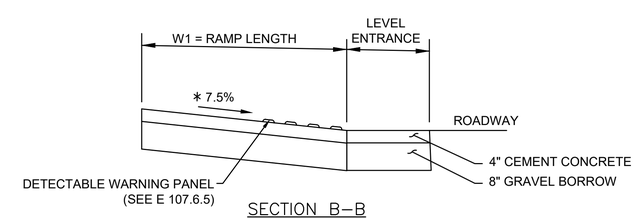


WCR #	RAMP REFERENCE POINT		WIDTH OF SIDEWALK (W)	WIDTH OF RAMP OPENING (MIN. 3'–0")	ROADWAY GUTTER SLOPE	LENGTH OF RAMP (W1)
	STATION	OFFSET				
NESMITH STREET (ROUTE 38) BASELINE						
37	2+62.64	28.45' RT	5.00'	3.00'	+1.4%	7.56' (6.50')
27	9+20.83	30.65' RT	5.00'	3.00'	+2.5%	16.99' (17.94')
40	2+29.03	25.69' RT	5.43	5.47'	+2.5%	6.50' (7.18')

WHEELCHAIR RAMP FOR ONE CONTINUOUS DIRECTION OF TRAVEL



SECTION A–A
N.T.S.



SECTION B–B
N.T.S.

NOTES:
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** TRANSITIONS TO/FROM 3" REVEAL.

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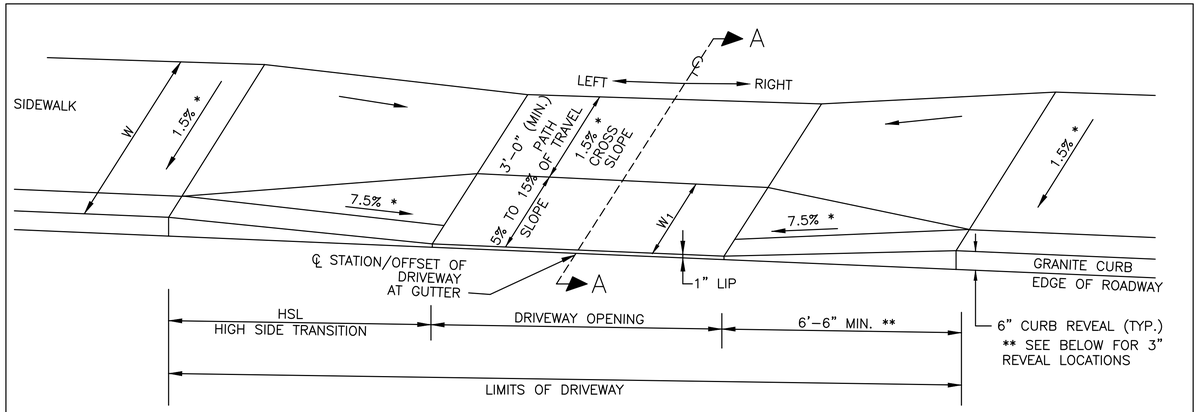
DETECTABLE WARNING PANELS ARE PAID AS AN INCIDENTAL PART OF THE WHEELCHAIR RAMP (ITEM 701.2).

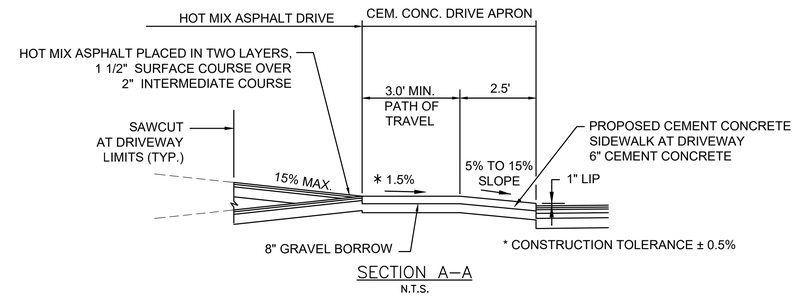
606189HD13(WCR AND DRIVEWAYS).DWG Plotted on 24 August 2018 10:31 AM

606189HD13(WCR AND DRIVEWAYS).DWG Plotted on 24 August 2018 10:31 AM



	℄ STATION/OFFSET OF PRIMARY RAMP AT GUTTER	WIDTH OF DRIVEWAY OPENING	WIDTH OF PRIMARY RAMP (W1)	WIDTH OF PATH OF TRAVEL	WIDTH OF SIDEWALK (W)	TRANSITION LENGTH AND SLOPE (%)			
						LEFT SIDE		RIGHT SIDE	
						%	L	%	L
ROGERS STREET BASELINE									
1	STA: 4+52.64 / 31.92' LT	18.68'	3.04'	4.00'	7.04'	+0.4%	6.50'	+0.1%	11.35'
FAIRMOUNT STREET BASELINE									
2	STA: 10+58.75 / 21.68' LT	25.45'	4.00'	5.45'	9.45'	+2.5%	**3.25'	+2.1%	11.00'
3	STA: 11+27.22 / 16.24' RT	26.44'	4.79'	3.00'	7.79'	−1.4%	9.00'	−0.7%	6.50'
NESMITH STREET (ROUTE 38) BASELINE									
4	STA: 4+46.93 / 19.49' LT	15.2'	2.50'	6.04'	8.54'	−1.8%	9.00'	−1.2%	6.50'
5	STA: 6+63.46 / 24.00' LT	21.4'	2.50'	3.00'	5.50'	−2.9%	11.00'	−2.9%	6.50'
6	STA: 8+31.70 / 24.00' LT	18.4'	2.50'	3.00'	5.50'	−2.5%	11.00'	−2.6%	6.50'
7	STA: 10+30.12 / 24.00' RT	36.3'	2.50'	3.55'	6.05'	+4.0%	6.50'	+3.2%	14.00'
8	STA: 11+17.77 / 24.00' LT	21.3'	2.50'	3.00'	5.50'	−4.1%	15.00'	−3.8%	6.50'
9	STA: 12+29.34 / 24.00' LT	22.4'	2.50'	3.00'	5.50'	−5.2	15.00'	−6.2%	**3.25'
10	STA: 12+94.14 / 28.62' LT	17.6'	10.46'	5.00'	15.46'	−6.0%	**7.50'	−5.7	**3.25'
E. MERRIMACK STREET (WEST)									
11	STA: 70+80.98 / 21.03' RT	10.4'	2.00'	4.41'	6.41'	−4.8%	15.00'	−4.1%	6.50'

DRIVEWAY APRON THROUGH SIDEWALK



SECTION A–A
N.T.S.

NOTES:

REFER TO MASSDOT STANDARD DRAWING E107.7.0.

"LEFT" AND "RIGHT", AND "+" AND "−" DETERMINED BY STANDING IN ROAD, FACING RAMP/DRIVEWAY, AND READING LEFT TO RIGHT.

* CONSTRUCTION TOLERANCE ±0.5%.

** TRANSITIONS TO/FROM 3" REVEAL

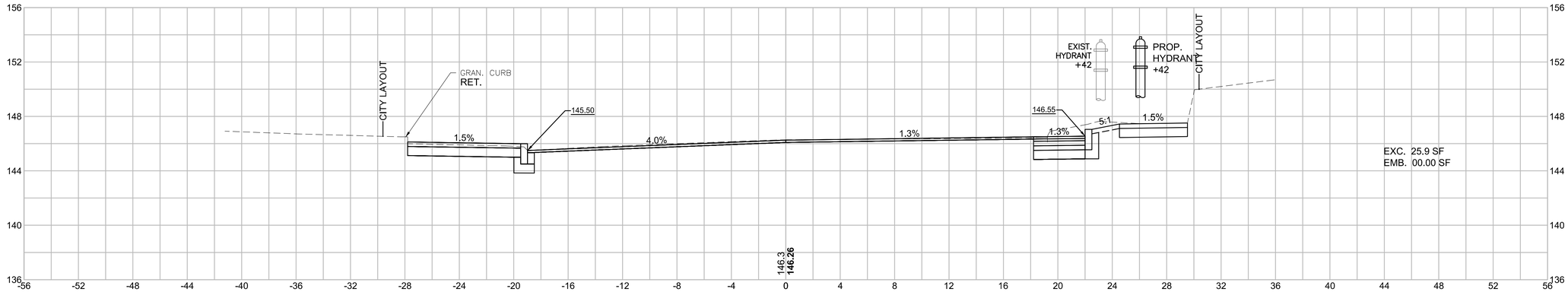
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	67	96
PROJECT FILE NO.	606189		

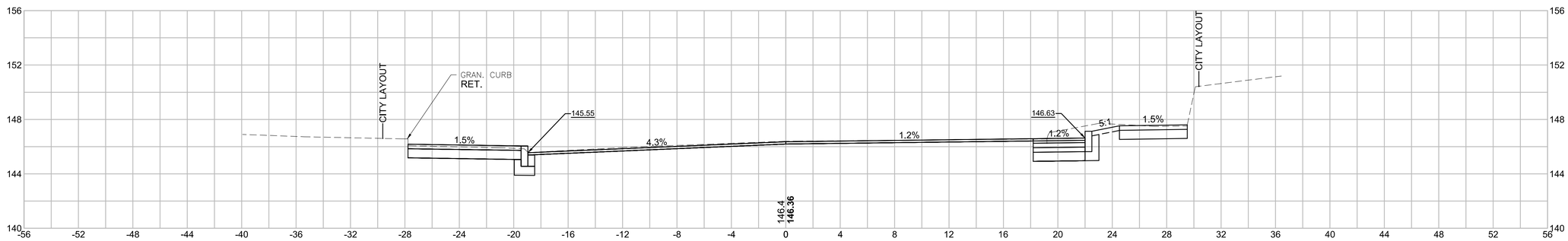
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

3+00 - BEGIN CROSS-SLOPE TRANSITION LT, -4.0% TO -5.0%.
3+00 - END CROSS-SLOPE TRANSITION LT, -4.9% TO -4.0%.

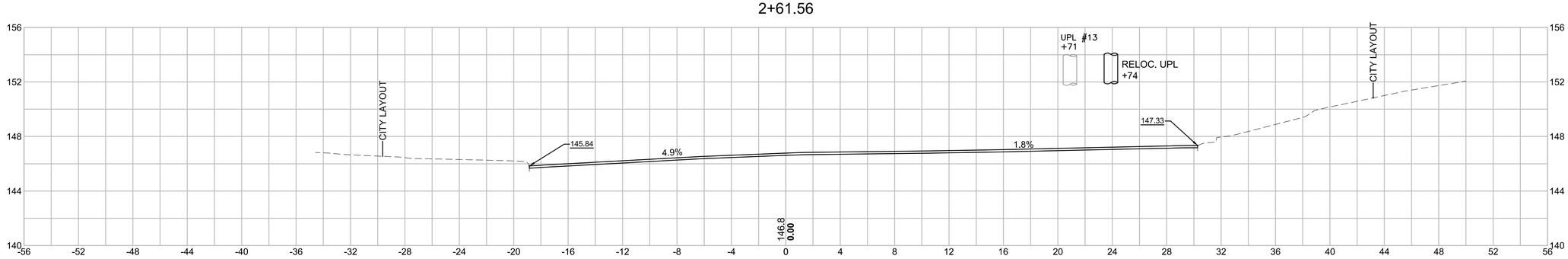


2+92.47 - WALKWAY / STAIRS LT



2+90 - BEGIN CROSS-SLOPE TRANSITION RT, +1.2% TO 4.0%.
2+90 - END CROSS-SLOPE TRANSITION RT, +1.8% TO +1.2%.
2+75 - BEGIN CROSS-SLOPE TRANSITION LT, -4.9% TO -4.0%
- LIMIT OF WORK, BEGIN CROSS-SLOPE TRANSITION RT, +1.80% TO +1.2%

2+61.56



4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

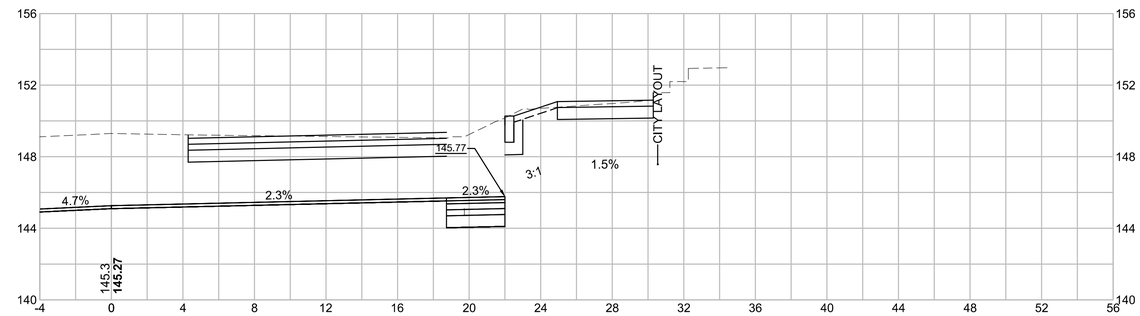
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	68	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

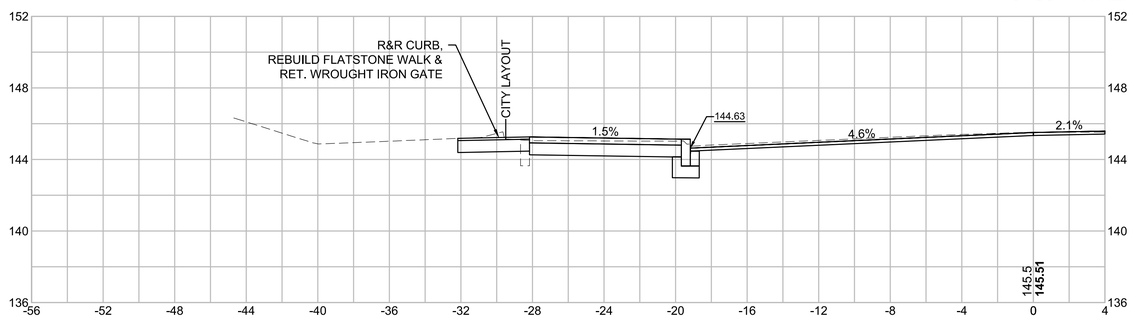
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

- STAIRS RT

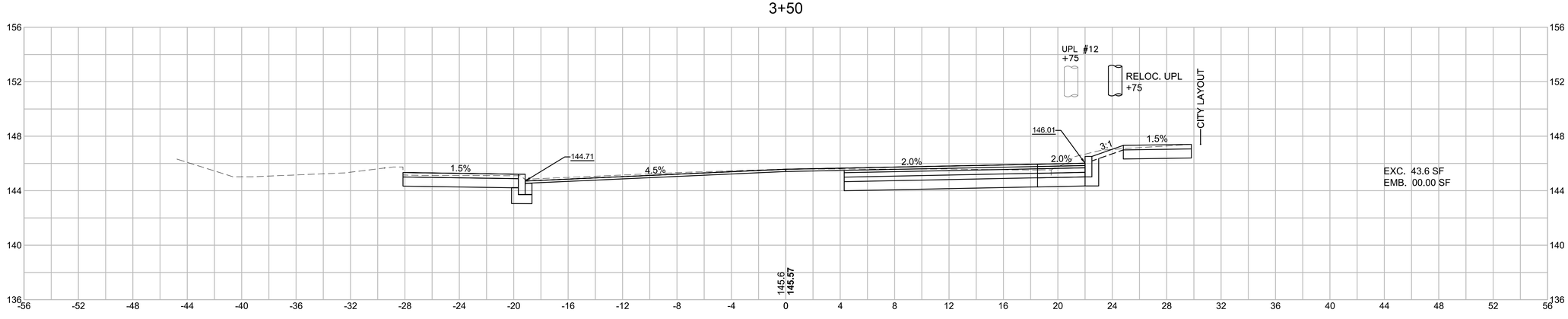
3+72.50



3+55 - WALKWAY LT



3+50



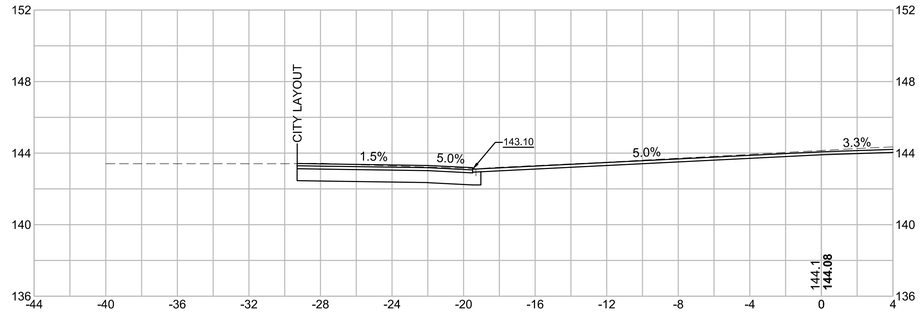
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

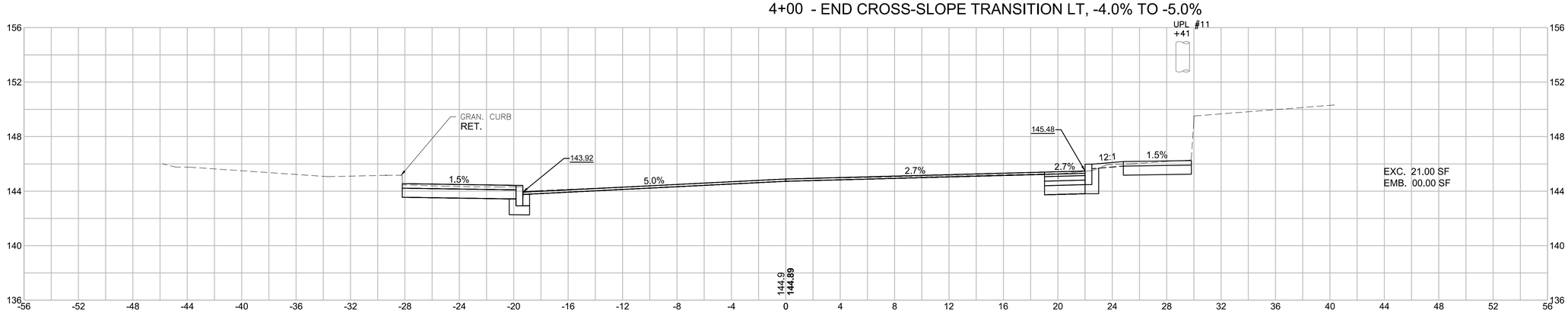
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	69	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

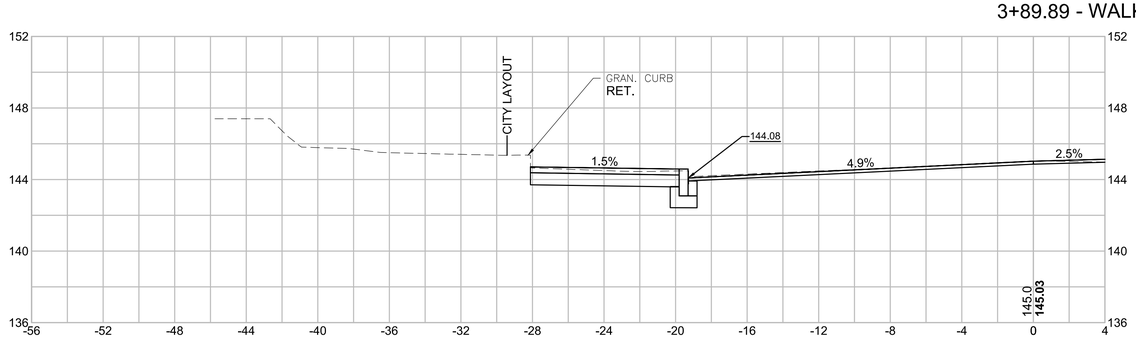
4+45.77 - DRIVEWAY LT



4+00 - END CROSS-SLOPE TRANSITION LT, -4.0% TO -5.0%



3+89.89 - WALKWAY / STAIRS LT



4 0 4 8
SCALE IN FEET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

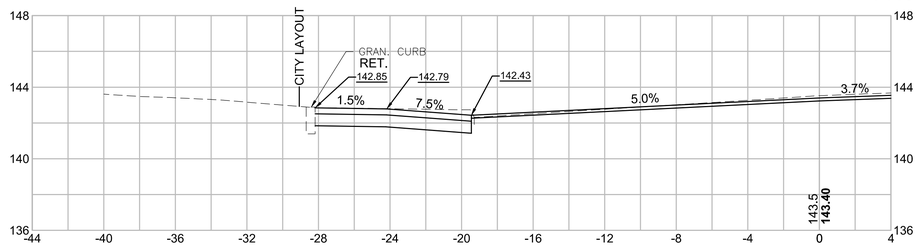
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	70	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

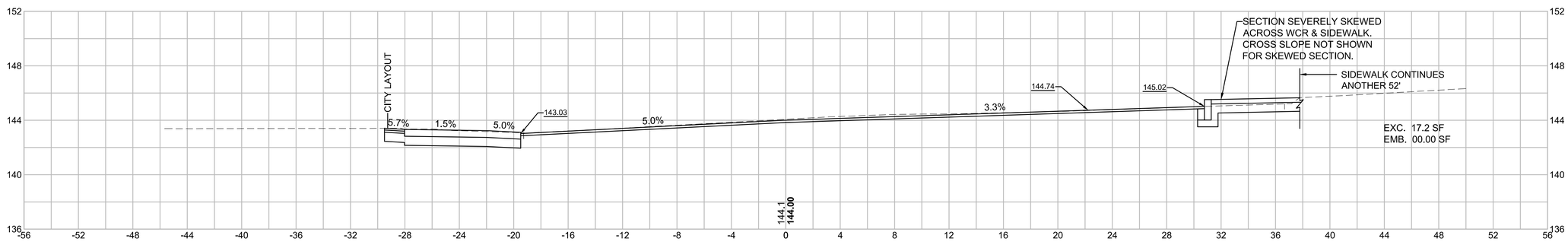
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

4+80 - BEGIN CROSS-SLOPE TRANSITION LT, -5.0% TO -6.0%

4+78.72 - PROP. WCR / EXIST. WALKWAY LT



4+50



4 0 4 8
SCALE IN FEET

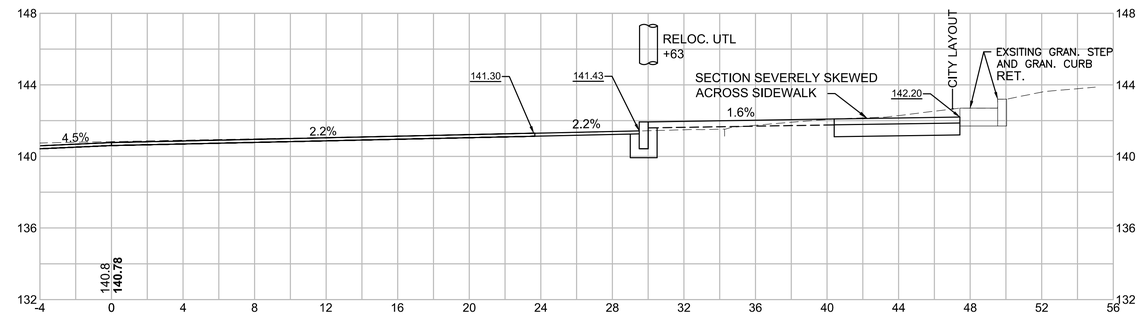
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	71	96
PROJECT FILE NO.	606189		

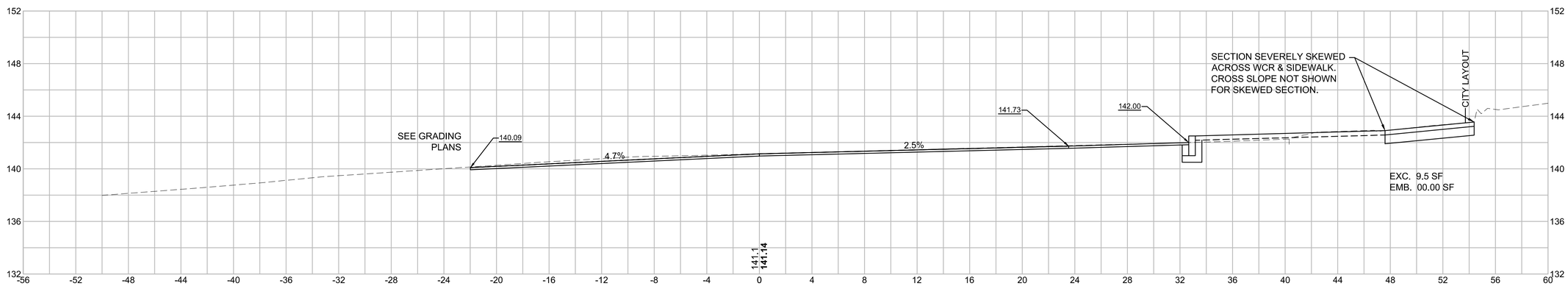
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

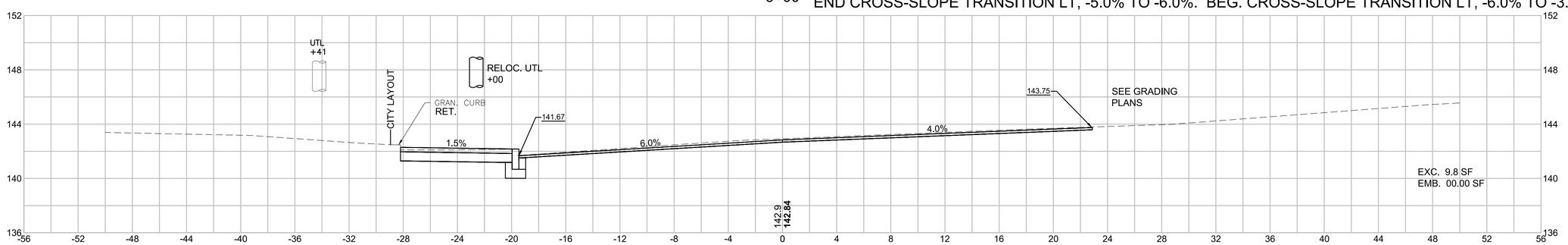
5+60 - GRANITE STEPS RT



5+50



5+00 - END CROSS-SLOPE TRANSITION RT, +1.2% TO +4.0%. BEG. CROSS-SLOPE TRANSITION RT, +4.0% TO -2.0%. END CROSS-SLOPE TRANSITION LT, -5.0% TO -6.0%. BEG. CROSS-SLOPE TRANSITION LT, -6.0% TO -3.0%.



4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

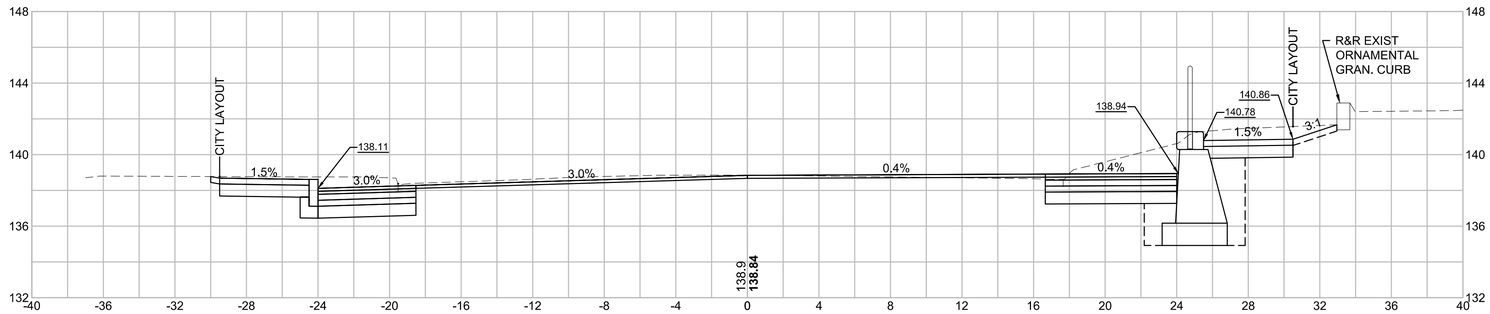
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	72	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

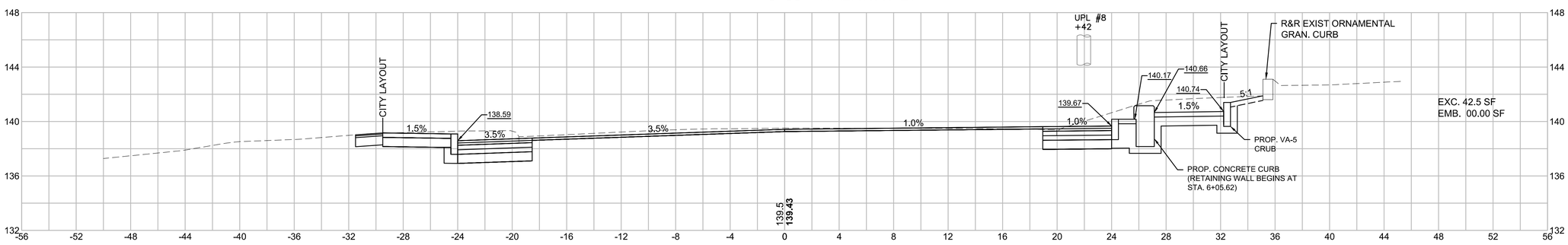
6+20 - END CROSS-SLOPE TRANSITION LT, -6.0% TO -3.0%

6+19.24 - CEM. STONE MASONARY WALL RT



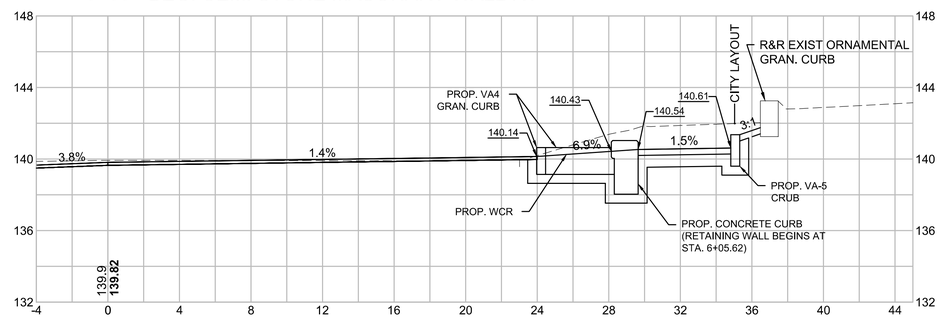
EXC. 42.5 SF
EMB. 00.00 SF
CL. "A" TR. EXC. 28.5 SF

6+00 - WALKWAY LT



EXC. 42.5 SF
EMB. 00.00 SF

5+88 - BEG. CEM. STONE MASONARY WALL RT



4 0 4 8
SCALE IN FEET

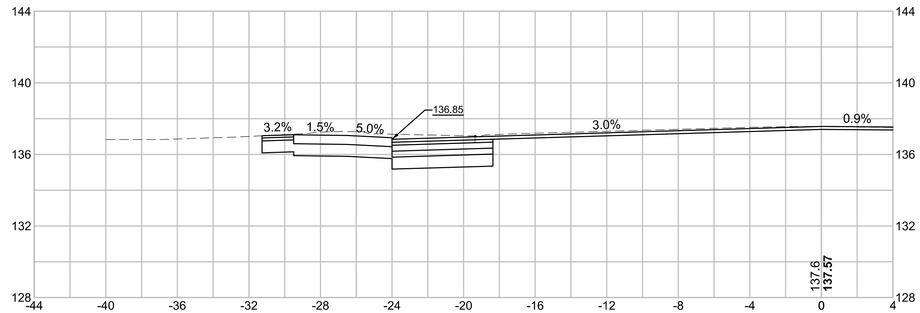
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	73	96
PROJECT FILE NO.	606189		

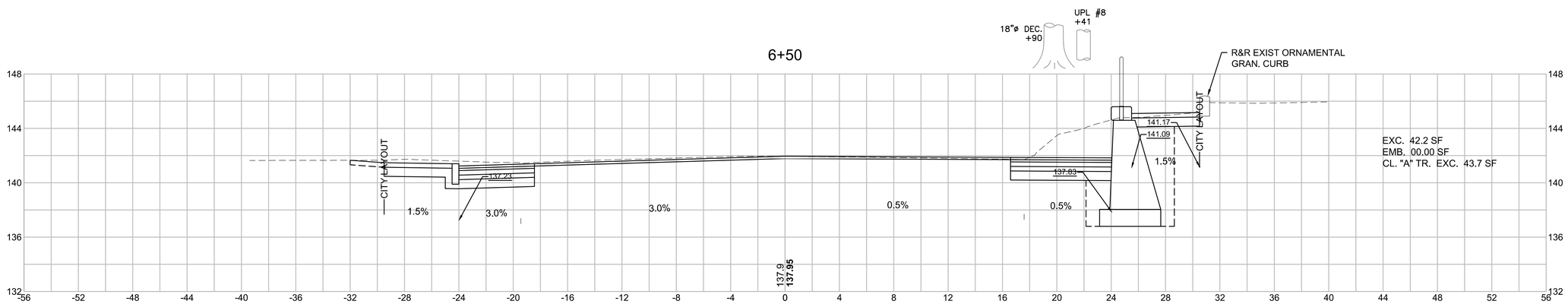
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:09 AM

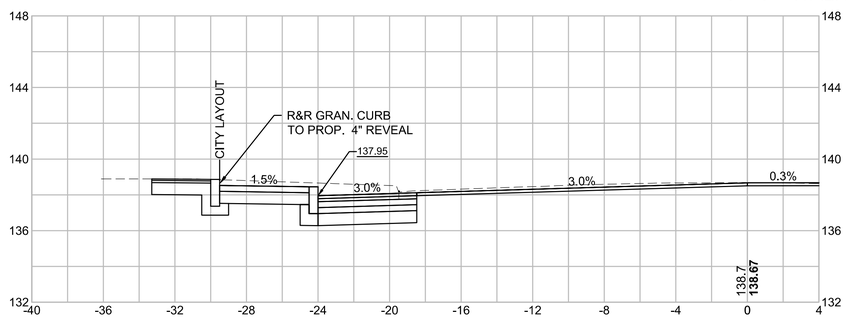
6+63.33 - DRIVEWAY LT



6+50



6+25 - WALKWAY / STEPS LT



4 0 4 8
SCALE IN FEET

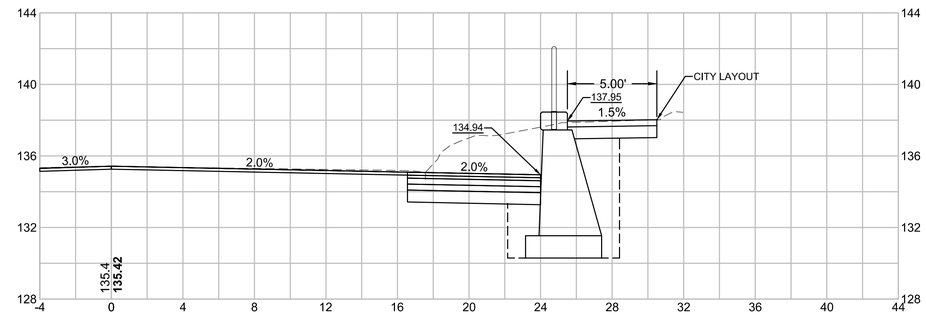
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	74	96
PROJECT FILE NO.	606189		

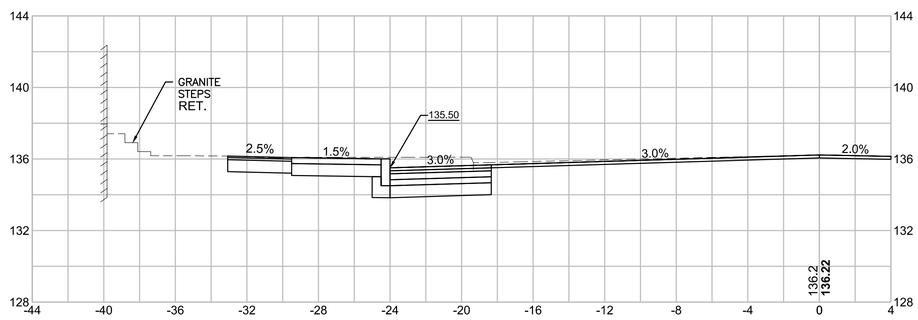
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:09 AM

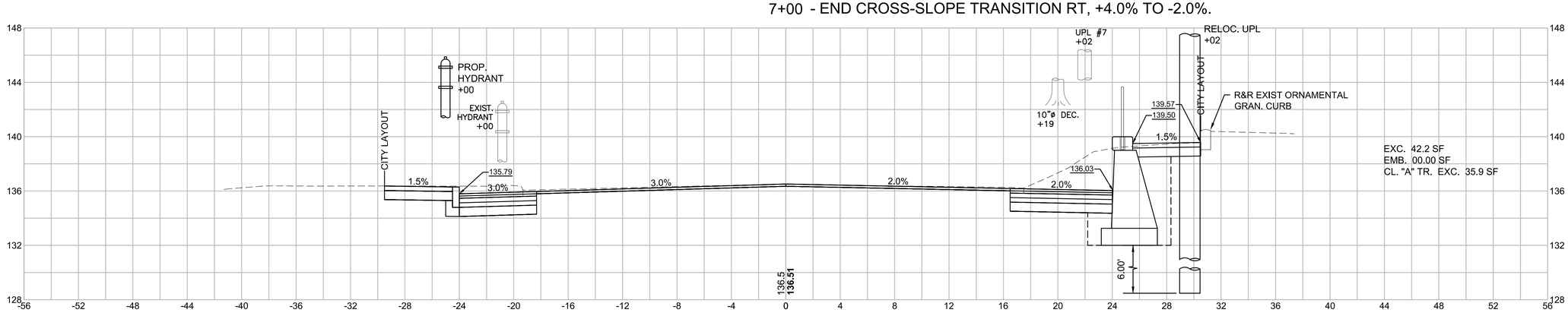
7+37.85 - STEPS RT



7+10.05 - WALKWAY / STEPS LT



7+00 - END CROSS-SLOPE TRANSITION RT, +4.0% TO -2.0%.



4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

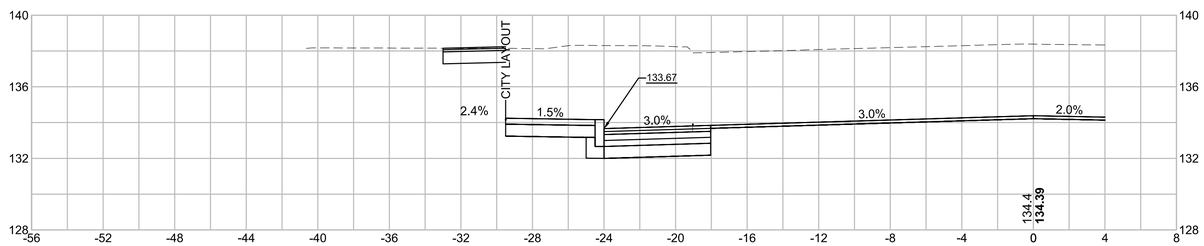
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	75	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

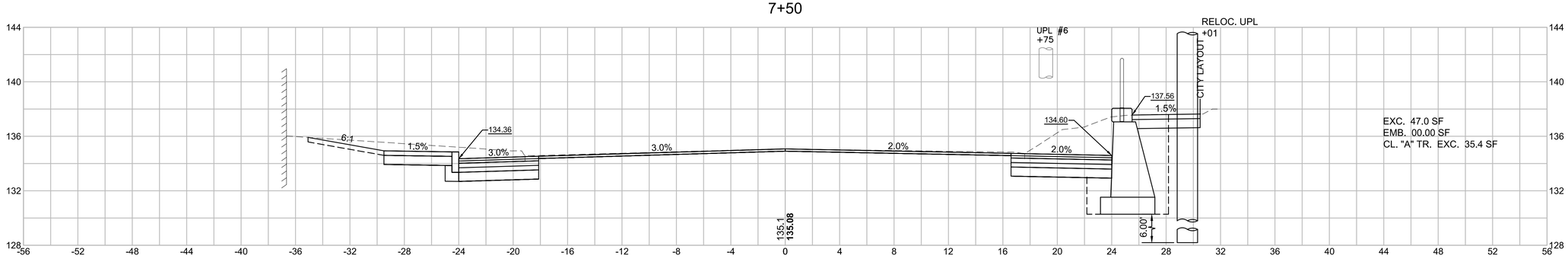
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

7+75 - BEGIN CROSS-SLOPE TRANSITION LT, -3.0% TO -2.3%
- WALKWAY LT

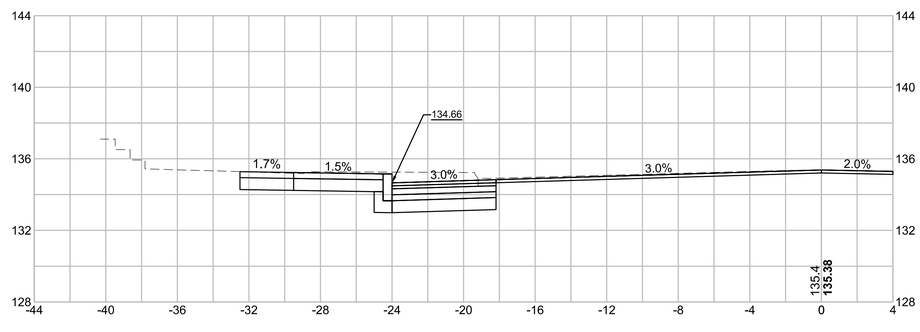
7+74



7+50



7+39.46 - WALKWAY / STEPS LT



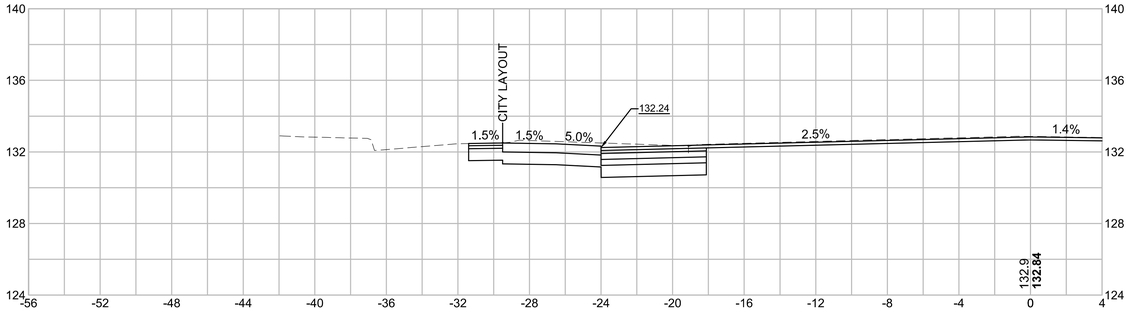
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	76	96
PROJECT FILE NO.	606189		

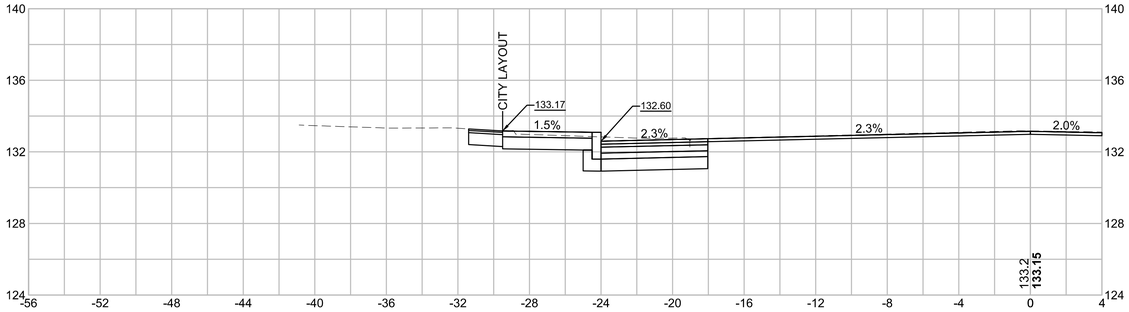
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

8+31.70 - DRIVEWAY LT



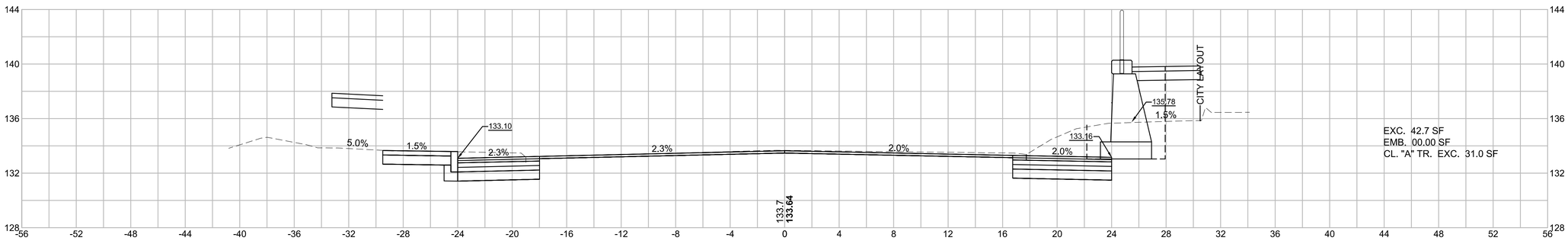
8+25 - BEGIN CROSS-SLOPE TRANSITION LT, -2.3% TO -3.0%

8+19.50 - WALKWAY LT



- WALKWAY / STEPS LT, END CROSS-SLOPE TRANSITION LT, -3.0% TO -2.3%

8+00



4 0 4 8
SCALE IN FEET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

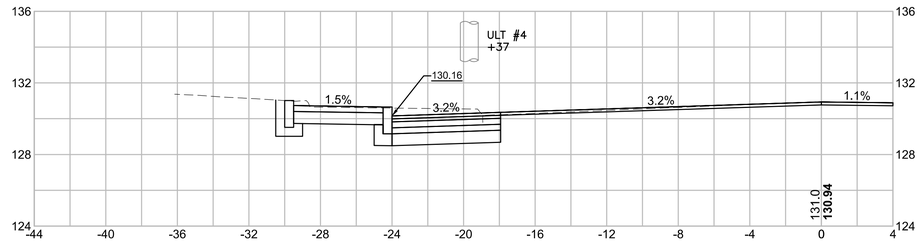
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	77	96
PROJECT FILE NO.	606189		

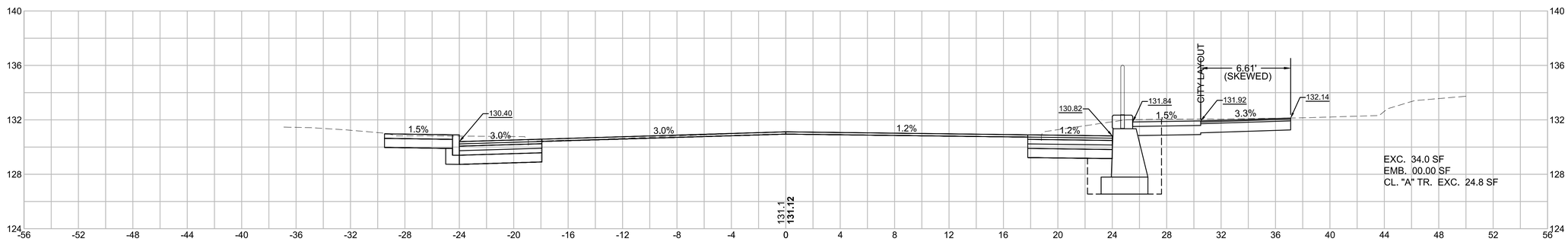
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

9+07.17 - WALKWAY / STEPS LT

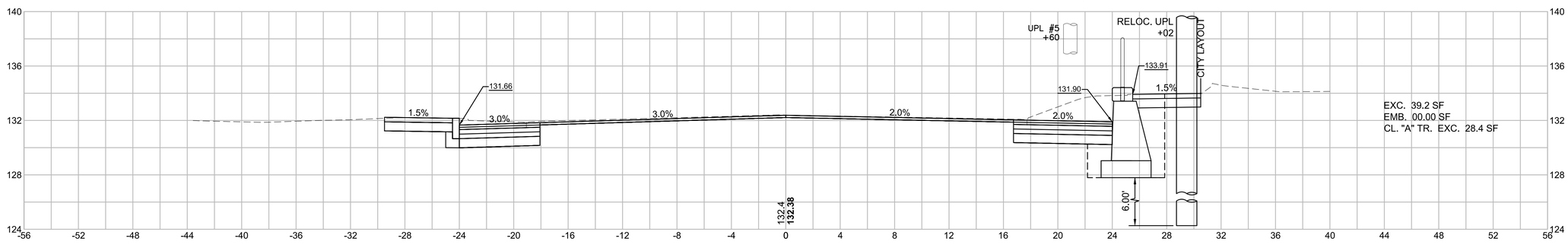


9+00 - BEGIN CROSS-SLOPE TRANSITION LT, -3.0% TO -4.7%



8+50 - BEGIN CROSS-SLOPE TRANSITION RT, -2.0% TO -1.1%.

8+50 - END CROSS-SLOPE TRANSITION LT, -2.3% TO -3.0%



4 0 4 8
SCALE IN FEET

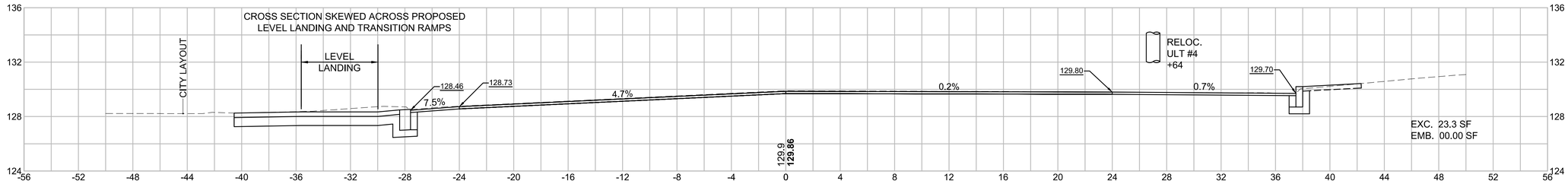
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	78	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

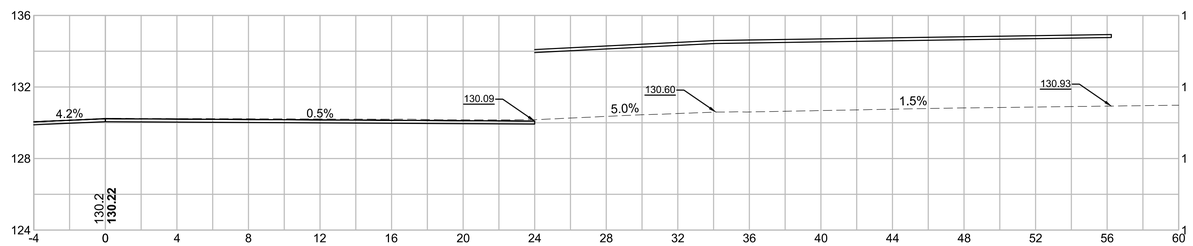
9+50 - BEGIN CROSS-SLOPE TRANSITION LT, -4.7% TO -3.0%

9+50 - END CROSS-SLOPE TRANSITION LT, -3.0% TO -4.7%



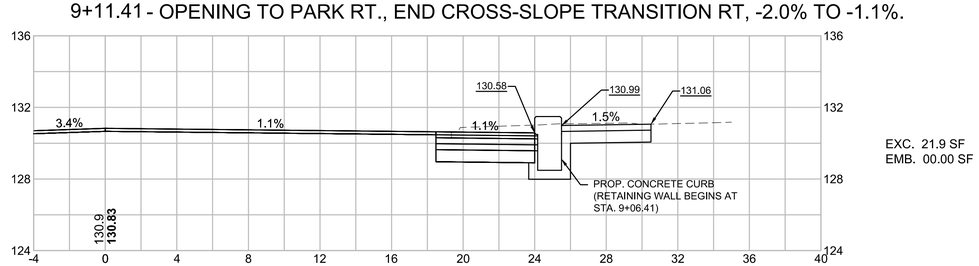
- CHESTNUT STREET RT

9+35.52



9+11.41 - BEGIN CROSS-SLOPE TRANSITION RT, -1.1% TO +2.0%.

9+11.41 - OPENING TO PARK RT., END CROSS-SLOPE TRANSITION RT, -2.0% TO -1.1%.



4 0 4 8
SCALE IN FEET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:10 AM

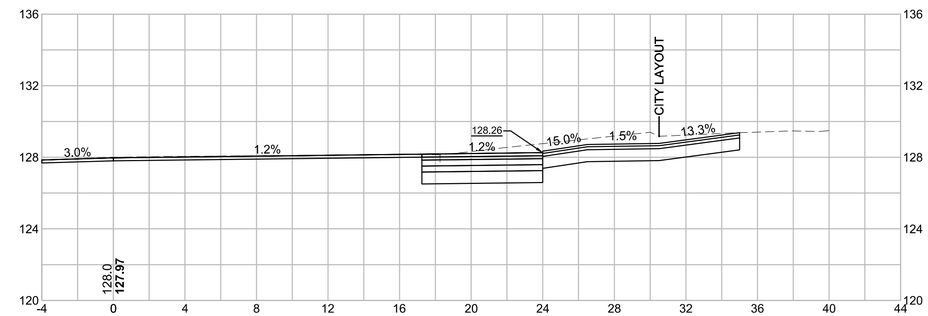
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	79	96
PROJECT FILE NO.	606189		

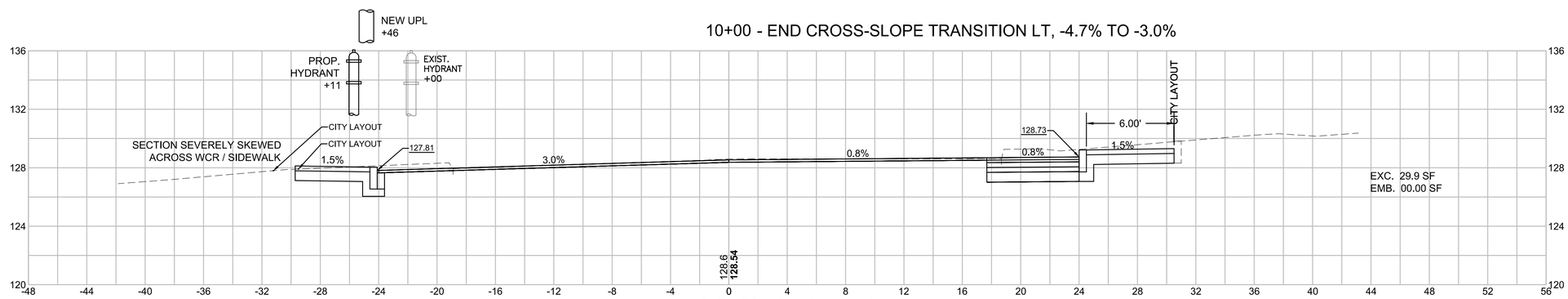
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

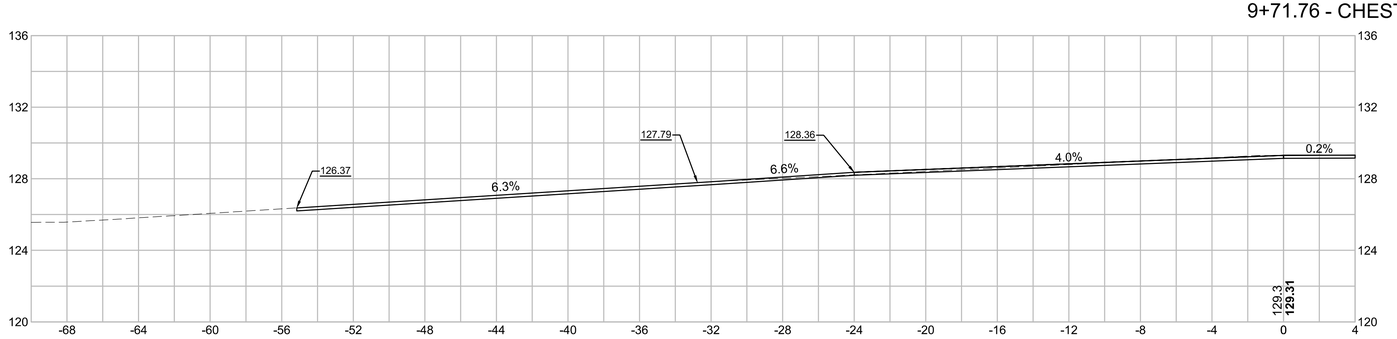
10+17.97 - DRIVEWAY RT



10+00 - END CROSS-SLOPE TRANSITION LT, -4.7% TO -3.0%



9+71.76 - CHESTNUT STREET LT



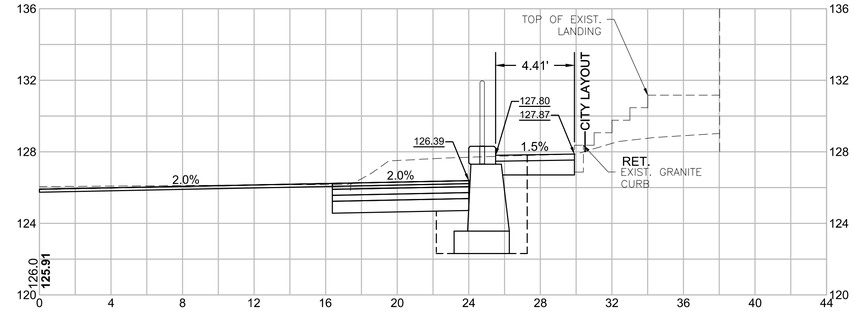
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	80	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

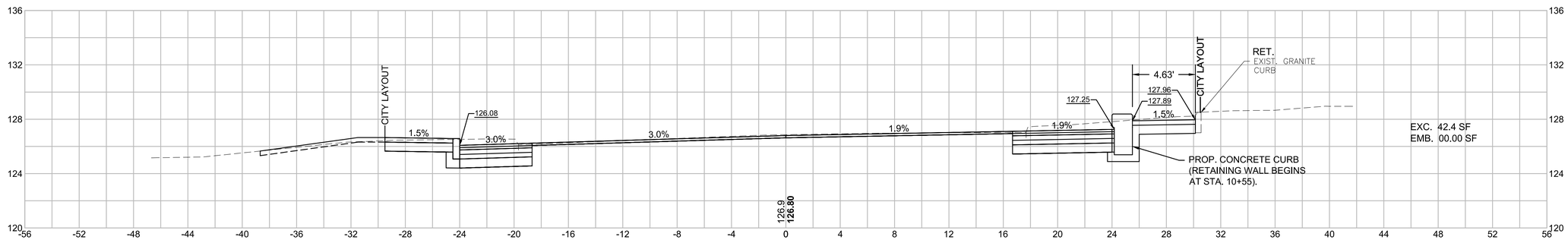
10+71.50 - STEPS RT



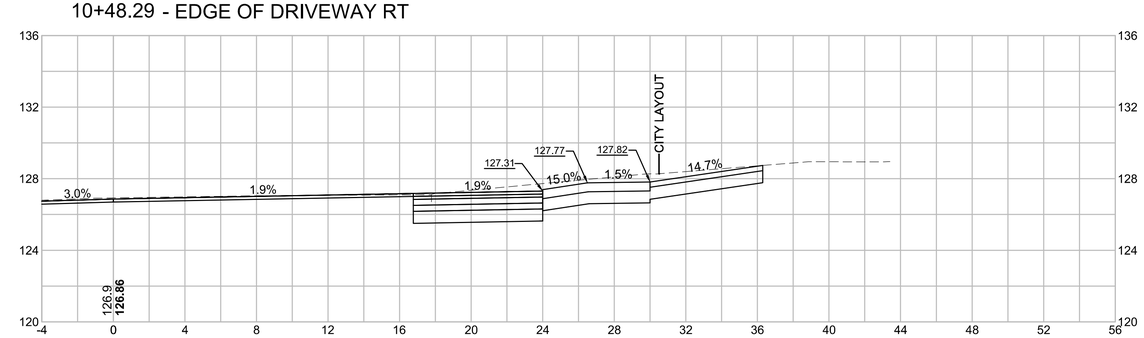
10+65 - BEGIN CROSS-SLOPE TRANSITION LT, -3.0% TO -2.0%

10+55 - END CROSS-SLOPE TRANSITION RT, -1.1% TO +2.0%.

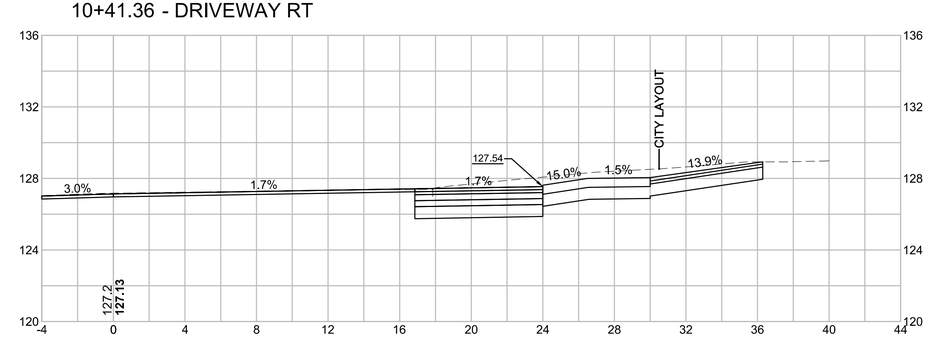
10+50 - BEG. OF WALL RT



10+48.29 - EDGE OF DRIVEWAY RT



10+41.36 - DRIVEWAY RT



4 0 4 8
SCALE IN FEET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

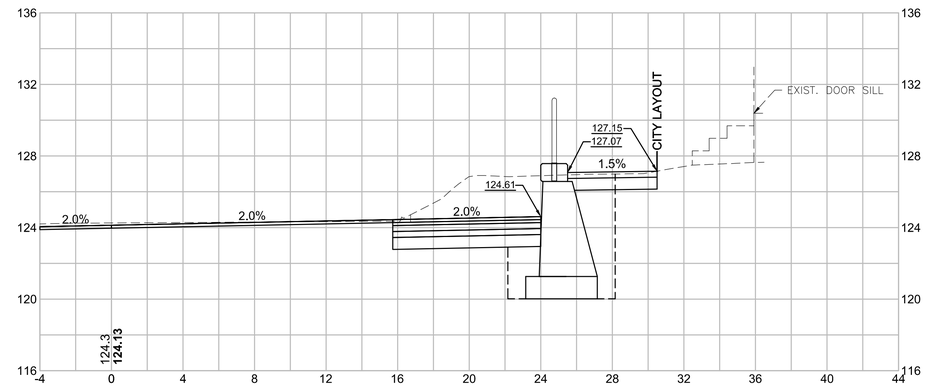
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	81	96
PROJECT FILE NO.	606189		

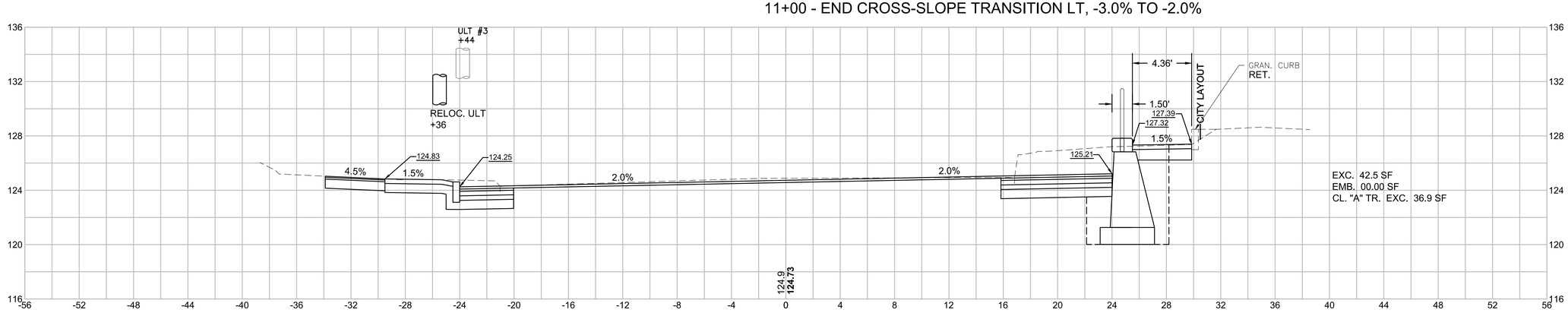
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

11+15.23 - STEPS RT

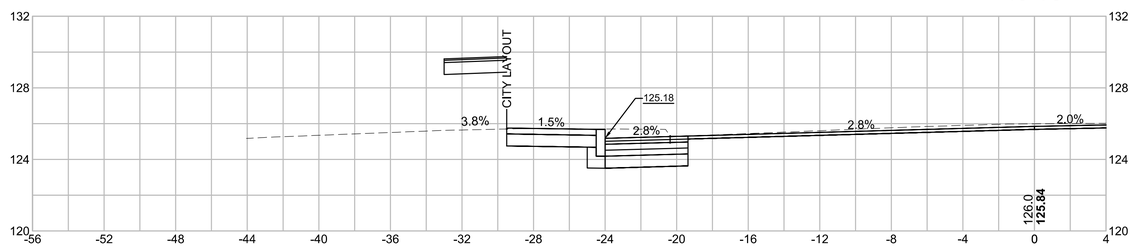


11+00 - END CROSS-SLOPE TRANSITION LT, -3.0% TO -2.0%



- WALKWAY LT

10+73



4 0 4 8
SCALE IN FEET

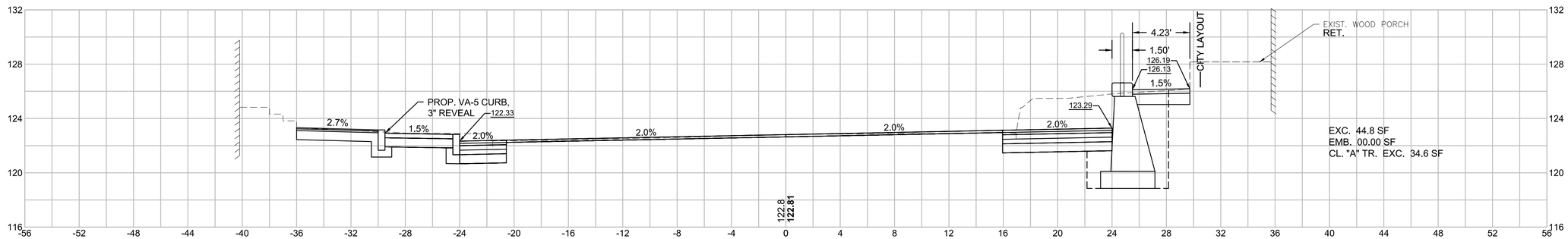
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	82	96
PROJECT FILE NO.	606189		

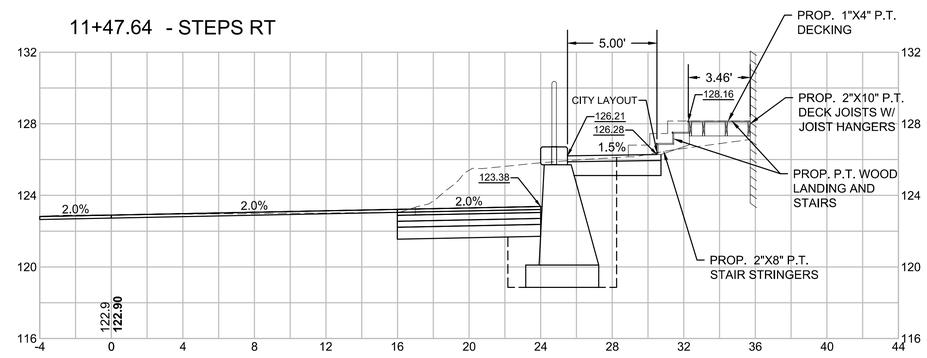
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

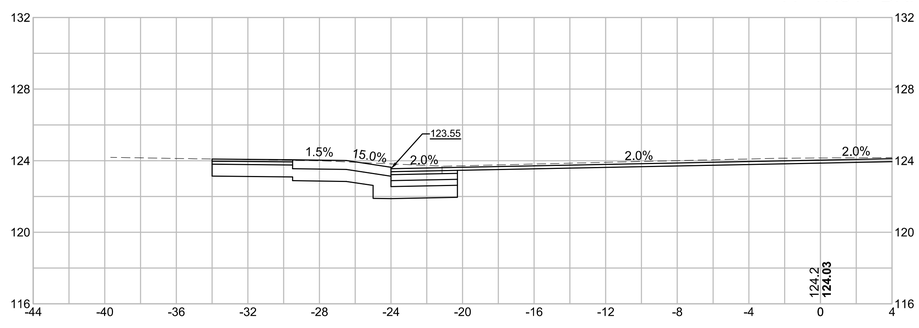
11+50 - WALKWAY / STAIRS LT



11+47.64 - STEPS RT



11+17.84 - DRIVEWAY LT



4 0 4 8
SCALE IN FEET

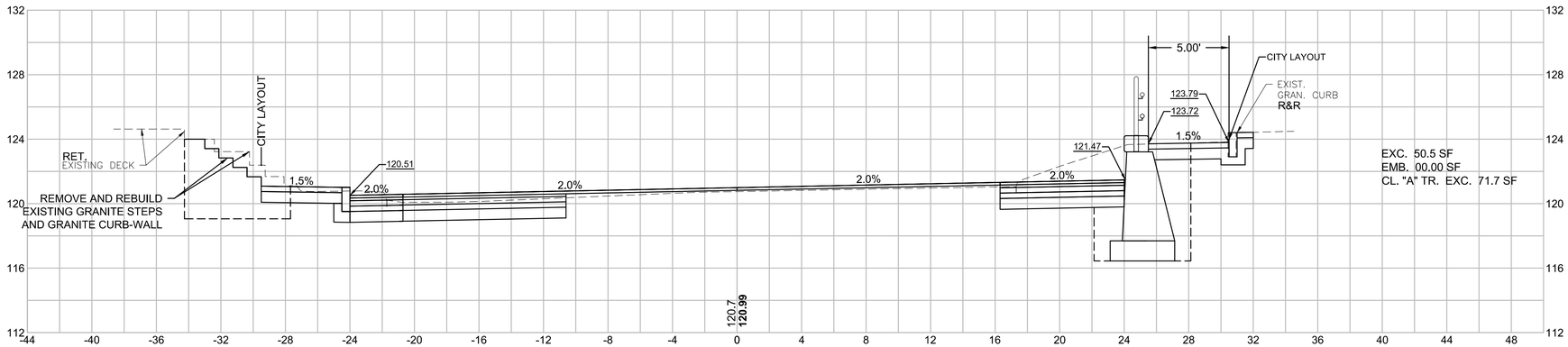
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	83	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

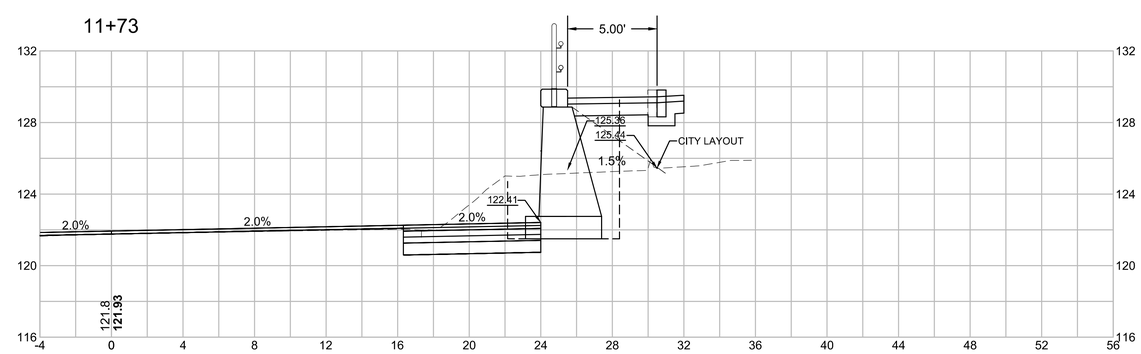
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:10 AM

11+94.42 - STEPS LT



- WALKWAY RT

11+73



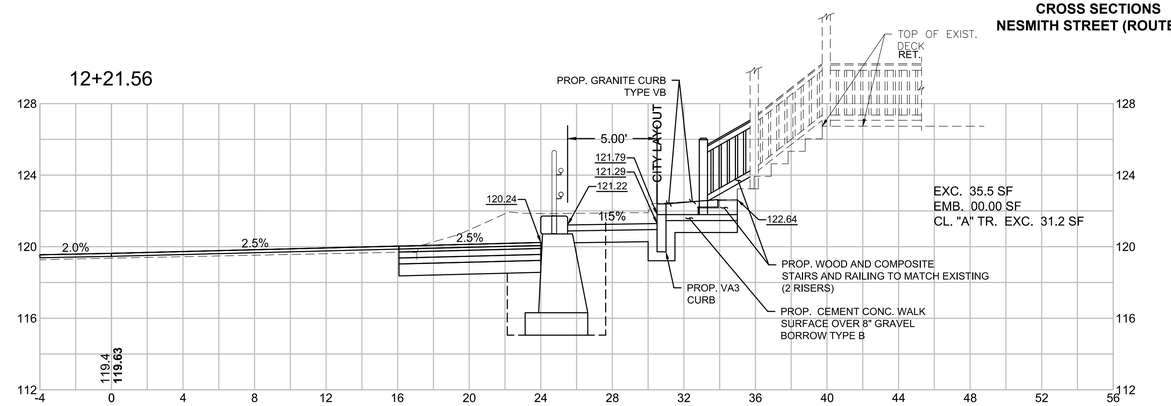
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

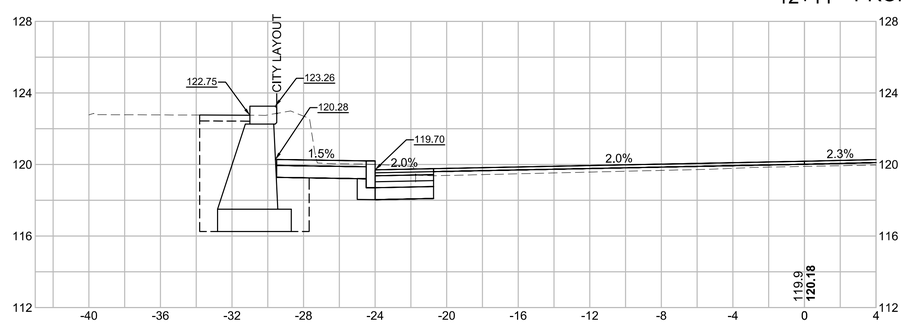
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	84	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

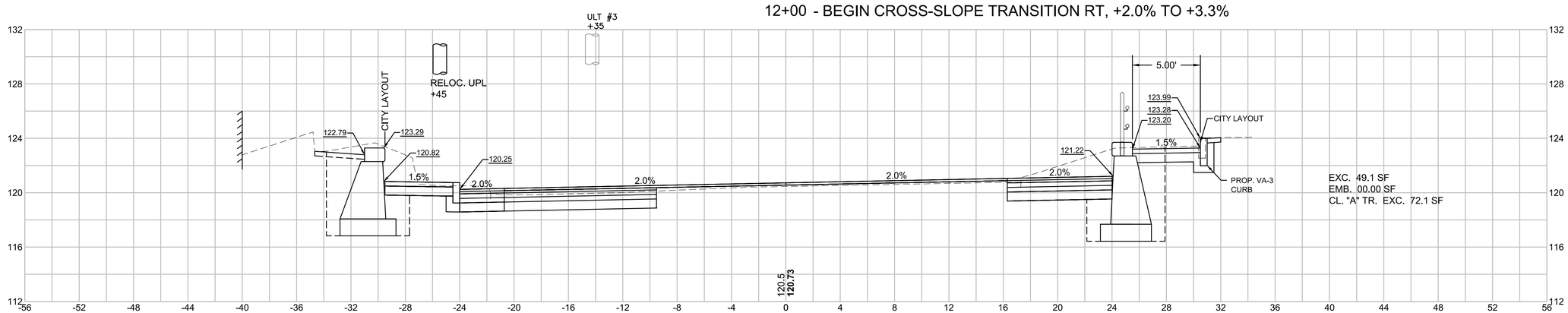
12+21.56



12+11 - PROP. CEM. STONE MASONRY WALL LT



12+00 - BEGIN CROSS-SLOPE TRANSITION RT, +2.0% TO +3.3%



4 0 4 8
SCALE IN FEET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

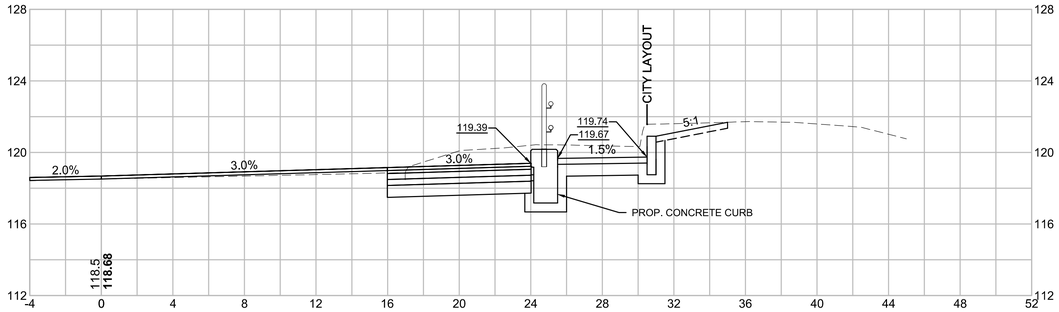
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	85	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

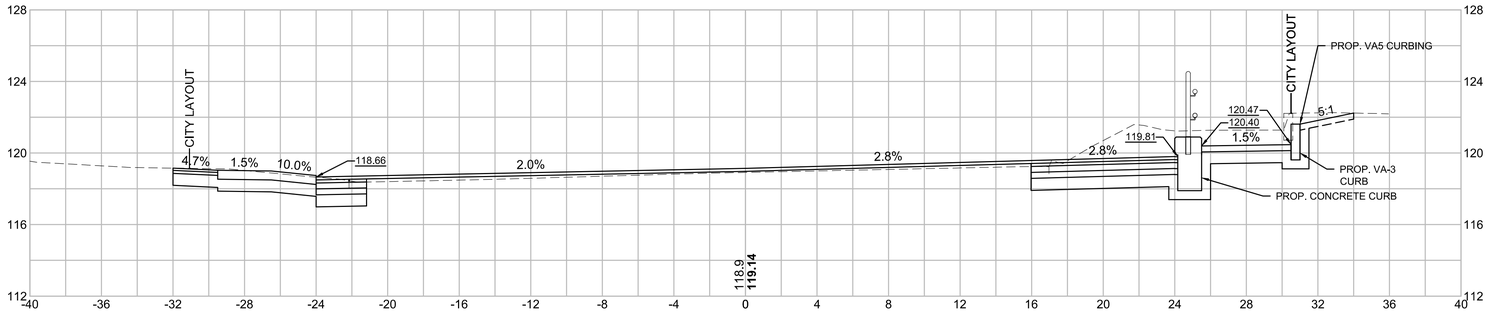
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

12+40 - BEGIN CROSS-SLOPE TRANSITION LT, -2.0% TO -3.4%

12+38.42



12+30.42 - DRIVEWAY LT / STEPS RT



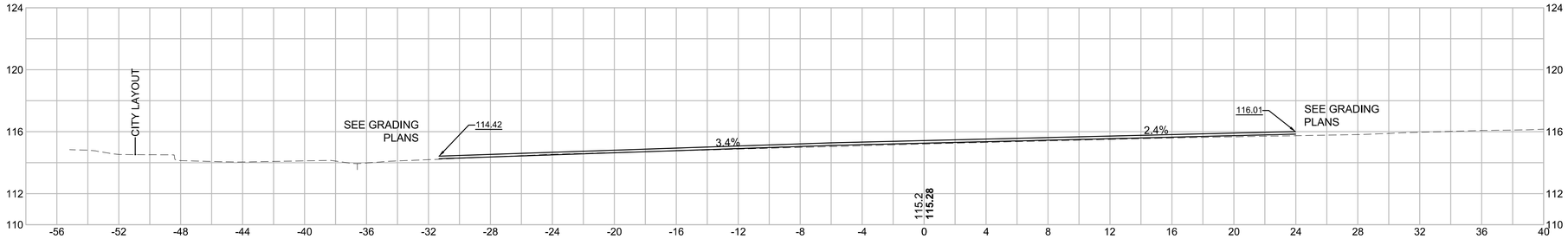
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	86	96
PROJECT FILE NO.	606189		

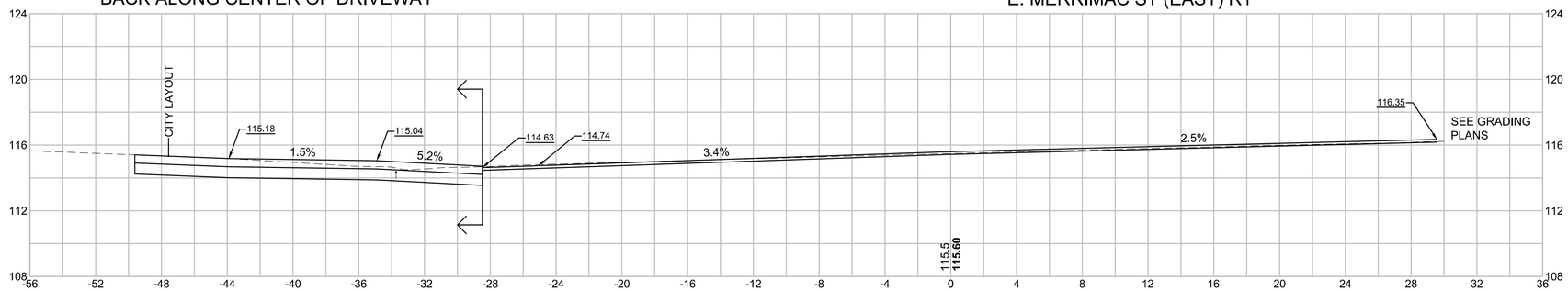
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

13+00



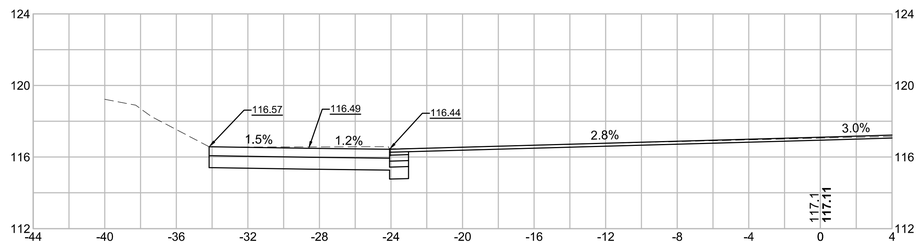
SECTION SKEWED FROM
PROP. EDGE OF PAVEMENT
BACK ALONG CENTER OF DRIVEWAY

12+93.73 - DRIVEWAY LT (SECTION SKEWED ACROSS DRIVEWAY) & E. MERRIMAC ST (EAST) RT



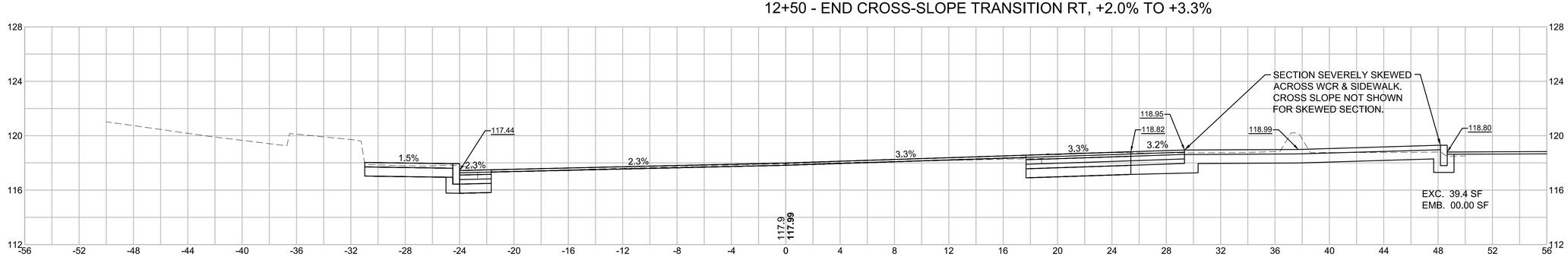
12+85 - END CROSS-SLOPE TRANSITION LT, -2.0% TO -3.4%

12+65.38 - PROP. WCR / EXIST STEPS LT



12+50 - BEGIN CROSS-SLOPE TRANSITION RT, +3.3% TO +1.2%

12+50 - END CROSS-SLOPE TRANSITION RT, +2.0% TO +3.3%



4 0 4 8
SCALE IN FEET

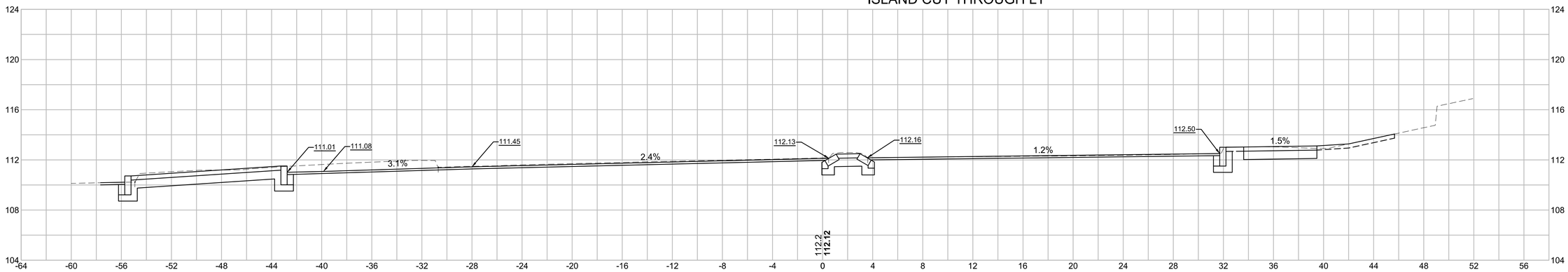
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

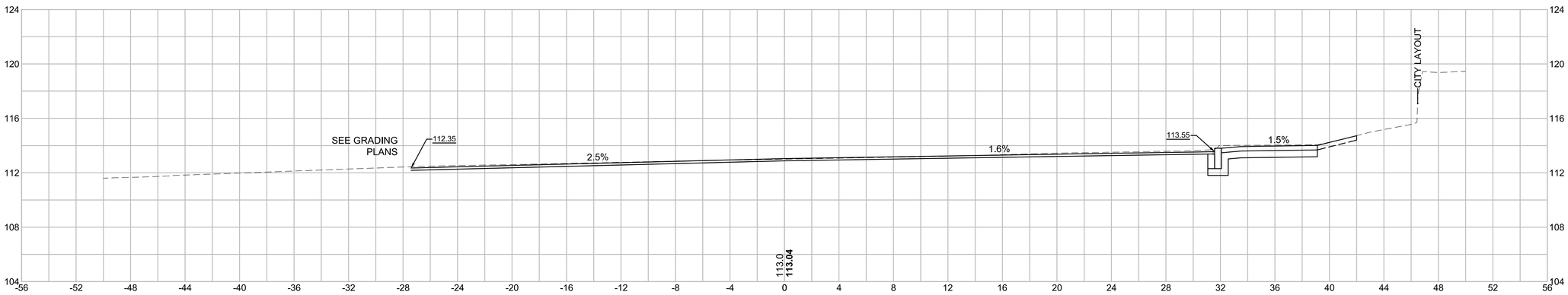
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	87	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
NESMITH STREET (ROUTE 38)

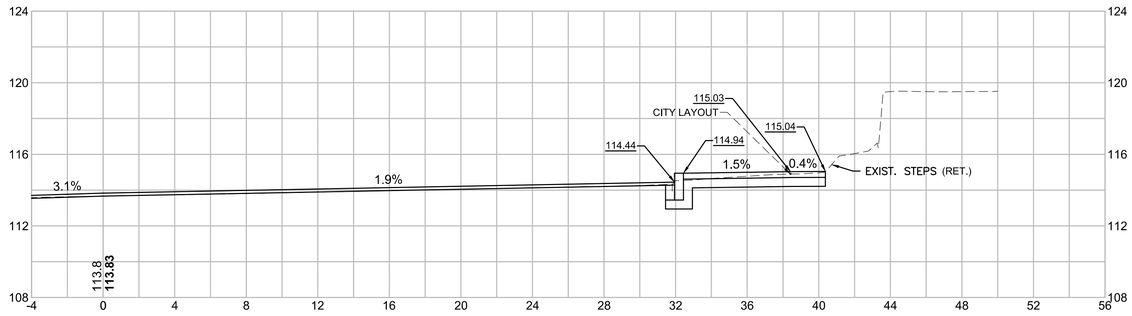
13+75 - BEGIN CROSS-SLOPE TRANSITION LT, -2.4% TO -2.5%
13+75 - BEGIN CROSS-SLOPE TRANSITION RT, +1.2% TO +1.0%
13+75 - END CROSS-SLOPE TRANSITION RT, +3.3% TO +1.2%
13+74.58 - MINI ISLAND (CENTER) AND ISLAND CUT THROUGH LT



13+55 - END CROSS-SLOPE TRANSITION LT, -3.4% TO -2.4%
13+50



13+31.19 - STEPS RT



4 0 4 8
SCALE IN FEET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:11 AM

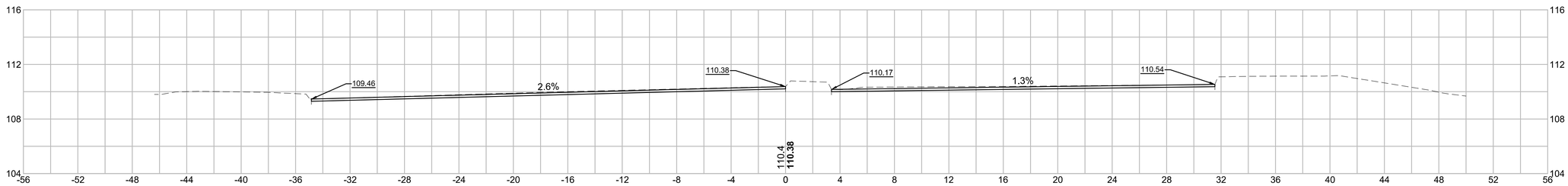
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	88	96
PROJECT FILE NO.	606189		

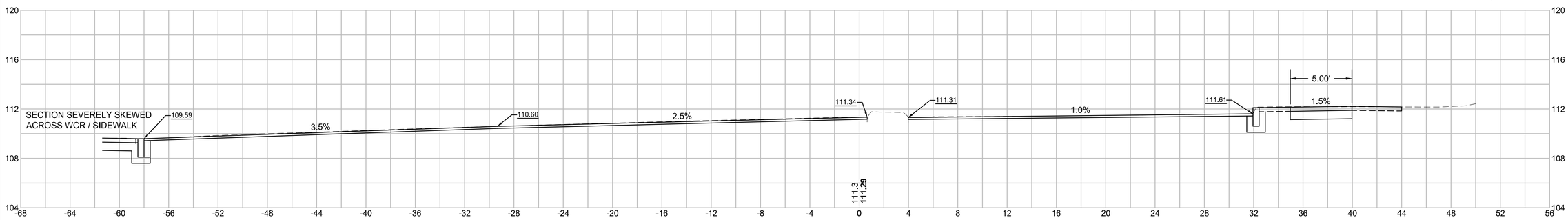
CROSS SECTIONS
NESMITH STREET (ROUTE 38)

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

14+33.38 - LIMIT OF WORK



14+00 - END CROSS-SLOPE TRANSITION LT, -2.4% TO -2.5%. END CROSS-SLOPE TRANSITION RT, +1.2% TO +1.0%



4 0 4 8
SCALE IN FEET

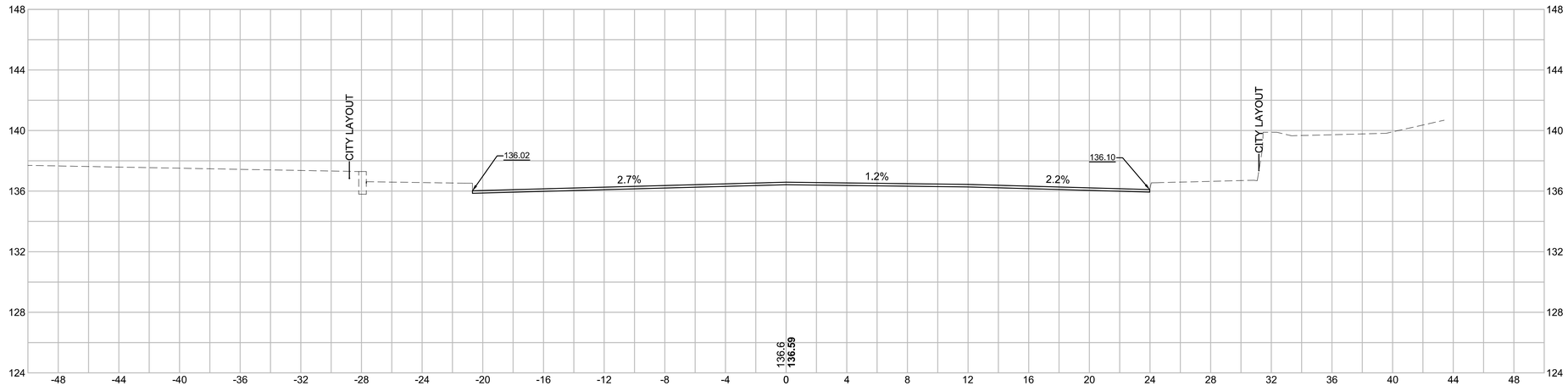
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	89	96
PROJECT FILE NO.	606189		

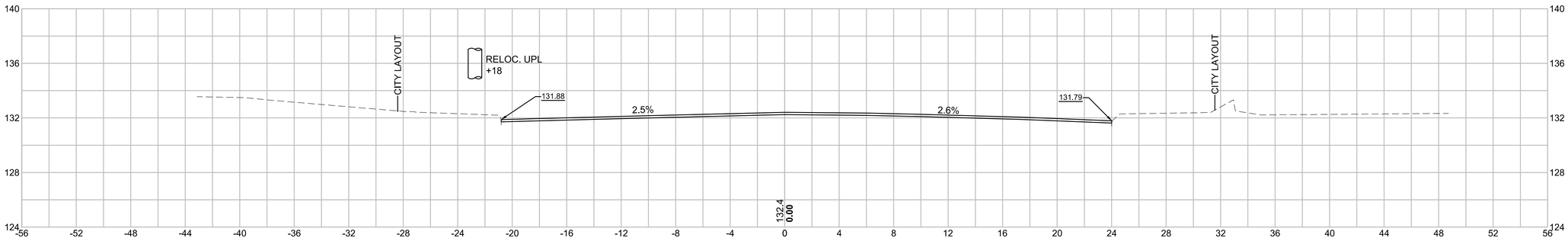
CROSS SECTIONS
ANDOVER STREET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

61+46



61+00 - LIMIT OF WORK



4 0 4 8
SCALE IN FEET

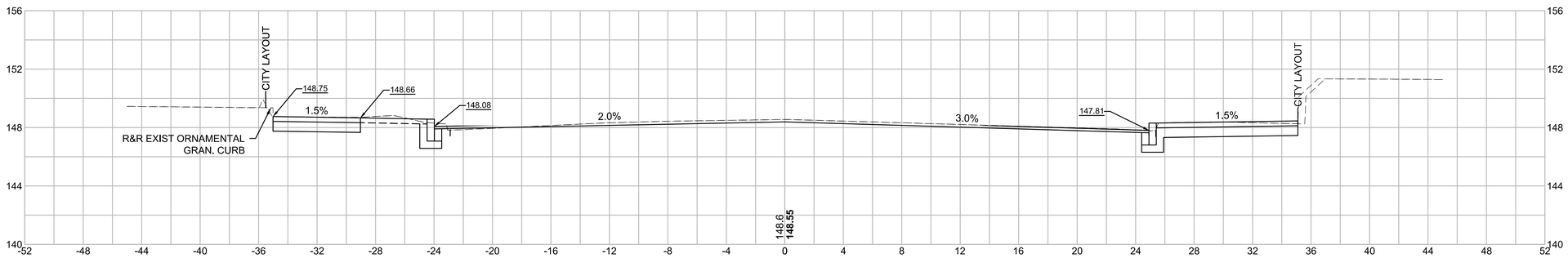
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	90	96
PROJECT FILE NO.	606189		

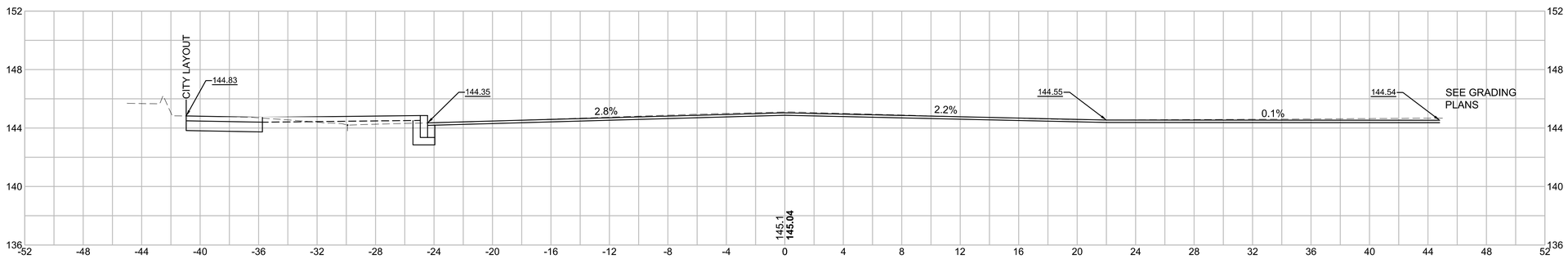
CROSS SECTIONS
ANDOVER STREET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

51+00



50+50



4 0 4 8
SCALE IN FEET

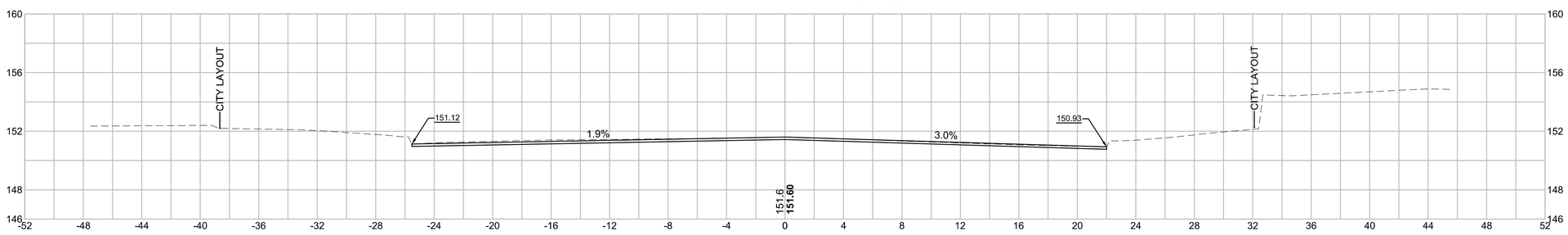
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	91	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
ANDOVER STREET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:11 AM

51+47.31 - SKEWED SECTION



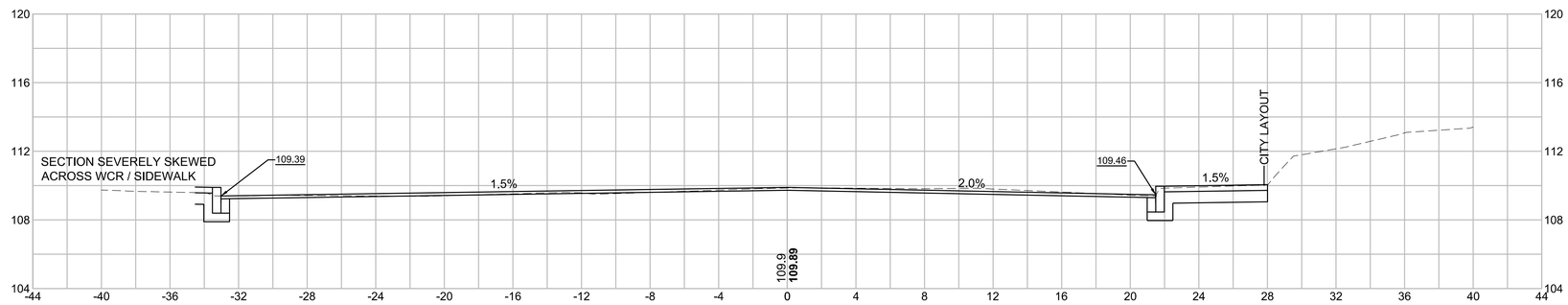
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

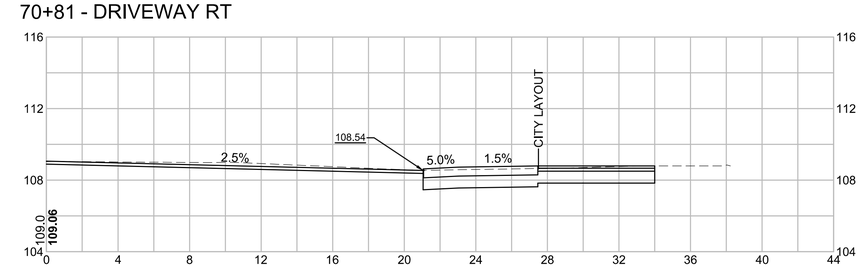
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	92	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
E. MERRIMACK STREET

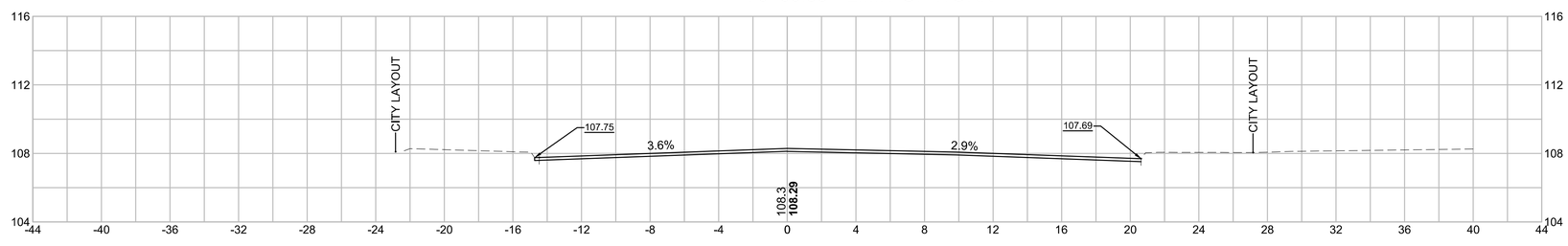
71+00



70+81 - DRIVEWAY RT



70+60.38 - LIMIT OF WORK



4 0 4 8
SCALE IN FEET

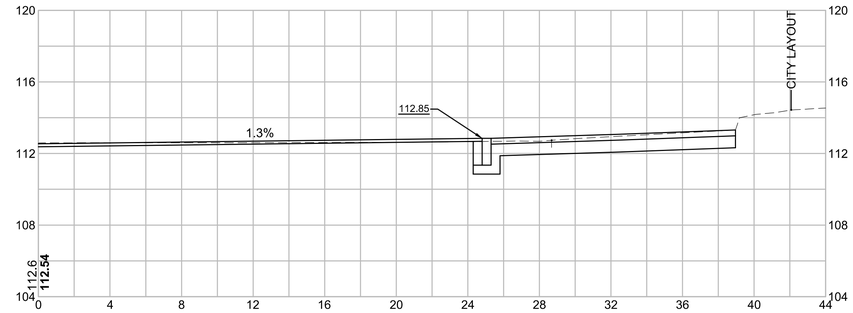
606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:11 AM

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

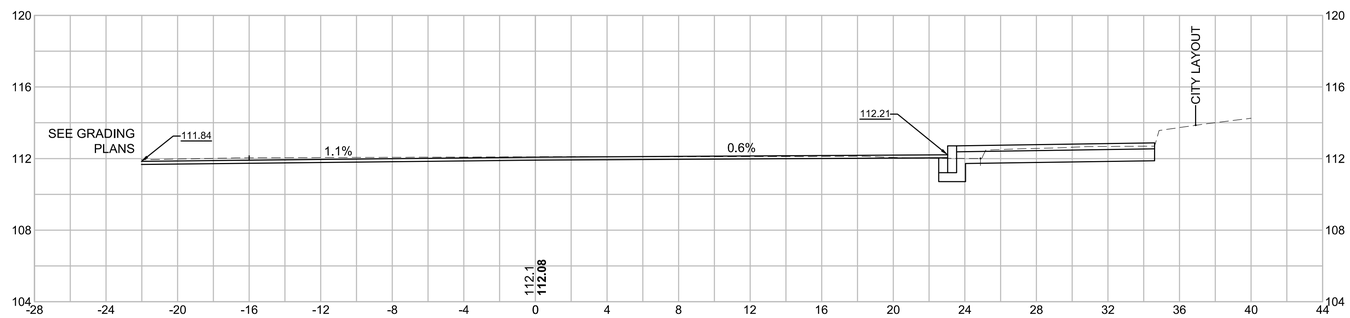
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	93	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
E. MERRIMACK STREET

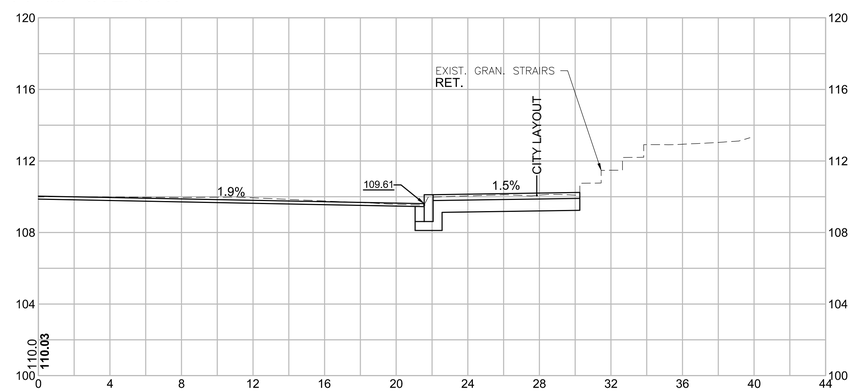
71+60.49 - WCR RT (SECTION SKEWED ACROSS RAMP)



71+50



71+03 - STEPS RT



4 0 4 8
SCALE IN FEET

606189HD10(XSECTIONS).DWG Plotted on 17-Sep-2019 9:12 AM

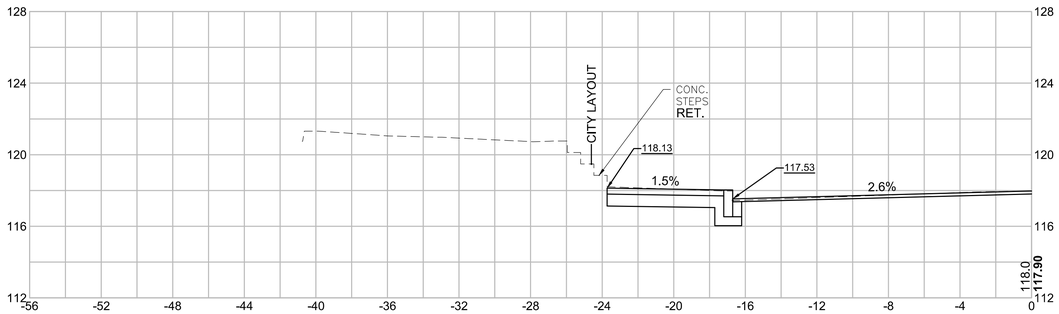
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	94	96
PROJECT FILE NO.	606189		

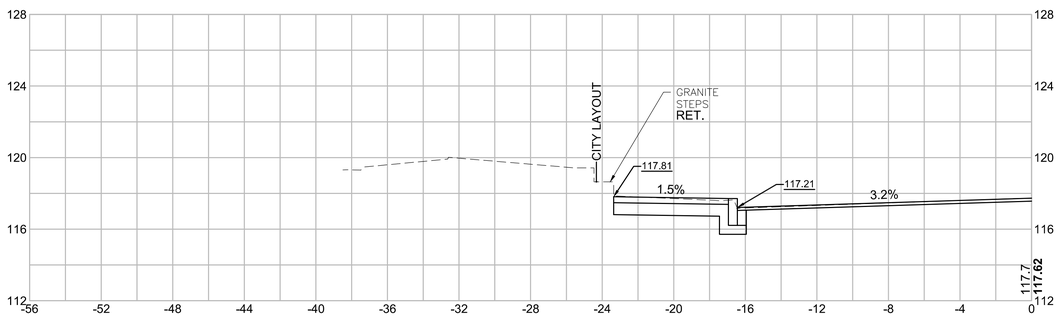
CROSS SECTIONS
E. MERRIMACK STREET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:12 AM

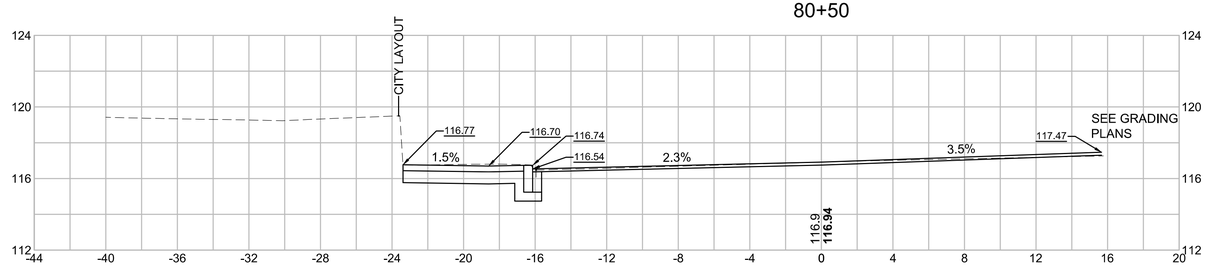
80+71.86 - STEPS LT



80+65.54 - STEPS LT



80+50



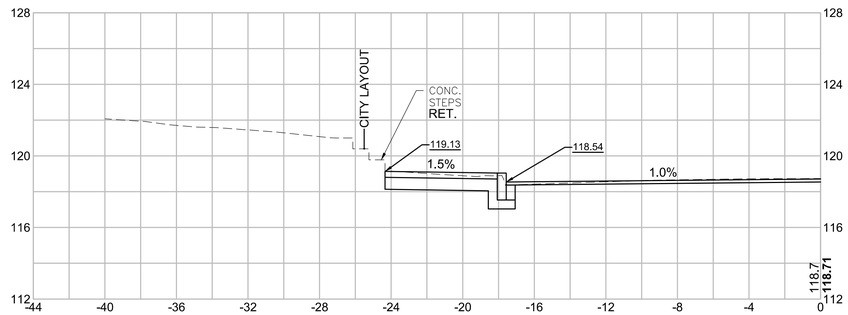
4 0 4 8
SCALE IN FEET

LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

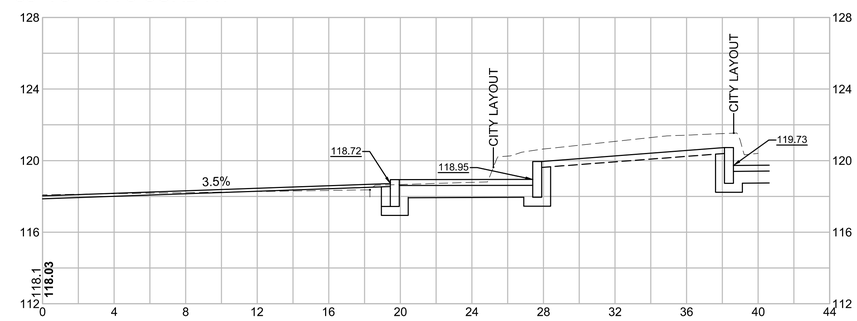
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	95	96
PROJECT FILE NO.	606189		

CROSS SECTIONS
E. MERRIMACK STREET

80+93.36 - STEPS / WALKWAY LT



80+75 - VA-5 CURB RT



4 0 4 8
SCALE IN FEET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:12 AM

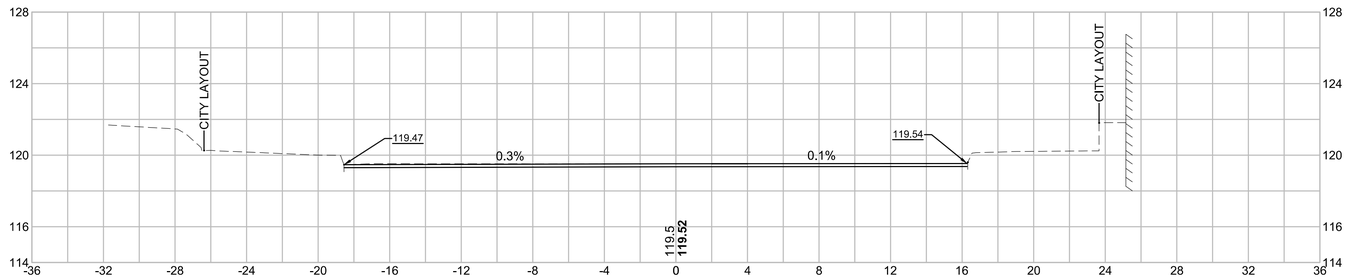
LOWELL - ROUTE 38
ROADWAY & INTERSECTION IMPROVEMENTS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	TAP/STP-0034(201)X	96	96
PROJECT FILE NO.	606189		

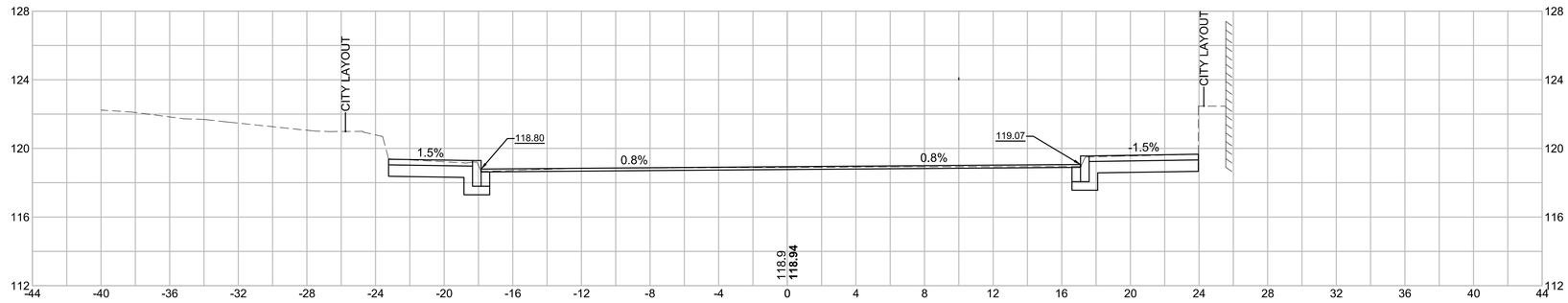
CROSS SECTIONS
E. MERRIMACK STREET

606189HD10\XSECTIONS\.DWG Plotted on 17-Sep-2019 9:12 AM

81+17 - LIMIT OF WORK



81+00



4 0 4 8
SCALE IN FEET