NOTES:

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

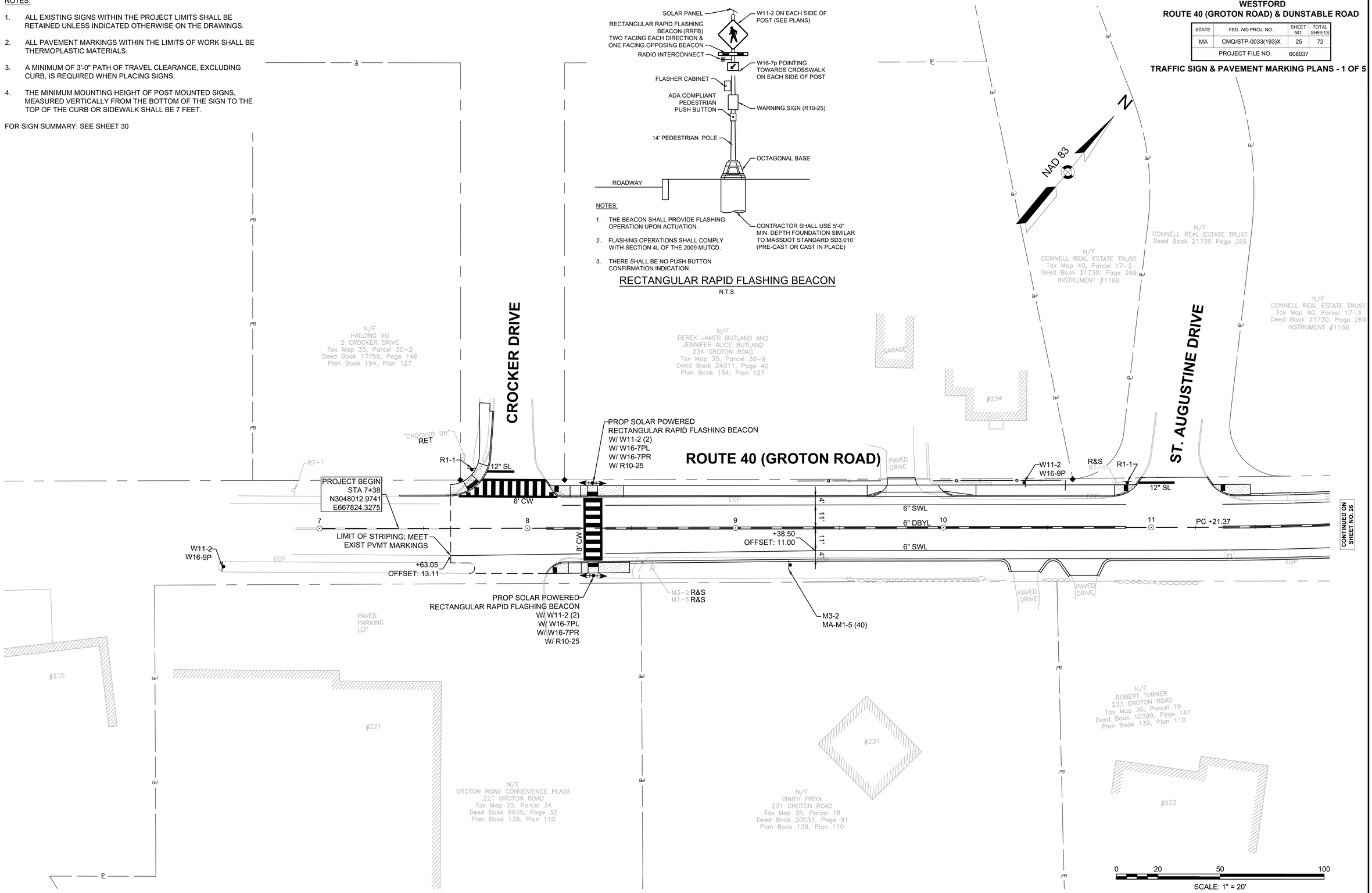
FOR SIGN SUMMARY: SEE SHEET 30

NOTES:

1. THE BEACON SHALL PROVIDE FLASHING OPERATION UPON ACTUATION.
2. FLASHING OPERATIONS SHALL COMPLY WITH SECTION 4L OF THE 2009 MUTCD.
3. THERE SHALL BE NO PUSH BUTTON CONFIRMATION INDICATION.

RECTANGULAR RAPID FLASHING BEACON

N.T.S.



CONTINUED ON SHEET NO. 26

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	25	72
PROJECT FILE NO.	608037		

TRAFFIC SIGN & PAVEMENT MARKING PLANS - 1 OF 5

608037(PSAE2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:46 PM

NOTES:

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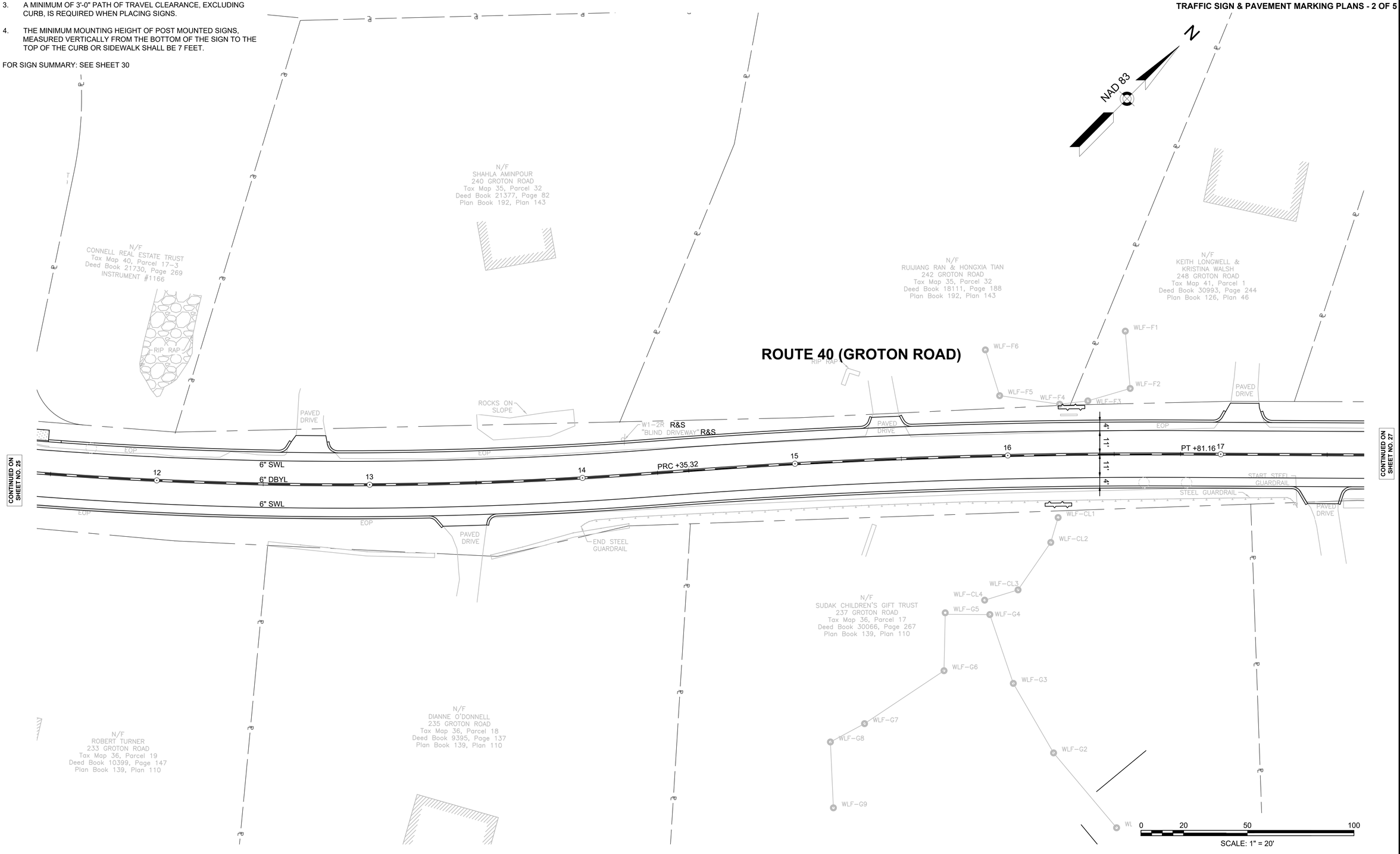
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.
4. THE MINIMUM MOUNTING HEIGHT OF POST MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF THE CURB OR SIDEWALK SHALL BE 7 FEET.

FOR SIGN SUMMARY: SEE SHEET 30

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	26	72
PROJECT FILE NO.	608037		

TRAFFIC SIGN & PAVEMENT MARKING PLANS - 2 OF 5



608037(PS&E2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:46 PM

NOTES:

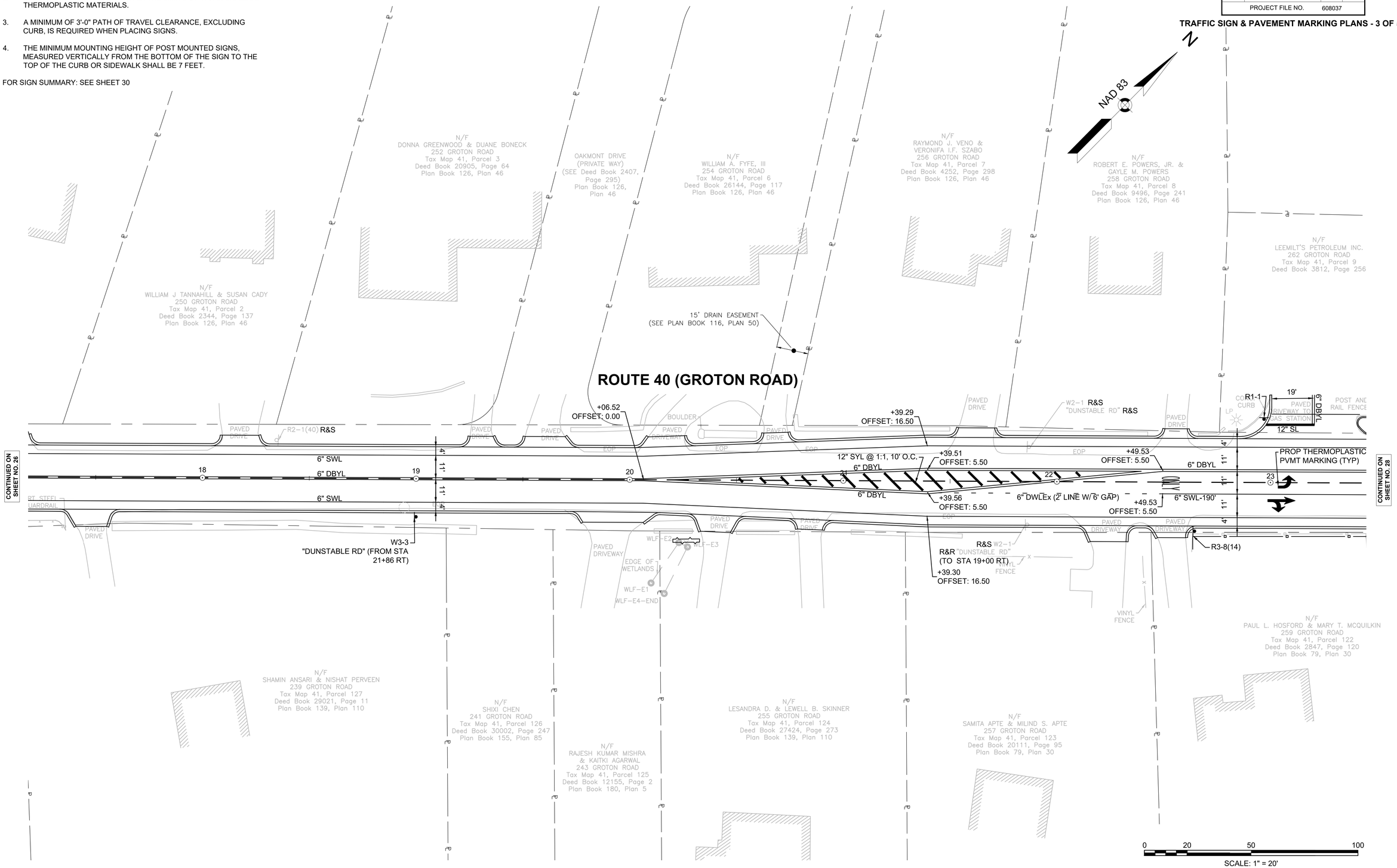
1. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. ALL PAVEMENT MARKINGS WITHIN THE LIMITS OF WORK SHALL BE THERMOPLASTIC MATERIALS.
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.
4. THE MINIMUM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

FOR SIGN SUMMARY: SEE SHEET 30

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	27	72
PROJECT FILE NO.	608037		

TRAFFIC SIGN & PAVEMENT MARKING PLANS - 3 OF 5



608037(PS&E2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:46 PM

NOTES:

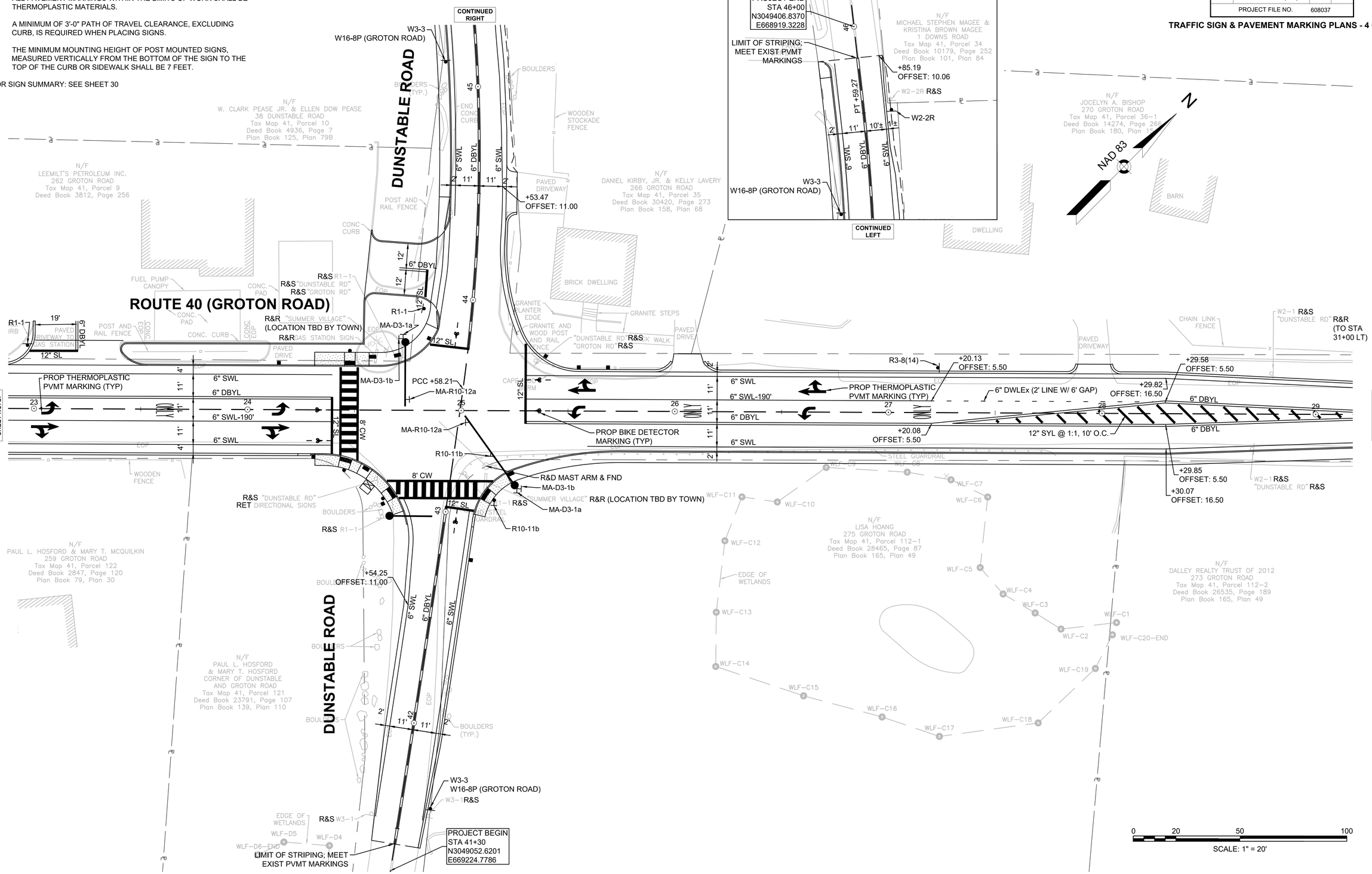
1. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. ALL PAVEMENT MARKINGS WITHIN THE LIMITS OF WORK SHALL BE THERMOPLASTIC MATERIALS.
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.
4. THE MINIMUM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

FOR SIGN SUMMARY: SEE SHEET 30

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	28	72
PROJECT FILE NO.	608037		

TRAFFIC SIGN & PAVEMENT MARKING PLANS - 4 OF 5



608037(PS&E2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:47 PM

NOTES:

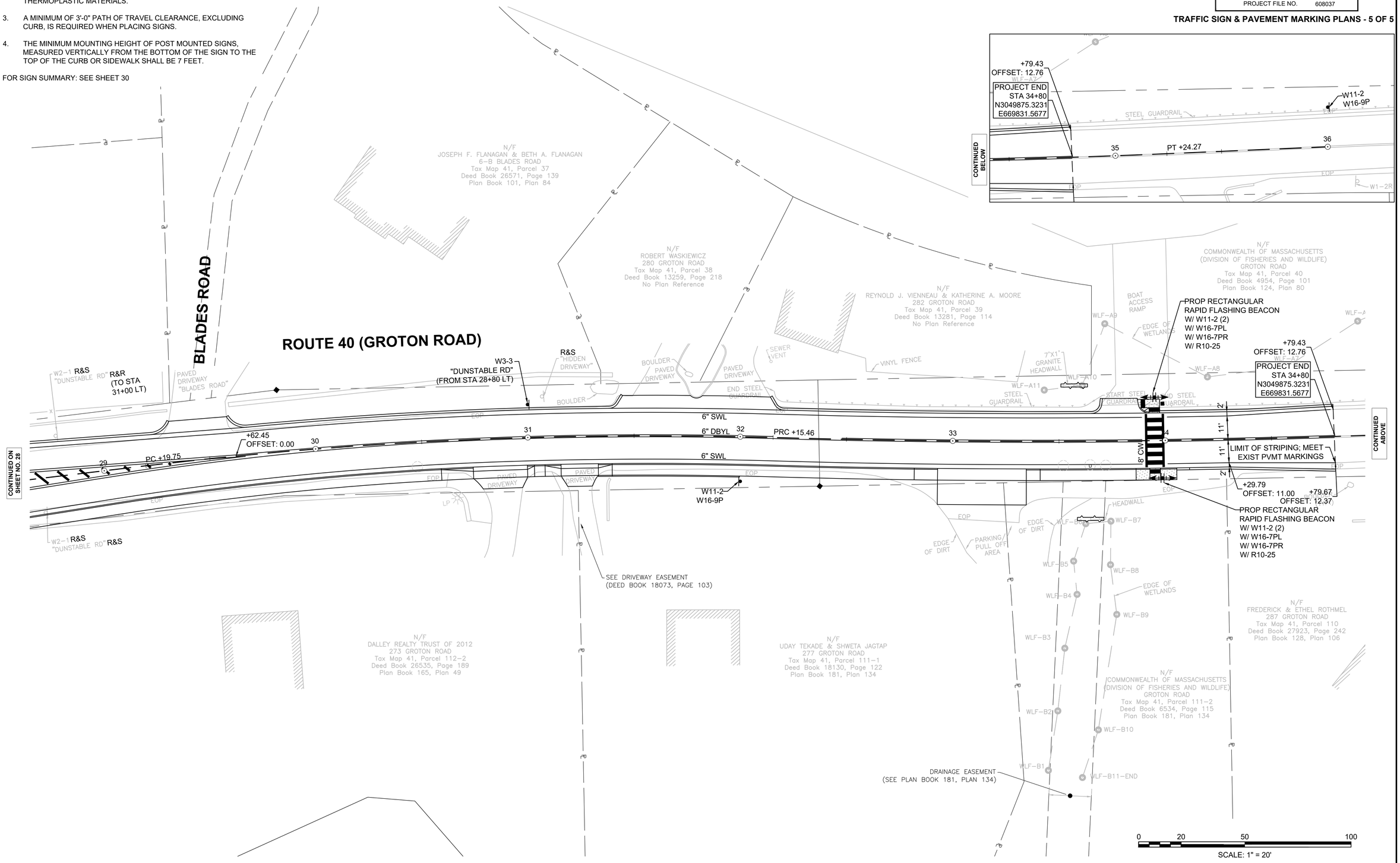
1. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. ALL PAVEMENT MARKINGS WITHIN THE LIMITS OF WORK SHALL BE THERMOPLASTIC MATERIALS.
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.
4. THE MINIMUM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

FOR SIGN SUMMARY: SEE SHEET 30

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	29	72
PROJECT FILE NO.	608037		

TRAFFIC SIGN & PAVEMENT MARKING PLANS - 5 OF 5



608037(PS&E2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:47 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	30	73
PROJECT FILE NO.	608037		

TRAFFIC SIGN SUMMARY

TRAFFIC SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN (in)			TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			SIZE AND NUMBER OF P-5 POSTS REQUIRED	UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT	LEGEND	LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR		BACK-GROUND	LEGEND	BORDER			
R1-1	30	30	STOP		(1)		4	RED	WHITE	WHITE	4	6.25	25.00
R3-8(14)	30	30	ONLY				2	WHITE	BLACK	BLACK	2	6.25	12.50
R10-11b	36	36	NO TURN ON RED				2	WHITE	BLACK	BLACK	0 MTD. ON MAST ARM	9.00	18.00
MA-R10-12a	30	36	LEFT TURN YIELD ON FLASHING	4C 5C 4B	3.5 2 2 2 3.5	10 CIRCLE	2	WHITE	BLACK / YELLOW	BLACK	0 MTD. ON MAST ARM	7.50	15.00
R10-25	9	12	PUSH BUTTON TO TURN ON WARNING LIGHTS		(1)		4	WHITE	BLACK	BLACK	0 MOUNT ON PED WARNING DEVICE	0.75	3.00
W2-2R	30	30					1	YELLOW	BLACK	BLACK	1	6.25	6.25
W3-3	30	30					4	YELLOW	BLACK / RED / GREEN	BLACK	4	6.25	25.00
W11-2	30	30					12	YELLOW	BLACK	BLACK	4 MOUNT 8 ON PED WARNING DEVICE	6.25	75.00
W16-7pL	24	12					4	YELLOW	BLACK	BLACK	0 MOUNT W/ W11-2	2.00	8.00
W16-7pR	24	12					4	YELLOW	BLACK	BLACK	0 MOUNT W/ W11-2	2.00	8.00
W16-8P (GROTON ROAD)	20	8	Groton Rd				2	YELLOW	BLACK	BLACK	0 MOUNT W/ W3-3	1.11	2.22
W16-9P	24	12	AHEAD				4	YELLOW	BLACK	BLACK	0 MOUNT W/ W11-2	2.00	8.00
MA-D3-1a	60	24	SEE RIGHT	12C / 9C	6 6	N/A	2	GREEN	WHITE	WHITE	0 MTD. ON MAST ARM	PAID UNDER ITEM 874.	
MA-D3-1b	81	24	SEE RIGHT	12C / 9C	6 6	N/A	2	GREEN	WHITE	WHITE	0 MTD. ON MAST ARM	PAID UNDER ITEM 874.	
MA-M1-5 (40)	24	24	40	12D	6 6		1	WHITE	BLACK	BLACK	1	4.00	4.00
M3-2	24	12	EAST		(1)		1	WHITE	BLACK	BLACK	0 MTD. W/ M1-5 (40)	2.00	2.00

MA-D3-1a

MA-D3-1b

NOTES:

(1) SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS FOR TEXT AND LEGEND DIMENSIONS.

2. THE MINIMUM MOUNTING HEIGHT OF POST-MOUNTED SIGNS, MEASURED VERTICALLY FROM THE BOTTOM OF THE SIGN TO THE TOP OF CURB OR SIDEWALK, OR THE ELEVATION OF THE NEAR EDGE OF TRAVEL WAY, SHALL BE 7 FEET UNLESS OTHERWISE SPECIFIED.

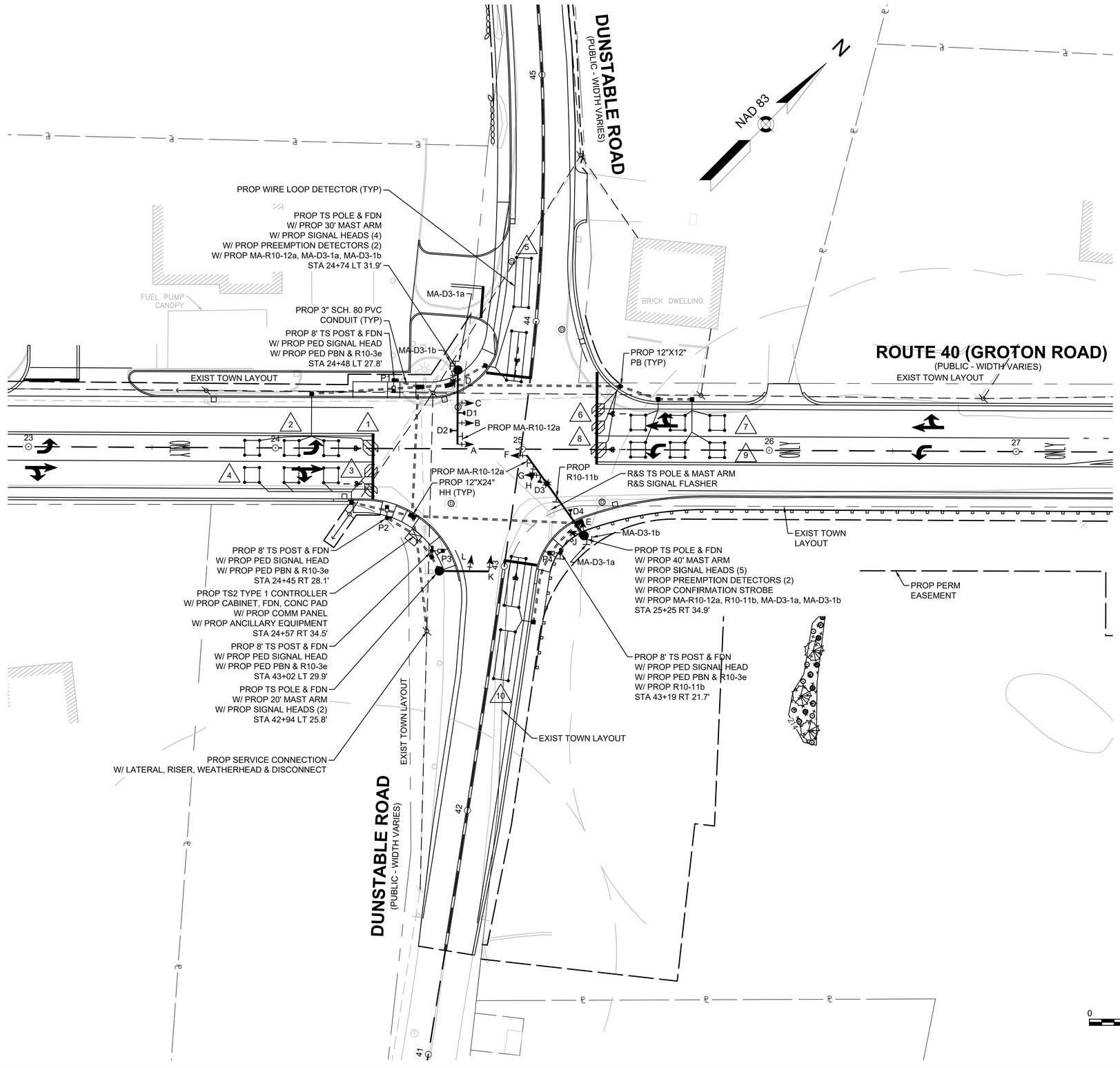
3. A MINIMUM OF 3'-0" PATH OF TRAVEL CLEARANCE, EXCLUDING CURB, IS REQUIRED WHEN PLACING SIGNS.

608037(PS&E2)HD8(TRAFFIC SIGN & PAVEMENT MARKING PLANS).DWG Plotted on 6-Jul-2018 1:47 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	31	73
PROJECT FILE NO.	608037		

TRAFFIC SIGNAL PLANS - 1 OF 2



NOTES:

1. PEDESTRIAN PUSH BUTTONS SHALL BE PERPENDICULAR TO THE CROSSWALK PATH OF TRAVEL, WITH THE ARROW PROVIDED ON THE PUSH BUTTON PARALLEL TO THE CROSSWALK PATH OF TRAVEL.
2. CROSSWALKS NOT SHOWN FOR VISUAL CLARITY OF TRAFFIC SIGNAL EQUIPMENT.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ITEMS REQUIRED TO INSTALL TRAFFIC SIGNAL INFRASTRUCTURE AT LOCATION BASED ON LOCATIONS AS SHOWN ON THE PLANS; INCLUDING, BUT NOT LIMITED TO, SHIELDING AND INSULATION OF OVERHEAD UTILITIES AND/OR USE OF LOW PROFILE EXCAVATION EQUIPMENT.

608037(PS&E2)HD9\TRAFFIC SIGNAL PLANS).DWG Plotted on 6-Jul-2018 1:47 PM

SEQUENCE AND TIMING CHART FOR FULLY-ACTUATED TRAFFIC SIGNAL CONTROL

GROTON ROAD (ROUTE 40) AT DUNSTABLE ROAD (WESTFORD, MASSACHUSETTS)

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
GROTON ROAD	EB-LT	F	R	R	R	FY	Y	R				R	R	R	G	Y	R	R	R	R				R	R	R	R	R	R
GROTON ROAD	EB-TR	G,J	R	R	R	G	Y	R				R	R	R	R	R	R	R	R	R				R	R	R	R	R	R
GROTON ROAD	WB-LT	A	G	Y	R	R	R	R				R	R	R	R	R	R	FY	Y	R				R	R	R	R	R	R
GROTON ROAD	WB-TR	B,C	R	R	R	R	R	R				R	R	R	R	R	R	G	Y	R				R	R	R	R	R	R
DUNSTABLE ROAD	NB	D,H	R	R	R	R	R	R				G	Y	R	R	R	R	R	R	R				R	R	R	R	R	R
DUNSTABLE ROAD	SB	E,K,L	R	R	R	R	R	R				R	R	R	R	R	R	R	R	R				G	Y	R	R	R	R
PEDESTRIAN	ALL	P1-P4	DW	DW	DW	DW	DW	DW				DW	DW	DW	DW	DW	DW	DW	DW	DW				DW	DW	DW	W	FDW	DW
MINIMUM INTERVAL			6			10						6			6			10						6					
VEHICLE EXTENSION			2			2						2			2			2						2					
MAXIMUM 1			10			50						15			10			50						15					
MAXIMUM 2			10			40						15			10			40						15					
YELLOW CLEARANCE				4.0			4.0						3.5			4.0			4.0						3.5				
RED CLEARANCE					1.0			1.0						1.0			1.0			1.0						1.0			
WALK																											7.0		
PEDESTRIAN CLEARANCE																												8.0	4.0
RECALL			OFF			SOFT						OFF			OFF			SOFT						OFF			OFF		
DETECTOR			NON-LOCK			NON-LOCK						NON-LOCK			NON-LOCK			NON-LOCK						NON-LOCK			LOCK		

FLASHING OPERATION	28	29	30	31	32	33	34	35	36	37	38	39
FR	R	R	R	G	Y	R	R	R	R	R	R	R
FY	R	R	R	G	Y	R	R	R	R	R	R	R
FR	G	Y	R	R	R	R	R	R	R	R	R	R
FY	G	Y	R	R	R	R	R	R	R	R	R	R
FR	R	R	R	R	R	R	G	Y	R	R	R	R
FR	R	R	R	R	R	R	R	R	R	G	Y	R
OUT	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
EMERGENCY ONLY	*			*			*			*		
		4.0			4.0			3.5			3.5	
			1.0			1.0			1.0			1.0
	-			-			-			-		
	-			-			-			-		
	Ø1/Ø6			Ø2/Ø5			Ø4			Ø8		

PRE-EMPTION PHASING AND PRIORITY

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	32	73
PROJECT FILE NO.	608037		

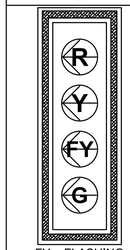
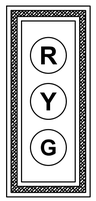
TRAFFIC SIGNAL PLANS - 2 OF 2

SEQUENCE & TIMING NOTES:
1. AUTOMATIC FLASHING OPERATION PER M.U.T.C.D. SECTION 4D.28-4D.31.
2. PEDESTRIAN PHASE UPON PUSH BUTTON ACTIVATION ONLY.
3. FYA = FLASHING YELLOW ARROW
4. MAXIMUM 1 = FREE OPERATIONS
   MAXIMUM 2 = M-F 7:00AM-9:00AM
   M-F 3:00PM-6:00PM
5. Ø4&Ø8 TO OPERATE IN DUAL ENTRY MODE
6. 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 WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
7. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
8. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
9. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.
10. FLASHING YELLOW ARROW INDICATIONS SHALL NOT DISPLAY WHILE A GREEN LEFT ARROW INDICATION IS ACTIVE.
11. IF Ø6 IS IN OPERATION FOLLOWING THE TERMINATION OF Ø1, THE SEQUENCE FOR SIGNAL HOUSING "A" SHALL BE SOLID GREEN ARROW, SOLID YELLOW ARROW, FLASHING YELLOW ARROW, SOLID YELLOW ARROW, AND SOLID RED ARROW.
12. IF Ø2 IS IN OPERATION FOLLOWING THE TERMINATION OF Ø5, THE SEQUENCE FOR SIGNAL HOUSING "G" SHALL BE SOLID GREEN ARROW, SOLID YELLOW ARROW, FLASHING YELLOW ARROW, SOLID YELLOW ARROW, AND SOLID RED ARROW.

CONSTRUCTION NOTES:
1. THE CONSTRUCTION SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. ALL MAST ARM FOUNDATIONS SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION "OVERHEAD SIGNAL STRUCTURE & FOUNDATION STANDARD DRAWINGS", DATED DECEMBER 2015.
3. ALL SIGNAL HEADS AND SIGNS SHALL BE RIGIDLY MOUNTED.
4. CONTRACTOR SHALL FINE-TUNE THE TIMING AND COORDINATION PARAMETERS IN THE PRESENCE OF THE ENGINEER AND TOWN OF WESTFORD REPRESENTATIVES FOLLOWING INSTALLATION.
5. PULL BOXES SHALL NOT BE LOCATED WITHIN ACCESSIBLE CURB RAMPS.
6. EXISTING OVERHEAD FLASHER TO BE REMOVED IMMEDIATELY PRIOR TO INSTALLATION OF PROPOSED MAST ARM INFRASTRUCTURE AT THE SOUTHEAST CORNER OF THE INTERSECTION.

EMERGENCY VEHICLE PRE-EMPTION NOTES:
1. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT EACH INTERSECTION.
2. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE Ø A (OR ØB, ØC, ØD) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCE (AS NOTED IN CHART) AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. NORMAL CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. CONFIRMATION STROBE (WHITE) SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.
6. FOLLOWING THE TERMINATION OF THE PRE-EMPTION PHASE(S), THE OPERATIONS SHALL PROGRESS TO THE PREFERENTIAL PHASE SEQUENCE.

PROPOSED SIGNAL HEAD DATA

A,F	B-E,G-H,J-L	P1-P4
 FY = FLASHING YELLOW		
ALL 12" L.E.D MODULES W/ TUNNEL VISORS, 5" BACKPLATE & 3" RETROREFLECTIVE STRIPS		ALL 16" L.E.D. W/ COUNTDOWN INDICATORS

GROTON ROAD (ROUTE 40) AT DUNSTABLE ROAD

LIST OF MAJOR ITEMS REQUIRED

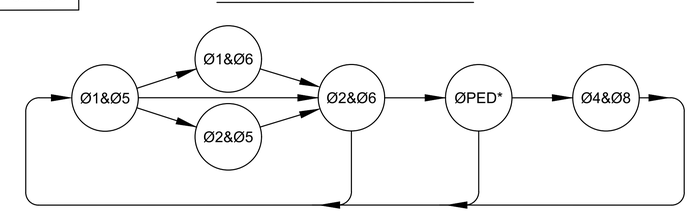
ITEM NO.	QUANTITY	DESCRIPTION
ITEM 815.1	1	8Ø TS 2 TYPE 1 CONTROLLER IN A TYPE P BASE MOUNTED CABINET W/ FOUNDATION - CONC PAD
	1	SERVICE CONNECTION W/ LATERAL, RISER, WEATHERHEAD AND DISCONNECT
	1	TS POLE W/ 20' MAST ARM, GALVANIZED STEEL MONOLEVER, W/ FOUNDATION (ORNAMENTAL)
	1	TS POLE W/ 30' MAST ARM, GALVANIZED STEEL MONOLEVER, W/ FOUNDATION (ORNAMENTAL)
	1	TS POLE W/ 40' MAST ARM, GALVANIZED STEEL MONOLEVER, W/ FOUNDATION (ORNAMENTAL)
	4	8' TS POST, W/ FOUNDATION (ORNAMENTAL)
	9	SIGNAL HEAD, 3-SECTION, 12" L.E.D. MODULES, TUNNEL VISORS, 5" BACKPLATES W/ 3" RETROREFLECTIVE STRIPS
	2	SIGNAL HEAD, 4-SECTION, 12" L.E.D. MODULES, TUNNEL VISORS, 5" BACKPLATES W/ 3" RETROREFLECTIVE STRIPS
	4	PEDESTRIAN SIGNAL HEAD, 16" L.E.D. MODULES, W/ COUNTDOWN INDICATOR
	4	PEDESTRIAN PUSH BUTTON (VIBRATORY) W/ AUDIBLE WARNING DEVICE (APS) & R10-3e SIGN SADDLE
	12	WIRE LOOP DETECTORS (6'X6' TYPE A)
	4	WIRE LOOP DETECTORS - BICYCLE (5'X5' TYPE D)
	2	WIRE LOOP DETECTORS - BICYCLE (6'X6' TYPE D)
	4	WIRE LOOP DETECTORS (6'X20' QUADRUPOLE)
	7	TYPE C, 2-CHANNEL CARD RACK LOOP DETECTOR AMPLIFIER (5 + 2 SPARES)
	1	LOOP DETECTOR CARD RACK & CHASSIS
	4	EMERGENCY PRE-EMPTION DETECTORS AND DETECTOR CABLING
	2	EMERGENCY PRE-EMPTION 2-CHANNEL PHASE SELECTORS
	1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
	1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
	1	MALFUNCTION MANAGEMENT UNIT (MMU)
	1	CABINET POWER SUPPLY
	2	SPARE B.I.U. (BUS INTERFACE UNITS)
	1	R&S TS POLE W/ 30' MAST ARM & FOUNDATION
	4	R&S 1-SECTION SIGNAL HOUSING
ITEM 811.31	8	12" X 12" PULL BOX
ITEM 811.22	4	ELECTRIC HANDHOLE - SD2.022
ITEM 804.3	±480 FT	3" SCH. 80 PVC CONDUIT
ITEM 832.	8	TS POLE MOUNTED SIGNS (MA-D3-1a, MA-D3-1b, R10-11b & MA-R10-12a RIGIDLY MOUNTED)

PROPOSED LOOP DETECTOR DATA

DETECTOR NO.	AMPLIFIER NO.	CHANNEL NO.	NO. SECTION/ SIZE	NO. OF TURNS	OPERATIONS	DELAY/ EXT.	PHASE CALLED	PHASE EXT.	LOOP CONNECTION
1	1	1	6'X6' TYPE D	3-3-3-3	PRESENCE	0	Ø5	Ø5/Ø2	SINGLE
2	2	1	3-6'X6' TYPE A	3	PRESENCE	0	Ø5	Ø5/Ø2	SERIES
3	1	2	2-5'X5' TYPE D	3-3-3-3	PRESENCE	0	Ø2	Ø2	SINGLE
4	2	2	3-6'X6' TYPE A	3	PRESENCE	0	Ø2	Ø2	SERIES
5	3	1	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø8	Ø8	SERIES
6	4	1	2-5'X5' TYPE D	3-3-3-3	PRESENCE	0	Ø6	Ø6	SINGLE
7	5	1	3-6'X6' TYPE A	3	PRESENCE	0	Ø6	Ø6	SERIES
8	4	2	6'X6' TYPE D	3-3-3-3	PRESENCE	0	Ø1	Ø1/Ø6	SINGLE
9	5	2	3-6'X6' TYPE A	3	PRESENCE	0	Ø1	Ø1/Ø6	SERIES
10	3	2	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø4	Ø4	SERIES

LOOP DETECTOR NOTES:
1. THE CONSTRUCTION SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY.
3. EACH LOOP GROUP SHALL BE SPLICED IN SINGLE PULL BOX AND WIRED TO SEPARATE CONTROLLER INPUT.
4. ALL BICYCLE LOOPS SHALL BE CONNECTED TO SEPARATE LOOP DETECTOR AMPLIFIERS CAPABLE OF HIGHER LEVELS OF SENSITIVITY.
5. UNLESS OTHERWISE NOTED, ALL LOOP DETECTORS SHALL BE PLACED IN THE CENTER OF THE LANE.

PREFERENTIAL PHASE SEQUENCE



* PEDESTRIAN PHASE UPON PUSH BUTTON ACTIVATION ONLY.

608037(PS&E2)HD9\TRAFFIC SIGNAL PLANS).DWG Plotted on 6-Jul-2018 1:47 PM

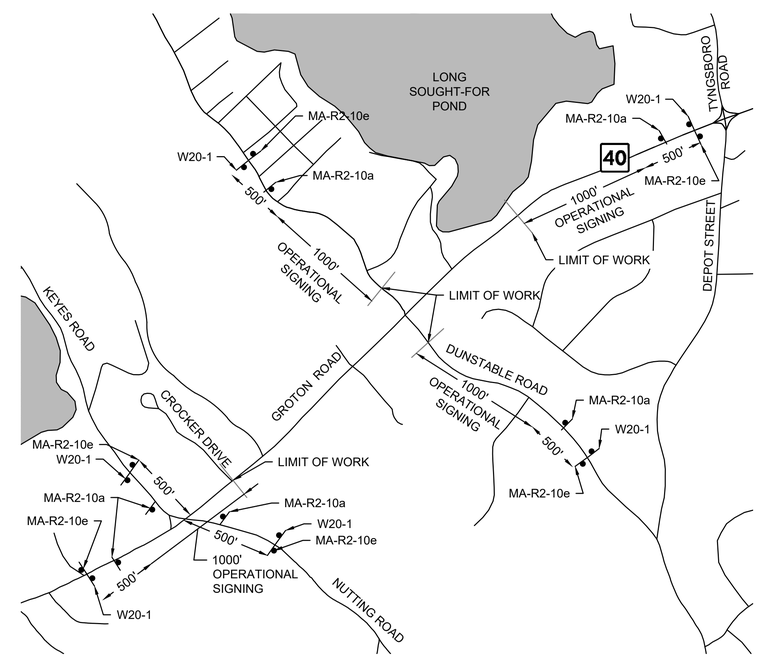
608037/PS&E2/HD10(TTCP).DWG Plotted on 7/6/2018 12:36 PM

TRAFFIC SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN (in)			TEXT DIMENSIONS (in)			NUMBER OF SIGNS REQUIRED	COLOR			UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT	LEGEND	LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR		BACK-GROUND	LEGEND	BORDER		
MA-R2-10a	48	36	WORK ZONE SPEEDING FINES DOUBLED	MASSDOT STANDARD SIGN			6	FL. ORANGE WHITE	BLACK BLACK	BLACK BLACK	12.00	72.00
MA-R2-10e	36	48	END ROAD WORK DOUBLE FINES END				6	FL. ORANGE WHITE	BLACK BLACK	BLACK BLACK	12.00	72.00
R4-7	24	30		SEE 2009 MUTCD FOR DIMENSIONS			4	WHITE	BLACK	BLACK	5.00	20.00
W1-4L	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W1-4R	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W5-1	36	36	ROAD NARROWS				4	FL. ORANGE	BLACK	BLACK	9.00	36.00
W8-1	36	36	BUMP				2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W8-3	36	36	PAVEMENT ENDS				2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W8-15	36	36	GROOVED PAVEMENT				2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W8-24	36	36	STEEL PLATE AHEAD				2	FL. ORANGE	BLACK	BLACK	9.00	18.00
W20-1	36	36	ROAD WORK AHEAD				6	FL. ORANGE	BLACK	BLACK	9.00	54.00
W20-4	36	36	ONE LANE ROAD AHEAD				4	FL. ORANGE	BLACK	BLACK	9.00	36.00
W20-7	36	36					2	FL. ORANGE	BLACK	BLACK	9.00	18.00
MA-W20-7b	36	36	POLICE OFFICER AHEAD	MASSDOT STANDARD SIGN			6	FL. ORANGE	BLACK	BLACK	9.00	54.00
W21-5aR	36	36	RIGHT SHOULDER CLOSED	SEE 2009 MUTCD FOR DIMENSIONS			1	FL. ORANGE	BLACK	BLACK	9.00	9.00

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN THE "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
7. THE FIRST TEN PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A SEQUENTIAL WARNING LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.



ADVANCED WARNING SCHEMATIC
N.T.S

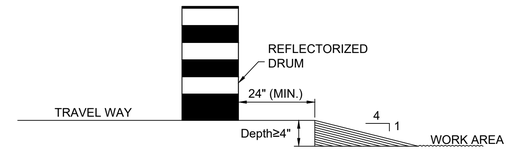
608037/PS&E2/HD10(TTCP).DWG Plotted on 7/6/2018 12:36 PM

LEGEND:

- ● REFLECTORIZED PLASTIC DRUM OR 36" CONE
- P/F POLICE/FLAGGER DETAIL
- TYPE III BARRICADE
- ARROW BOARD
- MEDIAN BARRIER
- WORK ZONE
- DIRECTION OF TRAFFIC
- SIGN
- IMPACT ATTENUATOR

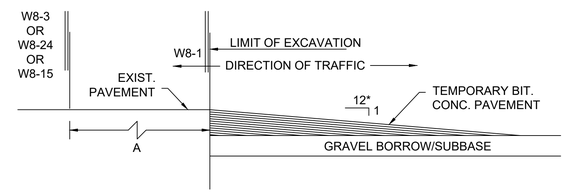
SUGGESTED WORK ZONE WARNING SIGN SPACING

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



LATERAL DROP-OFF DETAIL

NOT TO SCALE



LONGITUDINAL DROP-OFF DETAIL

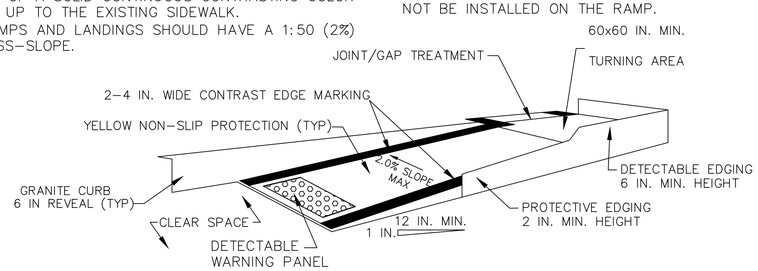
* - INCREASE SLOPE RATIO FOR HIGHER SPEEDS

NOT TO SCALE

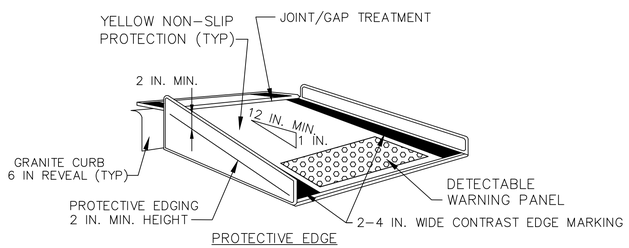
PEDESTRIAN TYPICAL DETAILS

NOTES:

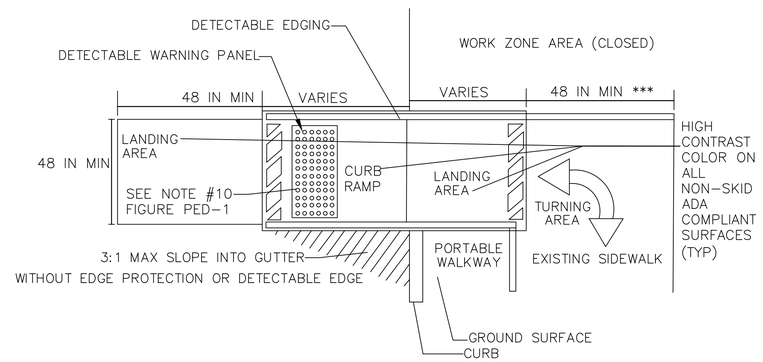
1. CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE AND NON–SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
3. DETECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS–SLOPE.
6. CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK, THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.



TEMPORARY CURB RAMP-PARALLEL TO CURB



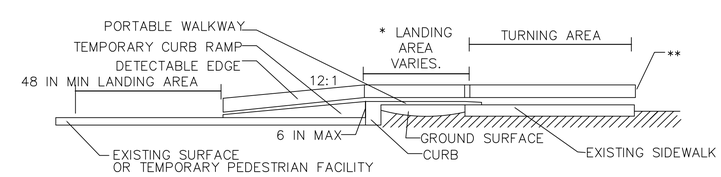
TEMPORARY CURB RAMP-PERPENDICULAR TO CURB



* –LANDING AREA USED TO OVERLAP NON–ADA COMPLIANT SURFACES.

** –DETECTABLE EDGE REMOVED IF A CONTINUOUS SIDEWALK.

*** –60 IN. IF AN OBSTRUCTION IS AT BACK OF SIDEWALK

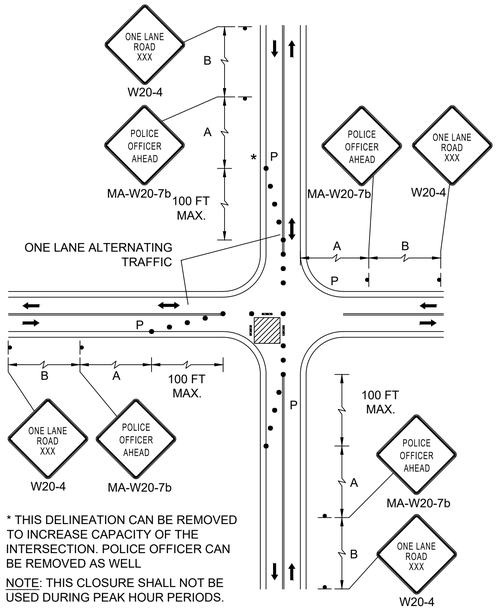


TEMPORARY CURB RAMP

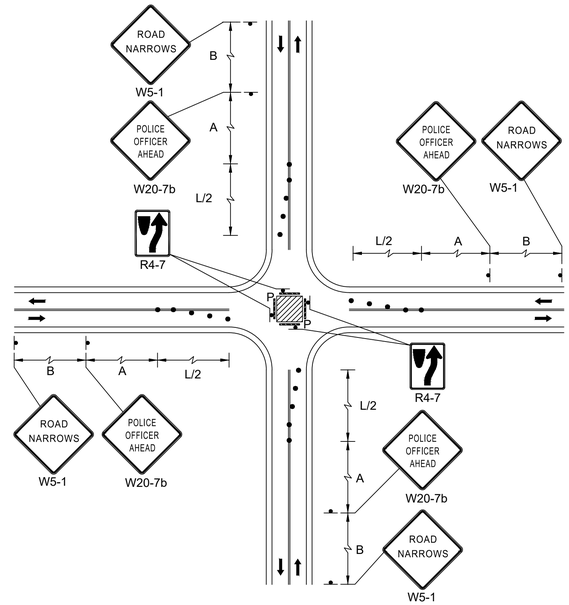
WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	35	73
PROJECT FILE NO.	608037		

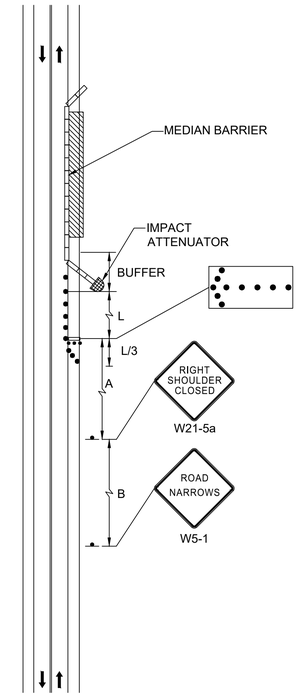
TEMPORARY TRAFFIC CONTROL PLANS - 3 OF 3



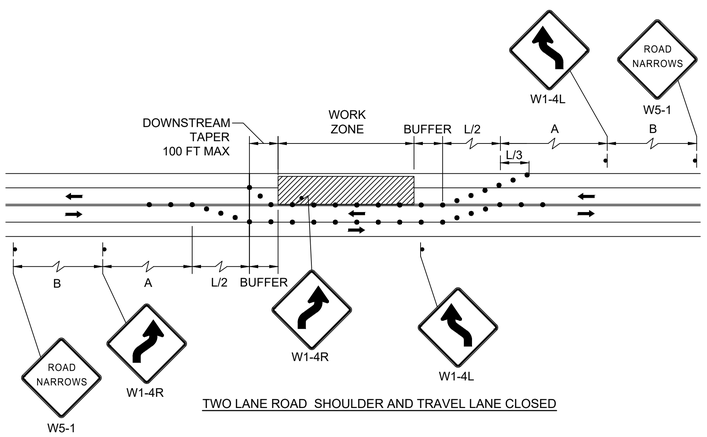
SINGLE LANE APPROACH ONE QUADRANT CLOSURE



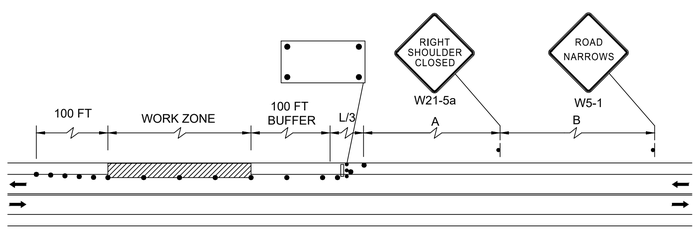
SINGLE LANE APPROACH CENTER CLOSURE



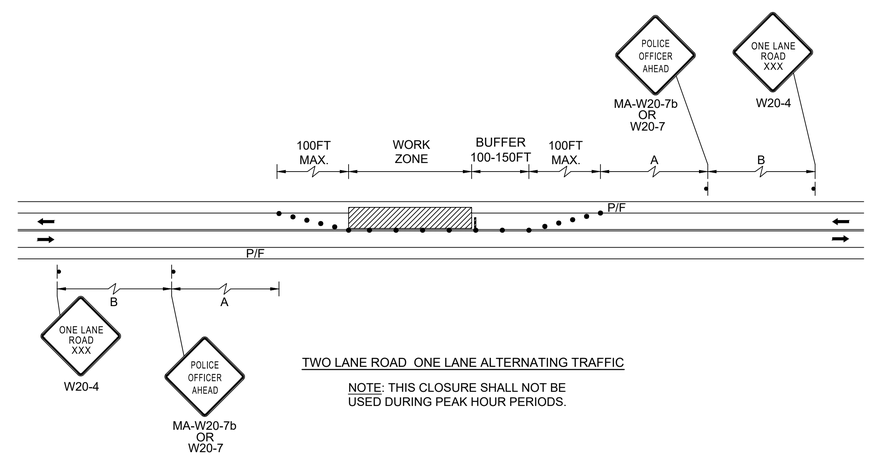
TWO LANE ROAD SHOULDER CLOSURE
(FOR HEADWALL DEMOLITION/ CONSTRUCTION)



TWO LANE ROAD SHOULDER AND TRAVEL LANE CLOSED



TWO LANE ROAD SHOULDER CLOSURE



TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC

NOTE: THIS CLOSURE SHALL NOT BE USED DURING PEAK HOUR PERIODS.

608037/PS&E2/HD10(TTCP).DWG Plotted on 7/6/2018 12:36 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	36	73
PROJECT FILE NO.	608037		

UTILITY PLANS - 1 OF 5

PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
1	PROP CBCI	8+23.0, 14.9' RT	212.72	-	208.70 (3)	SLAB TOP
2	PROP CBCI	8+53.0, 14.0' LT	214.26	-	210.25 (3)	SLAB TOP
3	EX DMH	8+64.9, 18.8' RT	214.73	207.95 (1) 209.65 (2) 211.50 (EX DMH 2)	205.00 (EX)	CORE HOLES IN EX DMH 1
4	PROP CB	11+37.4, 14.0' RT	227.25	-	223.40 (5)	OFFSET HOLE SLAB TOP
5	PROP DMH	11+56.1, 12.0' LT	227.38	223.25 (4) 223.60 (7)	223.15 (6)	SLAB TOP
6	EX DMH	11+56.2, 17.5' LT	227.55	223.10 (5) 223.40 (8 EX) 223.65 (EX DMH NW)	223.60 (EX)	CORE HOLE IN EX DMH 4
7	PROP CB	11+68.3, 14.0' LT	227.76	-	223.75 (5)	OFFSET HOLE SLAB TOP

EXISTING INVERT TABLE

DMH1
RIM=214.0±
15" INV.IN=211.50
15" INV.OUT=205.00

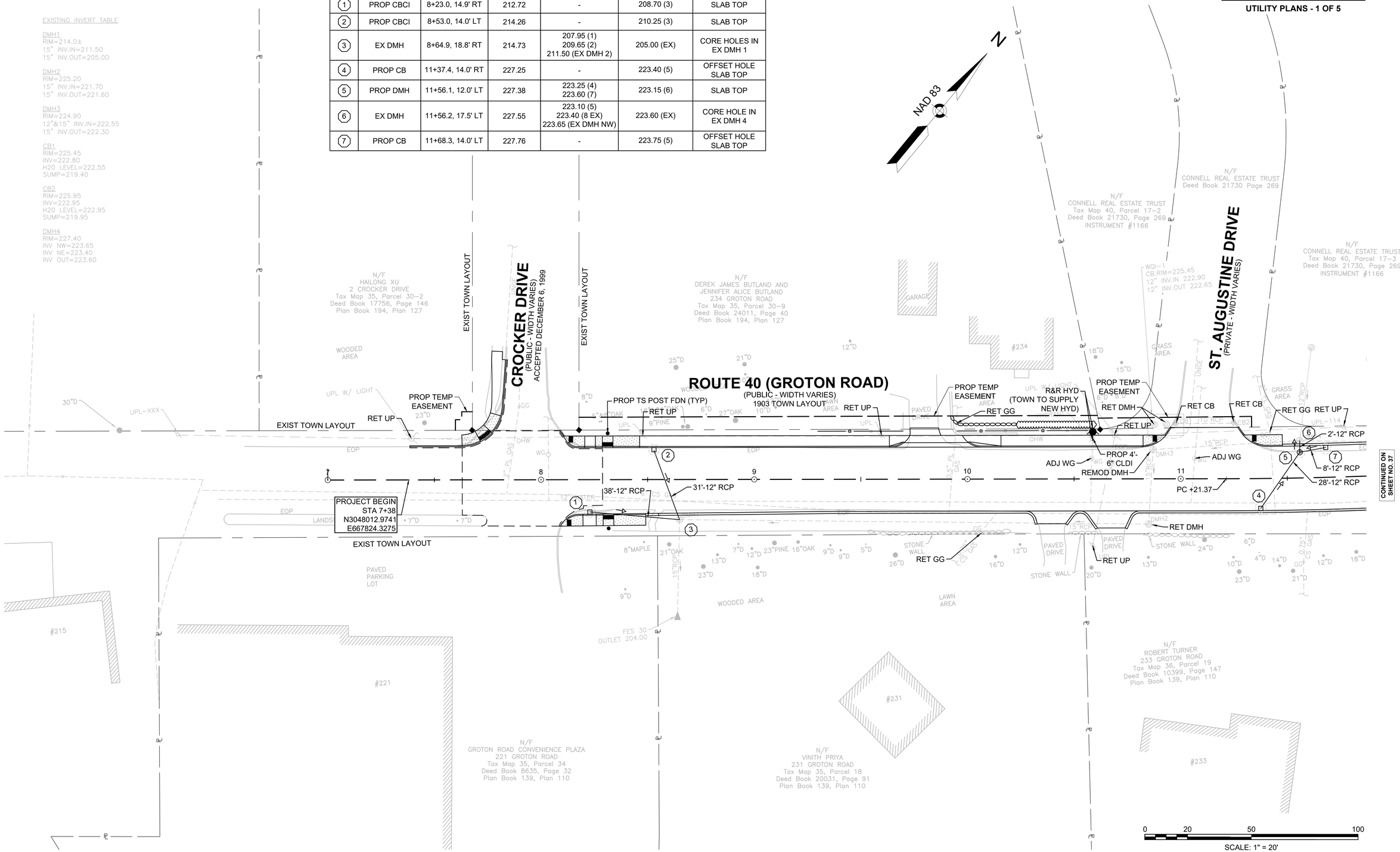
DMH2
RIM=225.20
15" INV.IN=221.70
15" INV.OUT=221.60

DMH3
RIM=224.90
12"&15" INV.IN=222.55
15" INV.OUT=222.30

CB1
RIM=225.45
INV=222.80
H20 LEVEL=222.55
SUMP=219.40

CB2
RIM=225.95
INV=222.95
H20 LEVEL=222.95
SUMP=219.95

DMH4
RIM=227.40
INV NW=223.65
INV NE=223.40
INV OUT=223.60



CONTINUED ON SHEET NO. 37

608037(PS&E2)HD1(UTILITY PLANS).DWG Plotted on 6-Jul-2018 1:48 PM

PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
8	CIT TO DMH	12+34.6, 13.6' LT	229.71	-	225.95 (EX)	EX CB 3
9	PROP DMH	16+28.5, 10.0' LT	229.58	225.20 (11) 225.20 (9B)	225.15 (9A)	SLAB TOP
9A	PROP HDWL	16+23.6, 24.7' RT	-	-	225.00	
9B	PROP HDWL	16+30.1, 21.4' LT	-	225.25 (9)	-	
10	PROP CB	16+64.1, 14.0' LT	229.16	-	225.65 (11)	SLAB TOP
11	PROP SPECIAL DMH	16+75.6, 3.3' LT	229.33	225.45 (10) 225.45 (12) 225.45 (13) 225.45 (15) 225.45 (16)	225.35 (9)	6' DIAMETER SLAB TOP
12	PROP CB	16+64.1, 14.0' RT	229.16	-	225.70 (11)	OFFSET HOLE SLAB TOP
13	PROP CB	16+84.0, 14.0' LT	229.10	-	225.65 (11)	SLAB TOP
15	PROP CB	16+84.0, 14.0' RT	229.10	-	225.70 (11)	OFFSET HOLE SLAB TOP

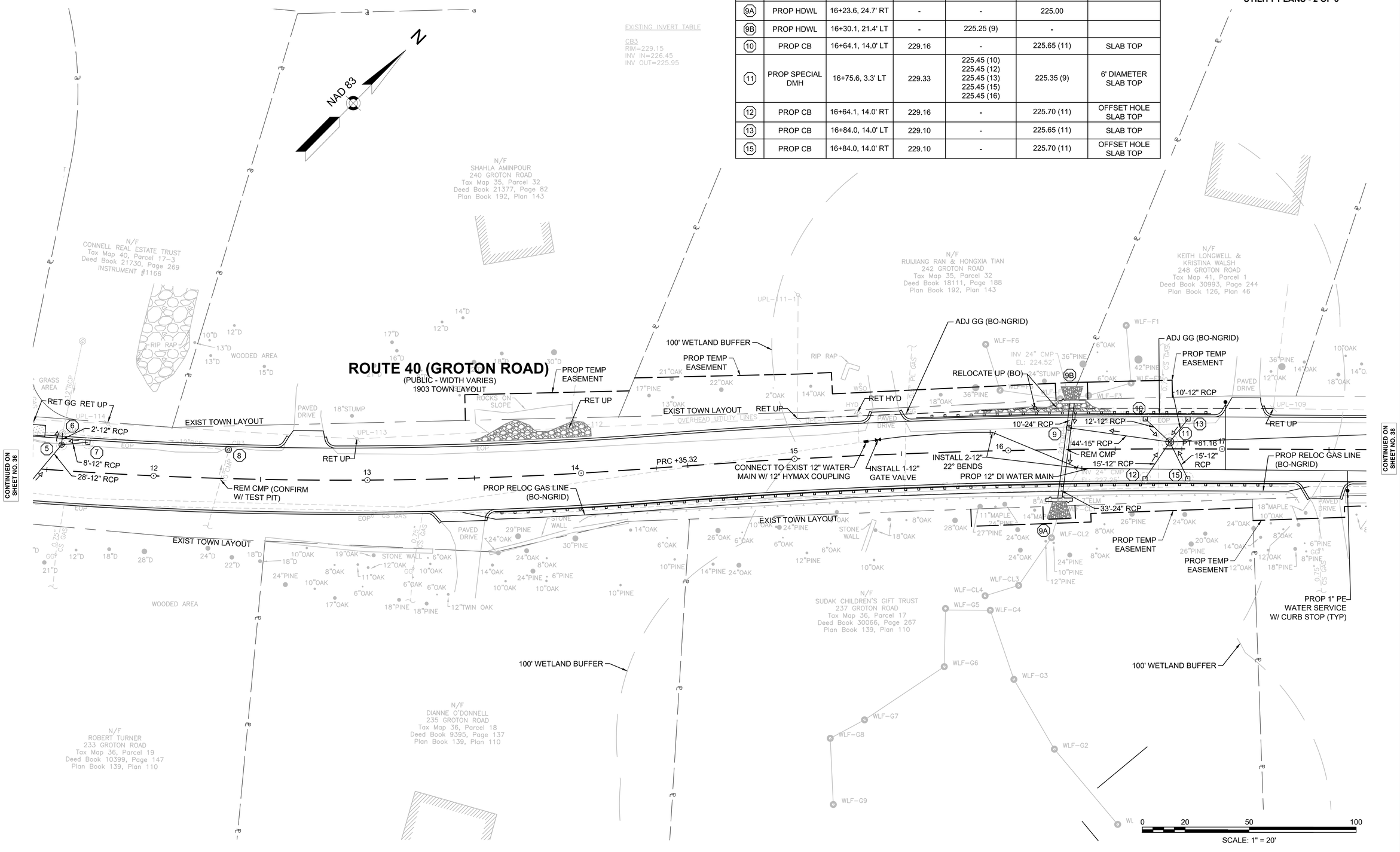
EXISTING INVERT TABLE

CB3
RIM=229.15
INV IN=226.45
INV OUT=225.95

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	37	73
PROJECT FILE NO.	608037		

UTILITY PLANS - 2 OF 5



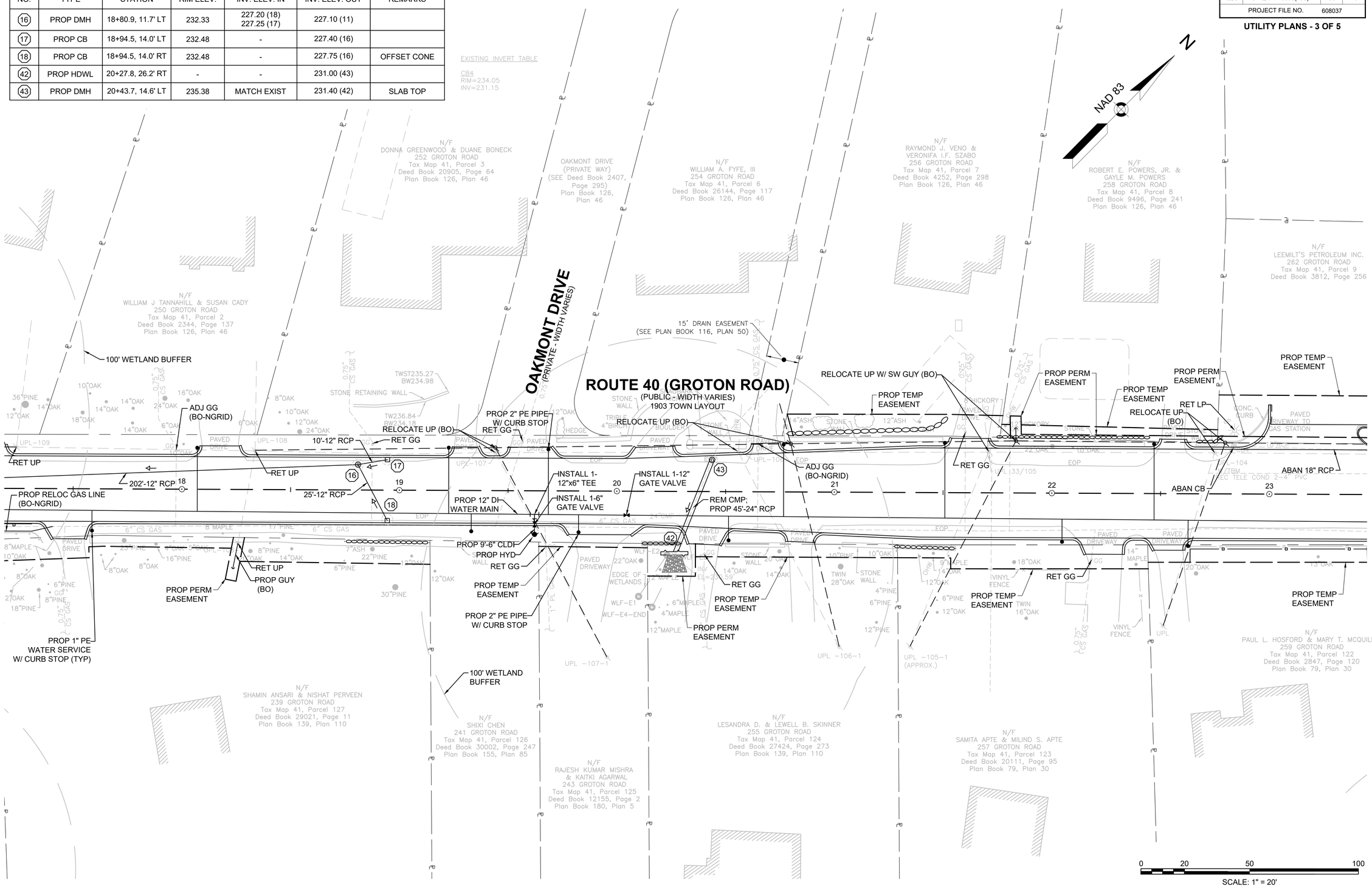
608037(PS&E2)HD11(UTILITY PLANS).DWG Plotted on 6-Jul-2018 1:48 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	38	73
PROJECT FILE NO.	608037		

UTILITY PLANS - 3 OF 5

PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
16	PROP DMH	18+80.9, 11.7' LT	232.33	227.20 (18) 227.25 (17)	227.10 (11)	
17	PROP CB	18+94.5, 14.0' LT	232.48	-	227.40 (16)	
18	PROP CB	18+94.5, 14.0' RT	232.48	-	227.75 (16)	OFFSET CONE
42	PROP HDWL	20+27.8, 26.2' RT	-	-	231.00 (43)	
43	PROP DMH	20+43.7, 14.6' LT	235.38	MATCH EXIST	231.40 (42)	SLAB TOP

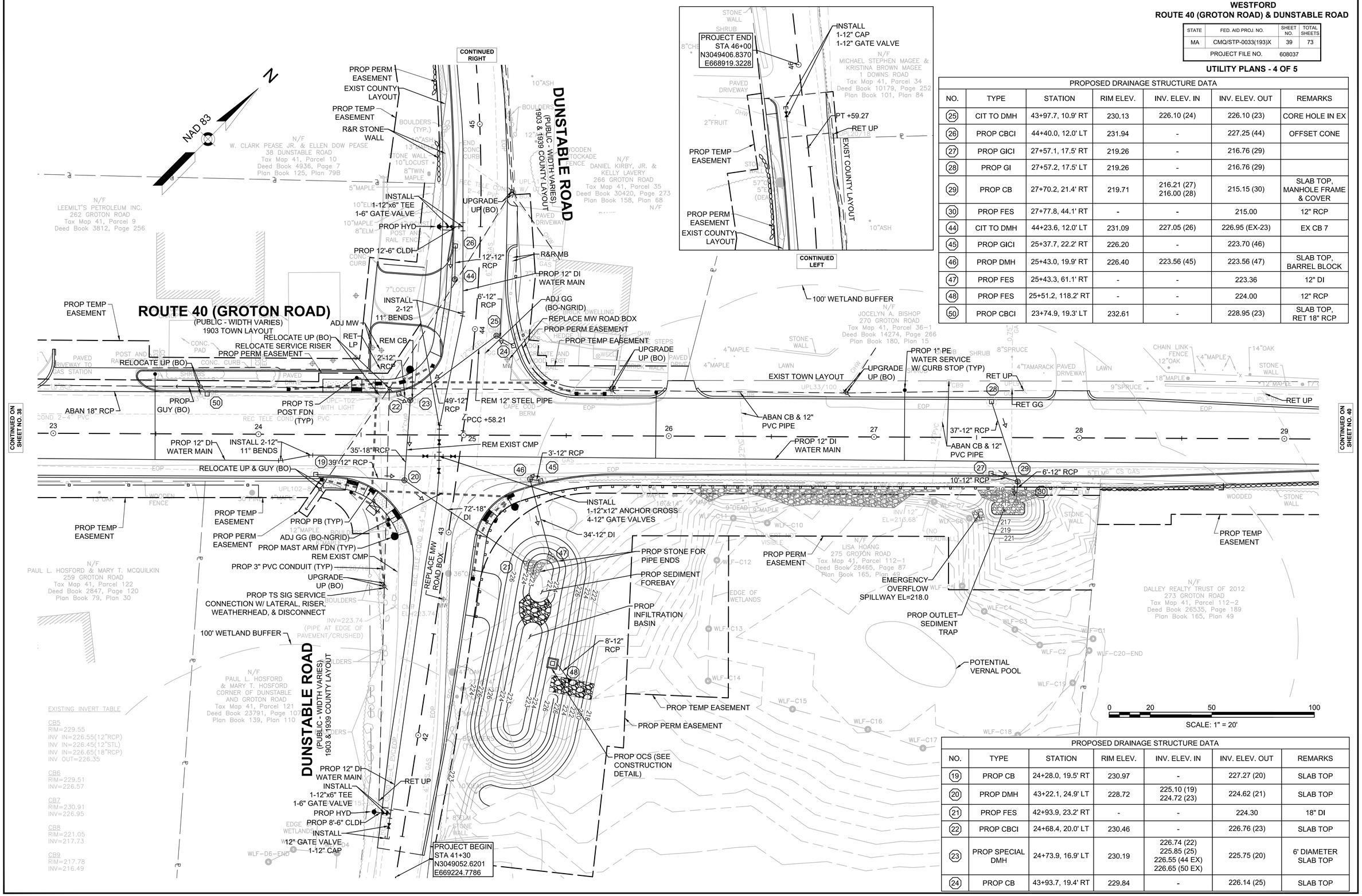


608037(PS&E2)HD11(UTILITY PLANS).DWG Plotted on 6-Jul-2018 1:48 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	39	73
PROJECT FILE NO.	608037		

UTILITY PLANS - 4 OF 5



PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
25	CIT TO DMH	43+97.7, 10.9' RT	230.13	226.10 (24)	226.10 (23)	CORE HOLE IN EX
26	PROP CBCI	44+40.0, 12.0' LT	231.94	-	227.25 (44)	OFFSET CONE
27	PROP GICI	27+57.1, 17.5' RT	219.26	-	216.76 (29)	
28	PROP GI	27+57.2, 17.5' LT	219.26	-	216.76 (29)	
29	PROP CB	27+70.2, 21.4' RT	219.71	216.21 (27) 216.00 (28)	215.15 (30)	SLAB TOP, MANHOLE FRAME & COVER
30	PROP FES	27+77.8, 44.1' RT	-	-	215.00	12" RCP
44	CIT TO DMH	44+23.6, 12.0' LT	231.09	227.05 (26)	226.95 (EX-23)	EX CB 7
45	PROP GICI	25+37.7, 22.2' RT	226.20	-	223.70 (46)	
46	PROP DMH	25+43.0, 19.9' RT	226.40	223.56 (45)	223.56 (47)	SLAB TOP, BARREL BLOCK
47	PROP FES	25+43.3, 61.1' RT	-	-	223.36	12" DI
48	PROP FES	25+51.2, 118.2' RT	-	-	224.00	12" RCP
50	PROP CBCI	23+74.9, 19.3' LT	232.61	-	228.95 (23)	SLAB TOP, RET 18" RCP

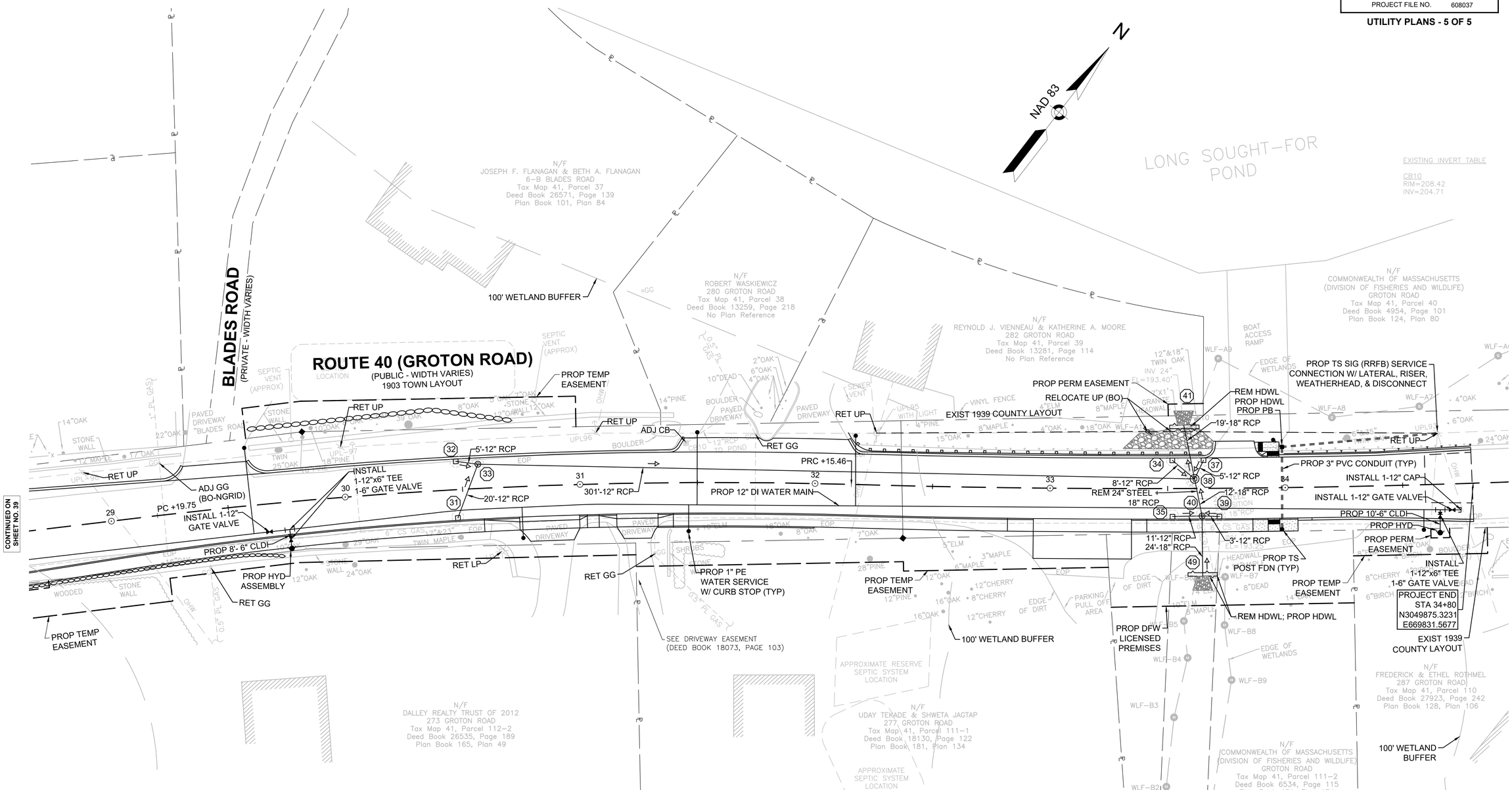
PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
19	PROP CB	24+28.0, 19.5' RT	230.97	-	227.27 (20)	SLAB TOP
20	PROP DMH	43+22.1, 24.9' LT	228.72	225.10 (19) 224.72 (23)	224.62 (21)	SLAB TOP
21	PROP FES	42+93.9, 23.2' RT	-	-	224.30	18" DI
22	PROP CBCI	24+68.4, 20.0' LT	230.46	-	226.76 (23)	SLAB TOP
23	PROP SPECIAL DMH	24+73.9, 16.9' LT	230.19	226.74 (22) 225.85 (25) 226.55 (44 EX) 226.65 (50 EX)	225.75 (20)	6' DIAMETER SLAB TOP
24	PROP CB	43+93.7, 19.4' RT	229.84	-	226.14 (25)	SLAB TOP

608037(PS&E)HD11(UTILITY PLANS).DWG Plotted on 6-Jul-2018 1:48 PM

WESTFORD
ROUTE 40 (GROTON ROAD) & DUNSTABLE ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	CMQ/STP-0033(193)X	40	73
PROJECT FILE NO.	608037		

UTILITY PLANS - 5 OF 5



PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
31	PROP CBCI	30+47.4, 12.1' RT	214.11	-	208.90 (33)	OFFSET CONE
32	PROP CB	30+47.8, 12.0' LT	214.09	-	208.90 (33)	
33	PROP DMH	30+57.1, 10.3' LT	213.61	208.70 (31) 208.85 (32)	207.00 (38)	
34	PROP CB	33+52.0, 12.0' LT	201.65	-	196.50 (38)	
35	PROP CBCI	33+52.0, 12.0' RT	201.65	-	196.45 (40)	OFFSET CONE
37	PROP CB	33+65.3, 12.0' LT	201.66	-	196.35 (38)	

PROPOSED DRAINAGE STRUCTURE DATA						
NO.	TYPE	STATION	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
38	PROP SPECIAL DMH	33+61.3, 3.4' LT	201.83	196.45 (33) 196.20 (34) 196.25 (37) 193.10 (40)	193.10 (41)	6' DIAMETER
39	PROP CBCI	33+71.9, 12.0' RT	201.71	-	196.40 (40)	
40	PROP DMH	33+64.6, 11.7' LT	201.68	196.35 (35) 196.35 (39) 193.15 (48)	193.15 (38)	
41	PROP HDWL	33+57.2, 25.5' LT	-	193.00 (38)	-	
49	PROP HDWL	33+64.7, 37.4' RT	-	-	193.25 (40)	

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