

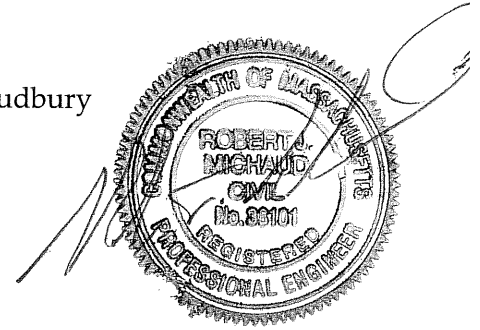
MEMORANDUM

DATE: June 16, 2016

TO: Ms. Jody Kablack
Director of Planning and Community Development Town of Sudbury
278 Old Sudbury Road Sudbury, MA 01776

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Second Response to Peer Review Comments**
The Village at Sudbury Station – 30 Hudson Road Sudbury, Massachusetts



MDM Transportation Consultants, Inc. (MDM) has prepared the following response to transportation-related peer review comments for the above-referenced project, as issued in a letter by the City's peer review consultant, Vanasse and Associates, Inc. (VAI), dated June 14, 2016. To facilitate review, specific comments are paraphrased with corresponding responses.

In summary our responses conclude that (a) driveway geometry adequately accommodates maneuvering requirements for the Town's largest emergency responding vehicles; (b) modifications to Peter's Way at Concord Road will prohibit and reasonably restrict left-turns onto Concord Road by means of a raised channelizing island feature; (c) the Applicant will incorporate supplemental signs that discourage non-resident "cut-through" along Peter's Way; and (d) the Applicant will implement supplemental pedestrian crossing controls at crossings near proposed Project driveways.

Fire Apparatus Accessibility

Comment T1: "The Applicant's engineer should provide revised AutoTurn® exhibits for both driveways that show not only the tire paths of the fire truck but also the swept path of the bumper and ladder overhangs. To the extent required, the corner radii of the driveways should be modified such that all elements of the fire truck (tire paths and overhangs) are accommodated within the paved areas without centerline incursions."

Response: The AutoTurn® exhibits presented in MDM's May 31, 2016 memo show the maximum vehicle swept paths that include both the vehicle bumper overhangs and wheel tracking using the Town's ladder truck dimensions. MDM also notes that the swept path of the vehicle ladder overhang, which extends slightly beyond the front vehicle bumper but is located

at the midpoint of the vehicle, falls within the maximum swept path of the ladder truck presented in the AutoTurn® exhibits. In some cases the wheel tracking (shown as a green line type on the exhibits) is coincident with the swept path of the vehicle bumper overhang (shown as a blue line type on the exhibits). These exhibits confirm that maximum vehicle swept path (including both wheel tracking and vehicle bumper overhangs) does not impact opposing travel lanes and that proposed curb radii and lane dimensions/alignment will satisfy maneuvering requirements for these vehicle types. As described under Response to Comment No. T2 below, additional AutoTurn® analysis is presented for additional modifications at Peter's Way and Concord Road that also confirms that appropriate swept path area is provided at that driveway as well. Reproduction of the originally submitted AutoTurn® exhibit (Figure 1 of the May 31, 2016 memo) is included in the **Attachments** for reference including wheel tracking and vehicle overhang tracking/swept path.

Measures to Reduce Potential "Cut-Through" Traffic

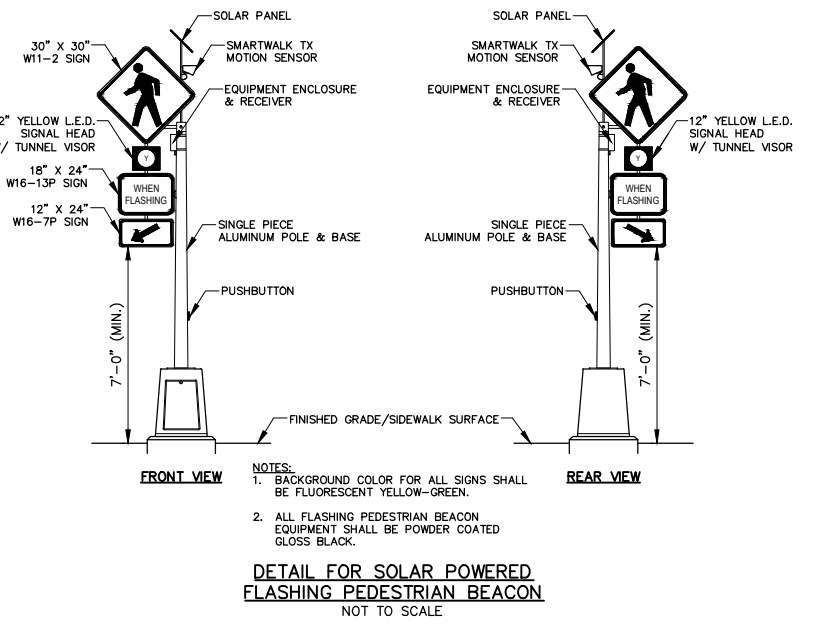
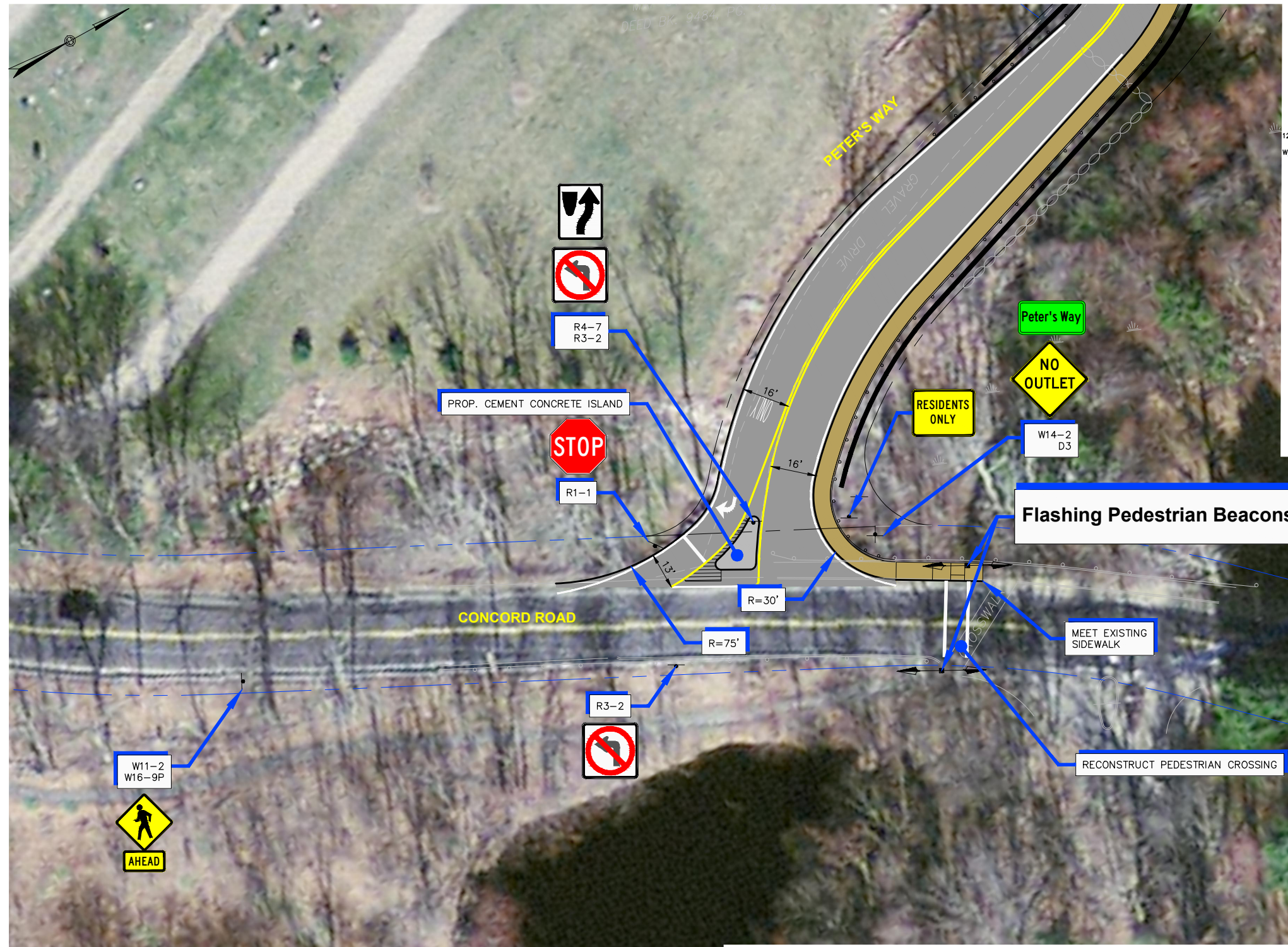
Comment T2: *"The Applicant should revise the proposed modifications to Peter's Way to address the following comments, which should also be reflected in the revisions to the fire truck turning analysis discussed previously:*

T2 (1): "Signs should be posted on Peter's Way at Concord Road stating "Residents Only" and "No Outlet"". Similar signs should be posted on the northbound exit from the roundabout internal to the project site".

Response: The Applicant will include the suggested Residents Only and No Outlet signs at Peter's Way as suggested. These signs are shown on the updated Conceptual Access Improvement Plan included as **Exhibit 1**. Placement of these sign types within the project site at the roundabout are not warranted.

T2 (2): "The proposed gate system should incorporate an emergency pre-emption system (OPTICOM®) for responding emergency vehicles."

Response: Peter's Way, a private road, will be designed for resident use only with appropriate signs as suggested by peer review above and ability to reverse direction for vehicles that inadvertently use this private road. Based on input from a working session held with the Town the week of June 13, 2016 gated control is not proposed.



- NOTES**
1. THIS PLAN INTENDED FOR DISCUSSION PURPOSES ONLY; IT IS NOT FOR CONSTRUCTION.
 2. FINAL DESIGN IS SUBJECT TO FIELD SURVEY BY OTHERS.
 3. PROPERTY LINES AND ACCESS LINE LOCATIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO DEED AND TITLE RECORDS.
 4. BASE PLAN SOURCE: SULLIVAN, CONNORS & ASSOCIATES AND USGS COLOR ORTHO IMAGERY.

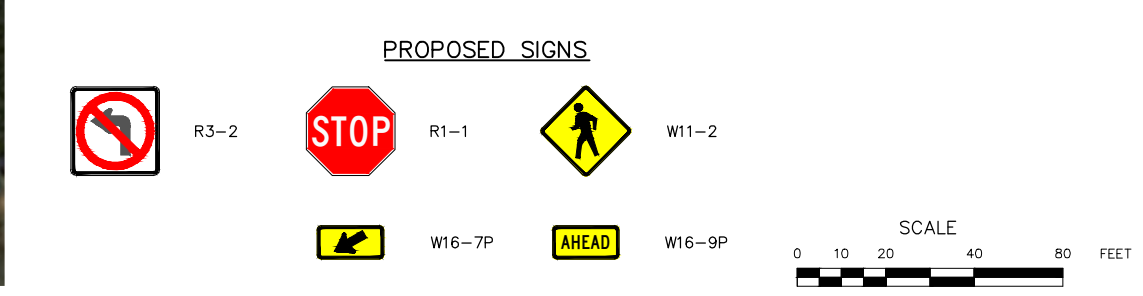


Exhibit 1

Concord Road/Peter's Way Improvements

CONCORD ROAD
SUDBURY, MASSACHUSETTS
PREPARED FOR:
SUDBURY STATION, LLC
2134 SEVILLA WAY
NAPLES, FLORIDA 34109

MDM TRANSPORTATION CONSULTANTS, INC.
PLANNERS & ENGINEERS

28 Lord Road, Suite 280
Marlborough, MA 01752
Tel: (508) 303-0370
Fax: (508) 303-0371

DATE: June 15, 2016 SCALE: As Noted

PROJECT No. 814 File: 814 Concept Plan Concord - Expanded Island.dwg Sheet 1 of 1

T2 (3): *“In order to prohibit left-turn movements exiting Peter’s Way to Concord Road, a necessity given the sight distance restrictions posed by vehicle queues along Concord Road at Peter’s Way, the proposed channelizing island should be raised with accompanying corner radii on the island and driveway that position exiting vehicles such that a left-turn maneuver cannot be made in a practical manner.”*

Response: The Peter’s Way island feature has been modified to include an expanded raised island with scored concrete panels, signs and markings that prohibit left-turns onto Concord Road and make left-turn exiting movements impractical. Refer to **Exhibit 1** for a conceptual layout of the revised driveway and associated signs and markings. The proposed geometry continues to accommodate emergency vehicle access/egress requirements as demonstrated in the AutoTurn® **Exhibit 2** which shows the swept path of the Town’s ladder truck (including vehicle overhangs).

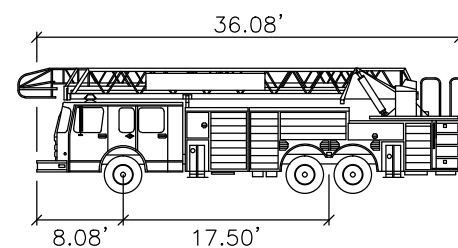
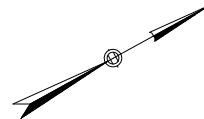
T2 (4): *“Given the limited utility of allowing left-turn entering movements from Concord Road, the Applicant could consider restricting access by way of Peter’s Way to right-turns only, prohibiting left-turn movements from both entering and exiting excepting emergency vehicles entering from Concord Road.”*

Response: The proposed updated driveway layout at Peter’s Way as presented in **Exhibit 1** is designed to allow appropriate swept path for emergency vehicle access that would principally include left-turns from Concord Road. As such, there is no practical way to restrict left-turn entering movements from occurring at the intersection. Likewise, eliminating left-turn access onto Peter’s Way from Concord Road is not warranted based on limited volume. The driveway design therefore allows the left-turn entry onto Peter’s Way.

Candy Hill Road Impacts

Comment T3 (1): *We would recommend that the Applicant’s engineer collect additional travel time data for the reverse movement (entering the Project site versus exiting) during the weekday evening peak hour for the travel routes that were evaluated and vehicle queues on the Old Sudbury Road westbound approach to Concord Road were observed to be excessive during this period. These queues were observed to extend beyond Peter Noyes Elementary School at times and may influence the selection of return travel routes to the Project site during the weekday evening commuter period.”*

Response: Existing signal operations at the Town Center do not reflect necessary fine-tuning of the signal phasing and timing before the Town Center improvements are completed. Accordingly, measurement of travel times along Route 27 will not correctly reflect actual delays once the signal improvement is fully completed. A more detailed discussion of MDM’s field



Sudbury Ladder

- Width : 8.33 FT.
- Track : 8.33 FT.
- Lock to Lock Time : 6.0 SEC.
- Steering Angle : 40.6°

Site Plan Source: Sullivan, Connors & Associates



observation of the signal operations is presented below that illustrate this point. A summary of inventoried signal controller settings and observed westbound PM signal phase time is included in the **Attachments** for reference.

Field review of the Town Center signal operations conducted by MDM on June 15, 2016 during the weekday evening peak period (4 to 6 PM) confirms that extensive vehicle queues occur (sometimes exceeding 2,000 feet) with associated travel delays that approach or exceed 2 minutes during this period. As a point of reference, analysis under fully implemented signal improvements (conditions that will only be reflected once final signal tuning is conducted by the Town) show that delays for the westbound movement will be less than 50 seconds on average per the prior submitted Synchro® analysis for Build conditions as reported in the December 2015 TIAS and subsequent technical memorandum of March 15, 2016. Current signal settings for the PM period as identified by review of the signal controller settings, indicate a maximum to 50 seconds of green time for the westbound signal phase; however, this time is not being fully utilized due to “gap-out”, a condition under which the signal phase “green time” ends when spacing between vehicles approaching the signal exceeds 2.5 seconds. In fact, measurement of actual allocated green time for this westbound movement ranged from only 25 seconds to 40 seconds of the 50-seconds of possible green time due to “gap-out” - despite the high vehicle demand and long queues on Route 27. This represents a significant loss of green time approaching only 50% effective green time utilization for many of the observed signal cycles during the PM peak period - hence the long queues and delays.

Since the Town Center project is still under construction, final tuning of the signal is expected to address this issue as is customary practice prior to closing out the construction process. Fine tuning could include a combination of (a) extending the clearance time for the westbound signal phase, thereby ensuring better use of the allotted green time, (b) inclusion of an additional detector loop on Route 27 to ensure inappropriate “gap-out” does not occur, and/or (c) rephrasing the signal to eliminate the eastbound lead signal phase during the PM peak hour (and hence more green-time allocation to the westbound traffic flow where it is needed).

Travel Time Data

Notwithstanding the fact that signal operations at the Town Center remain incomplete and subject to fine-tuning as described above, MDM collected travel time run data during the weekday evening peak period (4:00 am to 6:00 am) on Wednesday, June 15, 2016 for travel Route A (Route 27) and Route B (Water Row, Plympton Road, Candy Hill Road and Concord Road). These travel routes are depicted in **Exhibit 3**; travel time data are included in the **Attachments**. Projected travel times from the Site are estimated based on a travel speed of 15 miles per hour (mph) from a point central to the Site. The results of the travel time runs for the two travel route options are summarized in **Table 1**.

TABLE 1
TRAVEL TIME RESULTS

Route	Route Travel Distance	Route Travel Time
A (Route 27)	1.7 miles ¹	6 minutes, 20 seconds
B (Candy Hill Road)	2.1 miles ²	5 minutes, 43 seconds

¹Observed travel time plus 710-foot internal distance at 15 mph.

²Observed travel time plus 2,100-foot internal distance at 15 mph.

As summarized in **Table 1**,

- *Shortest Travel Distance.* The shortest travel route based on travel distance to destinations to the east is along Route 27 (Route A). The travel distance along Route B is approximately 20% longer.
- *Travel Time.* Travel time difference between routes A and B are materially insignificant (less than a 40 second difference), even including the longer delays experienced from signal operations and queuing along Route 27 (Old Sudbury Road) westbound. As described above, final signal tuning will result in a significant delay reduction compared to current conditions, resulting in estimated travel time saving of more than 2 minutes along Route A when compared to Route B. Route B also involves significant delays for left-turns onto Concord Road as vehicle queues on Concord Road often extend beyond Candy Hill Road during the PM peak hour – providing added disincentive to selecting this route as a preferred alternative (particularly when Town Center improvements are complete and the signal operations are fine-tuned).

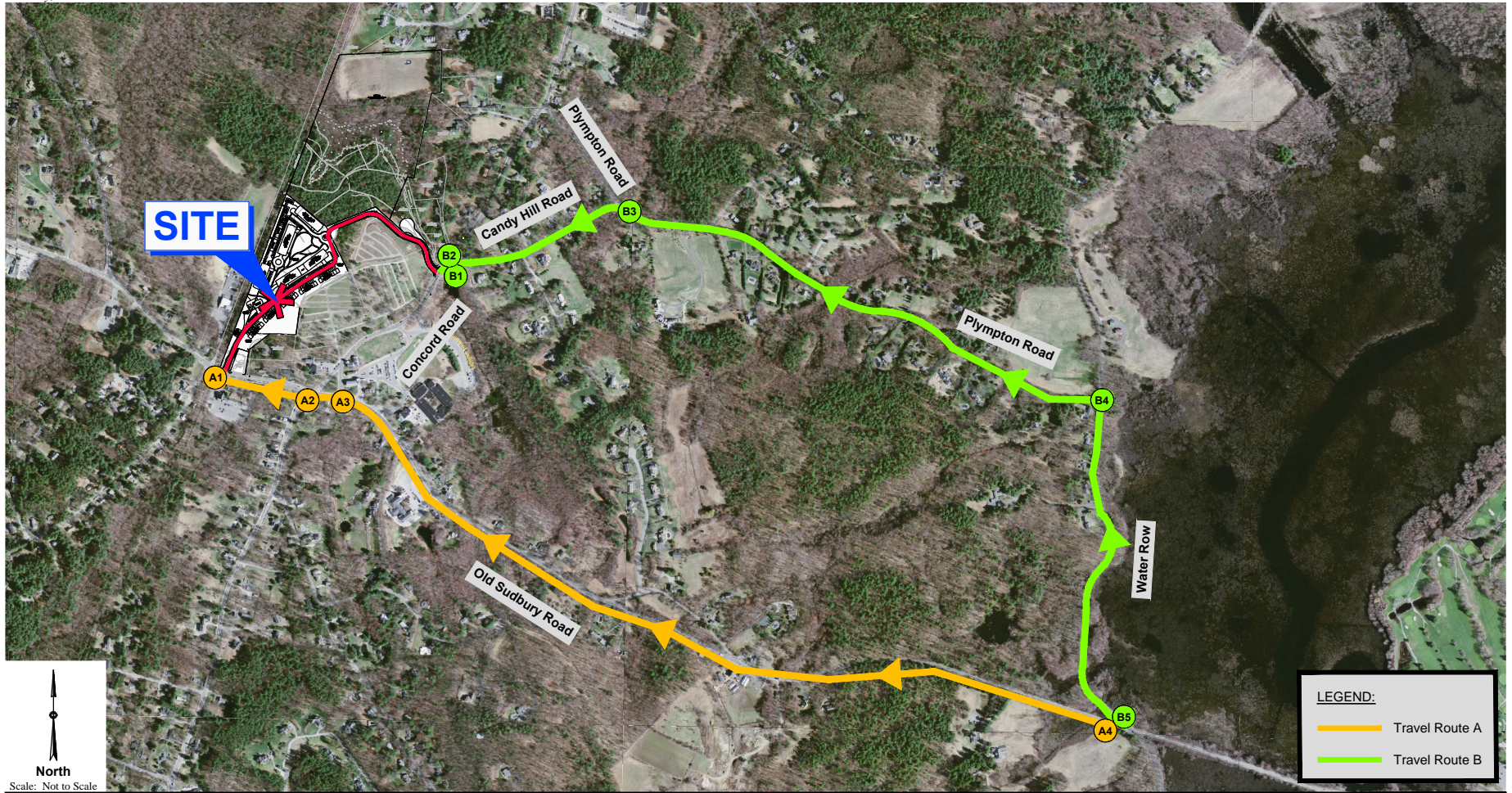


Exhibit 3

In summary, the shortest route by distance and time (following completion and fine tuning of the Town Center signal improvement) will be to use the primary site driveway along Route 27 and travel directly along Route 27 (Route A). The Route B option is not expected to be significant, consistent with existing travel patterns on area roadways.

Comment T3 (2): *"...it is important that the Applicant design the exit from Peter's Way in a manner that restricts or limits the potential for increased use of Candy Hill Road. Independent of the Project, the Town may want to consider implementing peak period turn restrictions to/from Candy Hill Road at Concord Road or Plympton Road as a means to reduce cut-through traffic."*

Response: Modification of the Peter's Way driveway as shown on **Exhibit 1** which now includes a raised channelizing island with scored concrete panels and markings/signs achieves the objective of limiting potential use of Candy Hill Road by project residents. The Applicant acknowledges that the Town may opt to further restrict turns at Candy Hill Road and/or Plympton Road independent of the Project.

Pedestrian Route Inventory

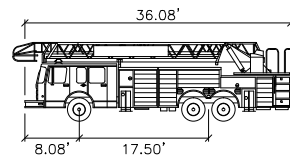
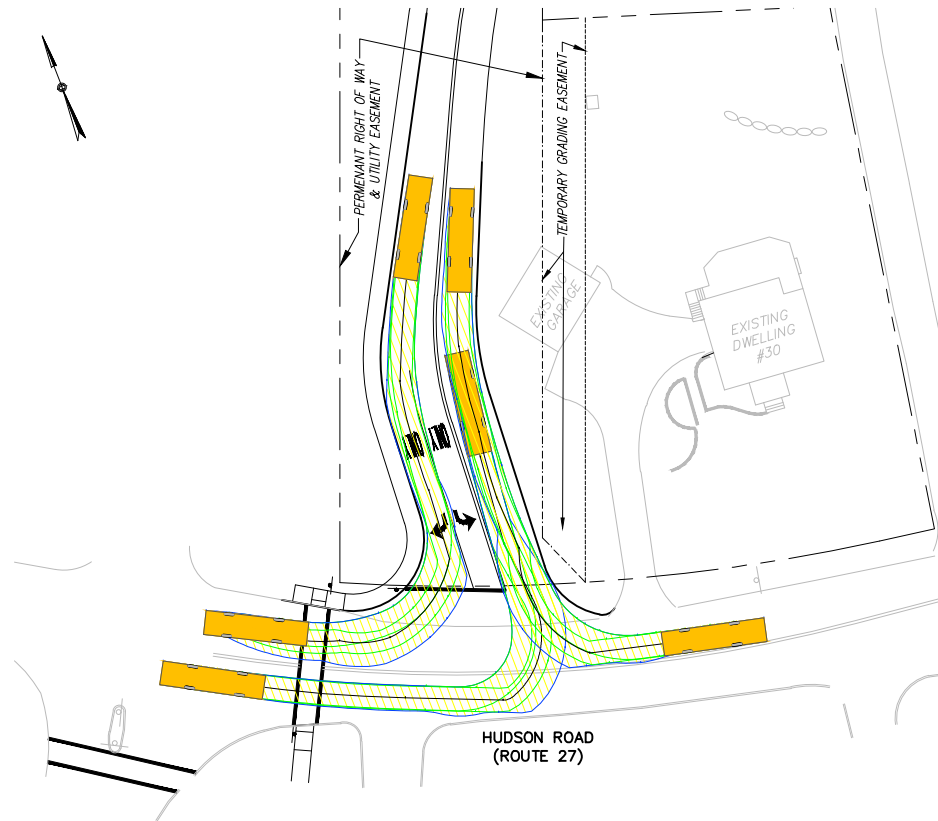
Comment T4: *"Given the speed of traffic approaching the Concord Road crossing at Candy Hill Road (prevailing speed of approximately 40 miles per hour), we would suggest that the Applicant consider the installation of pedestrian activated rectangular rapid flashing beacons (RRFBs) on either side of the improved crossing or a High Intensity Activated Crosswalk (a.k.a. "HAWK") pedestrian beacon to facilitate the safe crossing of Concord Road. Should similar accommodations be desired for the Hudson Road crossing, we would suggest the use of RRFBs vs. the HAWK system given the proximity of the crossing to Peakham Road."*

Response: The Applicant agrees to implement RRFBs at both the Concord Road and Hudson Road crossings (a typical RRFB installation is presented conceptually on **Exhibit 1**). The HAWK pedestrian beacon is not warranted or feasible at either location based on the MUTCD warrant thresholds of 20 pedestrian crossings per hour and/or the close proximity of Candy Hill Road and Peakham Road to the crossing locations (both crossings are within 100 feet of these streets in violation of HAWK criteria cited in the MUTCD).

Attachments

- Autoturn® Analysis Exhibits
- Travel Route Times -PM Peak Period
- Signal Data

□ Autoturn® Analysis



Sudbury Ladder

- Width : 8.33 FT.
- Track : 8.33 FT.
- Lock to Lock Time : 6.0 SEC.
- Steering Angle : 40.6°

Site Plan Source: Sullivan, Connors & Associates

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Residential Development
Sudbury, Massachusetts



Figure 1
AutoTurn Analysis
Sudbury Ladder Truck

Scale: As Noted
DWG No. 814 Autoturn(5-19-2016).dwg

Date: May 2016
Project No. 814

□ Travel Route Times – PM Peak Period

Route A											
Intersection		Stopwatch Lap Time									
		Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10
1	South Site Drive at Hudson Road (Rt 27)	00:18.0	00:17.0	00:18.0	00:22.0	00:20.0	00:25.0	00:20.0			
2	*Hudson Road (Rt 27) at Concord Road	00:19.0	01:05.0	02:25.0	01:25.0	01:25.0	01:15.0	02:25.0			
3	*Hudson Road (Rt 27) at Connector Road	02:04.0	02:10.0	01:50.0	03:45.0	04:45.0	04:40.0	02:30.0			
4	Old Sudbury Road (Rt 27) at Water Row	00:00.0	00:00.0	00:00.0	00:00.0	00:00.0	00:00.0	00:00.0			
	Condition at Old Sudbury @ Concord Road										

Total Trip Time 02:41.0 03:32.0 04:33.0 05:32.0 06:30.0 06:20.0 05:15.0

Average Travel Time 04:54.7

Route B											
Intersection		Stopwatch Lap Time									
		Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10
1	North Site Drive at Concord Road	00:13.0	00:07.0	00:07.0	00:40.0						
2	Concord road at Candy Hill Road	01:12.0	01:02.0	01:02.0	01:00.0						
3	Candy Hill Road at Plympton Road	02:01.0	02:04.0	02:02.0	02:01.0						
4	Plympton Road at Water Row	01:13.0	01:15.0	01:15.0	01:20.0						
5	Water Row at Old Sudbury Road (Rt 27)	00:00.0	00:00.0	00:00.0	00:00.0						

Total Trip Time 04:39.0 04:28.0 04:26.0 05:01.0

Average Travel Time 04:38.5

□ Signal Data

814 Sudbury

Hudson Road/ Concord Road/ Old Sudbury Road Signalized Intersection

Field Observations

6/15/2016

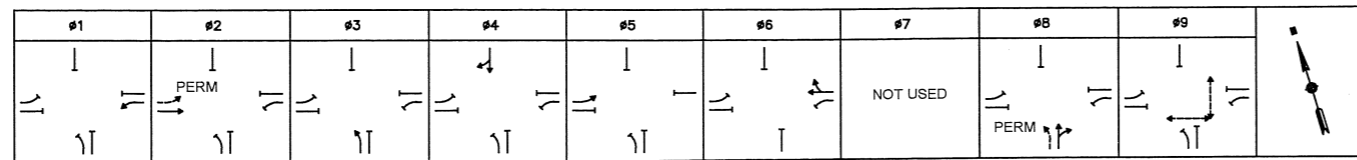
5:45 to 6:00 pm

Phase 6 - Westbound (Old Sudbury Road approach)

Green Time (seconds)	Yellow (seconds)	All Red (seconds)	Total Phase 6 (seconds)
28	4	2	34
39	4	2	45
35	4	2	41
40	4	2	46
24	4	2	30
38	4	2	44
34	4	2	40
29	4	2	35
38	4	2	44

SUDBURY
 RTE 27 AT CONCORD RD
 TRAFFIC PLANS
 SHEET 27 OF XX

03/11/2016
 10:30 Am
 (Intersection Under Construction)



- SEQUENCE & TIMING NOTES:
- 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.
 - THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
 - IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
 - 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.

SEQUENCE AND TIMING FOR FULL ACTUATED CONTROL (ISOLATED)

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	FLASH		
OLD SUDBURY ROAD	WB	A	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
OLD SUDBURY ROAD	WB	B,C	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
HUDSON ROAD	EB	D	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
HUDSON ROAD	EB	E	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
CONCORD ROAD	NB	F	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
CONCORD ROAD	NB	G	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
CONCORD ROAD	SB	H,J	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R											
PEDESTRIAN X-ING	NB-SB	P1-P2	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW											
PEDESTRIAN X-ING	EB-WB	P3-P4	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW											

TIMING IN SECONDS

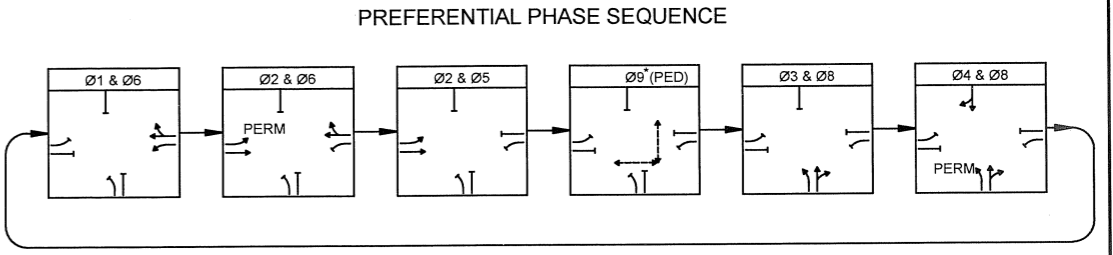
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27				
MINIMUM GREEN (INITIAL)	10																														
PASSAGE TIME (VEHICLE)	2	2.5																													
MAXIMUM 1	X10	X55																													
MAXIMUM 2	X10	X50																													
YELLOW CLEARANCE		X3	X4	X4	X2	X3	X2	X1	X4	X3	X4	X3	X4	X2																	
RED CLEARANCE																															
PEDESTRIAN WALK																															
PEDESTRIAN CLEARANCE																															

DETECTOR MEMORY: NON-LOCK, NON-LOCK, NON-LOCK, NON-LOCK, NON-LOCK, NON-LOCK, NON-LOCK, NON-LOCK, LOCK

RECALL: OFF, SOFT, OFF, OFF, OFF, OFF, SOFT, OFF, OFF

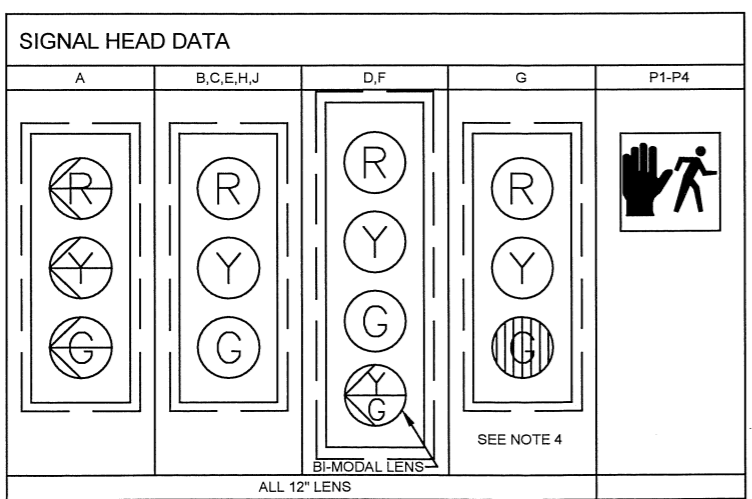
COORDINATION DATA

TIMING PLAN	CYCLE	OFFSET	#1	#2	#3	#4	#5	#6	#7	#8	#9



* UPON PEDESTRIAN PUSH BUTTON ACTUATION

- NOTES:
- AUTOMATIC FLASHING OPERATION PER 2009 M.U.T.C.D., AS AMENDED.
 - * UPON PEDESTRIAN PUSH BUTTON ACTUATION
 - PERM = PERMISSIVE
 - Ø4 & Ø8 DUAL ENTRY
 - MAXIMUM 1 = NORMAL OPERATION
 - MAXIMUM 2 = NOT USED
 - STOP AND GO OPERATION FOR 24 HOURS PER DAY. FLASHING OPERATION FOR EMERGENCY ONLY.
 - DURING PEDESTRIAN INTERVAL, FDW THROUGH YELLOW OPERATION SHALL NOT BE IN EFFECT.



- NOTES:
- ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 2" WIDE YELLOW REFLECTIVE BORDER.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 - SIGNAL HEAD G SHALL BE EQUIPPED WITH GEOMETRICALLY PROGRAMMABLE LOUVERS IN THE GREEN INDICATION, SET TO A 42° VIEW ANGLE.
 - ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.

LOOP DETECTOR DATA

DETECTOR NO.	NO. SECTION/ SIZE	NO. OF TURNS	OPERATIONS	DELAY /EXT	CALL PHASE	LOOP CONNECTION
1	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	2 SEC DELAY	Ø1	SERIES
2	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø6	SERIES
3	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	2 SEC DELAY	Ø5 (SEE NOTE 2)	SERIES
4	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø2	SERIES
5	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	2 SEC DELAY	Ø3 (SEE NOTE 3)	SERIES
6	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø8	SERIES
7	2-6'X20' QUADRUPOLE	2-4-2	PRESENCE	0	Ø4	SERIES

- NOTES:
- DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY
 - LOOP GROUP 3 SHALL CALL/EXTEND Ø2, THEN SWITCH TO CALL/EXTEND Ø5.
 - LOOP GROUP 5 SHALL CALL/EXTEND Ø3, THEN SWITCH TO CALL/EXTEND Ø8.

PRE-EMPTION PHASING & PRIORITY

DETECTOR & PRIORITY	PRE-EMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1	⇌	Ø2&Ø5
D2	2	⇌	Ø1&Ø6
D3	3	⇌	Ø3&Ø8
D4	4	⇌	Ø4

- EMERGENCY VEHICLE PRE-EMPTION OPERATION
- EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT THIS INTERSECTION.
 - PRE-EMPTION SIGNALS SHALL BE SERVICED ON A PRIORITY BASIS WITH DETECTORS D1, D2, D3 OR D4 ASSIGNED DESCENDING PRIORITIES AS FOLLOWS: (D1 HIGHEST AND D4 LOWEST)
 - 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 #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCES FOR THE ASSOCIATED PHASE(S) AS SHOWN IN THE SEQUENCE AND TIMING CHART AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
 - MINIMUM GREEN AND NORMAL VEHICLE CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
 - PRE-EMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

LIST OF MAJOR ITEMS REQUIRED

HUDSON ROAD/OLD SUDBURY ROAD (ROUTE 27) AT CONCORD ROAD

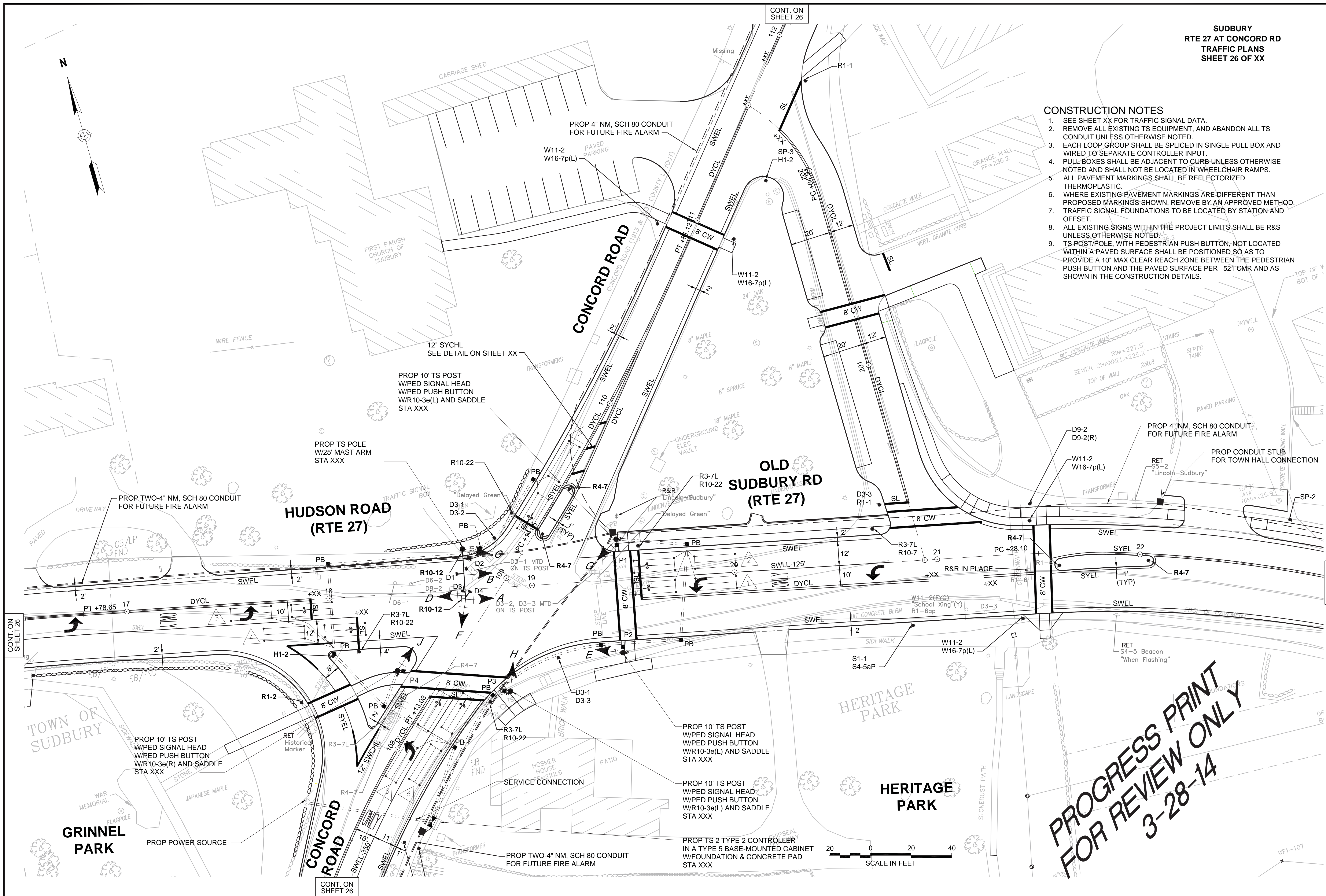
PAY ITEM	QUANTITY	DESCRIPTION
	1	ØØ TS 2 TYPE 2 CONTROLLER IN A TYPE 5 BASE MOUNTED CABINET INCLUDING FOUNDATION AND CONCRETE PAD
	X	TS 25' MAST ARM TYPE 2, HEAVY LOADING, STEEL, INCL. FOUNDATION
	X	TS POST 10' STANDARD INCL. FOUNDATION
	X	SIGNAL HEAD, 3-SECTION, 12" LENSES
	X	SIGNAL HEAD, 4-SECTION, 12" LENSES
	X	PEDESTRIAN SIGNAL HEAD (L.E.D.)
	X	PEDESTRIAN PUSH BUTTON WR10-3e(L) AND SIGN SADDLE
	X	PEDESTRIAN PUSH BUTTON WR10-3e(R) AND SIGN SADDLE
	X	TYPE C, 2-CHANNEL CARD RACK LOOP DETECTOR AMPLIFIER
	X	WIRE LOOP DETECTOR
	X	EMERGENCY PRE-EMPTION OPTICAL DETECTORS & DETECTOR CABLE
	X	EMERGENCY PRE-EMPTION 4 CHANNEL PHASE SELECTOR
	X	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
	X	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
	X	SERVICE CONNECTION (UNDERGROUND)
811.31	X	PULL BOX-12"x12"
804.3	X	3" NM CONDUIT, SCHEDULE 40

PLUS NECESSARY DUCT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

PROGRESS PRINT
 FOR REVIEW ONLY
 3-28-14

CONSTRUCTION NOTES

1. SEE SHEET XX FOR TRAFFIC SIGNAL DATA.
2. REMOVE ALL EXISTING TS EQUIPMENT, AND ABANDON ALL TS CONDUIT UNLESS OTHERWISE NOTED.
3. EACH LOOP GROUP SHALL BE SPLICED IN SINGLE PULL BOX AND WIRED TO SEPARATE CONTROLLER INPUT.
4. PULL BOXES SHALL BE ADJACENT TO CURB UNLESS OTHERWISE NOTED AND SHALL NOT BE LOCATED IN WHEELCHAIR RAMPS.
5. ALL PAVEMENT MARKINGS SHALL BE REFLECTORIZED THERMOPLASTIC.
6. WHERE EXISTING PAVEMENT MARKINGS ARE DIFFERENT THAN PROPOSED MARKINGS SHOWN, REMOVE BY AN APPROVED METHOD.
7. TRAFFIC SIGNAL FOUNDATIONS TO BE LOCATED BY STATION AND OFFSET.
8. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE R&S UNLESS OTHERWISE NOTED.
9. TS POST/POLE, WITH PEDESTRIAN PUSH BUTTON, NOT LOCATED WITHIN A PAVED SURFACE SHALL BE POSITIONED SO AS TO PROVIDE A 10' MAX CLEAR REACH ZONE BETWEEN THE PEDESTRIAN PUSH BUTTON AND THE PAVED SURFACE PER 521 CMR AND AS SHOWN IN THE CONSTRUCTION DETAILS.



**PROGRESS PRINT
 FOR REVIEW ONLY
 3-28-14**

CONT. ON SHEET 26

CONT. ON SHEET 26

CONT. ON SHEET 26