North Carver Development

FINAL ENVIRONMENTAL IMPACT REPORT

EEA No. 15639

SUBMITTED TO
The Executive Office of Energy and Environmental Affairs
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

PREPARED BY
vhb
99 High Street
Boston, MA 02110

PROPONENT
Route 44 Redevelopment, LLC
c/o Charter
500 Harrison Avenue - Suite 4R
Boston, MA 02118

February 28, 2019

North Carver Development

Carver, Massachusetts
EEA No. 15639

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500 Harrison Avenue – Suite 4R
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PREPARED BY **VHB**
99 High Street, 10th Floor
Boston, MA 02110

In association with:
Langdon Environmental, LLC
AHA Consulting Engineers
Sanborn, Head & Associates, Inc.
Wright-Pierce

February 28, 2018

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February 28, 2019

Ref: 12681.03

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 022114

Re: Final Environmental Impact Report, North Carver Development EEA No. 15639

Dear Secretary Beaton:

On behalf of Route 44 Redevelopment, LLC (the "Proponent"), VHB is pleased to submit the enclosed Final Environmental Impact Report (FEIR) for the North Carver Development (the "Project"). This FEIR has been prepared in accordance with the Secretary's Certificate on the Draft Environmental Impact Report (DEIR) for EEA No. 15639, issued September 14, 2018.

The Proponent is pleased to advance this important project in Carver, which is part of the implementation of the North Carver Urban Redevelopment Plan (NCURP). The NCURP was approved by the Department of Housing and Community Development subsequent to the issuance of the Secretary's Draft Record of Decision on March 17, 2017.

The Project is located on approximately 282.3 acres in the northwest corner of the Town of Carver adjacent to the municipal boundaries of the Towns of Plympton and Middleborough. The Project involves the construction of approximately 1.77 million square feet of new warehouse/distribution facilities with ancillary office uses, approximately 1,883 parking spaces, and paved access roads. To support the program, new utility infrastructure, a new sewage treatment facility and a new stormwater management system will be constructed. The Project Site will be accessed from a re-configured intersection of Montello Street and Route 58 and a new configuration for Montello Street. Facility construction is expected to begin in 2020.

Please publish notice of availability of the FEIR for public review in the March 6, 2019 edition of *The Environmental Monitor*. We look forward to your review of this project. Please contact me at 617-607-2972 if you have any questions.

Digital copies of this filing can be requested from skruel@vhb.com

Sincerely,

Stephanie Kruel

Stephanie Kruel

Senior Environmental Planner
skruel@vhb.com

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Table of Contents

List of Tables

List of Figures

Appendices

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1

Project Description and Permitting

Route 44 Redevelopment, LLC (the "Proponent") has prepared this Final Environmental Impact Report (FEIR) for the North Carver Development ("the Project") in accordance with the Certificate of the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on the Draft EIR (DEIR) (EEA No. 15639), issued on September 14, 2018, and the Massachusetts Environmental Policy Act (MEPA) regulations.

1.1 From the Secretary's Certificate

This chapter includes responses to the following scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the DEIR should:

- *Describe the project and identify any changes to the project since the filing of the DEIR* **Sections 1.2 and 1.3**; *and*
- *Identify and describe State, federal and local permitting and review requirements associated with the project including requests for Financial Assistance and Land Transfers and provide an update on the status of each of these pending actions* **Sections 1.4 and 1.5**.

1.2 Project Description

The Project involves the construction of up to 1.77 million square feet of new warehouse/ distribution facilities with ancillary office uses, 1,883 parking spaces, and paved access roads (Figure 1.1). To support the program, new utility infrastructure will be constructed, including a new 1,500-square foot sewage treatment facility with an associated 30,000 square foot leaching field, and water, electricity and communication distribution systems. The stormwater management system will incorporate Best Management Practices (BMPs) to manage the flow and quality of stormwater runoff from the Site. The Project Site will be accessed from a re-configured intersection at Montello Street and Route 58 and includes a new configuration for Montello Street.

General Project information is provided below.

- Project Name – North Carver Development
- EEA Number – 15639
- Proponent – Route 44 Redevelopment, LLC (Redeveloper designated by the Carver Redevelopment Authority under the North Carver Urban Renewal Plan)
- Project Location – Town of Carver
- Watershed – Buzzard's Bay
- MEPA Review Thresholds –
  - 301 CMR 11.03 (1)(a)1 – Alteration of 50 or more acres of land;
  - 301 CMR 11.03 (1)(a)2 – Creation of 10 or more acres of impervious area;
  - 301 CMR 11.03 (5)(b)4 a. – New discharge or Expansion in discharge to a sewer system of 100,000 or more gpd of sewage, industrial waste water or untreated stormwater;
  - 301 CMR 11.03(6)(a)(6) – Generation of 3,000 or more NEW ADT on roadways providing access to a single location; and
  - 301 CMR 11.03(6)(a)(7) – Construction of 1,000 or more NEW parking spaces at a single location.

1.3 Review History

On January 31, 2017, in accordance with MEPA, the Proponent submitted an Expanded Environmental Notification Form, a Certificate for which was issued on March 17, 2017. A Draft Environmental Impact Report (DEIR) was then submitted on July 16, 2018, resulting in a Certificate dated September 14, 2018, which included the scope for this FEIR. This FEIR responds to that scope, as well as the agency and public comments received on the DEIR. A detailed response to all agency and public comments can be found in Chapter 6, Response to Comments. Please refer to Appendix D for a copy of the EEA Secretary's Certificate and all comment letters received on the DEIR.

1.4 Changes Since the DEIR

Since the filing of the DEIR a minor change has been made to the Site plan. Site access from Montello Street has been shifted approximately 130 feet to the north. This results in a reduction of impacts within the 200-foot Riverfront Area.

1.5 Updated Permitting Requirements

Table 1.1 below lists the permits, approval and reviews that are anticipated for the Project.

TABLE 1.1 ANTICIPATED PERMITS, APPROVALS AND REVIEWS

Agency	Permit/Approval/Review	Status
Federal		
Environmental Protection Agency (EPA) – Region I	National Pollutant Discharge Elimination System (NPDES) Construction General Permit	To be submitted prior to construction
State		
MEPA Office	Certificate on the FEIR (this filing)	Submitted February 28, 2019
MassDEP	BRP WP 83 Hydrogeological Evaluation Report	To be submitted after FEIR submittal
	Groundwater Discharge Permit (310 CMR 5.00)	To be submitted after approval of Hydrogeological Evaluation Report
	BRP WP 70 Individual Permit for Groundwater Discharge from a Sewage Treatment	To be submitted after approval of Hydrogeological Report
	BRP WS 33 Permit – Distribution Modification Permit for systems that serve fewer than 3,300 people	To be submitted prior to implementation
	Corrective Action Design (CAD) Permit (310 CMR 19.000)	Issued February 2019
MassDOT	Highway Access Permit	To be submitted prior to construction
Local		
Carver Conservation Commission	Order(s) of Conditions	To be submitted prior to construction
Town of Carver Planning Board	Special Permit(s)	To be submitted during final design
Carver Redevelopment Authority	NCURP Design Review(s)	To be submitted during final design
Carver Zoning Board of Appeals	Zoning variances (if required)	To be submitted during final design

1.6 Financial Assistance

As indicated in the DEIR, the current agreement between the Carver Redevelopment Authority and the Proponent requires that the Proponent fund all the costs associated with implementing NCURP, including the proposed development described in the EIR documents. The Carver Redevelopment Authority will work with the Proponent to implement the NCURP including applying for financial assistance from Agencies of the Commonwealth and others. Specific potential sources of State financial assistance have not been identified to date.

1.7 Updated Agency Coordination

Since filing the DEIR on July 16, 2018, the Project Proponent has coordinated with the following agencies and organizations:

- MassDOT District 5 – February 13, 2019
- MassDOT Public/Private Development Unit (PPDU) Boston – February 12, 2019
- Southeastern Regional Planning & Economic Development District (SRPEDD) – January 28, 2019
- Town of Carver – January 29, 2019

0 250 500 Feet

LEGEND

- Proposed Stormwater BMP
- Proposed Buildings
- Proposed Pervious Areas
- Proposed Impervious Areas
- Existing Open Water
- Existing Cranberry Bogs
- Existing Tree Cover to Remain
- Project Site Boundary
- Leach Field

Figure 1.1
Proposed Project

North Carver Development
Carver, Massachusetts

2

Land Alteration, Wetlands and Water Resources

This chapter includes information pertaining to land alteration, wetlands, and water resources as required by the Secretary's Certificate on the DEIR dated September 14, 2018.

2.1 From the Secretary's Certificate

This chapter includes responses to the scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Provide a detailed description of proposed regrading of the site, including excavation and the use of fill material from on-site and off-site sources* **Section 2.2**;
- *Include an updated plan showing areas to be filled pursuant to the ACO* ***Figure*** **2.1**;
- *Clarify the total amount of fill material to be brought to the site and whether that volume may be reduced by the reuse of fill material generated on-site* **Section 2.2**;
- *Show the locations where fill has been placed for regrading purposes and the depth of fill* **Figure 2.1**;
- *Include plans showing the proposed site elevation in relation to existing wetland features* **Figure 2.2**;
- *Provide a detailed description of the project's impacts on wetland resource areas, including all temporary and permanent impacts* **Section 2.3.1**;
- *Provide plans showing proposed structures, regrading and construction activities in Riverfront Area and BVW, and describe measures that will be undertaken to minimize impacts* **Figure 2.3 and Section 2.3.2**;
- *Provide a detailed description, including plans, of BVW replication areas and Riverfront Area restoration* **Figure 2.3 and Section 2.3.3**;

- *Provide the results of the hydrologic study and describe the design of the proposed WWTF and effluent disposal area* **Sections 2.3.1 and 2.3.2**;
- *Review how the wastewater facilities will comply with water quality standards* **Section 2.3.3**; *and*
- *Include commitments for ongoing monitoring and the establishment of escrow accounts for maintenance and replacement* **Section 2.3.4**.

2.2 Land Alteration

This section includes information about the regrading of the site, including the location and amount of fill anticipated.

The Project has a limit of disturbance encompassing approximately 123 acres of the Project Site. Much of the Project Site operated as a sand and gravel operation which has stripped the land of much of its vegetation and has created unnatural topographic patterns throughout the Site. Within the limit or disturbance, existing topography ranges on the Site from approximately elevation 68 to elevation 129. In general, the Site elevations near the on-site resource areas are bermed up, and site topography generally slopes from southwest to northeast.

Reclamation of the Project Site is ongoing in accordance with a MassDEP Administrative Consent Order (ACO, file number ACO-SE-16-4002) as well as a Fill Management Plan prepared by Langdon Environmental and approved by both the MassDEP and the Town of Carver Planning Board. Phase I of the Fill Management Plan included improvements to Park Avenue, an initial acceptance of fill on-site, cleaning up of debris piles located on-site, and acceptance of asphalt, brick and concrete (ABC) materials. Phase I was completed on or about September 1, 2017. Phase II of the Fill Management Plan will complete Site preparation and involves remediation of existing wood waste dumps and debris piles, acceptance and processing of ABC materials, and general long-term Site improvements. In total, the ACO will allow for approximately 732,000 cubic yards (cy) of soil over the two phases.

The schematic grading of the Project will be a significant earthwork operation, needing to accommodate the flat footprints that the proposed development program of warehouse/distribution facilities will require. The northwest corner of development associated with proposed Building A will require approximately 21 feet of fill, which is the largest amount of fill on the Site. The southeast corner of development associated with proposed Building C will require the largest cuts on the Site, of approximately 38 feet. This is an area containing a large knob that provided a buffer between the sand and gravel operations and the existing residential properties off Montello Street. At this stage of the schematic grading design, finish floor elevations are 94.0 for Building A, 90.0 for Building B, and 98.0 for Building C (all elevations are in NAVD 88). Table 2.1 shows the earthwork volumes anticipated based on the schematic grading design. These numbers are subject to change as the site design process progresses, based on geotechnical recommendations and potential tenant needs.

TABLE 2.1 SCHEMATIC GRADING EARTHWORK VOLUMES

	VOLUME (CY)
On-Site Fill Required	1,095,000
On-Site Cut Required*	355,000
On-Site Net Volume**	740,000 - Fill
Off-Site Fill per ACO	732,000
Net Earthwork Volume	8,000 – Fill

*It is anticipated that all cut will be reused on-site
**Cut/Fill Factor of 1.0/1.0 was used to generate on-site cut and fill volumes

2.3 Wetlands

This section includes a detailed description of the project's impacts on wetland resource areas, including all temporary and permanent impacts; describes measures that will be undertaken to minimize construction period impacts; and describes Bordering Vegetated Wetland (BVW) replication areas and Riverfront Area (RA) restoration measures.

2.3.1 Potential Impacts

The Project will result in unavoidable permanent impacts to jurisdictional areas associated with Stream 2018-03 and BVW Wetland 2, as indicated in Table 2.2 and depicted in Figure 2.3.

TABLE 2.2 PERMANENT WETLAND RESOURCE IMPACTS

Wetland Resource	BVW (sf)	Bank (lf)	LUWW (sf)	Inner Riparian Zone (sf)	Outer Riparian Zone (sf)	Riverfront Area Total (sf)
Permanent Impact Area	910	0	0	15,600	32,150	47,750

Permanent impacts to 910 sf of BVW and 47,750 sf of RA would occur due to the relocated intersection of Montello Street with Route 58, which improves sight lines and better accommodates truck turns. As compared to the DEIR alignment, the intersection of the site access road with Montello Street has been shifted to the northwest. This alignment minimizes direct impact to RA while providing the necessary roadway geometry to convey the daily and peak period trips associated with the Project safely into and out of the Site. The Inner Riparian Zone (IRZ) areas that would be permanently impacted include previously altered areas within the Montello St. roadway layout and an adjacent formerly residential parcel. The Outer Riparian Zone (ORZ) that would be permanently impacted consists of previously altered areas within the Montello Street roadway layout and the adjacent formerly residential parcel to the north of the stream and forested upland to the south of the stream. Approximately 5,250 sf of additional impact to the forested upland ORZ would occur due to a portion of a stormwater management

basin, which is not feasible to locate entirely outside of the RA. The BVW areas that would be permanently impacted include 210 sf at Wetland 1, which comprises an abandoned cranberry bog and a forested wetland immediately adjacent to Montello Street, and 700 sf at Wetland 2, which consists of a pocket of forested wetland between Route 58 and Montello Street and the forested wetland to which it is connected via the culvert under Route 58.

Impacts to wetland resources have been avoided and minimized to the maximum extent practicable by aligning the site access road within the existing footprint of Montello Street as much as possible and locating the intersection of the site access drive with Montello Street mostly outside of RA. Retaining walls are proposed along both sides of the relocated portion of Montello Street to minimize encroachment into jurisdictional resources.

There are wetland impacts associated with the site access road that are unavoidable but have been minimized to the maximum extent practicable. To maintain the hydraulic capacity of the existing structure, the design intent is to keep the existing culvert that flows under Montello Street in place and span the culvert with a structure that can shield the culvert from loading that will be caused by additional truck traffic. To achieve desired drainage patterns and grading, retaining walls will be built around the spanning structure, and culvert headwalls will be reconstructed within the footprint of the existing structures as much as possible.

2.3.2 Construction Period Impact Reduction

Roadway reconstruction would also result in temporary impacts to the same RA and BVW areas that would be permanently impacted by the project, as shown in Table 2.2. Temporary wetland resource impacts (Table 2.3) are unavoidable, due to the need for work zones for reconstruction of the existing culvert under Montello Street and for construction of retaining walls along the relocated site access that are proposed to minimize encroachment into wetland resources. To minimize construction impacts, the intent is to leave the existing culvert flowing under Montello Street in place and only rebuild the headwalls in concert with the proposed retaining walls. Temporary impacts of this reconstruction will be minimized by utilizing modular block retaining walls, which do not have a large foundation footprint.

During construction, appropriate best management practices would be implemented to avoid and minimize potential impacts to jurisdictional resources. These measures would be detailed in a site-specific Stormwater Pollution Prevention Plan prepared by the construction contractor in accordance with the requirements of the National Pollutant Discharge Elimination System Permit. Measures that would be used include but are not limited to: phasing the work to minimize disturbed area, providing erosion controls at the limit of work, regular sweeping of paved areas and installation of catch basin inserts to capture sediment.

Upon completion of construction, temporary impact areas would be restored in-place, in-kind. Restoration would consist of grading the sites to match preconstruction contours, providing suitable topsoil for plant growth, and installing seed and plantings to match the preconstruction vegetative composition. Figure 2.3 depicts the permanent and temporary wetland impact areas.

TABLE 2.3 TEMPORARY WETLAND RESOURCE IMPACTS

Wetland Resource	BVW (sf)	Bank (lf)	LUWW (sf)	Inner Riparian Zone (sf)	Outer Riparian Zone (sf)	Riverfront Area Total (sf)
Temporary Impact Area	490	85	190	4,380	2,080	6,460

2.3.3 Wetland Resource Area Replication, Restoration and Enhancement

Mitigation for permanent impact to BVW would be provided in accordance with 310 CMR 10.53 (4)(b) 1-7. Figure 2.3 includes a Conceptual Wetland Mitigation area showing a feasible location for a wetland replication area that would establish at least 1,100 of BVW to offset the proposed BWV loss at an impact to mitigation ration of at least 1:1. The mitigation area would be established by excavating an area of upland adjacent to Wetland 2 to the same grade as 1 foot below the existing wetland grade. One foot of wetland soil would then be installed to bring the soil surface up to match the grade of Wetland 2. Exposed soils would be stabilized with a wetland seed mixture and wetland tree and shrub plantings would be installed based on the impacted wetland area. Mitigation area plantings would include species such as red maple (*Acer rubrum*), highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*) and black willow (Salix nigra), swamp azalea (*Rhododendron viscosum*), red-osier dogwood (*Cornus sericea*), and spicebush *(Lindera benzoin*). The plan will include measures to control erosion during construction and post-construction monitoring to document establishment of at least 75 percent cover with indigenous wetland plant species within two growing seasons. The details of the plan will be presented in the NOI for the proposed construction activities.

As mitigation for alteration of IRZ and ORZ riparian zones, the existing pavement would be removed, and seeding and plantings would be established within the footprint of the portion of Montello Street that would no longer be utilized due to the relocated access. Elsewhere along the proposed access road, seeding and plantings would be established within existing disturbed RFA areas. Opportunities exist near the impact areas to enhance approximately 12,650 sf of IRZ and 60,590 sf of ORZ in this manner. These areas are currently sparsely vegetated and/or dominated by non-native invasive species (such as Russian olive (*Elaeagnus angustifolia*)), so appropriate plantings would restore a more natural plant community and enhance the ability of the RFA to contribute to the protection of the interests of the Wetlands Protection Act (WPA). Proposed plantings to enhance and restore RFA areas would include trees such as sweet birch (*Betula lenta*), white pine *(Pinus strobus*), big-tooth aspen (*Populus grandidentata*), black cherry (*Prunus serotina*), red oak (*Quercus rubra*) and shrubs including maple-leaf viburnum (*Viburnum acerifolium*), American hazelnut (*Corylus Americana*), and American witch-hazel, (*Hamamelis virginiana*). The understory areas would be seeded with a New England Conservation/Wildlife Mix including species such as Virginia wild rye (*Elymus virginicus*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), red fescue (*Festuca rubra)*, switch grass (*Panicum virgatum*), partridge pea (*Chamaecrista fasciculata*), deer tongue (*Panicum clandestinum*), yellow Indian grass (S*orghastrum nutans*), smooth oxeye (*Heliopsis helianthoides*), common milkweed (*Asclepias syriaca*), spotted joe-

pye-weed (*Eupatorium maculatum*), grass-leaved goldenrod (*Euthamia graminifolia*), blue vervain *(Verbena hastata*), New England aster (*Symphotrichum novae-angliae*), and early goldenrod (*Solidago juncea*). RFA restoration and enhancement areas are shown on Figure 2.3.

2.4 Water Resources

This section includes the results of the hydrogeologic study; a description of the design of the proposed Waste Water Treatment Facility (WWTF) and effluent disposal area; a discussion of WWTF compliance with water quality standards; and commitments for ongoing monitoring and the establishment of escrow accounts for maintenance and replacement.

2.4.1 Hydrogeologic Study

Between September 2017 and August 2018, a hydrogeologic study for the Site was preformed to support the Ground Water Discharge Permit application. A copy of the Hydrogeologic Evaluation Report is included in Appendix A, and the report will be submitted to the Department of Environmental Protection prior to submitting the Ground Water Discharge Permit application.

2.4.2 Preferred Waste Water Treatment Alternative

During wastewater treatment process technology screening, three manufacturers with strong local representation and extensive successful track records stood out:

- Membrane Bioreactor: (manufactured by Koch, Wilmington, MA);
- Moving Bed Bioreactor: (manufactured by AquaPoint, New Bedford, MA); and
- Submerged Active Growth Bioreactor: (manufactured by FR Mahoney, Rockland, MA).

All three process manufacturers can meet permit effluent limits with a factor of safety and each are committed to providing the Proponent with a process guarantee in addition to equipment warrantees. The Owner and Engineer will conduct interviews with manufacturers and complete detailed cost/benefit analyses before making a final decision on the process technology.

2.4.3 Description of Proposed WWTF and Effluent Disposal Area

The description of the wastewater treatment process will be completed after final selection and completion of the Engineering Report required to be submitted with the Groundwater Discharge Permit application.

Official percolation tests performed by Sanborn Head were in the range of 2 to 5 minutes per inch. MassDEP's allowable design loading rate for leaching chambers is 3 gallons per day per square foot of leaching area based on the percolation rates. A minimum of 12,700 square feet of primary leaching area will be provided and a reserve leaching area totaling 50 percent of primary area or a minimum of 6,350 sf will be provided.

The leaching area is planned for construction in an unpaved area with no anticipated future loading and the preferred leaching system method includes perforated PVC pressure laterals installed in High Density Polyethylene (HDPE) leaching chambers surrounded by granular aggregate with a filter fabric separation layer above. Unsuitable soils below the system will be removed and replaced with Title V sand. The bottom of the system will be installed with a vertical separation of 4 feet over the predicted groundwater mound superimposed on estimated seasonal high groundwater.

2.4.4 Compliance with Groundwater Standards

Based on the results of the hydrogeological investigation, MassDEP will issue effluent limitations that will comply with groundwater standards including BOD, TSS, nitrogen, oil & grease, pH and fecal coliform. The final design of the wastewater treatment facility will account for effluent limits in the Groundwater Discharge Permit and the facility will be operated to meet permit conditions under average and maximum flows. The design will incorporate the need to inspect, service, repair and replace all equipment so that worn components that are detected can be replaced quickly, resulting in minimum upset to processes.

The operator selection will be based on qualifications and experience. The operator will be included as a participant in the start-up and training phase of construction to ensure that there is a smooth transition from construction to permit-compliant operation. To give the operator the tools to efficiently manage the WWTF, the design will incorporate both automatic and manual process controls to integrate the operation of pumps, flow meters, water quality probes, pressure transmitters, motor operated valve actuators and blowers. The operator will maintain the treatment facility equipment per the schedule set by MassDEP in the Groundwater Discharge Permit at a minimum. Industrial wastewater discharges to the sewer system will be prohibited and building uses that could generate non-domestic wastewater will be monitored by the owner.

2.4.5 Commitments for Ongoing Monitoring

Ongoing monitoring of the treatment process and monitoring wells will be specified in the Groundwater Discharge Permit and the operator will perform all monitoring functions including laboratory analysis and submit monthly monitoring reports to MassDEP.

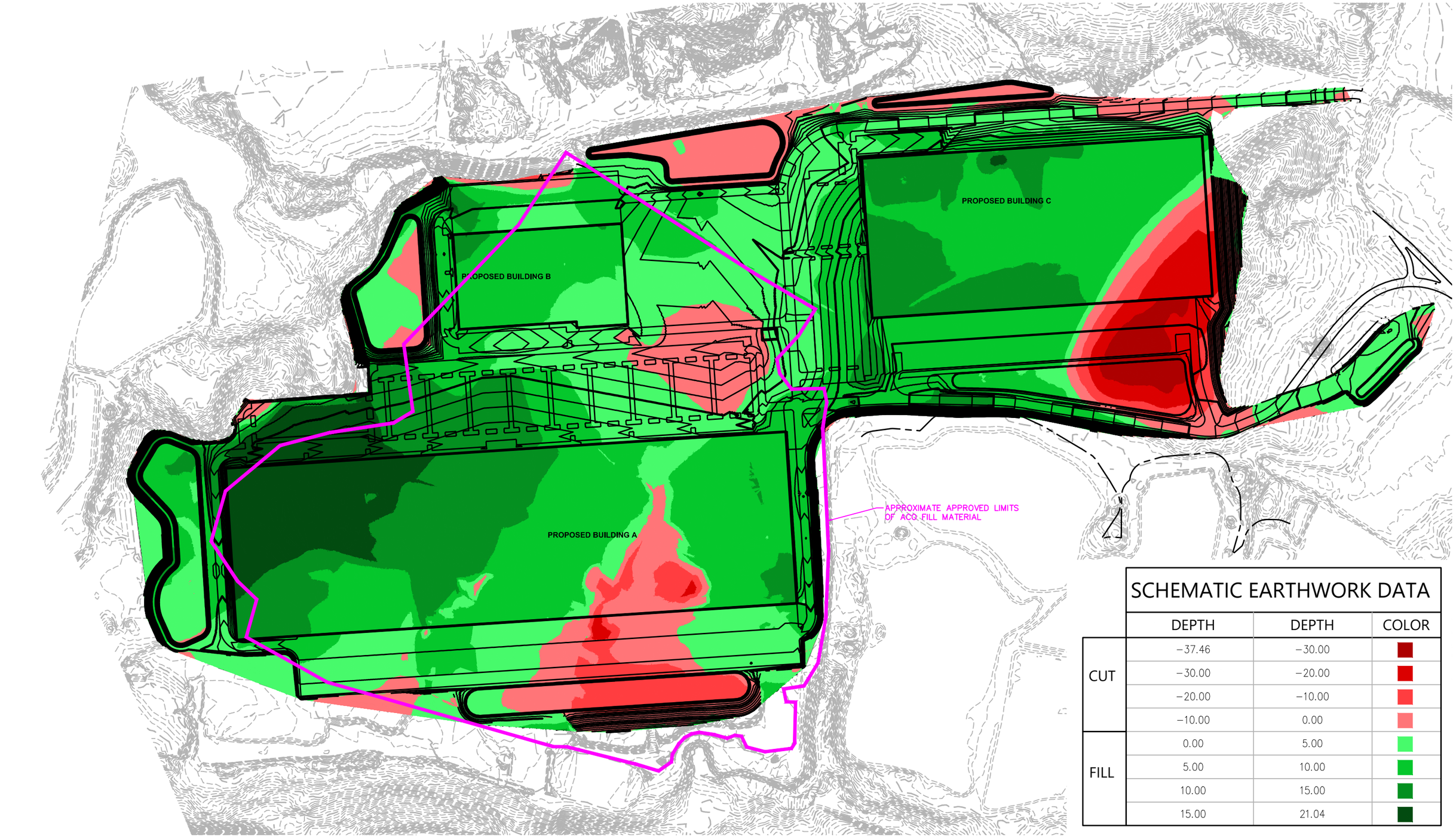
2.4.6 Escrow Accounts for Maintenance and Replacement

In accordance with 314 CMR 5.15, the Owner will be required sign and submit with the permit application a Certification stating that the Owner is responsible for the operation of the facility, including reporting, monitoring, maintenance, repair and replacement of the Privately Owned Wastewater Treatment Facility (PWTF).

MassDEP has the discretion to waive the establishment of a financial assurance mechanism, including Immediate Repair and Replacement Accounts when the following conditions are met:

- The Proponent remains the single responsible owner of the wastewater collection system, wastewater treatment facility and disposal field;
- The developer owns or controls by easement the land occupied by the wastewater facilities; and
- The WWTF does not treat any sewage from residential uses, hospitals, nursing or personal care facilities, residential care facilities, or assisted living facilities.

MassDEP also has the discretion to require the owner to establish, fund and maintain a financial assurance mechanism that provides for immediate repair and replacement accounts at any time to ensure the WWTF operates in compliance with the permit.



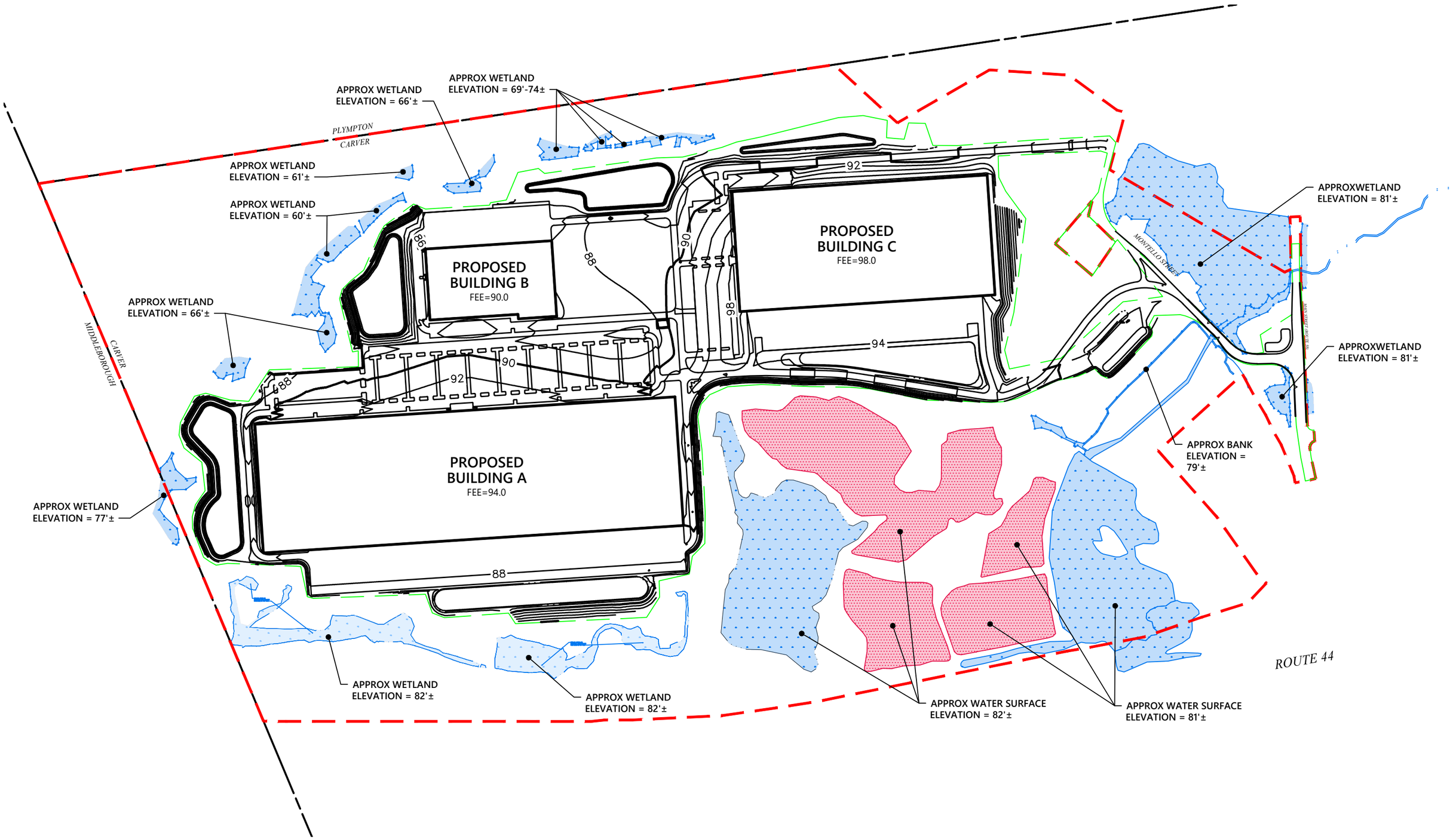
SCHEMATIC EARTHWORK DATA			
	DEPTH	DEPTH	COLOR
CUT	−37.46	−30.00	
	−30.00	−20.00	
	−20.00	−10.00	
	−10.00	0.00	
FILL	0.00	5.00	
	5.00	10.00	
	10.00	15.00	
	15.00	21.04	

0 75 150 300 Feet

vhb

Depth of Fill and ACO Limits
North Carver Development
Carver, Massachusetts

Figure 2.1



0 200 400 800 Feet

Site and Wetland Elevations
North Carver Development
Carver, Massachusetts

Fig 2.2

2/11/2019

RESOURCE AREA IMPACT TOTALS

- OUTER RIPARIAN IMPACTS*=32,150 SF
- INNER RIPARIAN IMPACTS=15,600 SF

- PERMANENT BVW IMPACTS=910 SF
- TEMPORARY BVW IMPACTS=490 SF

- TEMPORARY LUWW IMPACTS=190 SF
- TEMPORARY BANK IMPACTS=85 LF

*EXCLUDES IMPACT FROM STORMWATER MANAGEMENT MEASURES

IMPACT, ENHANCEMENT AND MITIGATION TOTALS

- OUTER RIPARIAN ENHANCEMENT AREA=60,590 SF
- INNER RIPARIAN ENHANCEMENT AREA=12,650 SF

- WETLAND REPLICATION AREA=1,100 SF

OUTER RIPARIAN IMPACTS=21,800 SF

RIVERFRONT ENHANCEMENT AREA=53,300 SF

OUTER RIPARIAN IMPACTS=5,200 SF

WETLAND REPLICATION AREA=1,100 SF

RIVERFRONT ENHANCEMENT AREA=7,290 SF

RIVERFRONT ENHANCEMENT AREA=7,300 SF

RIVERFRONT ENHANCEMENT AREA=2,100 SF

STORMWATER IMPACT =5250 SF

TEMP LUWW IMPACTS=50 SF
TEMP BANK IMPACTS=25 LF

INNER RIPARIAN IMPACTS = 15,600 SF

TEMP LUWW IMPACTS=90 SF
TEMP BANK IMPACTS=20 LF

TEMP LUWW IMPACTS=50 SF
TEMP BANK IMPACTS=40 LF

PERM BVW IMPACTS=210 SF
TEMP BVW IMPACTS=240 SF

OUTER RIPARIAN IMPACTS=5,150 SF

RIVERFRONT ENHANCEMENT AREA=3,250 SF

PERM BVW IMPACTS=300 SF
TEMP BVW IMPACTS=250 SF

PERM BVW IMPACTS=400 SF

200'RA
100'RA

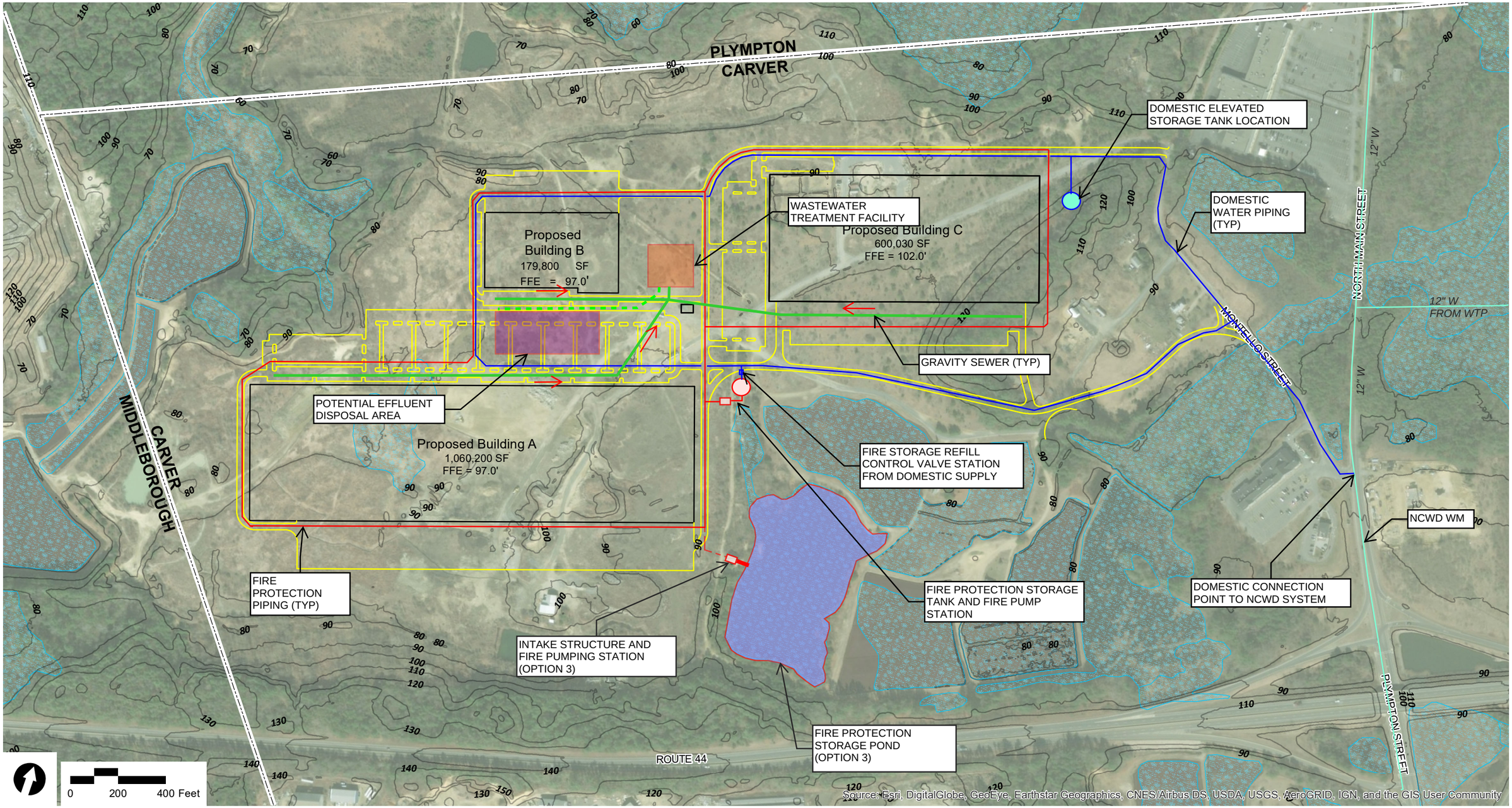
0 50 100 200 Feet

INNER RIPARIAN RIVERFRONT ENHANCEMENT AREA
OUTER RIPARIAN RIVERFRONT ENHANCEMENT AREA
INNER RIPARIAN RIVERFRONT IMPACT AREA
OUTER RIPARIAN RIVERFRONT IMPACT AREA
TEMPORARY WETLAND IMPACT AREA
PERMANENT WETLAND IMPACT AREA
WETLAND MITIGATION AREA
TEMP LUWW/BANK IMPACT AREA

vhb

Impact, Enhacement and Mitigation Areas **Fig 2.3**
North Carver Development
Carver, Massachusetts 1/24/2019

W:\GIS_Development\Projects\MA\Carver\13989_WWTF-WaterDist\MXDs\Basemap.mxd



Source:

LEGEND

- GRAVITY SEWER
- EFFLUENT FORCE MAIN
- EFFLUENT DISPOSAL AREA
- WASTEWATER TREATMENT AREA

Figure 2.4

Proposed Wastewater Collection, Treatment and Disposal Concept Plan

North Carver Development
Carver, Massachusetts

3

Traffic and Transportation

This chapter includes information pertaining traffic and transportation as required by the Secretary's Certificate on the DEIR dated September 14, 2018.

3.1 From the Secretary's Certificate

This chapter includes responses to the scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Include additional details regarding the method used to calculate trip generation* **Section 3.2**;
- *Discuss traffic monitoring operations at the intersection of Route 58 at Parsonage Road and Mayflower Road* **Section 3.4.4**;
- *Review options for signal timing and other adjustments at the proposed intersection of Route 58 at Montello Street if necessary to address traffic operational deficiencies and conflicts caused by long queue lengths* **Section 3.4.1**;
- *Clarify whether the phased mitigation measures will be triggered by deterioration of LOS or satisfaction of the traffic signal warrant analysis* **Section 3.4.3**;
- *Include commitments to implement safety measures identified in the RSAs for the intersections of Route 58 at Plymouth Street, Route 44 at Route 105 and the Middleborough Rotary* **Section 3.4.1**;
- *Identify improvements to be implemented by the Proponent at the intersections of Route 58 at High Street, Route 58 at Plymouth Street and the Middleborough Rotary to ensure that the intersections operate at the 2025 No Build levels or provide justification why such mitigation is unnecessary or infeasible* **Section 3.4.1**;
- *Design the site driveways and internal circulation roadways to accommodate busses and shelters* **Section 3.3.2**;
- *Review opportunities for land banking, shared spaces or other means of minimizing the number of parking spaces and impervious area* **Section 3.3.1**;

- *Provide greater detail, including plans, of the bicycle and pedestrian facilities proposed to be constructed along Route 58* **Section 3.4.2 and Figure 3.1**;
- *Include sidewalks on both sides of Route 58 between the proposed intersection of Route 58 at Montello Street and the shopping center, a crosswalk across Route 58 and bicycle accommodations* **Section 3.4.2 and Figure 3.1**;
- *Include roadways designed in accordance with MassDOT's Complete Streets guidance* **Section 3.4.2 and Figure 3.1**;
- *Describe how the Proponent will monitor employee trips and, if necessary add or modify the TDM plan to achieve the goal of a 5 percent reduction in vehicle trips* **Section 3.4.4**; *and*
- *Include a revised Transportation Monitoring Program that includes 24-hour ATR counts at the site driveway on a typical weekday and Saturday, a travel survey of employees and patrons of the site and TMCs and operations analyses for the weekday morning, weekday evening and Saturday peak periods at mitigated intersections* **Section 3.4.4**.

3.2 Trip Generation

As discussed in DEIR section 5.5.12 The rate at which any development generates traffic is dependent upon several factors such as size, location, and concentration of surrounding developments. The Project involves the construction of 1.77 million square feet of new warehouse/distribution facilities with ancillary office uses. Since the tenant(s) of the Site is unknown at this time, trip generation estimates based on the Institute of Transportation Engineers (ITE) Trip Generation,10th Edition[1] for four Land Use Codes (LUC) and empirical data from four facilities were reviewed and are listed below.

- **ITE LUC 150 (Warehousing):** data based on 29 to 47 studies depending on time period.
- **ITE LUC 154 (High-Cube Transload and Short-Term Storage Warehouse):** data based on 91 to 103 studies depending on time period.
- **ITE LUC 155 (High-Cube Fulfillment Center Warehouse):** data based on one to two studies depending on time period.
- **ITE LUC 156 (High-Cube Parcel Hub Warehouse):** data based on three to four studies depending on time period.
- **Empirical data (MS Walker)**: data from the MS Walker Distribution facility located in Readville/Milton, MA.
- **Empirical data (Campanelli Industrial Park)**: data from the Campanelli Industrial Park located in Middleborough, MA.

[1] *Trip Generation, 10th Edition*, Institute of Transportation Engineers, Washington, D.C., 2017.

- **Empirical data (Amazon Fulfillment Center):** data specific to Amazon Fulfillment Centers for both regular and peak seasons.
- **Empirical data (Stop & Shop Distribution Center)**: data from the Stop & Shop Distribution facility (which is no longer in existence) located in Readville/Milton, MA.

A comparison of all the trip generation rates indicate ITE rates for LUC's 150 and 154 are on the lower end and ITE rates for LUC's 155 and 156 are on the higher end. It should be noted that the trip rates for LUC 150 and LUC 154 are based on a significant number of studies (30 or more) while the trip rates for LUC 155 and LUC 156 are based on an extremely limited number of studies (four or less). It is worth noting that the average of the empirical rates, which are based on facilities which are anticipated to be similar to the Project, falls in between the ITE rates, but closer to the LUC 150 and LUC 154 rates which as stated above are based on a much larger sample size of studies.

To provide a highly conservative analysis and maintain consistency with MassDOT TIA Guidelines, the trip generation rates for ITE LUC 150 and 156 were averaged to obtain the Project trip generation rate. For example, the average daily rate for ITE LUC 150 of 1.74 trips per thousand square feet and ITE LUC 156 of 7.75 trips per thousand square feet were averaged to obtain the Project trip generation daily rate of 4.75 trips per thousand square feet. The new Project trip generation daily rate of 4.75 trips per thousand square feet was then applied to 1.77 million square feet of space to obtain the Project's 8,398 total daily trips. The same process was then used to determine the Project's weekday morning and evening peak hour trip totals, as seen in Table 3.1. This approach results in a higher trip generation rate for a warehouse/distribution facility than is likely to be realized and provides the flexibility to accommodate any tenant or combination of tenants. No adjustment was made for pass-by and/or internal capture trips as they are not typical for this type of use.

Directional distribution data for ITE LUC 150 (Warehousing) was utilized for the Project's trips since it is based on a substantially higher number of studies than ITE LUC 156 (High-Cube Parcel Hub Warehouse) and is generally consistent with the empirical data and the expected characteristics of this type of facility.

As a warehouse development, the Project is expected to generate significant daily truck traffic. Data from the sources listed above was reviewed to identify an appropriate truck trip generation percentage. Based on this review, it was determined that a reasonable estimate for daily truck trip generation is five percent of the total daily trips. Warehouse/distribution facilities typically operate over multiple shifts and occasionally on a 24-hour basis. To provide a fair but conservative analysis of the Project's truck impacts, it was assumed that trucks would arrive and depart evenly over a 12-hour operating day. This assumption is consistent with the data sources reviewed and provide a conservative estimate of truck activity during the peak hours. In reality, it is likely that truck activity during the peak commute hours will be lower. The Project trip generation summary is presented in Table 3.1

Table 3.1 Trip Generation Summary

	ITE LUC 150 (Ware-housing) [1]	ITE LUC 156 (High-Cube Parcel Hub Warehouse) [2]	Project Trip Generation Rate & Distribution [3]	Total Trips [4]	Passenger Vehicle Trips [5]	Truck Trips [6]
Weekday Daily						
Enter	50%	50%	50%	4,199	3,989	210
Exit	50%	50%	50%	4,199	3,989	210
Total	1.74	7.75	4.75	8,398	7,978	420
Weekday Morning						
Enter	77%	50%	77%	593	575	18
Exit	23%	50%	23%	177	159	18
Total	0.17	0.70	0.44	770	734	36
Weekday Evening						
Enter	27%	68%	27%	198	180	18
Exit	73%	32%	73%	537	519	18
Total	0.19	0.64	0.42	735	699	36

[1] Trip generation rate and directional distribution for ITE LUC 150 (Warehousing) based on 29 to 47 studies depending on time period.
[2] Trip generation rate and directional distribution for ITE LUC 156 (High-Cube Parcel Hub Warehouse) based on 3 to 4 studies depending on time period.
[3] Project trip generation rate is the average of the rates for ITE LUC 150 (Warehousing) and ITE LUC 156 (High-Cube Parcel Hub Warehouse). Project directional distribution based on for ITE LUC 150 (Warehousing).
[4] Trip generation estimate based with the Project trip generation rate and directional distribution applied to 1.77 msf of space.
[5] Accounts for 95-percent of total daily trips.
[6] Accounts for 5-percent of total daily trips and assumed to arrive regularly over a 12-hour work day.

As shown in Table 3.1, the Project is estimated to generate approximately 770 total new trips (593 entering/177 exiting) during the weekday morning peak hour 735 total new trips (198 entering/537 exiting) during the weekday evening peak hour. It should be reiterated that this is a higher than expected trip generation rate for a warehouse/distribution facility and provides the flexibility to accommodate any tenant or combination of tenants.

3.3 Site Design

3.3.1 Parking

As discussed in DEIR Section 5.5.3, parking for the proposed Project is based on an evaluation of the likely demands at the Site and its physical layout. The proposed parking supply of 1,883 spaces (for both passenger vehicles and trucks) was developed based on the Project's anticipated trip generation and employee density. As previously stated, the tenant(s) of the Site is unknown at this time and the Proponent has committed to build-out the surface parking area on an as-needed basis. As the tenant(s) are identified, the Proponent will coordinate with

each tenant to identify their specific parking needs and only build the necessary parking supply to support the use.

3.3.2 Site Access and Circulation

Access to the Project Site will be provided via two driveways along Montello Street, which provides access to Route 58. As discussed in DEIR Section 5.7.1.1, Montello Street was proposed to be gated just north of its intersection with the northern Site driveway to restrict Project-related traffic on the residential portion of the street. Since the filing of the DEIR, the Proponent has had discussions with the Southeastern Regional Planning & Economic Development District (SRPEDD) and the Town of Carver. Based on these discussions, providing a gate in this location is no longer the preferred option for reasons which included the complexity of permitting a closure of a public roadway at a municipal boundary and maintenance. As an alternative, left-turns will be restricted from the northern Site driveway, the Proponent will encourage tenants to require all traffic to the Site to arrive via the intersection of Route 58 and the realigned Montello Street, and work with the Town of Carver and Town of Plympton to implement a heavy vehicle restriction on the segment of Montello Street north of the northern Site driveway. In addition, the geometry of the intersection of the northern Site driveway and Montello Street intersection will be reconfigured so the through movement will be between the northern Site driveway and the northbound approach of Montello Street, which will discourage the use of the segment of Montello Street north of the northern Site driveway. These improvements will be coordinated with the Towns of Carver and Plympton through the appropriate regulatory processes.

The Project Site has been designed to be able to accommodate buses and shelters should service from the Greater Attleboro Taunton Regional Transit Authority (GATRA) be provided in the future. The Proponent is committed to continue working with GATRA as future opportunities for transit service to the Project Site are presented.

3.4 Mitigation

The following sections discuss improvement measures that will be implemented to minimize Project-related impacts.

3.4.1 Intersection Improvements

Based on the safety review and traffic analysis, mitigation measures are proposed at the following intersections to address Project related impacts as well as existing deficiencies. The Project will likely be built in phases and occupied by one or more tenants. Therefore, the implementation of the mitigation measures will be phased to coincide with the Project's impacts. The improvements discussed in this section represent the full build-out of the transportation mitigation measures and details on the mitigation phasing are presented in Section 3.4.3.

Route 58 at Montello Street (Preferred Access Alternative)

As discussed in DEIR Section 5.7.1.1, the Preferred Access Alternative shifts the intersection of Montello Street with Route 58 approximately 400 feet to the north. Under this alternative, Montello Street is realigned to create a perpendicular intersection with Route 58, improving sight lines and better accommodating truck turns. The existing unsignalized intersection at Montello Street would remain to provide access to the Silo Marketplace Shopping Center and a northbound left-turn lane pocket would be added. A left-turn lane warrant analysis was performed based on the National Cooperative Highway Research Program (NCHRP) Web-Only Document 193 (Development of Left-Turn Lane Warrants for Unsignalized Intersections) to assess the need for a left-turn lane based on intersection volumes. Based on the results of the warrant analysis, a northbound left-turn lane is warranted at the intersection during both peak periods under 2025 Build conditions. The left-turn lane warrant analysis is included in Appendix B. Based on discussions with the Town of Carver, the segment of the existing Montello Street between the realigned Montello Street and Route 58 would be discontinued as a public roadway and only provide access to the Silo Marketplace Shopping Center. The segment of the existing Montello Street between the Silo Marketplace Shopping Center northern driveway and the realigned Montello Street would be closed and the pavement removed. It should be noted that other improvement options were considered at this location based on factors including physical constraints, feasibility, operational benefits, and cost. At this time, the proposed improvements reflect the preferred improvement option. These improvements will be coordinated with the Town of Carver and MassDOT through the appropriate regulatory processes. Figure 3.1 shows a conceptual plan of the preferred Site access and an 80-scale plan is included in Appendix B.

The lane geometry at the intersection would include separate left-turn and right-turn lanes on the Montello Street eastbound approach; separate left-turn and through lanes on the Route 58 northbound approach; and a shared through/right-turn lane on the Route 58 southbound approach.

A traffic signal warrant analysis was performed for the intersection of Route 58 with the realigned Montello Street under the 2025 Build conditions. Since this is a proposed intersection which does not exist today, only peak hour volumes were developed. Therefore, the traffic signal warrant analysis was performed for the volume-based peak hour warrant (Warrant 3) and the warrant was met for this location during both the weekday morning and evening peak hours. The signal at the intersection of Route 58 and Montello Street would be coordinated with the signals at the intersections of Route 58 at Route 44 Westbound ramps and Route 58 at Route 44 Eastbound ramps. All the signals will be equipped with emergency pre-emption.

Signal phasing at this location provided in the DEIR included a protected/permitted left turn phase for Route 58 northbound approach. However, comments from the Southeastern Regional Planning & Economic Development District (SRPEDD) requested a protected only left-turn phase for Route 58 northbound approach be considered to provide a safer movement for vehicles and trucks entering the Site. An updated analysis has been completed which includes the modified

phasing at this location. The final signal design at this location will be coordinated with the Town of Carver during the local permitting process. As shown in Table 3.2, the intersection of Route 58 and Montello Street is expected to operate at an overall LOS B during the weekday morning and evening peak hours. It should also be noted that the northbound approach queues under the 2025 Build Condition with Mitigation will not block the unsignalized intersection of Route 58 at Silo Marketplace driveway. The capacity analysis results are included in Appendix B.

Table 3.2 Intersection Capacity Analysis with Mitigation – Route 58 at Montello Street (Preferred Access Alternative)

Location / Movement	2025 No-Build Conditions					2025 Build Conditions					2025 Build Condition with Mitigation				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Route 58 @ Realigned Montello Street South															
Weekday Morning	*Intersection does not exist under 2025 No-Build Conditions.*					*Intersection does not exist under 2025 Build Conditions.*									
EB L											0.18	44	D	12	36
EB R											0.21	2	A	0	24
NB L											0.83	27	C	177	217
NB T											0.31	2	A	72	31
SB T/R											0.72	33	C	237	#454
Overall												**20**	**B**		
Weekday Evening															
EB L											0.21	33	C	33	73
EB R											0.68	17	B	128	237
NB L											0.68	48	D	88	m153
NB T											0.49	5	A	72	91
SB T/R											0.67	24	C	276	405
Overall												**18**	**B**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 95th percentile queue, in feet.
e 50th percentile queue, in feet.
95th percentile volume exceeds capacity, queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.

Route 58 at Route 44 Westbound Ramps

As discussed in DEIR Section 5.6.2, with the addition of the Project's trips, the Route 44 Westbound ramp approach to Route 58 (unsignalized) is expected to operate at LOS F conditions. To address the Project related impacts, the Proponent is proposing to signalize this location and modify the lane geometry on Route 58. The lane geometry of the Route 58 southbound approach would include two through lanes (and maintain the channelized right-turn lane), and the Route 58 northbound approach would include a shared left-turn/through lane and through lane. The two-lane northbound section of Route 58 would be carried to the north to meet the two-lane section proposed as part of the Proposed Access Alternative at Route 58 and Montello Street (south). The four-lane cross-section of Route 58 would be carried south to the intersection with the Route 44 Eastbound ramps. The proposed four-lane cross section along Route 58 will fit within the existing curb-to-curb width and require the removal of the existing median and restriping. Limited sliver widening, within the existing right-of-way, will be required

along the east side of Route 58 north of the Route 44 Westbound off-ramp. The Route 44 Westbound off-ramp approach would remain as a single lane with a channelized right-turn lane. Concurrent pedestrian crossings to accommodate the existing crosswalks would be included in the proposed signal phasing and five-foot shoulders to accommodate bicycles would be provided. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Eastbound ramps and Montello Street. It should be noted that other improvement options were considered at this location based on factors including physical constraints, feasibility, operational benefits, and cost. At this time, the proposed improvements reflect the preferred improvement option. Figure 3.1 shows a conceptual plan of the Route 58 at Route 44 ramps with the proposed improvements and an 80-scale plan is included in Appendix B. Traffic operations with the proposed improvements in place are summarized in Table 3.3 and the results were included in DEIR Appendix A.

A traffic signal warrant analysis was performed for the intersection of Route 58 at the Route 44 Westbound ramps under the 2025 Build conditions. The Manual on Uniform Traffic Control Devices (MUTCD) lists specific criteria, or warrants, for the consideration of installation of a traffic signal at an intersection. The traffic signal warrant analysis provides guidance as to locations where signals would not be appropriate and locations where they could be considered further. The traffic signal warrant analysis was performed for the volume-based peak hour warrant (Warrant 3) and the warrant was met for this location during both the weekday morning and evening peak hours. The signal warrant analysis was included in DEIR Appendix A.

As shown in Table 3.3, the intersection of Route 58 at Route 44 Westbound ramps is expected to operate at overall LOS B and LOS C during the weekday morning and weekday evening peak hours, respectively. The Route 44 Westbound off-ramp approach experiences significant improvement for delay and queues.

Route 58 at Route 44 Eastbound Off-ramp and On-Ramp

As discussed in DEIR Section 5.6.2, with the addition of the Project's trips, the Route 44 Eastbound ramp approach to the intersection of Route 58 (unsignalized) is expected to operate at LOS F conditions. To address the Project related impacts, the Proponent is proposing to signalize both the Route 44 Eastbound off-ramp and on-ramp (which will remain offset) and modify the lane geometry on Route 58. The lane geometry of the Route 58 southbound approach would include a shared left-turn/through lane and a through lane, and the Route 58 northbound approach would include two through lanes (and maintain the channelized right-turn lane). The two southbound lanes of Route 58 would be carried south to meet the existing two-lane southbound section. The Route 44 Eastbound off-ramp approach would remain as a single lane with a channelized right-turn lane. Concurrent pedestrian crossings to accommodate the existing crosswalks would be included in the proposed signal phasing and five-foot shoulders to accommodate bicycles would be provided. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Westbound ramps and Montello Street. It should be noted that other improvement options were considered at this location based on factors including physical constraints, feasibility,

operational benefits, and cost. At this time, the proposed improvements reflect the preferred improvement option. Figure 3.1 shows a conceptual plan of the Route 58 at Route 44 ramps with the proposed improvements and an 80-scale plan is included in Appendix B. Traffic operations with the proposed improvements in place are summarized in Table 3.3 and the results were included in DEIR Appendix A.

A traffic signal warrant analysis was performed for the intersection of Route 58 at the Route 44 Eastbound off-ramp and on-ramp under the 2025 Build conditions. The Manual on Uniform Traffic Control Devices (MUTCD) lists specific criteria, or warrants, for the consideration of installation of a traffic signal at an intersection. The traffic signal warrant analysis provides guidance as to locations where signals would not be appropriate and locations where they could be considered further. The traffic signal warrant analysis was performed for the volume-based peak hour warrant (Warrant 3) and the warrant was met for this location during both the weekday morning and evening peak hours. The signal warrant analysis was included in DEIR Appendix A.

As shown in Table 3.3, the intersection of Route 58 at Route 44 Eastbound ramps is expected to operate at overall LOS B and LOS A during the weekday morning and weekday evening peak hours, respectively. The Route 44 Eastbound off-ramp approach experiences significant improvement for delay and queues.

Table 3.3 Intersection Capacity Analysis with Mitigation – Route 58 at Route 44 Ramps

Location / Movement	2025 No-Build Conditions					2025 Build Conditions					2025 Build Condition with Mitigation				
	D [a]	v/c [b]	Del [c]	LOS [d]	95 Q [e]	D	v/c	Del	LOS	95 Q	v/c	Del	LOS	50 Q [f]	95 Q
Route 58 @ Route 44 WB Ramps															
Weekday Morning															
WB L/T/R	215	0.19	9	A	18	320	>1.20	>120	F	508	0.82	39	D	136	216
NB L	120	0.13	9	A	10	120	0.14	10	A	13	*Movement does not exist under 2025 Build Conditions with Mitigation.*				
NB T	*Movements do not exist under 2025 No-Build Conditions.*					*Movements do not exist under 2025 Build Conditions.*					0.64	9	A	111	350
SB T/R											0.32	3	A	28	48
Overall												**12**	**B**		
Weekday Evening															
WB L/R	445	0.99	66	F	325	485	>1.20	>120	F	1202	0.86	40	D	250	356
NB L	90	0.01	9	A	8	90	0.14	11	B	13	*Movement does not exist under 2025 Build Conditions with Mitigation.*				
NB T	*Movements do not exist under 2025 No-Build Conditions.*					*Movements do not exist under 2025 Build Conditions.*					0.64	14	B	81	263
SB T/R											0.60	16	B	239	313
Overall												**21**	**C**		
Route 58 @ Route 44 EB Off-Ramp															
Weekday Morning															
EB L/R	185	0.38	16	C	45	325	>1.20	>120	F	690	0.55	23	C	137	221
NB T	*Movements do not exist under 2025 No-Build Conditions.*					*Movements do not exist under 2025 Build Conditions.*					0.49	16	B	166	218
SB T											0.38	11	B	61	121
Overall												**16**	**B**		
Weekday Evening															
EB L/R	310	0.73	31	D	148	355	>1.20	>120	F	823	0.70	31	C	165	270
NB T	*Movements do not exist under 2025 No-Build Conditions.*					*Movements do not exist under 2025 Build Conditions.*					0.31	11	B	88	120
SB T											0.62	11	B	118	222
Overall												**14**	**B**		
Route 58 @ Route 44 EB On-Ramp															
Weekday Morning															
NB T/R	*Movement does not exist under 2025 No-Build Conditions.*					*Movement does not exist under 2025 Build Conditions.*					0.36	0	A	0	0
SB L	135	0.15	9	A	13	170	0.24	11	B	23	*Movement does not exist under 2025 Build Conditions with Mitigation.*				
SB L/T	*Movement does not exist under 2025 No-Build Conditions.*					*Movement does not exist under 2025 Build Conditions.*					0.41	3	A	85	62
Overall												**1**	**A**		
Weekday Evening															
NB T/R	*Movement does not exist under 2025 No-Build Conditions.*					*Movement does not exist under 2025 Build Conditions.*					0.25	0	A	0	0
SB L	90	0.09	9	A	8	185	0.21	10	A	20	*Movement does not exist under 2025 Build Conditions with Mitigation.*				
SB L/T	*Movement does not exist under 2025 No-Build Conditions.*					*Movement does not exist under 2025 Build Conditions.*					0.62	4	A	29	78
Overall												**3**	**A**		

Note The intersections are unsignalized under the 2025 No-Build and 2025 Build conditions and signalized under the 2025 Build with mitigation condition.

[a] Demand, in vehicles

[b] Volume to capacity ratio.

[c] Average total delay, in seconds per vehicle.

[d] Level-of-service.

[e] 95th percentile queue, in feet.

[f] 50th percentile queue, in feet.

Route 58 at Plymouth Street

As discussed in DEIR Section 5.4.4.1, the intersection of Route 58 at Plymouth Street is a Highway Safety Improvement Program (HSIP) location and the Proponent funded and conducted and Road Safety Audit (RSA) which was completed in May 2018. The RSA report identified safety issues and potential safety enhancements. The Proponent is proposing to implement the following measures to mitigate the existing safety deficiencies and poor operations:

- Refresh the faded pavement markings;
- Replace faded signage;
- Install advanced warning signage on both the Route 58 northbound and southbound approaches to notify drivers of the upcoming lane geometry and signal; and
- Signal timing improvements and time of day programming.

As discussed in DEIR Section 5.6.2, under 2025 No-Build conditions, the intersection operates poorly during the weekday morning peak hour. The addition of the Project's trips is expected to have a minimal impact, with no new movements at the intersection operating at an unacceptable LOS and minimal increase in average queue lengths for the majority of movements. However, in order to minimize the impact of the Project related trips, an analysis was completed with optimized signal timings for this location. As shown in Table 3.4, the intersection of Route 58 at Plymouth Street is expected to operate at LOS E and LOS C during the morning and evening peak hours, respectively, under 2025 Build Conditions with Mitigation. The capacity analysis results are included in Appendix B.

Route 44 at Route 105 (Plympton Street)

As discussed in DEIR Section 5.4.4.1, the intersection of Route 44 at Route 105 is a Highway Safety Improvement Program (HSIP) location and the Proponent funded and conducted and Road Safety Audit (RSA) which was completed in May 2018. The RSA report identified safety issues and potential safety enhancements. The Proponent is proposing to implement the following measures to mitigate the existing safety deficiencies and poor operations:

- Signal timing improvements and time of day programming.

As discussed in DEIR Section 5.6.2, under 2025 No-Build conditions, the intersection operates at LOS D/E. The addition of the Project's trips is only expected to have a moderate impact on the eastbound through movement during the weekday morning peak hour at the intersection. Minimal impacts are anticipated for all other movements. In order to minimize the impact of the Project related trips, an analysis was completed with optimized signal timings for this location. As seen in Table 3.4, the intersection of Route 44 at Route 105 is expected to operate at LOS D during both the morning and evening peak hours under 2025 Build Conditions with Mitigation. The capacity analysis results are included in Appendix B.

Table 3.4 Intersection Capacity Analysis with Mitigation – Route 58 at Plymouth Street & Route 44 at Route 105

Location / Movement	2025 No-Build Conditions					2025 Build Conditions					2025 Build Conditions w/Mitigation				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Route 58 @ Plymouth Street															
Weekday Morning															
EB L/T/R	>1.20	>120	F	~426	#612	>1.20	>120	F	~465	#653	>1.20	>120	F	~386	#585
WB L/T/R	0.58	13	B	22	91	0.65	13	B	22	102	0.46	7	A	26	92
NB L	0.05	11	B	5	18	0.05	11	B	5	18	0.07	19	B	8	25
NB T/R	0.57	17	B	182	283	0.79	25	C	295	#523	1.02	68	E	~488	#709
SB L	0.18	6	A	13	27	0.32	7	A	16	32	0.47	19	B	30	63
SB T/R	0.38	6	A	72	118	0.43	7	A	87	142	0.54	17	B	169	260
Overall		**>120**	**F**				**>120**	**F**				**68**	**E**		
Weekday Evening															
EB L/T/R	1.07	110	F	~133	#277	1.17	>120	F	~147	#291	0.87	57	E	119	#257
WB L/T/R	0.46	15	B	26	82	0.49	15	B	26	86	0.41	11	B	23	78
NB L	0.11	14	B	8	27	0.20	19	B	9	33	0.34	28	C	11	39
NB T/R	0.58	19	B	165	276	0.68	23	C	203	#393	0.71	25	C	224	344
SB L	0.41	7	A	33	58	0.57	10	B	46	76	0.68	17	B	57	#98
SB T/R	0.67	11	B	205	324	0.83	18	B	315	#543	0.90	26	C	395	#710
Overall		**26**	**C**				**32**	**C**				**27**	**C**		
Route 105 @ Route 44															
Weekday Morning															
EB L	0.18	39	D	17	45	0.19	39	D	17	45	0.21	42	D	18	47
EB T	0.93	45	D	342	#591	1.09	84	F	~528	#784	0.98	51	D	456	#723
EB R	0.02	0	A	0	0	0.01	0	A	0	0	0.01	0	A	0	0
WB L	0.58	44	D	76	135	0.59	45	D	76	135	0.93	98	F	85	#199
WB T	0.68	21	C	277	426	0.72	22	C	311	#481	0.72	23	C	326	#491
WB R	0.02	0	A	0	0	0.02	0	A	0	0	0.02	0	A	0	0
NB L/T/R	1.08	95	F	~280	#488	1.11	107	F	~280	#488	1.06	91	F	~279	#472
SB L/T/R	0.70	49	D	85	#191	0.77	56	E	86	#199	0.68	47	D	87	#179
Overall		**48**	**D**				**65**	**E**				**53**	**D**		
Weekday Evening															
EB L	0.47	40	D	57	103	0.48	40	D	57	103	0.67	60	E	64	#147
EB T	0.93	45	D	322	#548	0.96	50	D	360	#608	0.88	37	D	346	#563
EB R	0.09	1	A	0	8	0.08	1	A	0	8	0.08	1	A	0	9
WB L	0.65	44	D	92	159	0.67	45	D	92	159	0.81	66	E	105	#220
WB T	0.81	31	C	307	#558	0.96	48	D	431	#723	0.94	41	D	401	#650
WB R	0.05	0	A	0	0	0.05	0	A	0	0	0.05	0	A	0	1
NB L/T/R	0.90	51	D	174	#351	0.91	53	D	174	#351	0.92	56	E	194	#372
SB L/T/R	0.56	35	C	101	175	0.58	36	D	101	176	0.57	37	D	110	185
Overall		**39**	**D**				**46**	**D**				**43**	**D**		

a Demand, in vehicles
b Volume to capacity ratio.
c Average total delay, in seconds per vehicle.
d Level-of-service.
e 95th percentile queue, in feet.
f 50th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.
m Volume for 95th percentile queue is metered by upstream signal.
- Volume exceeds capacity, therefore results cannot be calculated.

3.4.2 Multimodal Accommodations

As discussed in DEIR Section 5.7.2, there are no public transit service or formal bike accommodations within the vicinity of the Site. Pedestrian accommodations in the form of sidewalks and crosswalks are provided at the Route 58 and Route 44 interchange, however these accommodations do not connect into a larger pedestrian facility network. The Project Site is located in a rural area with limited population and only limited commercial/retail opportunities within walking/biking distance of the Site. As a result, pedestrian and bicycle trips to the Site are expected to be very low.

As part of the Project's mitigation, the existing pedestrian accommodations will be maintained and enhanced by providing pedestrian phases at the proposed Route 58 at Route 44 interchange signals, as well as providing five-foot wide shoulders along Route 58 to accommodate bicycles. In addition to these enhancements, sidewalks along the west side of Route 58 will be extended from the Route 44 Westbound on-ramp to the Silo Marketplace Shopping Center driveway and a crosswalk will be provided across Route 58 at the intersection with the Silo Marketplace Shopping Center driveway. Advanced warning signage alerting drivers of the crosswalk will also be installed.

3.4.3 Mitigation Implementation

Mitigation Phasing Summary

As discussed in DEIR Section 5.7.3, the Project will likely be built in phases and occupied by one or more tenants. Therefore, a sensitivity analysis was completed to identify the time at which the mitigation at the following intersections should be implemented due to a degradation of operations as a result of Project related trips.

- Route 58 at Montello Street (under the Preferred Access Alternative)
  - Phase 1: Shifting the intersection of Route 58 at Montello Street to approximately 400 feet to the north with the lane geometry previously discussed. The intersection will be unsignalized with the realigned Montello Street eastbound approach under STOP control. The existing unsignalized intersection at Montello Street will remain to provide access to the Silo Marketplace Shopping Center and a northbound left-turn lane pocket will be added.
  - Phase 2: Signalizing the intersection of Route 58 at realigned Montello Street.
- Route 58 at Route 44 Westbound and Eastbound ramps
  - Phase 1: Signalizing the intersections of Route 58 at the Route 44 Westbound and Eastbound ramps without modifying the lane geometry on Route 58.
  - Phase 2: Maintaining the signals and modifying the lane geometry on Route 58 to a four-lane cross section in the vicinity of the ramps.
- Route 58 at Plymouth Street
- Route 44 at Route 105 (Plympton Street)

It should be reiterated that poor operations are expected at the intersections of Route 58 with the Route 44 Westbound and Eastbound ramps under future conditions without the addition of any Project trips, and the proposed mitigation addresses the already deficient operations in addition to the Project's impacts. The proposed mitigation for the intersections of Route 58 at Plymouth Street and Route 44 at Route 105 address existing safety and operational issues, and these locations will operate similar to or better than 2025 No-Build Conditions.

Table 3.5 summarizes approximate peak hour total trips and corresponding anticipated range of development occupancy that will trigger each transportation mitigation element. Figure 3.1 shows the full build-out of all the roadway mitigation. Figures 3.2 and 3.3 show Level 1 and Level 2 of the roadway mitigation, respectively, which correspond to the elements shown in Table 3.5.

As discussed in DEIR Section 5.7.3, the Proponent is proposing to conduct traffic monitoring at these locations after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses and signal warrant evaluations at key locations, the Proponent will work with the Town of Carver and MassDOT to implement the mitigation level necessary. It should be noted that the installation of new traffic signals will not occur until the MUTCD traffic signal warrant is met for the specific location. If it is determined the next level of mitigation is necessary, and there is a period after a tenant occupies a portion of the development but prior to the mitigation implementation where traffic operations are unacceptable, the Proponent is committed to coordinating and funding police control during commuter peak periods until a time when the mitigation is complete.

Table 3.5 Mitigation Phasing Summary

Mitigation Level	Mitigation Element	Description	Approximate Peak Hour Total Trips to Trigger Need [1]	Anticipated Range of Occupancy to Trigger Need [2]
Level 1 (Figure 3.2)	Route 58 at Montello Street (Preferred Access Alternative) Phase 1	Relocation of Route 58 at Montello Street and geometric improvements.	Prior to any additional trips	Prior to any occupancy
Level 1 (Figure 3.2)	Multimodal Accommodations	Extension of sidewalks on Route 58, addition of crosswalk across Route 58 at Silo Market Place Shopping Center, and installation of advanced warning signage.	Prior to any additional trips	Prior to any occupancy
Level 2 (Figure 3.3)	Route 58 at Route 44 WB & EB Ramps Phase 1	Signalization of Route 58 at Route 44 WB & EB ramps with no geometric changes.	225 trips	500,000 sf to 1,300,000 sf
Level 2 (Figure 3.3)	Route 58 at Plymouth Street	Safety improvements and signal timing improvements.	225 trips	500,000 sf to 1,300,000 sf

Mitigation Level	Mitigation Element	Description	Approximate Peak Hour Total Trips to Trigger Need [1]	Anticipated Range of Occupancy to Trigger Need [2]
	Route 44 at Route 105 [3]			
Full Build-out (Figure 3.1)	Route 58 at Montello Street (Preferred Access Alternative) Phase 2	Signalization of Route 58 at Montello Street.	550 trips	1,300,000 sf to 1,770,000 sf
Full Build-out (Figure 3.1)	Route 58 at Route 44 EB & WB Ramps Phase 2	Modifying the lane geometry on Route 58 to a four-lane cross section.	550 trips	1,300,000 sf to 1,770,000 sf

[1] Approximate peak hour total trips (entering and exiting) to trigger the need for each phase of the off-Site roadway improvements.

[2] Anticipated range of development occupancy. The low end of development occupancy assumes the Project generates trips consistent with ITE LUC 150 (Warehousing) rates and the high end of development occupancy assumes the Project generates trips consistent with the average of rates for ITE LUC 150 (Warehousing) and ITE LUC 156 (High-Cube Parcel Hub Warehouse).

[3] It should be noted that the impact of the Project's trips does not results in a degradation in level of service until full occupancy of the development, however the Proponent will implement these improvements during Level 2 since they include safety benefits as well.

3.4.4 Transportation Demand Management (TDM)

TDM Measures

As discussed in DEIR Section 5.7.4, in recognition of the existing and future traffic demands on the study area roadway system, several TDM measures are proposed and the Proponent will encourage future tenant(s) to implement these to help reduce the number of SOVs traveling to and from the Site.

Given the rural nature of the Project and the limited transit options that are available, the Proponent aims to achieve a five-percent reduction in vehicle trips as compared to the projected ITE trip generation estimates. It should be noted that to provide a conservative analysis, the expected reduction in vehicle trips as a result of the TDM measures was not credited toward to the Project's estimated trip generation. These TDM measures include the following:

- Provide an on-Site and dedicated Transportation Management Coordinator to facilitate and assist with the various TDM measures;
- Install conduit in support of potential future electric vehicle charging stations where appropriate in parking areas;
- Provide an on-Site ATM machine, cafeteria, and mail drop boxes for employees and customers;
- Survey and evaluate employee transportation needs, and support a carpool and ride-matching coordination program through the promotion of Bay State Commute (formerly NuRide) or other MassRIDE initiatives;

- Designate preferential low emissions vehicle only spaces within general and employee parking areas;
- Provide employees with a guaranteed ride home; and
- Use direct deposit for employee paychecks.

Transportation Monitoring Program

As discussed in DEIR Section 5.7.5, the proponent is required to complete an annual TMP to begin six months after full occupancy of the Project and extend for a period of five years, in addition to the traffic monitoring as each portion of the development is occupied. The data collection as part of the TMP will be distributed to MassDOT and MassDEP per their reporting requirements. The TMP will include ATR counts for a 24-hour period on a typical weekday and Saturday at the following locations:

- Montello Street east of Route 58,
- Southern Site driveway (*added since the DEIR*),
- Northern Site driveway (*added since the DEIR*), and
- Middleborough Rotary (Route 44, Route 28, and Route 18 approaches) (*added since the DEIR*).

In addition, TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at the following locations:

- Route 58 at Montello Street,
- Route 58 at Route 44 Westbound ramps,
- Route 58 at Route 44 Eastbound off-ramp and on-ramp,
- Route 58 at Plymouth Street (*added since the DEIR*),
- Route 58 at Parsonage Road/Mayflower Road (*added since the DEIR*), and
- Route 44 at Route 105 (*added since the DEIR*).

In addition to reporting the traffic count data, operational analysis and MUTCD traffic signal warrant analysis (at the required locations) will be completed and used to determine when each level of transportation mitigation is triggered.

TDM Monitoring Program

As discussed in DEIR Section 5.7.6, in addition to the traffic monitoring program, the Proponent is also required to monitor the participation in, and effectiveness of the proposed TDM program on Site. The Proponent will work with the appointed on-Site TDM coordinator to conduct a travel survey of employees and patrons of the Site to provide a summary of the participation rate for each tenant on the Site and the estimated reduction in Site-generated traffic associated with the TDM measures in place throughout the Site. Based on the results of

the summary, the Proponent will work with the tenants to reasonably modify the TDM measures if the resulting reduction in vehicle trips is less than the Proponent's goal of a five-percent reduction. Consistent with the TMP, the annual TDM monitoring program will begin six months after full occupancy of the Project and extend for a period of five years.

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Additional Mitigation Locations

- Route 58 at Plymouth Street — Signal timing improvements and updated signage and pavement markings
- Route 44 at Route 105 — Signal timing improvements

Figure 3.1

Conceptual Roadway Mitigation
Full Build-Out

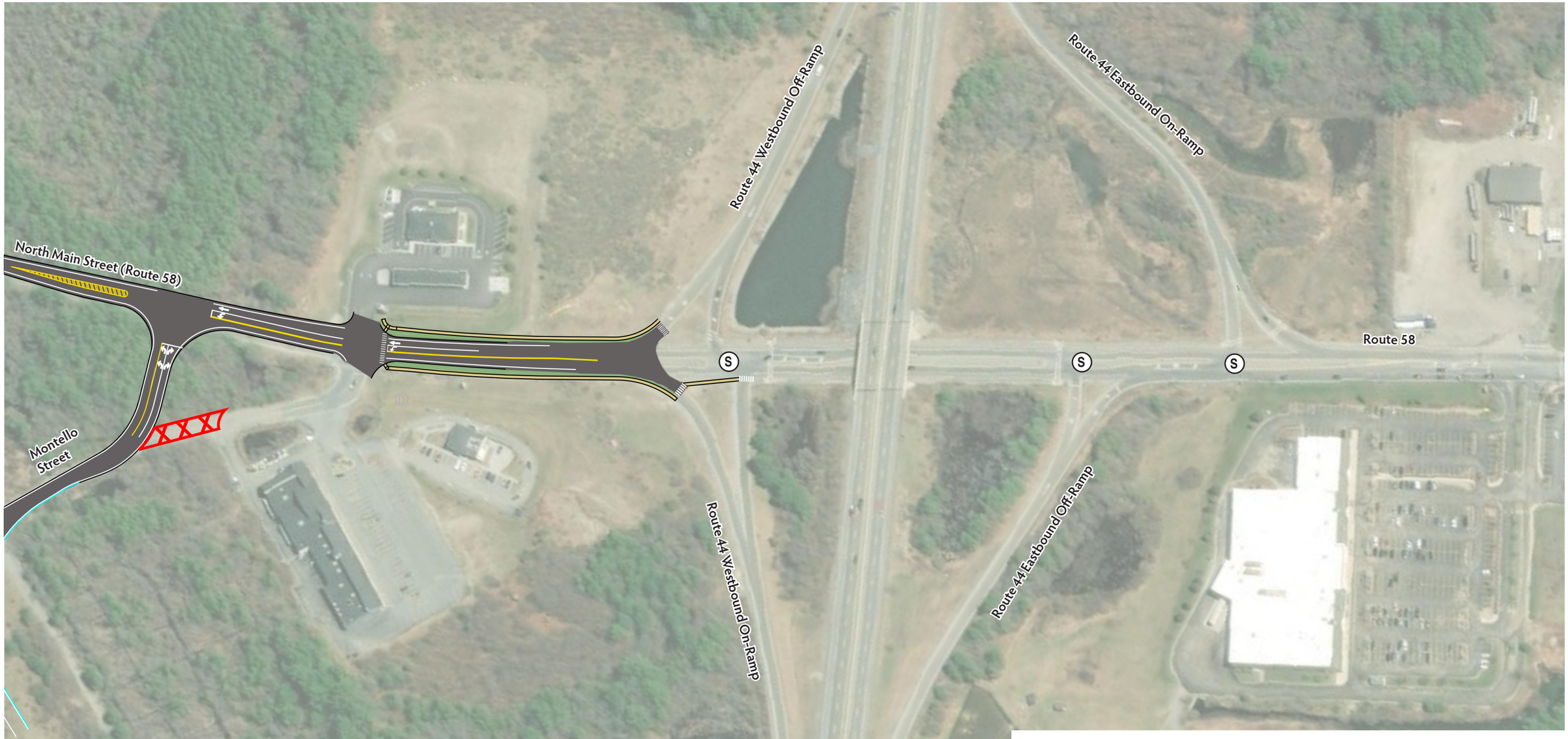
North Carver Development
Carver, Massachusetts

Discontinued Roadway Segment

Figure 3.2

Conceptual Roadway Mitigation
Level 1

North Carver Development
Carver, Massachusetts



Ⓢ Proposed Signal

XXX Discontinued Roadway Segment

Additional Mitigation Locations

- **Route 58 at Plymouth Street** — **Signal timing improvements and updated signage and pavement markings**
- **Route 44 at Route 105** — **Signal timing improvements**

Figure 3.3

Conceptual Roadway Mitigation
Level 2

North Carver Development
Carver, Massachusetts

4

Greenhouse Gas Emissions

This chapter includes information pertaining to greenhouse gas emissions as required by the Secretary's Certificate on the DEIR dated September 14, 2018.

4.1 From the Secretary's Certificate

This chapter includes responses to the scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Provide the analysis and information requested in DOER's comment letter* **Sections 4.2-4.3**;
- *Confirm that the Base Case design incorporates all applicable requirements of the Building Code* **Section 4.2**;
- *Provide a revised analysis of stationary-source GHG emissions under the Base Case and Design Case that includes additional mitigation measures such as increased roof insulation with R values of R-40 to R-50* **Section 4.2**;
- *Review the feasibility of incorporating heat pumps into the project design, including financial incentives available through Alternative Energy Credits and savings that could result from eliminating the need for gas infrastructure* **Section 4.2**;
- *Provide an updated analysis of solar PV feasibility and provide a schematic roof plan showing potential space for solar PV systems in coordination with skylights and other rooftop systems* **Section 4.3**; *and*
- *Explore a commitment to install solar on a minimum of 30 percent of the total roof area* **Section 4.3**.

4.2 Stationary Source GHG Analysis Update

The Project is subject to the MEPA Greenhouse Gas Emissions Policy and Protocol (effective November 1, 2007) and is required to analyze stationary source GHG emissions associated with energy consumption by the project's buildings. A detailed assessment of energy

consumption and stationary source emissions was provided in the DEIR filing. The Project's program has not changed since this filing. An updated energy consumption and GHG emissions analysis was prepared to respond to the scope from the Secretary's Certificate and comments provided by DOER.

The energy model estimates each buildings' electricity and gas usage based on building design and system assumptions using Appendix G of ASHRAE 90.1-2013[1]. The amount of consumed energy is then converted into the amount of CO_2 emitted using the standardized conversion factors. CO_2 emissions were quantified for (1) the Base Case corresponding to the minimum requirements of ASHRAE 90.1-2013 and (2) the Design Case, which includes all energy saving measures that were deemed to be reasonable and feasible. The Base Case has been revised since the DEIR filing to incorporate Section C406.1 conservation measures required by the energy code. The measures incorporated into the four Project buildings were a 10 percent improvement in HVAC system performance and a 10 percent improvement in lighting power densities over the requirements of ASHRAE 90.1-2013. The stationary source assessment calculated CO_2 emissions for the following build conditions:

- Build Condition with MA Building Code (the "Base Case") - The Project assuming typical construction materials and building equipment/systems that meet the minimum requirements of the base code. This baseline is established by the energy code as being defined by ASHRAE 90.1–2013 and includes required Section C406.1 code measures
- Build Condition with Energy Conservation Measures (the "Design Case") - The Project assuming building design and system improvements that meet the MEPA GHG Policy.

In response to comments by DOER, the Proponent has elected to improve the proposed design of the four Project buildings to include additional mitigation measures. The four buildings will include R-40 rooftops, an improvement over the R-30 rooftops previously proposed in the DEIR. Additionally, the Proponent has included high efficiency heat pump systems for the office spaces into the design of all four buildings. Heat pump systems are not considered for the entire building as the warehouse space is heated-only, so air source heat pumps would not feasible. A more detailed presentation of the updated energy model is presented in Appendix C.

The resulting energy consumption and stationary source GHG emissions of the Project is presented in Table 4.1. Under the Base Case, the CO_2 emissions for the Project are estimated to be 2,570.4 tpy. With the currently proposed building design and system improvements, the estimated CO_2 emissions are 2,319.2 tpy which is a savings of 251.3 tpy. The equivalent estimated energy use reduction for the Project is approximately 12.9 percent, which equates to an approximately 9.8 percent overall reduction in stationary source CO_2 emissions when compared to the Base Case. Overall, the energy use savings and GHG emissions reductions are

[1] American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., *ASHRAE 90.1-2013-Energy Standard for Buildings Except* Low-*Rise Residential Buildings*, Appendix G, 2013.

slightly less than the values presented in the DEIR due to the increased efficiency of the Base Case and the implementation of the Section C406.1 measures.

TABLE 4.1 STATIONARY SOURCE CO_2 EMISSIONS FOR THE OVERALL PROJECT (FULL BUILD)

Building	Energy Consumption (MMBtu/yr)			CO_2 Emissions (tons/yr)		
	Base Case	Design Case	Percent Savings	Base Case	Design Case	Percent Reduction
Building A	17,799	15,461	13.1%	1,503.6	1,344.7	10.6%
Building B	2,358	2,036	13.7%	190.5	175.1	8.1%
Building C	10,471	9,192	12.2%	872.2	795.6	8.8%
WWTF Building	40	36	10.4%	4.2	3.8	10.4%
Total	**30,668**	**26,725**	**12.9%**	**2,570.4**	**2,319.2**	**9.8%**

tons/yr = short tons per year

The FEIR Design Case is compared to the DEIR Design Case in Table 4.2. Since the DEIR, the Proponent has committed to additional stationary source mitigation measures that result in more energy efficient buildings. These measures include R-40 roof insulation and the use of air source pumps in the office spaces. The resulting mitigation measures reduces energy consumption across the Site by 17.7 percent compared to the DEIR design and reduces GHG emissions 11.3 percent compared to the DEIR design. This savings represents a significant improvement in energy efficiency across the Site compared to the previously presented building designs.

TABLE 4.2 STATIONARY SOURCE CO_2 EMISSIONS COMPARISON TO THE DEIR

Building	Energy Consumption (MMBtu/yr)			CO_2 Emissions (tons/yr)		
	DEIR Design Case	FEIR Design Case	Percent Savings	DEIR Design Case	FEIR Design Case	Percent Reduction
Building A	18,404	15,461	16.0%	1,499.70	1,344.70	10.3%
Building B	3,103	2,036	34.4%	232.1	175.1	24.6%
Building C	10,894	9,192	15.6%	879.7	795.6	9.6%
WWTF Building	58	36	37.9%	4.3	3.8	11.6%
Total	**32,459**	**26,725**	**17.7%**	**2,615.80**	**2,319.20**	**11.3%**

tons/yr = short tons per year

4.3 Rooftop Solar PV Analysis

Solar, or Photovoltaic (PV), panels are comprised of an array of small solar cells that convert sunlight to electricity. The constant and significant improvements in PV technologies are making PV systems lighter and more cost efficient. This Project has the potential for a variety of flat roofs on the Project's buildings that may be appropriate for PV system installation.

An update to the Solar PV analysis provided in the DEIR filing has been conducted to consider an array system that would cover 30 percent of the rooftop on each of the buildings. A summary of the size and production of this system in provided in Table 4.3. With a system covering 30 percent of the Project rooftops, approximately 9,597 MWh of electricity would be generated annually. This electricity generation would reduce GHG emissions by 3,407 tons per year, more that the total stationary source GHG emissions anticipated under the proposed design.

TABLE 4.3 30 PERCENT OF ROOF AREA PV ANALYSIS

Rooftop	System Size (kW)	Annual Generation (kWh)	GHG Reduction (tons per year)
Building A	4,432	5,733,436	2,035
Building B	480	620,950	220
Building C	2,500	3,234,114	1,148
WWTF Building	6	8,152	3
Total	**7,418**	**9,596,652**	**3,407**

tons/yr = short tons per year

A draft rooftop plan showing the potential PV array covering 30 percent of the roof area are presented in Figure 4.1. The Proponent recognizes that based on the studies to date, PV is a viable option to bring renewable energy to the Site and reduce the development's carbon footprint. The Proponent will continue to carry PV arrays covering 30 percent of the roof area through the Project's design, unless further progression of the design finds that such system would be infeasible.

4.4 Mobile Source GHG Mitigation Update

The mobile source GHG assessment of the DEIR calculated the GHG emissions for Project-related mobile sources. Since the DEIR, the traffic analysis has been updated to reflect additional proposed roadway improvements. These additional measures include signal timing optimizations at the intersections of Route 58 at Plymouth Street and Route 44 at Route 105. Also, the phasing of the signal at the intersection of the Site driveway with Route 58 has been changed to allow for a protected left turn on the northbound approach. These additional mitigation measures are expected to bring the total GHG reduction due to roadway improvements to 1,180 tons (25 tons more than the DEIR roadway improvements).

The Proponent is still committed to implementing a comprehensive TDM program as described in the DEIR. Implementation of the TDM program is expected to improve air quality in the study area by promoting the use of alternative forms of transportation over the use of single-occupant motor vehicle (SOV) trips to the Project Site. This modal shift results in lower Project-related VMT which consequentially reduces indirect Project emissions. Although not easily modeled, previous estimates of similar TDM programs in an urban area have ranged on the order of two percent reduction in vehicle miles travelled from the Project generated trips. Assuming a similar relationship to GHG emissions, this would correlate to an approximately

104 tons of CO_2 per year reduction in mobile source GHG based on estimated Project emissions. This results in a final Project-related CO_2 emissions total of 3,891 tpy. A summary of the mitigation emissions reduction is seen in Table 4.4.

TABLE 4.4 MOBILE SOURCE CO_2 EMISSIONS MITIGATION ANALYSIS RESULTS (TPY)

Pollutant	Project-Related CO_2 Emissions[a]	Estimated Reductions Due to TDM Measures[b]	Estimated Reductions Due to Roadway Improvements[c]	Resulting Project-Related CO_2 Emissions
Greenhouse Gas (CO_2)	5,176	-104	-1,180	3,891

[a] Represents the difference in CO_2 emissions between the 2025 Build and No-Build Conditions
[b] Mitigation from TDM Measures estimated as 2 percent of unmitigated Project-related emissions.
[c] Mitigation from roadway improvement measures, such as signal optimization or intersection realignments.

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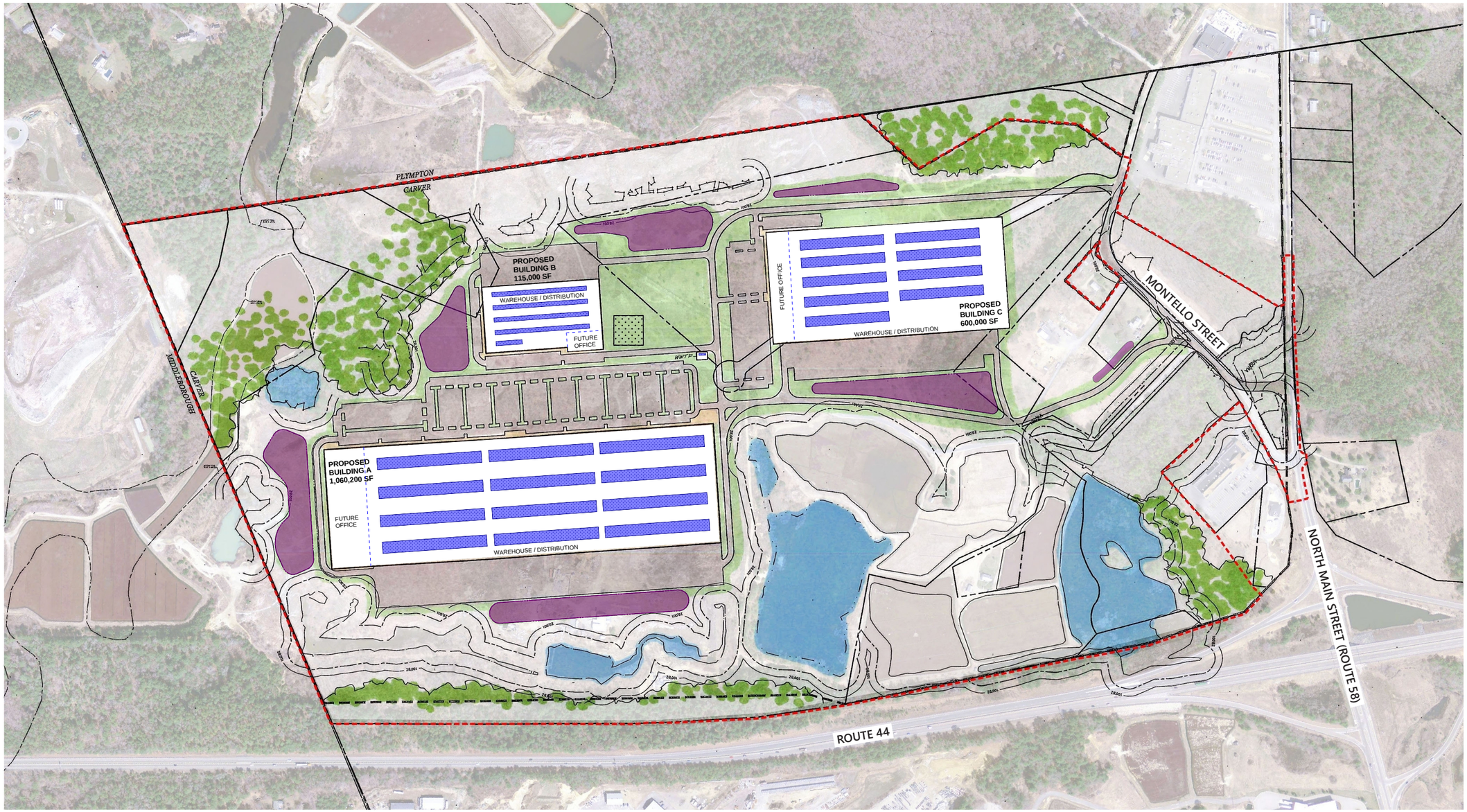

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LEGEND

- Proposed Stormwater BMP
- Proposed Buildings
- Proposed Pervious Areas
- Proposed Impervious Areas
- Existing Open Water
- Existing Cranberry Bogs
- Existing Tree Cover
- Project Site Boundary
- Leach Field
- PV Panels Row

PV Panels cover 30% of the roof area. The proposed layout provides enough space to access panels for repairs and maintenance Panels face South with 20 degree tilted angel

Figure 4.1

Potential Rooftop PV Configuration

North Carver Development
Carver, Massachusetts

5

Mitigation and Draft Section 61 Findings

As required by 301 CMR 11.07(6)(k) of the Massachusetts Environmental Policy Act (MEPA), this chapter provides updated draft Section 61 Findings for each agency action to be taken on the Project. It also provides a summary of proposed mitigation measures.

5.1 From the Secretary's Certificate

This chapter includes responses to the scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Include a separate chapter summarizing proposed mitigation measures and draft Section 61 Findings for each permit to be issued by State Agencies* **Section 5.2**;
- *Include a commitment to provide a self-certification to the MEPA Office at the completion of the project* **Section 5.2.2**.
- *Contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation* **Section 5.3**; and
- *Clearly indicate which mitigation measures will be constructed or implemented based upon project phasing, either tying mitigation commitments to overall project square footage/phase or environmental impact thresholds, to ensure that measures are in place to mitigate the anticipated impact associated with each development phase* **Section 5.3**.

5.2 Draft Section 61 Findings

M.G.L Chapter 30, Section 61, requires that "[a]ll authorities of the commonwealth … review, evaluate, and determine the impact on the natural environment of all works, projects or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the Environment. … Any determination made by an agency of the commonwealth

shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." The finding required by Section 61 "shall be limited to those matters which are within the scope of the environmental impact report, if any, required … [on a project]." M.G.L Chapter 30, Section 62A.

The Project is subject to a Mandatory EIR and meets the following review thresholds:

- 301 CMR 11.03 (1)(a)1 – Alteration of 50 or more acres of land;
- 301 CMR 11.03 (1)(a)2 – Creation of 10 or more acres of impervious area;
- 301 CMR 11.03 (5)(b)4 a. – New discharge or Expansion in discharge to a sewer system of 100,000 or more gpd of sewage, industrial waste water or untreated stormwater;
- 301 CMR 11.03(6)(a)(6) – Generation of 3,000 or more NEW ADT on roadways providing access to a single location; and
- 301 CMR 11.03(6)(a)(7) – Construction of 1,000 or more NEW parking spaces at a single location.

Table 5.1 includes a list of anticipated state permits, approvals, and reviews.

TABLE 5.1 ANTICIPATED STATE PERMITS, APPROVALS AND REVIEWS

AGENCY	Permit/Approval/Review	Status
MEPA Office	Final MEPA Certificate	After submission of FEIR
MassDEP	BRP WP 83 Hydrogeological Evaluation Report	To be submitted after FEIR submittal
	Groundwater Discharge Permit (310 CMR 5.00)	To be submitted after approval of Hydrogeological Evaluation Report
	BRP WP 70 Individual Permit for Groundwater Discharge from a Sewage Treatment	To be submitted after approval of Hydrogeological Report
	BRP WS 33 Permit – Distribution Modification Permit for systems that serve fewer than 3,300 people	To be submitted prior to implementation
MassDOT	Highway Access Permit	To be submitted prior to construction

5.2.1 MassDOT

D R A F T O N L Y

J. Lionel Lucien, P.E.
Manager - Public/Private Development Unit
Massachusetts Department of Transportation, Highway Division - Boston
10 Park Plaza, Room 4150
Boston, MA 02116
(EEA No. 15639)

These findings for the North Carver Development (the "Project"), (EEA No. 15639), have been prepared in accordance with the provisions of M.G.L. c. 30, Section 61 and 301 CMR 11.00. On *XXX*, the Secretary of Energy and Environmental Affairs issued a decision stating that the Project's Final Environmental Impact Report ("FEIR"), dated *XXX*, adequately and properly complied with the Massachusetts Environmental Policy Act and its implementing regulations.

5.2.1.1 Project Description

The Project Site is located on approximately 283.2 acres of land in the northwest corner of the Town of Carver. The Project involves the construction of 1.77 million square feet of new warehouse/distribution facilities with ancillary office uses, 1,883 parking spaces (for both passenger vehicles and trucks), and paved access roads (Figure 1.1). To support the program, new utility infrastructure, a new sewage treatment facility and a new stormwater management system will be constructed. The Project Site will be accessed from a re-configured intersection of Montello Street and Route 58 and a new configuration for Montello Street.

5.2.1.2 Overall Project Impacts

Occupancy of the Project is expected to generate 8,398 new vehicle-trips to and from the Project Site during an average weekday, including 770 trips during the weekday morning peak hour and 735 trips during the weekday evening peak hour. MassDOT has assessed the impacts of this anticipated traffic load on the surrounding regional roadway network based upon information set forth in the DEIR and FEIR.

The North Carver Development Project-related traffic would be expected to have varying levels of operational and safety impacts throughout the study area. The study area includes the following locations:

- Montello Street at Shopping Center Driveway (north)
- Montello Street at Shopping Center Driveway (south)
- Route 58 (North Main Street) at Montello Street (south)
- Route 58 (North Main Street) at Route 44 Westbound ramps
- Route 58 (North Main Street) at Route 44 Eastbound off-ramp
- Route 58 (North Main Street) at Route 44 Eastbound on-ramp
- Route 58 (North Main Street) at High Street
- Route 58 (North Main Street) at Plymouth Street
- Route 58 (North Main Street) at Montello Street (north)
- Route 58 (North Main Street) at Parsonage Road/Mayflower Road
- Route 44 at Route 105 (Plympton Street)
- Middleborough Rotary

The specific traffic impacts at each of these locations and the mitigation measures required to address them are detailed below as part of this Section 61 Finding.

5.2.1.3 Specific Project Impacts and Mitigation Measures

MassDOT has analyzed the operational and safety impacts in the affected state highway area due to the proposed warehouse/distribution facility Project and has determined that the mitigation measures outlined below are required to minimize the traffic impacts of this Project. Based on discussions with MassDOT, the Proponent has committed to undertake the following mitigation measures in cooperation with the identified parties.

Montello Street at Shopping Center Driveway (north)

The 2025 No-Build scenario indicates that Levels of Service (LOS) for this unsignalized intersection will be at Levels A/A (Average Delay = 8/8 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels A/A (Average Delay = 9/12 seconds) during the weekday morning/weekday evening peak hours.

Prior to occupancy of the Project, the Proponent will be re-aligning Montello Street and shifting the intersection of Route 58 and Montello Street to the north. This will limit the interaction between Project-related trips and the shopping center (Silo Marketplace) driveway traffic, which would improve operations and safety at this location. The existing unsignalized intersection at Montello Street would remain to provide access to the shopping center, but would be truncated at its' northern driveway.

This intersection is under Town of Carver jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and the Town of Carver.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Montello Street at Shopping Center Driveway (south)

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels A/A (Average Delay = 9/9 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels B/B (Average Delay = 11/14 seconds) during the weekday morning/weekday evening peak hours.

Prior to occupancy of the Project, the Proponent will be re-aligning Montello Street and shifting the intersection of Route 58 and Montello Street to the north. This will limit the interaction between Project-related trips and the shopping center (Silo Marketplace) driveway traffic, which would improve operations and safety at this location. The existing unsignalized

intersection at Montello Street would remain to provide access to the shopping center, but would be truncated at its' northern driveway.

This intersection is under Town of Carver jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and the Town of Carver.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Montello Street (south)

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels F/F (Average Delay = 84/66 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels F/F (Average Delay = n/a/>120 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this unsignalized intersection of Route 58 at Silo Marketplace Shopping Center driveway will be at Levels B/F (Average Delay = 14/>120 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this signalized intersection of Route 58 at the realigned Montello Street (south) will be at Levels B/B (Average Delay = 20/18 seconds) during the weekday morning/weekday evening peak hours.

Prior to occupancy of the Project, the Proponent will be re-aligning Montello Street and shifting the intersection of Montello Street with Route 58 approximately 400 feet to the north. Under this alternative, Montello Street is realigned to create a perpendicular unsignalized intersection. The lane geometry at the intersection would include separate left-turn and right-turn lanes on the Montello Street eastbound approach; separate left-turn and through lanes on the Route 58 northbound approach; and a shared through/right-turn lane on the Route 58 southbound approach.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses and a signal warrant evaluation, the Proponent will determine if a signalization of the intersection is warranted and if it is, implement this second phase of mitigation. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Westbound and Eastbound ramps.

This intersection is under MassDOT and Town of Carver jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent, MassDOT, and the Town of Carver.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Route 44 Westbound ramps

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels A/F (Average Delay = 9/66 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels F/F (Average Delay = >120/>120 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this signalized intersection will be at Levels B/C (Average Delay = 12/21 seconds) during the weekday morning/weekday evening peak hours.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses and a signal warrant evaluation, the Proponent will determine if signalization of the intersection is warranted and if it is, implement this first phase of mitigation. Concurrent pedestrian crossings to accommodate the existing crosswalks would be included in the proposed signal phasing. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Eastbound ramps and Montello Street.

Post implementation of the first phase of mitigation at this location, the Proponent will continue to conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses, the Proponent will determine if modifying the lane geometry on Route 58 from two lanes to four lanes is necessary and if it is, implement this second phase of mitigation. The lane geometry of the Route 58 southbound approach would include two through lanes (and maintain the channelized right-turn lane), and the Route 58 northbound approach would include a shared left-turn/through lane and through lane. The Route 44 Westbound off-ramp and on-ramp approaches would remain unchanged. Five-foot shoulders to accommodate bicycles would be provided along Route 58.

This intersection is under MassDOT jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and MassDOT.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Route 44 Eastbound off-ramp

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels A/F (Average Delay = 9/66 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels F/F (Average Delay = >120/>120 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario

indicates that the LOS for this signalized intersection will be at Levels B/B (Average Delay = 16/14 seconds) during the weekday morning/weekday evening peak hours.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses and a signal warrant evaluation, the Proponent will determine if signalization of the intersection (as a cluster with the off-set Route 44 Eastbound on-ramp) is warranted and if it is, implement this first phase of mitigation. Concurrent pedestrian crossings to accommodate the existing crosswalks would be included in the proposed signal phasing. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Westbound ramps and Montello Street.

Post implementation of the first phase of mitigation at this location, the Proponent will continue to conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses, the Proponent will determine if modifying the lane geometry on Route 58 from two lanes to four lanes is necessary and if it is, implement this second phase of mitigation. The lane geometry of the Route 58 southbound approach would include a shared left-turn/through lane and a through lane, and the Route 58 northbound approach would include two through lanes (and maintain the channelized right-turn lane). The Route 44 Eastbound off-ramp and on-ramp approaches would remain unchanged. Five-foot shoulders to accommodate bicycles would be provided along Route 58.

This intersection is under MassDOT jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and MassDOT.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Route 44 Eastbound on-ramp

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels A/A (Average Delay = 9/9 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels B/A (Average Delay = 23/20 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this signalized intersection will be at Levels A/A (Average Delay = 1/3 seconds) during the weekday morning/weekday evening peak hours.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses and a signal warrant evaluation, the Proponent will determine if signalization of the intersection (as a cluster with the off-set Route 44 Eastbound off-ramp) is warranted and if it is, implement this first phase of mitigation.

Concurrent pedestrian crossings to accommodate the existing crosswalks would be included in the proposed signal phasing. In addition, the signal would be coordinated with the adjacent proposed signals of Route 58 with the Route 44 Westbound ramps and Montello Street.

Post implementation of the first phase of mitigation at this location, the Proponent will continue to conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses, the Proponent will determine if modifying the lane geometry on Route 58 from two lanes to four lanes is necessary and if it is, implement this second phase of mitigation. The lane geometry of the Route 58 southbound approach would include a shared left-turn/through lane and a through lane, and the Route 58 northbound approach would include two through lanes (and maintain the channelized right-turn lane). The Route 44 Eastbound off-ramp and on-ramp approaches would remain unchanged. Five-foot shoulders to accommodate bicycles would be provided along Route 58.

This intersection is under MassDOT jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and MassDOT.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at High Street

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels D/E (Average Delay = 28/40 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels F/F (Average Delay = 53/79 seconds) during the weekday morning/weekday evening peak hours.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Plymouth Street

The 2025 No-Build scenario indicates that LOS for this signalized intersection will be at Levels F/C (Average Delay = >120/26 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this signalized intersection will be at Levels F/C (Average Delay = >120/32 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this signalized intersection will be at Levels E/C (Average Delay = 68/27 seconds) during the weekday morning/weekday evening peak hours.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses, the Proponent will determine if signal

timing improvements and time of day programming, refreshed pavement markings, replacement of faded signage, and installation of advanced warning signage on both the Route 58 northbound and southbound approaches are necessary and if it is, implement these mitigation measures.

This intersection is under Town of Carver jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and the Town of Carver.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Montello Street (north)

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels C/C (Average Delay = 16/22 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels C/C (Average Delay = 18/24 seconds) during the weekday morning/weekday evening peak hours.

Prior to occupancy of the Project, left-turns will be restricted from the northern Site driveway, the Proponent will encourage tenants to require all traffic to the Site to arrive via the intersection of Route 58 and the realigned Montello Street, and work with the Town of Carver and Town of Plympton to implement a heavy vehicle restriction on the segment of Montello Street north of the northern Site driveway. In addition, the geometry of the intersection of the northern Site driveway and Montello Street intersection will be reconfigured so the through movement will be between the northern Site driveway and the northbound approach of Montello Street, which will discourage the use of the segment of Montello Street north of the northern Site driveway.

The installation of the proposed gate will be coordinated between the Proponent and the Towns of Carver and Plympton through the appropriate regulatory processes.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 58 (North Main Street) at Parsonage Road/Mayflower Road

The 2025 No-Build scenario indicates that LOS for this signalized intersection will be at Levels A/B (Average Delay = 9/11 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this signalized intersection will be at Levels A/B (Average Delay = 9/11 seconds) during the weekday morning/weekday evening peak hours.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Route 44 at Route 105 (Plympton Street)

The 2025 No-Build scenario indicates that LOS for this signalized intersection will be at Levels D/D (Average Delay = 48/39 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this signalized intersection will be at Levels E/D (Average Delay = 65/46 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build with traffic mitigation scenario indicates that the LOS for this signalized intersection will be at Levels D/D (Average Delay = 53/43 seconds) during the weekday morning/weekday evening peak hours.

Post occupancy of the Project, the Proponent will conduct traffic monitoring at this location after a tenant occupies a portion of the development. Based on the results of the traffic monitoring, in combination with capacity analyses, the Proponent will determine if signal timing improvements and time of day programming are necessary and if it is, implement these mitigation measures.

This intersection is under MassDOT jurisdiction. The determination of appropriate design and construction details at this intersection should be coordinated between the Proponent and MassDOT.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Middleborough Rotary

The 2025 No-Build scenario indicates that LOS for this unsignalized intersection will be at Levels F/F (Average Delay = >120/>120 seconds) during the weekday morning/weekday evening peak hours. The 2025 Build scenario indicates that the LOS for this unsignalized intersection will be at Levels F/F (Average Delay = >120/>120 seconds) during the weekday morning/weekday evening peak hours.

There are no additional feasible means to avoid or minimize the Project's traffic impacts at this location that the Proponent could be required to implement.

Multimodal Accommodations

Prior to occupancy of the Project, the sidewalks along the west side of Route 58 will be extended from the Route 44 Westbound on-ramp to the Silo Marketplace Shopping Center driveway and a crosswalk will be provided across Route 58 at the intersection with the Silo Marketplace Shopping Center driveway. Advanced warning signage alerting drivers of the crosswalk will also be installed.

Transportation Demand Management (TDM)

In recognition of the existing and future traffic demands on the study area roadway system, several TDM measures are proposed and the Proponent will encourage future tenant(s) to implement these to help reduce the number of SOVs traveling to and from the Site.

Given the rural nature of the Project and the limited transit options that are available, the Proponent aims to achieve a five-percent reduction in vehicle trips as compared to the projected ITE trip generation estimates. It should be noted that to provide a conservative analysis, the expected reduction in vehicle trips as a result of the TDM measures was not credited toward to the Project's estimated trip generation. These TDM measures include the following:

- Provide an on-site and dedicated Transportation Management Coordinator to facilitate and assist with the various TDM measures;
- Install conduit in support of potential future electric vehicle charging stations where appropriate in parking areas;
- Provide an on-site ATM, cafeteria, and mail drop boxes for employees and customers;
- Survey and evaluate employee transportation needs, and support a carpool and ride-matching coordination program through the promotion of Bay State Commute (formerly NuRide) or other MassRIDE initiatives;
- Designate preferential low emissions vehicle only spaces within general and employee parking areas;
- Provide employees with a guaranteed ride home; and
- Use direct deposit for employee paychecks.

Follow-up Services

The Proponent has committed that the final tenanting of the Project Site shall result in trip generation and trip distribution characteristics consistent with those identified in the DEIR and FEIR. The Proponent is committed to complete an annual Traffic Monitoring Program (TMP) to begin six months after full occupancy of the Project and extend for a period of five years, in addition to the traffic monitoring as each portion of the development is occupied. The data collected as part of the TMP will be distributed to MassDOT and MassDEP per their reporting requirements. The TMP will include ATR counts for a 24-hour period on a typical weekday and Saturday at the following locations:

- Montello Street east of Route 58,
- Southern Site driveway,
- Northern Site driveway, and
- Middleborough Rotary (Route 44, Route 28, and Route 18 approaches).

In addition, TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at the following locations:

- Route 58 at Montello Street,
- Route 58 at Route 44 Westbound ramps,
- Route 58 at Route 44 Eastbound off-ramp and on-ramp,
- Route 58 at Plymouth Street,
- Route 58 at Parsonage Road/Mayflower Road, and
- Route 44 at Route 105.

In addition to reporting the traffic count data, operational analysis and MUTCD traffic signal warrant analysis (at the required locations) will be completed and used to determine when each level of transportation mitigation is triggered.

In addition to the traffic monitoring program, the Proponent is also required to monitor the participation in, and effectiveness of the proposed TDM program on Site. The Proponent will work with the appointed on-site TDM coordinator to conduct a travel survey of employees and patrons of the Site to provide a summary of the participation rate for each tenant on the Site and the estimated reduction in Site-generated traffic associated with the TDM measures in place throughout the Site. Based on the results of the summary, the Proponent will work with the tenants to reasonably modify the TDM measures if the resulting reduction in vehicle trips is less than the Proponent's goal of a five-percent reduction. Consistent with the TMP, the annual TDM monitoring program will begin six months after full occupancy of the Project and extend for a period of five years.

5.2.1.4 Findings

For the reasons stated above, MassDOT hereby finds that, with implementation of the mitigation measures described above, all practicable means and measures will be taken to avoid or minimize adverse traffic and related impacts to the environment resulting from the Project. Appropriate conditions consistent with this Section 61 Finding will be included in the access and traffic signal permits to be issued by MassDOT to describe more fully and ensure implementation of these measures.

_____ _____

By Date

5.2.2 GHG Self-Certification

In accordance with the MEPA GHG Policy, the Proponent will provide a self-certification to the MEPA Office signed by an appropriate professional (e.g., engineer, architect, transportation planner, general contractor) following completion of construction to demonstrate that the stationary source GHG emissions have been mitigated. A draft commitment letter for this self-certification submission is provided below.

DRAFT ONLY

Secretary Matthew A. Beaton
Executive Office of Energy & Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

ATTN: Deirdre Buckley, Director, MEPA Office

Re: Letter of Commitment for Stationary Source Greenhouse Gas Emissions Self-Certification
EA No. 15639 – North Carver Development, Carver, MA

Dear Secretary Beaton and Director Buckley:

On behalf of Route 44 Redevelopment, LLC, VHB has prepared a summary of the estimated reduction in overall energy use and stationary source Greenhouse Gas (GHG) emissions for the North Carver Development in the northwest corner of the Town of Carver (the "Project").

In accordance with the current MEPA Greenhouse Gas Emissions Policy and Protocol (the "GHG Policy") dated May 2010, the stationary source GHG assessment was provided to the MEPA Office as part of the Final Environmental Impact Report (the "FEIR") filed on February 28, 2019. The design case assumed building design and system improvements that would result in energy reductions, in accordance with the GHG Policy.

The energy conservation measures for the full build-out of the Project are estimated to reduce the overall energy use by 12.9 percent resulting in a 9.8 percent reduction in stationary source CO_2 emissions when compared to the baseline case. The following table presents the estimated energy savings and CO_2 emissions reductions for the Project.

Project Component	Energy Consumption (MMBtu)			CO_2 Emissions (tons/yr)[1]		
	Base Case[2]	Design Case	Percent Savings	Base Case[2]	Design Case	Percent Reduction
Total Site	30,668	26,725	12.9%	2,570.4	2,319.2	9.8%

1 tons/yr = short tons per year
2 The Base Case represents current Base Energy ASHRAE 90.1-2013 standards and Section C406.1 measures.

The building energy model results/energy savings and estimated stationary source GHG emissions reductions are preliminary. Following completion of construction of each element, the Proponent will submit a self-certification to the MEPA Office, signed by an

appropriate professional, which identifies the as-built energy conservation measures and documents the stationary source GHG emissions reductions from the baseline case.

If you have any questions, please contact me at (617) 607-2972 or skruel@vhb.com.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Stephanie Kruel

Project Manager

cc: George McLaughlin, Route 44 Development, LLC
Robert Delhome, Route 44 Development, LLC

5.3 Proposed Mitigation

The Proponent, where practicable, would mitigate or compensate for unavoidable impacts. This section provides a summary of impacts from and mitigation required for implementation of the Project. Table 5.2 summarizes the Proponent's mitigation commitments and implementation schedule. The Proponent (which term shall include each and every successor in interest to the original Proponent) will be responsible for implementing all of the mitigation measures. All costs are anticipated to be borne by the Proponent unless otherwise indicated.

TABLE 5.2 SUMMARY OF MITIGATION MEASURES

Category	Mitigation Measure	Schedule	Estimated Cost
Land Alteration			
	Consider further reductions in impervious coverage and tree protection as design progresses.	During design	N/A
Traffic and Transportation			
	Re-align Montello Street to create a perpendicular intersection with Route 58, to the north of the existing intersection, and signalize.	During and Post-construction	$5,500,000 - $6,000,000
	Extend the sidewalks on Route 58, addition of crosswalk across Route 58 at Silo Market Place Shopping Center, and installation of advanced warning signage.	During construction	
	Install a traffic signal at the intersection of Route 58 at Route 44 Westbound ramps and modify the existing Route 58 cross section from 2 lanes to 4 lanes.	Post-construction	
	Install a traffic signal at the intersection of Route 58 at Route 44 Eastbound ramps and modify the existing Route 58 cross section from 2 lanes to 4 lanes.	Post-construction	
	Implement safety and signal timing improvements at the intersections of Route 58 at Plymouth Street and Route 44 at Route 105.	Post-construction	$25,000 - $50,000

Category	Mitigation Measure	Schedule	Estimated Cost
	Implement the following Transportation Demand Management Measures: ▪ Provide an on-site and dedicated Transportation Management Coordinator to facilitate and assist with the various TDM measures; ▪ Install conduit in support of potential future electric vehicle charging stations where appropriate in parking areas; ▪ Provide an on-site ATM machine, cafeteria, and mail drop boxes for employees and customers; ▪ Survey and evaluate employee transportation needs, and support a carpool and ride-matching coordination program through the promotion of NuRide or other MassRIDE initiatives; ▪ Designate preferential low emissions vehicle only spaces within general and employee parking areas; ▪ Provide employees with a guaranteed ride home and; ▪ Use direct deposit for employee paychecks.	During and Post-construction	$25,000 - $50,000
	Complete an annual traffic monitoring program (TMP) to begin six months after full occupancy of the Project and extend for a period of five years. The data collected as part of the TMP will be distributed to MassDOT and MassDEP per their reporting requirements. The TMP will include ATR counts for a 24-hour period on a typical weekday and Saturday at Montello Street east of Route 58; Southern Site driveway; Northern Site driveway, Middleborough Rotary (Route 44, Route 28, and Route 18 approaches). In addition, TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at Route 58 at Montello Street; Route 58 at Route 44 Westbound ramps; Route 58 at Route 44 Eastbound off-ramp and on-ramp; Route 58 at Plymouth Street; Route 58 at Parsonage/Mayflower Road; and Route 44 at Route 105.	Post-construction	$100,000 - $125,000
Air Quality & Greenhouse Gas			
	Implement the following transportation mitigation program to help mitigate the air quality impacts of Project-related traffic: ▪ Construct a new intersection that realigns Montello Street with Route 58, resulting in delay savings and related emissions reductions; ▪ Signalize the intersections of Route 58 with the Route 44 Eastbound and Westbound Ramps resulting in delay savings and related emissions reductions; and ▪ Implement Transportation Demand Management (TDM) measures that will result in lower Project-related VMT and related emissions reductions.	During construction	See Below
	Require Site buildings to meet the MA State Building Code and encourage further reductions in stationary source GHG emissions	During construction	N/A

Category	Mitigation Measure	Schedule	Estimated Cost
	beyond minimum code requirements to the maximum extent practicable.		
	Continue to evaluate CHP and rooftop solar PV systems as Project design advances.	During design	TBD
	Design Project buildings to be designed to be "solar ready" with the appropriate structural capacity and electrical infrastructure to incorporate a Solar PV system at a future date.	During design	N/A
Climate Change Adaptation and Resiliency			
	To help mitigate the impact of extreme heat, consider the use of a low-albedo roofing system, either in the form of white roofing materials or rooftop solar PV systems.	During design	TBD
	Construct a comprehensive stormwater management system to help mitigate stormwater runoff.	During design	TBD
	Ascertain which systems and procedures could potentially add resilience during periods of peak demand when the electricity grid is experiencing high levels of stress; in the case of power loss during storms; or during other emergency situations.	During design	TBD
Wetlands			
	Provide mitigation for unavoidable impacts to BVW on-site and in-kind in accordance with 310 CMR 10.53 (4)(b) 1-7.	During design	TBD
	Develop a Wetland Mitigation Plan to detail how the area will be established. The plan will include measures to control erosion during construction and post-construction monitoring to document establishment of at least 75 percent cover with indigenous wetland plant species within two growing seasons.	During design & construction, post-construction	TBD
Stormwater			
	Construct low impact development (LID) stormwater management measures to reduce peak runoff rates, maximize groundwater recharge and improve water quality.	During construction	TBD
	Investigate additional LID techniques such as bioretention, tree box filters, bioswales, and recycling roof runoff for irrigation purposes as Site design progresses.	During design	TBD
Water Supply			
	Employ the following measures to avoid degradation of public and private well water quality: ▪ See entries under Wastewater Collection, Treatment and Disposal	During operations	TBD
	Employ the following measure to avoid impacts to capacity of private wells: ▪ Recharge the high-quality effluent from the wastewater treatment facility to the groundwater in the same quantity that	During operations	TBD

Category	Mitigation Measure	Schedule	Estimated Cost
	groundwater is extracted for water supplied to the Project to contribute to the sustainability of the aquifer.		
	Employ the following measure to improve fire protection capacity in the NCWD distribution system: ▪ Construct 2,000 feet of domestic water main and a new 125,000-gallon elevated storage tank for NCWD to provide the NCWD with reliable system pressure and provide all NCWD customers will potential benefits.	During Construction	TBD
Wastewater Collection, Treatment and Disposal			
	Employ the following measures to avoid degradation of public and private well water quality: ▪ Process wastewater flow in an advanced wastewater treatment facility to provide high quality effluent that will prevent the adverse impacts to private and community wells. ▪ Construct wastewater collection, treatment and disposal facilities in compliance with DEP's minimum acceptable separation distances to public wells, private wells, water supply lines and surface waters. ▪ Locate and construct effluent disposal facilities to provide a minimum of 4 feet of vertical separation to the predicted groundwater mound superimposed on the estimated seasonal high groundwater elevation. ▪ Design effluent disposal facilities in accordance with recommendations in the approved Hydrogeologic Report based on evaluation of the impacts of the treated wastewater effluent discharge to the groundwater as part of the Groundwater Discharge Permit process, to be reviewed in detail by DEP. ▪ In accordance with the Groundwater Discharge Permit, perform effluent and well monitoring and submit monthly reports to DEP. ▪ Prepare the Owner's certification of responsibility for the operation of the wastewater treatment facility, including reporting, monitoring, maintenance, repair and replacement. ▪ Prohibit industrial wastewater and wastewater from outside the site that might reduce the effectiveness or affect the capacity of the wastewater treatment facility. ▪ Monitor the treatment process and monitoring wells as specified in the Groundwater Discharge Permit and the perform all monitoring functions including laboratory analysis and submit monthly monitoring reports to DEP.	During operations	TBD
	Employ the following measures to avoid degradation of groundwater quality:	During permitting,	TBD

Category	Mitigation Measure	Schedule	Estimated Cost
	▪ Prepare a hydrogeologic report evaluating the impacts of the treated wastewater discharge to the ground as part of the Groundwater Discharge Permit process. Prepare final design of the wastewater collection, treatment and disposal system in accordance recommendations in the approved hydrogeological report and Groundwater Discharge Permit. ▪ Design the wastewater treatment facility to account for effluent limits in the Groundwater Discharge Permit and operate the WWTF to meet permit conditions under average and maximum flows. ▪ Incorporate into the design provisions for inspecting, servicing, repairing and replacing equipment so that worn components that are detected can be addressed quickly, resulting in minimizing upsets to the treatment processes. ▪ Select the operator be based on qualifications and experience. Include the operator as a participant in the start-up and training phase of construction to ensure that there is a smooth transition from construction to permit-compliant operation. ▪ Give the operator the tools to efficiently manage the WWTF by incorporating into the design both automatic and manual process controls integrating the operation of pumps, flow meters, water quality probes, pressure transmitters, motor operated valves and blowers. ▪ The operator will maintain the treatment facility equipment per the schedule set by DEP in the Groundwater Discharge Permit at a minimum. ▪ Industrial wastewater discharges to the sewer system will be prohibited and building uses that could generate non-domestic wastewater will be monitored by the owner. ▪ Prevent impacts to groundwater quality by providing vertical separation of effluent from groundwater. Horizontal separation of effluent disposal area from private and community drinking water wells will result in additional treatment of effluent as it travels through the soil. ▪ Perform the required monitoring under the Groundwater Discharge Permit of treatment plant effluent and groundwater quality and elevations in downgradient wells. Utilize monitoring results to make routine process or operation modifications needed to meet effluent limits in the Groundwater Discharge Permit. ▪ Provide the Owner's certification of responsibility as described in 314 CMR 5.15 (1) to DEP and hire a licensed professional treatment plant operator.	design, and operations	

Category	Mitigation Measure	Schedule	Estimated Cost
	▪ Submit monthly reporting to MassDEP to provide MassDEP with the mechanism for tracking and enforcing treatment and disposal system performance.		
	Employ the following measure to avoid degradation of wetlands: ▪ Implement the recommendations of the approved hydrogeologic report, which will include an assessment of hydraulic impacts of the treated wastewater discharge to wetlands. ▪ Construct wastewater facilities in accordance with DEP's minimum acceptable separation distances to surface waters.	During design and construction	TBD
	Employ the following measures to attenuate noise from treatment facility mechanical equipment: ▪ House the electrical and mechanical equipment, with the exception of the standby generator, in a treatment building to provide noise attenuation, especially for continuously operating aeration blowers. ▪ House the standby generator in a sound-attenuating enclosure. The generator will be exercised automatically weekly for less than one hour to provide necessary run-time and to confirm that standby power is available if needed to keep the wastewater treatment plant fully functional. The time of exercising will be selected for weekdays during the middle of the day to eliminate noise impacts to neighbors.	During design and operations	TBD
	Employ the following measures to control odor from treatment facility process tanks: ▪ Process and dispose of wastewater moving through the collection, treatment and disposal system quickly to avoid nuisance odors. ▪ Vent tanks containing wastewater to an air collection net-work connected to an activated carbon odor control system. ▪ Implement policies that restrict potential odor-generating activities such as liquid sludge pumping and removal to times of the day with the least impact.	During operations	TBD
	Implement required mitigation related to the capacity of the aquifer to accommodate discharge of treated effluent from the WWTF through the Groundwater Discharge Permit process (314 CMR 5.00). ▪ Implement the recommendations of the approved hydrogeologic report, which will include an assessment of hydraulic impacts of the treated wastewater discharge to wetlands	During permitting and design	TBD
	Commit to ongoing monitoring and establishing escrow accounts for maintenance and replacement.	During permitting	N/A

Category	Mitigation Measure	Schedule	Estimated Cost
	▪ Sign and submit with the permit application a Certification stating that the Owner is responsible for the operation of the facility, including reporting, monitoring, maintenance, repair and replacement of wastewater collection, treatment and disposal facilities.		
Solid and Hazardous Waste			
	Promote and ensure special handling, dust control, and management and disposal of any contaminated environmental media to prevent construction delays and to provide adequate protection to workers and any nearby sensitive receptors.	During construction	TBD
Construction Period Impacts			
	Draft a Construction Management Plan (CMP) that includes detailed information on construction activities, specific construction mitigation measures, and construction materials access and staging area plans to minimize impact on the surrounding area.	Prior to construction	TBD
	Minimize the noise impact of construction activities through the use of mufflers, limiting idling, and using quieter construction techniques when practicable.	During construction	TBD
	Implement the diesel reduction strategies outlined in MassDEP's *Diesel Engine Retrofits in the Construction Industry: A How to Guide (2008)*, which are to reduce idling; replace/repower/rebuild vehicles and engines; retrofit; and refuel through compliance with Massachusetts' Anti-Idling law (310 CMR 7.11), MassDEP's Diesel Retrofit Program (DRP), Massachusetts' Low Sulfur Diesel standards (301 CMR 7.05), U.S. EPA's Clean Air Nonroad Diesel Rule, and U.S. EPA's Tier 4 Emissions Standards (40 CFR part 1039).	During construction	TBD
	Properly maintain and repair all equipment and vehicles to minimize exhaust emissions, including odors.	During construction	TBD
	Require contractors to reduce potential emissions and minimize air quality impacts, and to comply with Massachusetts' Dust, Odor, Construction, and Demolition law (310 CMR 7.09).	During construction	N/A
	Utilize construction period erosion and sedimentation control measures as specified by the Order of Conditions and the Stormwater Pollution Prevention Plan (SWPPP).	During construction	TBD
	Provide on-site parking for construction workers.	During construction	N/A
	Maintain existing traffic patterns to avoid full road closures or detours during the period of construction improvements.	During construction	N/A
	Provide detailed construction vehicle routing and staging and plans to maintain acceptable transportation operations around the Site in the CMP.	Prior to construction	TBD
	Repair any damage to adjacent roadways caused by construction activity per Town standards.	Post construction	TBD

Category	Mitigation Measure	Schedule	Estimated Cost
	Implement a Construction Waste Management Plan (CWMP) to comply with the MA Construction and Demolition Materials Waste Ban at 310 CMR 19.017.	During construction	TBD
	Target a 75% recycling/diversion rate.	During construction	N/A

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6

Responses to Comments

This chapter presents comments received on the North Carver DEIR (EEA No. 15639). It identifies the comment letters received by MEPA during the DEIR public comment period and provides responses to each comment in a tabular format. The Certificate of the Secretary of Energy and Environmental Affairs, dated September 14, 2018, and each annotated comment letter, are included in Appendix C.

6.1 From the Secretary's Certificate

This chapter includes responses to the following scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Contain a copy of this Certificate and a copy of each comment letter received* **Appendix C**; and
- *Include direct responses to comments to the extent that they are within MEPA jurisdiction* **Section 6.3**.

6.2 DEIR Comment Letters

Table 6.1 lists the identifying letter number, commenter, affiliation, date for each comment letter received by MEPA, and the page in this chapter where responses can be found. Scoping comments from the Secretary of Energy and Environmental Affairs and their associated responses are included in the individual chapters of this FEIR.

TABLE 6.1 LIST OF DEIR COMMENT LETTERS

Letter No.	Commenter	Affiliation	Date	Page
C	Matthew Beaton, Secretary	Executive Office of Energy and Environmental Affairs	September 14, 2018	RTC 6-1
1	Pasquale Ciaramella	Old Colony Planning Council (OCPC)	August 22, 2018	RTC 6-5

Letter No.	Commenter	Affiliation	Date	Page
2	David J. Mohler	Massachusetts Department of Transportation (MassDOT)	August 23, 2018	RTC 6-5
3	William Napolitano	Southeastern Regional Planning & Economic Development District (SRPEDD)	August 23, 2018	RTC 6-12
4	Jonathan E. Hobill	Department of Environmental Protection (DEP)	August 24, 2018	RTC 6-13
5	Francis J. Gay	Greater Attleboro-Taunton Regional Transit Authority (GATRA)	August 24, 2018	RTC 6-15
6	Paul F. Ormond	Department of Energy Resources (DOER)	August 27, 2018	RTC 6-16
7	Robert Belbin	Resident	Undated	RTC 6-16

6.3 Responses to Comments

Table 6.2 provides responses to each comment identified in the letters included in Table 6.1. For those comments that are addressed directly in the text of the FEIR, a section reference is provided. For those comments that are not addressed directly in the text of the FEIR, a response is provided below. Comments have been transcribed exactly as found in the comment letters, complete with any erroneous spelling or other matter that might otherwise be taken as an error of transcription.

Comment #	Comment	Response
C.1	The FEIR should describe the project and identify any changes to the project since the filing of the DEIR.	The requested information is provided in Chapter 1, Sections 1.2 and 1.3.
C.2	It should include updated site plans, if applicable, for existing and post development conditions at a legible scale. Conceptual plans should be provided at a legible scale and clearly identify buildings, impervious areas, driveways and internal circulation roads, stormwater and utility infrastructure and any off-site roadway mitigation.	There have been no changes to the Project since filing the DEIR, therefore updated site plans are not necessary.
C.3	The FEIR should identify and describe State, federal and local permitting and review requirements associated with the project including requests for Financial Assistance and Land Transfers and provide an update on the status of each of these pending actions.	The requested information is provided in Chapter 1, Sections 1.4 and 1.5.
C.4	It should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.	Updated descriptions of applicable requirements are included in each chapter of the FEIR as appropriate.
C.5	The FEIR should provide a detailed description of proposed regrading of the site, including excavation and the use of fill material from on-site and off-site sources.	The requested information is provided in Chapter 2, Section 2.2.
C.6	It should include an updated plan showing areas to be filled pursuant to the ACO.	The requested information is provided in Chapter 2, Figure 2.1.
C.7	The FEIR should clarify the total amount of fill material to be brought to the site and whether that volume may be reduced by the reuse of fill material generated on-site.	The requested information is provided in Chapter 2, Section 2.2.
C.8	It should show the locations where fill has been placed for regrading purposes and the depth of fill.	The requested information is provided in Chapter 2, Figure 2.2.
C.9	The FEIR should include plans showing the proposed site elevation in relation to existing wetland features.	The requested information is provided in Chapter 2, Section 2.2.
C.10	The FEIR should include additional details regarding the method used to calculate trip generation.	The requested information is provided in Chapter 3, Section 3.2.
C.11	It should respond to comments submitted by the Old Colony Planning Commission (OCPC) regarding monitoring traffic operations at the intersection of Route 58 at Parsonage Road and Mayflower Road.	The requested information is provided in Chapter 3, Section 3.3.
C.12	As requested by the Southeastern Regional Planning and Economic Development District (SRPEDD), the FEIR should review options for signal timing and other adjustments at the proposed intersection of Route 58 at Montello Street if necessary to address traffic operational deficiencies and conflicts caused by long queue lengths.	The requested information is provided in Chapter 3, Section 3.3.

Comment #	Comment	Response
C.13	The FEIR should expand upon the discussion of mitigation presented in the DEIR. It should clarify whether the phased mitigation measures will be triggered by deterioration of LOS or satisfaction of the traffic signal warrant analysis.	The requested information is provided in Chapter 3, Section 3.3.
C.14	The FEIR should include commitments to implement safety measures identified in the RSAs for the intersections of Route 58 at Plymouth Street, Route 44 at Route 105 and the Middleborough Rotary.	The requested information is provided in Chapter 3, Section 3.3.
C.15	The TIA documented that project generated traffic will impact the intersections of Route 58 at High Street, Route 58 at Plymouth Street and the Middleborough Rotary but did not propose any mitigation measures. The FEIR should identify improvements to be implemented by the Proponent to ensure that the intersections operate at the 2025 No Build levels or provide justification why such mitigation is unnecessary or infeasible.	The requested information is provided in Chapter 3, Section 3.3.
C.16	As recommended by the Greater Attleboro-Taunton Regional Transit Authority (GATRA), the site driveways and internal circulation roadways should be designed to accommodate busses and shelters.	The requested information is provided in Chapter 3, Section 3.4.
C.17	I encourage the Proponent to consider land banking parking spaces until they are necessary. The FEIR should review opportunities for land banking, shared spaces or other means of minimizing the number of parking spaces and impervious area.	The requested information is provided in Chapter 3, Section 3.4.
C.18	The FEIR should provide greater detail, including plans, of the bicycle and pedestrian facilities proposed to be constructed along Route 58.	The requested information is provided in Chapter 3, Section 3.4.
C.19	The Proponent should provide sidewalks on both sides of Route 58 between the proposed intersection of Route 58 at Montello Street and the shopping center, a crosswalk across Route 58 and bicycle accommodations.	The requested information is provided in Chapter 3, Section 3.4.
C.20	All roadways should be designed in accordance with MassDOT's Complete Streets guidance.	The requested information is provided in Chapter 3, Section 3.4.
C.21	The DEIR notes that the Proponent expects that the proposed TDM measures will achieve a 5 percent reduction in vehicle trips. The FEIR should describe how the Proponent will monitor employee trips and, if necessary add or modify the TDM plan to achieve this goal.	The requested information is provided in Chapter 3, Section 3.5.
C.22	As requested by MassDOT, the Transportation Monitoring Program should be revised to include 24-hour ATR counts at the site driveway on a typical weekday and Saturday, a travel survey of employees and patrons of the site and TMCs and operations analyses for the weekday morning, weekday evening and Saturday peak periods at mitigated intersections.	The requested information is provided in Chapter 3, Section 3.5.

Comment #	Comment	Response
C.23	The FEIR should provide the analysis and information requested in DOER's comment letter.	The requested information is provided in Chapter 4, Sections 4.2-4.3.
C.24	It should confirm that the Base Case design incorporates all applicable requirements of the Building Code.	The requested information is provided in Chapter 4, Section 4.2.
C.25	If necessary, the FEIR should provide a revised analysis of stationary-source GHG emissions under the Base Case and Design Case that includes additional mitigation measures such as increased roof insulation with R values of R-40 to R-50.	The requested information is provided in Chapter 4, Section 4.2.
C.26	The FEIR should review the feasibility of incorporating heat pumps into the project design, including financial incentives available through Alternative Energy Credits and savings that could result from eliminating the need for gas infrastructure.	The requested information is provided in Chapter 4, Section 4.2. Heat pumps have been included in the proposed design for the office spaces.
C.27	The FEIR should provide an updated analysis of solar PV feasibility and provide a schematic roof plan showing potential space for solar PV systems in coordination with skylights and other rooftop systems.	The requested information and figure is provided in Chapter 4, Section 4.3.
C.28	I strongly encourage the Proponent to make a commitment to install solar on a minimum of 30 percent of the total roof area.	An updated discussion on solar PV is provided in Chapter 4, Section 4.3.
C.29	The FEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project.	The requested information is provided in Chapter 5, Section 5.2.2.
C.30	The FEIR should provide a detailed description of the project's impacts on wetland resource areas, including all temporary and permanent impacts.	The requested information is provided in Chapter 2, Section 2.3.1
C.31	It should provide plans showing proposed structures, regrading and construction activities in Riverfront Area and BVW, and describe measures that will be undertaken to minimize impacts.	The requested information is provided in Chapter 2, Section 2.3.3
C.32	The FEIR should provide a detailed description, including plans, of BVW replication areas and Riverfront Area restoration.	The requested information is provided in Chapter 2, Section 2.3.3
C.33	The FEIR should provide the results of the hydrologic study and describe the design of the proposed WWTF and effluent disposal area.	The requested information is provided in Chapter 2, Sections 2.4.1 and 2.4.2.
C.34	It should review how the wastewater facilities will comply with water quality standards.	The requested information is provided in Chapter 2, Section 2.4.3.
C.35	It should include commitments for ongoing monitoring and the establishment of escrow accounts for maintenance and replacement.	The requested information is provided in Chapter 2, Section 2.4.4.
C.36	The FEIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies.	The requested information is provided in Chapter 5, Section 5.2

Comment #	Comment	Response
C.37	The FEIR should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation.	The requested information is provided in Chapter 5, Section 5.3
C.38	The FEIR should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing, either tying mitigation commitments to overall project square footage/phase or environmental impact thresholds, to ensure that measures are in place to mitigate the anticipated impact associated with each development phase.	The requested information is provided in Chapter 5, Section 5.3
C.39	The FEIR should contain a copy of this Certificate and a copy of each comment letter received.	The requested information is provided in Appendix C.
C.40	In order to ensure that the issues raised by commenters are addressed, the FEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction.	The requested information is provided in Chapter 6, Section 6.3.
C.41	The Proponent should circulate the FEIR to those parties who commented on the EENF and/or DEIR, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations.	The requested information is provided in Chapter 6, Section 6.3.
C.42	Several commenters submitted comments on the EENF electronically without providing a mailing address. The Proponent should distribute the FEIR to these commenters via email.	The FEIR was distributed via email to those who provided email addresses.
C.43	A copy of the FEIR should be made available for public review at the Carver, Plympton, and Middleborough Public Libraries.	A hard copy of the FEIR has been delivered to the three libraries indicated.

Comment #	Commenter	Comment	Response
1.1	OCPC	Though analyzed in the DEIR, OCPC notes that the signalized intersection of Route 58 at Parsonage Road/ Mayflower Road in Plympton is not included in the proposed Transportation Monitoring Plan (TMP). Given the proximity of the project site to this intersection, combined with the concern for the potential transportation impacts of the Project, it is requested that this intersection be added to the Transportation Monitoring Program. Inclusion of this intersection will allow for an assessment of the resultant transportation impacts and for the determination of potential deficiencies.	The intersection of Route 58 at Parsonage Road/Mayflower Road has been added to the TMP. See Chapter 3, Section 3.4.4 for details regarding the transportation monitoring program.
1.2	OCPC	the intersection of Route 58 at Parsonage Road/ Mayflower Road in Plympton is not included in the proposed Transportation Monitoring Plan (TMP). As such, the Project's actual impact on this intersection along with the potential need for mitigation cannot be determined as the project is built out. As such, it is requested that this location be added to the Transportation Monitoring Program in order to adequately gauge the resultant transportation affects and that the Project provide necessary mitigation measures to address deficiencies should they arise from the Project.	The intersection of Route 58 at Parsonage Road/Mayflower Road has been added to the TMP. See Chapter 3, Section 3.4.4 for details regarding the transportation monitoring program.
2.01	MassDOT	The FEIR should provide the square footage figures used for LUC 150 and LUC 156 to derive the trip generation rates, as MassDOT cannot replicate the trip generation methodology without this information.	A discussion on the Project's trip generation methodology is provided in Chapter 3, Section 3.2.
2.02	MassDOT	The FEIR should update the trip generation methodology if the development profile becomes more clarified.	The development profile has not changed since the filing of the DEIR and therefore the trip generation methodology has not been updated. See Chapter 3, Section 3.2 for details on the trip generation methodology.
2.03	MassDOT	The Proponent carried out RSA's at the Route 58 at Plymouth Street and Route 44 at Route 105 intersections in May 2018. The Proponent must commit to specific safety and operational improvements at each of these intersections and detail these measures in the FEIR.	The Proponent has expanded the transportation mitigation program to include improvements at these locations. See Chapter 3, Section 3.4 for further details.

Comment #	Commenter	Comment	Response
2.04	MassDOT	A sensitivity analysis determined the number of peak hour trips that would be needed for signalization [at Route 58 (North Main Street) at Montello Street (south); Route 58 (North Main Street) at Route 44 Westbound Ramps; Route 58 (North Main Street) at Route 44 Eastbound Ramps] to be needed...It is unclear whether these figures are based on satisfaction of the traffic signal warrant analysis or deterioration of the intersection LOS to LOS E or F.	The installation of new traffic signals will not occur until the MUTCD traffic signal warrant is met for the specific location. See Chapter 3, Section 3.4.3 for details on the mitigation implementation.
2.05	MassDOT	The Proponent will implement signalization of the intersection [at Route 58 (North Main Street) at Montello Street (south); Route 58 (North Main Street) at Route 44 Westbound Ramps; Route 58 (North Main Street) at Route 44 Eastbound Ramps] based on the results of the traffic monitoring program, in combination with capacity analyses and a signal warrant evaluation. The Proponent has also committed to coordinating and funding police control during peak periods if traffic operations are unacceptable prior to the mitigation implementation. The Proponent should define whether this would occur in the period prior to the traffic signal being erected or if unacceptable conditions can be triggered without the need for signalization of the intersection.	The Proponent will coordinate and fund police control during commuter peak periods only during the period between the determination that the next level of mitigation is necessary until the mitigation is complete. See Chapter 3, Section 3.4.3 for details on the mitigation implementation.

Comment #	Commenter	Comment	Response
2.06	MassDOT	The Proponent indicates it will only add five to ten vehicles to this approach (Route 58 (North Main Street) at High Street); however, the capacity analysis indicates much more significant impacts between the 2025 No-Build and Build conditions. The FEIR should explore operational and safety improvements at this intersection and provide mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Appropriate justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.	The Project is expected to add five to ten vehicles during the peak hours to the stop-controlled High Street westbound approach, which equates to only one vehicle every six to twelve minutes. The High Street westbound 95th percentile queue is expected to only increase by approximately one vehicle between 2025 No-Build and 2025 Build conditions and the unsignalized intersection capacity analysis methodology is conservative. In addition, a traffic signal is not warranted at this intersection. Therefore, there are no feasible mitigation measures to avoid or minimize the Project's impacts at this location. Instead, the mitigation dollars associated with this project are being directed to locations where the Project's impacts are anticipated to be greater.
2.07	MassDOT	The FEIR should explore operational and safety improvements at this intersection [Route 58 (North Main Street) at Plymouth Street] and provide mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.	The Proponent has expanded the transportation mitigation program to include improvements at the intersection of Route 58 and Plymouth Street. See Chapter 3, Section 3.4 for further details.

Comment #	Commenter	Comment	Response
2.08	MassDOT	This intersection [Route 44 at Route I 05 (Plympton Street)] is anticipated to deteriorate from an LOS D to LOS E in the weekday morning peak hour between the 2025 No-Build and Build conditions. The Proponent does not provide any justification for not exploring operational improvements at this intersection in the TIA. An RSA was conducted at this intersection in May 2018; the FEIR should explore operational and safety improvements explored in the RSA and, if necessary, provide additional mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.	The Proponent has expanded the transportation mitigation program to include improvements at the intersection of Route 44 at Route 105. See Chapter 3, Section 3.4 for further details.

Comment #	Commenter	Comment	Response
2.09	MassDOT	MassDOT is also currently in the preliminary design phase for future improvement plans for the rotary to address long-term operational and safety deficiencies. The FEIR should explore means to implement some of the long-term recommendations including in these improvement plans. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.	The Project is expected to add approximately 175 vehicles during the peak hours, which equates to less than five-percent of the total rotary volume. MassDOT recently completed interim improvements at the rotary, which included modifying the geometry of the rotary, resurfacing and restriping each approach and the inner rotary to accommodate two lanes, and updating and adding traffic signs. The long-term preferred improvement alternative identified in the Interchange Modification Report includes significant reconstruction of the rotary and has an estimated construction cost of $79 million. The project still needs to go through the full environmental review, permitting, and design. There is no construction time-frame for the improvements at this time. There is no feasible contribution commensurate with the impacts created by the Project that the Proponent could make toward advancing the Preferred Alternative. The Proponent has discussed this approach with MassDOT staff and agreed that the Project's limited impacts do not warrant mitigation at this location. However, discussions with MassDOT staff indicated that no traffic monitoring is being conducted on the iterim improvements and therefore the Proponent is including the Middleborough Rotary in the transportatoin monitoring program (TMP). See Chapter 3, Section 3.4.4 for further details.

Comment #	Commenter	Comment	Response
2.10	MassDOT	Any proposed mitigation within the state highway layout and all internal site circulation must be consistent with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including pedestrians, bicyclists, and public transit riders. Where these criteria cannot be met, the proponent should provide justification, and should work with the MassDOT Highway Division to obtain a design waiver.	See Chapter 3, Section 3.4.2 for details regarding multimodal accommodations which will be included as part of the proposed improvements.
2.11	MassDOT	The Proponent is encouraged to continue to investigate reducing parking or land banking of parking spaces until and unless needed, based on monitoring conducted at a future date.	See Chapter 3, Section 3.3.1 for details on the Project's proposed parking supply and phasing.
2.12	MassDOT	The Proponent is expected to provide sidewalks along both sides of Route 58 along the 400 feet between the shopping center driveway and the new Route 58/Montello Street (south) intersection. The Proponent is also expected to provide a crosswalk across Route 5 8 to connect to the existing curb cut at the northern limit of the existing sidewalk along the east side of the roadway, as well as bicycle infrastructure which is more effective than the five-foot wide shoulders along Route 58 proposed as mitigation in the DEIR. The FEIR should provide justification should these improvements not found to be feasible.	The Proponent has expanded the mitigation program to include the extension of sidewalks and a crosswalk at the intersection of Route 58 and Silo Marketplace Shopping Center driveway. See Chapter 3, Section 3.4.2 for additional details.
2.13	MassDOT	MassDOT's EENF response letter requested that the Proponent coordinate with the Greater Attleboro Taunton Regional Transit Authority (GATRA) to investigate the possibility of future service to the site. This coordination is not documented in the DEIR. The FEIR should detail this coordination and explore alternative means should GA TRA be unable to provide services to the site.	The Proponent has designed the side to accommodate potential GATRA service and has and will continue to coordinate with GATRA as future opportunities for transit service to the Project Site are presented. See Chapter 3, Section 3.3.2 for additional details.
2.14	MassDOT	The Proponent should work toward identifying the details of the [TDM] measures as well as developing additional programs.	An updated discussion on the TDM program is provided in Chapter 3, Section 3.4.4.

Comment #	Commenter	Comment	Response
2.15	MassDOT	The Proponent should also consult with MassRIDES, the Commonwealth's Travel Options provider, to help implement the TDM program.	See Chapter 3, Section 3.4.4 for the proposed TDM measures to be implemented for the Project.
2.16	MassDOT	The Proponent is also required to conduct an annual traffic monitoring program for a period of five years, beginning six months after occupancy of the Full-Build project. At a minimum, the monitoring program should include: • Simultaneous automatic traffic recorder (A TR) counts at the site driveway for a continuous 24-hour period on a typical weekday and Saturday; • Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator); and • Weekday AM, weekday PM and Saturday peak hour turning movement counts (TMCs) and operations analysis at "mitigated"	See Chapter 3, Section 3.4.4 for details regarding the transportation monitoring program.
2.17	MassDOT	The results of each iteration of the monitoring program should be summarized in a technical memorandum provided to MassDOT PPDU and the District 5 Office.	The Proponent will provide a technical memorandum to MassDOT PPDU and the District 5 Office upon completion of each monitoring program.
2.18	MassDOT	The FEIR should include a revised Draft Section 61 Finding, outlining the mitigation measures the Proponent has committed to implementing in conjunction with this project, including any additional mitigation resulting from the RSAs.	See Chapter 5, Section 5.2.1. for a revised version of the Draft Section 61 findings.
2.19	MassDOT	The FEIR should provide an update of the local permitting processes for the proposed project, particularly with respect to any transportation issues being discussed.	The requested information is provided in Chapter 1, Section 1.6.
2.20	MassDOT	We strongly encourage the Proponent to consult with MassDOT before any transportation issues are discussed in local meetings or hearings.	The Proponent has met with MassDOT Public/Private Development Unit (PPDU) on February 12, 2019 and MassDOT District 5 Office on February 13, 2019 to discuss the transportation issues prior to the filing of the FEIR. Details are provided in Chapter 1, Section 1.7.

Comment #	Commenter	Comment	Response
2.21	MassDOT	The Proponent should continue consultation with appropriate MassDOT units, including PPDU and the District 5 Office, to discuss preparation of the FEIR.	The Proponent has met with MassDOT Public/Private Development Unit (PPDU) on February 12, 2019 and MassDOT District 5 Office on February 13, 2019 to discuss the transportation issues prior to the filing of the FEIR. Details are provided in Chapter 1, Section 1.7.
3.1	SRPEDD	The DEIR does not provide capacity analysis and/or a traffic signal timing plan. Based on our internal analysis during the AM peak period, the only option that would allow the proponent to obtain a LOS A would have to include a permitted left-turn phase. A protected left-turn phase will yield a worse LOS C, however, a protected left-turn phase is ideal to provide for safe movements if a signal becomes warranted.	An intersection capacity analysis has been completed for the proposed intersection of Route 58 at realigned Montello Street. See Chapter 3, Section 3.4.1 for additional details.
3.2	SRPEDD	SRPEDD is concerned by the close proximity of the relocated Montello Street intersection to the Silo Marketplace and gas station driveways, in regards to the queues extending beyond these driveway causing conflicts at this location.	See Chapter 3, Section 3.4.1 for details on the operations at the intersection of Route 58 and realigned Montello Street.
3.3	SRPEDD	SRPEDD would like to inquire if there is a possibility of leaving access open from the Silo Marketplace to the relocated Montello Street, rather than discontinuing the access. This would give customers at the Silo Marketplace the option to exit and enter at the Silo Marketplace access or at the proposed Montello Street. This would assist drivers in exiting in the event that Route 58 experiences queues. In the event that a signal is installed at the relocated Montello Street, this will also provide customers the option of exiting at the signal rather than a stop control.	The Proponent is concerned that if this segment of Montello Street remains open, it would become a cut-through route for vehicles resulting in additional traffic through the Silo Marketplace Shopping Center creating operational and safety concerns. Therefore, the Proponent is proposing this segment of Montello Street be discontinued. The Proponent has met with MassDOT, SRPEDD, and Town of Carver staff who all approved of this approach.

Comment #	Commenter	Comment	Response
4.1	MassDEP	An area of approximately 950 square feet of bordering vegetated wetland is proposed for permanent alteration. A wetland mitigation area of at least 1:1 wetland replication area is proposed in order to comply with the wetland replication standards set forth under 310 CMR 10.55. This information should be provided with any Notice of Intent application. A second wetland resource area impacted by road development would be approximately 1.7 acres of Riverfront Area. In accordance with the General Performance Standards set forth under 310 CMR 10.58, an alternatives analysis must be provided with any Notice of Intent application. The applicant should also provide all drainage calculations and supporting information detailing all stormwater management drainage structures. The best management practices should be done in accordance with the Department's Stormwater Standards.	The information noted will be provided to the Carver Conservation Commission with the Notice of Intent as requested.
4.2	MassDEP	MassDEP encourages the Project Proponent to continue exploring and implementing conservation efforts that incorporate Best Management Practices (BMPs) at the Project site.	The project will incorporate low-flow plumbing fixtures into building designs. Outside water use will be kept to a minimum by planting drought-resistant vegetation and by reducing the area requiring irrigation.
4.3	MassDEP	The Proponent should coordinate closely with the North Carver Water District (NCWD) when the [fire suppression water] tank is to be filled to ensure that a sufficient amount of water is available to supply its existing customers.	The additional storage volume from the construction of the 125,000 gallon elevated domestic water storage tank will allow the NCWD WTP to pump and treat groundwater at maximum capacity and make the majority of that water available for fire storage tank filling without impacting domestic supply to the District's customers.
4.4	MassDEP	The possibility of activating the interconnection with the Town of Middleboro should be explored when the fire suppression water tank is filled.	The Owner will coordinate closely with NCWD and the Town of Middleboro to identify opportunities to obtain mutual benefits from an emergency interconnection.

Comment #	Commenter	Comment	Response
4.5	MassDEP	The Project Proponent is advised that if oil and/or hazardous material are identified during the implementation of this Project, notification pursuant to the Massachusetts Contingency Plan (310 CMR 40.0000) must be made to MassDEP, if necessary. A Licensed Site Professional (LSP) should be retained to determine if notification is required and, if need be, to render appropriate opinions.	A LSP has been retained to determine if notification is required and, if need be, to render appropriate opinions.
4.6	MassDEP	the FEIR should clarify the application of a 5% trip reduction credit for the TDM program (as noted at page 5-35) and a 2% reduction in VMT for the TDM program (as noted at page 6-7). While individual trips and VMT are not necessarily congruent, the FEIR should provide supporting data to justify application of these reduction credits attributable to the TDM program, particularly in light of the rural location and nature (warehousing) of the proposed development. A 5% overall trip reduction credit for the TDM program appears overly aggressive for the Project type. The proposed TDM and traffic monitoring programs should include an assessment of mode share and application of the TDM program elements to verify the assumptions made in the DEIR (or modified for the FEIR) and propose actions to be undertaken by the Proponent should the mode share goals not be reached.	An updated discussion on the TDM is provided in Chapter 3, Section 3.4.4.
4.7	MassDEP	Additional means to reduce Project-related stationary and mobile source emissions are available on-site and should be considered. The DEIR noted the potential feasibility of on-site solar using the roof space on the warehouses, but only committed to making the roofs solar ready. We strongly encourage the Proponent to commit to the placement of solar on each roof within the Project area, as these large rooftops have proven viable locations for such systems and will assist the Commonwealth in meeting its GHG reduction goals outlined in the Global Warming Solutions Act.	Please refer to Chapter 4, Section 4.3 for an updated discussion on Solar PV.

Comment #	Commenter	Comment	Response
4.8	MassDEP	Additionally, the warehouse space will generate significant truck traffic. Depending upon the end user and their needs (i.e. a distribution center, use of refrigerated trucks), the Proponent should consider implementation of EPA SmartWay-verified idling reduction technologies on-site	The Proponent will consider the implementation of EPA Smartway-verified IRTs as the design and details of the buildings/users progress. In addition, the Proponent will coordinate with future tenants/owners to encourage the use and implementation of EPA Smartway-verified IRTs.
4.9	MassDEP	Finally, the Proponent should post permanent signage regarding Massachusetts Idling Regulations (310 CMR 7.11) limiting idling to five minutes or less on-site.	The Proponent will post permanent signage regarding Massachusetts Idling Regulations (310 CMR 7.11) limiting idling to five minutes or less on-site.
5.1	GATRA	On-site roadways should be developed in order for demand response vehicles to enter the site and circulate in an efficient manner.	The proposed site layout has been designed to accommodate transit circulation within the Project Site should bus service be provided. See Chapter 3, Section 3.3.2 for additional details.
5.2	GATRA	If shelters are constructed, the facility should meet all appropriate ADA guidelines and path of travel for individuals with disabilities to access the bus service.	The proposed site layout has been designed to accommodate transit circulation within the Project Site should bus service be provided. If bus shelters are constructed in the future, the facility will meet all appropriate ADA guidelines and path of travel for individuals with disabilities to access the bus service. See Chapter 3, Section 3.3.2 for additional details.
6.1	DOER	Confirm that C406.1 measures are a part of the baseline; provide additional measures to compensate if they are not. Increased roof assembly (R-40 or R-50) is recommended.	The requested information is provided in Chapter 4, Section 4.2.
6.2	DOER	Investigate heat pumps for space heating (which can also double for cooling).	Heat pumps have been included in the proposed design for conditioning of the office spaces. Heat pumps are not feasible for the warehouse space as the warehouses are heated-only spaces.
6.3	DOER	Evaluate value of Alternative Energy Credits (AECs).	An updated energy model analysis including heat pumps for the office spaces is provided in Chapter 4, Section 4.2.

Comment #	Commenter	Comment	Response
6.4	DOER	Evaluate value of gas elimination.	Gas elimination is not considered as heat pumps are not feasible for the warehouse space as the warehouses are heated-only spaces.
6.5	DOER	Incorporate solar PV on at least 30% of the roofs. Develop scale roof plan showing PV areas. Show coordination strategy with skylights and other rooftop features.	An updated discussion on solar PV is provided in Chapter 4, Section 4.3.
7.1	Belbin	Who provided the electronic copy to the Town?	A hard copy of the DEIR was delivered via FedEx to the Carver Redevelopment Authority on 7/19/18. The cover letter contained a link to the online electronic version.
7.2	Belbin	What paper was the MEPA comment period posted in?	The DEIR was advertised in MEPA's Environmental Monitor on 7/25/18 in compliance with 301 CMR 11.15(2). Availability of an EIR is not required to be published in a newspaper.
7.3	Belbin	Protecting the Aquafer that we use as drinking water is a major concern of mine. Environmental discharge to the land, ground water and air around the development is of great concern. We residents need to be protected from dangerous/hazardous discharge. The building of the water tank storage and its maintenance is important to insure it is built and maintained.	Protection of groundwater is a critical concern for the Owner and designers. Protection measures can be found in DEIR Chapter 5 under Water Supply and Wastewater Collection, Treatment and Disposal, as well as in FEIR Chapter 2, Section 2.4.
7.4	Belbin	There is no proof of any Tax base increase to the town without having an occupant.	Estimates of tax benefits are beyond the scope of the DEIR.
7.5	Belbin	I could not read and go through all the report and documents please start the process over so that the RDA can go over all the documents.	The DEIR met all circulation requirements in compliance with 301 CMR 11.16(3).

7

Circulation

This chapter contains the lists of agencies and organizations that commented on the EENF or DEIR, state and municipal agencies from whom the Proponent will seek permits or approvals, and other parties as specified in 301 CMR 11.16.

7.1 From the Secretary's Certificate

This chapter includes responses to the scoping items in the Secretary's Certificate. The subheading under which these responses can be found is included in **bold** after each scoping item. According to the Certificate, the FEIR should:

- *Circulate the FEIR to those parties who commented on the EENF and/or DEIR, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations* **Sections 7.2, 7.3 and 7.5**;
- *Distribute the FEIR comments via email to these commenters who submitted comments on the DEIR electronically without providing a mailing address* **Section 7.5***; and*
- *Make a copy of the FEIR available for public review at the Carver, Plympton, and Middleborough Public Libraries* **Section 7.4**.

7.2 State Agencies and Elected Officials

Secretary Mathew A. Beaton
Executive Office of Energy &
Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

DEP/Southeastern Regional Office
Attn: MEPA Coordinator
20 Riverside Drive
Lakeville, Massachusetts 02347

DEP/Southeastern Regional Office
Bureau of Water Resources
Attn: Jonathan E. Hobill
20 Riverside Drive
Lakeville, Massachusetts 02347

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, Massachusetts 02116

Massachusetts Department of Transportation, District #5
Attn: MEPA Coordinator
1000 County Street. Box 111
Taunton, Massachusetts 02780

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

Southeast Regional Planning & Economic Development District
88 Broadway
Taunton, Massachusetts 02780

Department of Agricultural Resources
Attn: MEPA Coordinator
16 West Experiment Station
University of Massachusetts
Amherst, MA 01003

Department of Energy Resources
Attn: Paul F. Ormond
100 Cambridge Street, 10th Floor
Boston, Massachusetts 02114

Department of Housing and Community Development
Attn: Ashley Emerson
100 Cambridge Street, Suite 300
Boston, Massachusetts 02114

7.3 Town Officials and Departments

Town of Carver

Town of Carver
Board of Selectmen
Carver Town Hall
108 Main Street
Carver, Massachusetts 02330

Carver Redevelopment Authority
Carver Town Hall
108 Main Street
Carver, Massachusetts 02330

Planning Board
Carver Town Hall
108 Main Street
Carver, Massachusetts 02330

Conservation Commission
Carver Town Hall
108 Main Street
Carver, Massachusetts 02330

Board of Health
Carver Town Hall
108 Main Street
Carver, Massachusetts 02330

Town of Plympton

Town of Plympton Board of Selectmen
Attn: Christine Joy
5 Palmer Road, Route 58
Plympton, Massachusetts 02367

Town of Plympton Planning Board
5 Palmer Road, Route 58
Plympton, Massachusetts 02367

Plympton Conservation Commission
5 Palmer Road, Route 58
Plympton, Massachusetts 02367

Town of Plympton Board of Health
5 Palmer Road, Route 58
Plympton, Massachusetts 02367

Town of Middleborough

Town of Middleborough Board of Selectmen
10 Nickerson Avenue
Middleborough, MA 02346

Town of Middleborough Health Department
20 Center Street
Middleborough, MA 02346

Middleborough Conservation Commission
20 Center Street, 2nd Floor
Middleborough, MA 02346

Town of Middleborough Planning Department
20 Center Street, 2nd Floor
Middleborough, MA 02346

7.4 Libraries

Carver Public Library
2 Meadowbrook Way
Carver, MA 02330

Plympton Public Library
248 Main Street
Plympton, MA 02367

Middleborough Public Library
102 North Main Street
Middleborough, MA 02346

7.5 Other Organizations and Public Comments

Old Colony Planning Council
Attn: Pasquale Ciaramella
70 School Street
Brockton, MA 02301-4097

SRPEDD
Attn: William Napolitano, Environmental Program Director
88 Broadway
Taunton, MA 02780-2557

GATRA
Attn: Francis J. Gay, Administrator
10 Oak Street, 2nd Floor
Taunton, MA 02780-3950

Lisa Maffioli – lisa.maffioli@yahoo.com
Cornelius Shea – csheaiii@yahoo.com
Karen and Bruce Tuscher – karbrumer@me.com
Jeanne Winslow – Jwinslow4@partners.org
Robert Belbin – housecallbob@comcast.net
Maureen Cantin – ombrerose@verizon.net
Rick Jackson – rickjackson001@gmail.com
Samantha Mahoney – samahoney213@gmail.com
Gordon Massingham – gordonmassingham@gmail.com
Rafael Moreno – elafito@hotmail.com
Kim Shea – carverchick@gmail.com

APPENDIX A: Hydrogeologic Evaluation Report

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SANBORN HEAD

Building Trust. Engineering Success.

HYDROGEOLOGIC EVALUATION REPORT
North Carver Development
Carver, Massachusetts

Prepared for: Route 44 Development, LLC
c/o Charter Environmental
File No. 4250.01
August 31, 2018

SANBORN HEAD
Building Trust. Engineering Success.

239 Causeway Street, Suite 105
Boston, MA 02114

Ms. Martha Sullivan
Massachusetts DEP Southeast Region
20 Riverside Drive
Lakeville, Massachusetts 02347

August 31, 2018
File No. 4250.01

Re: Hydrogeologic Evaluation Report
North Carver Development
Carver, MA

Dear Bob,

Enclosed please find our Hydrogeological Evaluation Report for the proposed subsurface disposal of up to 40,000 gallons per day (gpd) of treated sanitary wastewater for North Carver Development in Carver, MA.

We understand that an application for a permit a Ground Water Discharge Permit is being prepared by Wright-Pierce (WP) for the proposed redevelopment use. This report is intended to supplement the application for the permit.

If you have any questions, please contact the undersigned at (978) 392-0900.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Mark N. Ruberti
Senior Project Engineer

Quincy Pratt
Project Manager

COMMONWEALTH OF MASSACHUSETTS
STANLEY S. SADKOWSKI III
CIVIL
No. 47865
REGISTERED PROFESSIONAL ENGINEER

Stan S. Sadkowski, P.E.
Senior Associate/Senior Vice President

QP/MPH/SSS:mnr

cc: Conor Nagle ~ Vanasse Hangen Brustlin, Inc
Edward Whatley ~ Wright-Pierce

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

On behalf of Route 44 Development, LLC (Client), Sanborn, Head & Associates, Inc. (Sanborn Head) has prepared this Hydrogeologic Evaluation Report to support the application for a Groundwater Discharge Permit (GDP) for subsurface disposal of treated sanitary wastewater at the North Carver Development in Carver, Massachusetts (Site). The purpose of this hydrogeological evaluation is to assess the soil and groundwater conditions at the Site to support the installation of a subsurface disposal system. The subsurface disposal system is being designed by Wright-Pierce (WP) of Andover Massachusetts.

The proposed redevelopment includes the construction of approximately 1.77 million square feet of new warehouse/distribution facilities with ancillary office uses, and the construction of associated parking and access roads. To support the redevelopment, a new on-site sanitary wastewater treatment facility and soil absorption system (leaching field) is proposed with a design capacity of approximately 40,000 gallons per day (gpd) distributed over an area of 200,000 square feet (sf) including 13,300 square feet as a primary area and 6,700 square feet as reserve.

A GDP application is being prepared by Wright-Pierce, Inc. (WP) for the proposed redevelopment. This report is intended to supplement the application for the permit and is subject to the limitations in Appendix A.

1.1 Existing Conditions

The Site consists of approximately 282.3 acres located off Montello Street and Park Avenue in the northwest corner of Carver, Massachusetts. The Site is bounded by the Town of Plympton to the north, Montello Street and Main Street (Route 58) to the east, Route 44 to the south, and the Town of Middleborough to the West, Generally the land surrounding the Site consists of cranberry bogs and undeveloped woodlands, with the exception of residential homes on Montello Street and Heather's Path to the north of the Site in Carver and Plympton. In addition, the Middleborough Landfill border the Site to the west.

Most of the Site is undeveloped except for residential homes along Montello Street. The Whetstone Brook, a perennial stream, flows through the western corner of the Site. Existing cranberry bogs and associated water reservoirs used to maintain water levels in the bogs, and wetland resource areas associated with the Whetstone Brook are located within the Site boundary. A large portion of the Site (approximately 127 acres) is a depleted sand and gravel quarry. Currently, the Site is accepting soil to raise the grades in preparation for the future development. An Administrative Consent Order (ACO) from Massachusetts Department of Environmental Protection (DEP) and special permits from the Town of Carver were obtained for the Site prior to site filling activities. Prominent site features are shown on Figure 2.

The proposed development also includes an abandoned wastewater disposal facility, located at One Park Avenue. Based on public records kept by the Town of Carver, the former leaching field consisted of approximately one acre of open sand beds and associated treatment operations. The former sand beds are located approximately 600 feet northeast

of the proposed soil absorption system. According to the records, the facility was demolished in January 2013. Based on the observed groundwater flow, the former wastewater treatment facility is cross-gradient from the proposed system.

Ground surface elevations vary across the Site, but the prevailing grade (excluding stockpiles) generally slopes towards the northwest from approximately elevation (El.) 130 feet in the southwestern portion of the Site to approximately El. 62 feet in the northwestern portion of the Site. A high point in the northwestern portion of the Site near Montello Street exists at approximately El. 128 feet.

1.2 Scope of Work

The objective of our work was to perform a hydrogeological evaluation to support the application for a Groundwater Discharge Permit to allow subsurface discharge of treated wastewater from the proposed redevelopment. To meet this objective, Sanborn Head completed the following scope of work:

- Prepared a public notice and published it in the May 23, 2018 issue of *Environmental Monitor* indicating that a work plan has been prepared and was submitted to DEP as required by 314 CMR 5.09(1)(b); received an approval letter from DEP on July 16, 2018;
- Obtained and reviewed United States Geological Survey (USGS) topographic maps of the project area; bedrock geology and surficial geology maps; National Resource Conservation Service (NRCS) soil survey maps for Plymouth County; and a Massachusetts Geographical Information System (MassGIS) "Title 5 Setbacks" plan for Carver, MA;
- Obtained and reviewed relevant data collected during previous studies performed at the Site, including test pits, test borings, and groundwater level measurements in monitoring wells at the Site;
- Identified locations of public water supply wells within 1-mile of the leaching fields, and locations of private water supply wells within a ½-mile radius of the proposed leaching fields;
- Observed and logged twelve (12) unofficial deep observation hole test pits and completed five (5) percolation tests to evaluate potential locations for the subsurface disposal system between September 2017 and March 2018;
- Collected three (3) soil samples for grain size distribution analyses from the completed unofficial deep hole observation test pits in which percolation tests were conducted;
- Observed and logged four (4) official deep observation hole test pits and completed two (2) official percolation tests that were witnessed by a Ms. Martha Sullivan of DEP and Mr. Kevin Forgue of the Town of Carver Board of Health (BOH) on June 26, 2018;
- Collected two (2) soil samples for grain size distribution analyses from the recently completed deep hole observation test pits in which percolation tests were conducted;

- Installed three (3) groundwater monitoring wells in the area of the proposed disposal system;
- Performed in situ slug tests in the three monitoring wells;
- Collected groundwater level measurements in the monitoring wells at the Site;
- Performed a Frimpter analysis to estimate seasonal high groundwater;
- Performed a groundwater mounding analysis to estimate the rise in groundwater levels resulting from operation of the proposed soil absorption system at the design flow rate; and
- Prepared this report that summarizes the field data and the results of our hydrogeological evaluation.

2.0 REVIEW OF EXISTING DATA

The following sections present Site information obtained from public sources and previous investigations performed at the Site.

2.1 Federal Maps

The Site area is shown on the United States Geologic Survey (USGS) quadrangle topographic map for Plympton, Massachusetts dated 1977. Whetstone Brook, which connects to the Prospect Bog Reservoir, and associated wetlands are located in the north and northwest portion of the Site. The USGS topographic map is shown on Figure 1.

The USGS Bedrock Geologic Map of Massachusetts (Zen, et al. 1983) was reviewed. The map identifies bedrock at the Site as part of the Rhode Island Formation, which is comprised of sandstone, graywacke, shale, and conglomerate; minor beds of meta-anthracite and fossil plants.

USGS Surficial Geologic Mapping for the Site was obtained using the Massachusetts Office of Geographic and Environmental Information (MassGIS) online viewer. The surficial geology in the proposed leaching field is coarse, glacial, stratified outwash deposits consisting of sand and gravel. A deposit of floodplain alluvium is present in the southwest portion of the Site where the wetlands are located.

The Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) was also used by Sanborn Head to obtain information regarding the Site soils. The survey indicates that the area surrounding the proposed leaching field and the downgradient areas to the north are mapped as sandy Udipsamments (a young soil consisting of unconsolidated sand deposits). Soils north of the Site are mapped as Aquepts with parent material consisting of coarse-loamy human transported material over sandy and gravelly glaciofluvial deposits derived from granite and gneiss.

2.2 State Maps

Sanborn Head used the MassGIS online data viewer to download a map of Title 5 Setback Areas which is reproduced herein as Figure 3. We also used the MassGIS online data viewer to identify public water supply wells within a 1-mile radius of the proposed leaching fields. The map shows that the proposed leaching fields are not located within an Interim Wellhead Protection Area (IWPA), or a Zone II wellhead protection area, or other environmental resource areas. Two non-community public water supply wells (MAID #4052046-01G and #4052057.01G) are located within a mile of the proposed leaching fields as shown on Figures 3 and 4.

2.3 Town of Carver and Plympton

A review of Town of Carver and Town of Plympton records was conducted by Sanborn Head personnel on July 17, 2018 to identify the locations of possible private water supply wells within a ½-mile radius of the proposed leaching fields. No residences or businesses were identified within a ½-mile of the leaching fields in the Town of Middleborough; therefore, a record review in the town of Middleborough was not performed. The Town of Carver provides municipal water service to one (1) commercial property within ½-mile of the proposed leaching field, to the south of the Site (across Route 44). Other commercial and residential properties in Carver within a ½-mile radius of the leaching fields were assumed to have on-site private wells to provide potable water. The Town of Plympton does not provide municipal water to its residents; therefore, it was assumed that residences to the north and northwest of the Site have on-site private wells for potable water. MassGIS mapping, last revised October 5, 2016, was used to identify property boundaries and existing structures. The approximate locations of private water supply wells within a ½-mile radius of the proposed leaching fields are shown on Figure 4.

2.4 Topographic Survey of Existing Site Conditions

Figure 2 includes an existing conditions plan with topographic contours of the ground surface and property boundaries which was adapted from the plan entitled "Basemap – Existing Conditions" (Existing Conditions Plan) prepared by Vanasse Hangen Brustlin, Inc (VHB) received on September 25, 2017. The ground surface elevations shown on the plan and discussed in this report reference the North American Vertical Datum of 1988 (NAVD 88).

3.0 SUBSURFACE EXPLORATION PROGRAM

The following paragraphs describe recent subsurface exploration programs and infiltration testing by Sanborn Head.

3.1 Unofficial Test Pit Excavations

Two rounds of unofficial deep observation hole test pits were excavated by Charter Contracting Company, LLC (Charter) to evaluate areas suitable for subsurface infiltration. The excavations were completed on September 25 and 27, 2017 and March 9, 2018. Twelve (12) deep observation hole test pits, designated SHTP-1 through SHTP-7 and SHTP-100 through SHTP-104, were excavated as part of the exploration programs. The deep hole

observation test pits were terminated at depths between 8 and 19 feet and were logged by a Massachusetts certified Soil Evaluator from Sanborn Head.

The approximate locations of the unofficial deep hole observation test pits are shown on Figure 5 and the test pit logs are included in Appendix C. The test pit locations were located in the field by Sanborn Head using a handheld Topcon GRS-1 Global Positioning System (GPS) with sub-meter accuracy tied to the Massachusetts State Plane coordinate system. Ground surface elevations at the unofficial test pit locations were obtained by Sanborn Head by interpolating topographic contours from the Existing Conditions Plan prepared by VHB and received on September 25, 2017.

3.2 Monitoring Well Installations

Three groundwater monitoring wells, designated SH-1W through SH-3W, were installed to approximately 25 feet below ground surface (bgs) by Crawford Drilling Services of Gardner, MA on June 15, 2018 and observed by Sanborn Head personnel. Two (2) of the monitoring wells were installed on the anticipated downgradient side of the proposed leaching field (northern side), and one monitoring well was installed on the anticipated upgradient side of the proposed leaching field (southern side). The monitoring well logs are provided in Appendix C.

3.3 Official Test Pit Excavations

Four (4) deep observation hole test pits (SHTP-200 through SHTP-203) were excavated in the proposed primary and reserve leaching field areas on June 26, 2018 by Charter. The test pits were terminated at depths between 13 and 16 feet due to repeated sidewall collapse. The test pits were logged by a Massachusetts certified Soil Evaluator from Sanborn Head. The test pits were witnessed by Ms. Martha Sullivan from DEP and Mr. Kevin Forgue from the Town of Carver BOH.

The approximate locations of the deep observation hole test pits are shown on Figure 5 and the test pit logs are included in Appendix C. The test pit locations were located in the field by Sanborn Head using a handheld Topcon GRS-1 Global Positioning System (GPS) with sub-meter accuracy tied to the Massachusetts State Plane coordinate system. Ground surface elevations at the official test pit locations were obtained by Sanborn Head by interpolating topographic contours from the Existing Conditions Plan prepared by VHB and received on September 25, 2017.

3.4 Groundwater Level Measurements

Sanborn Head collected groundwater level measurements in monitoring wells SH-1W through SH-3W on June 15 and June 26, 2018 to measure groundwater depth and flow in the vicinity of the proposed leaching fields. The measured depth to groundwater and the corresponding groundwater elevations are provided in Table 1.

Groundwater level observations were also made in deep observation hole test pits by Sanborn Head between March and June 2018 in the area of the proposed soil disposal system. Sanborn Head measured the depth to groundwater in six test pits (SHTP-102 and SHTP-103, and SHTP-200 through SHTP-203), and noted evidence of seasonal high

groundwater if present (e.g., redoximorphic features or mottling). The data are summarized in Table 2.

3.5 Soil Percolation Tests

Five (5) percolation tests were completed during the unofficial deep observation hole test pits by a Soil Evaluator from Sanborn Head on September 27, 2017 and March 9, 2018. The percolation tests were completed in test pits SHTP-02, SHTP-05, SHTP-07, SH-101, and SH-102 between approximately 42 and 98 inches bgs. The percolation tests were performed in the most restrictive layer observed in the test pits, which was the natural sand layer.

Two (2) percolation tests were also completed by a Soil Evaluator from Sanborn Head on June 26, 2018 and witnessed by Ms. Martha Sullivan of DEP and Mr. Kevin Forgue of the Carver BOH. The percolation tests were performed in the natural sand layer observed in SHTP-201 and SHTP-203, at a depth of approximately 48-inches below the existing ground surface bgs. Natural fine to coarse sand was observed in the deep observation hole test pits without encountering a more restrictive layer; therefore, the natural sand layer was used for the percolation tests. The measured percolation rates for both test pits were less than two minutes per inch. The percolation test logs are included in Appendix C.

3.6 Permeability (Slug) Tests

On June 26, 2018, Sanborn Head performed rising-head slug tests in monitoring wells SH-1W through SH-3W to estimate saturated hydraulic conductivity of the proposed receiving soil. Six (6) consecutive rising-head tests were performed in the three wells. Groundwater levels were measured continuously during testing on a 0.5-second interval using a pressure transducer.

Sanborn Head calculated the hydraulic conductivity for the saturated soils present within the screened zone based on the rising-head slug testing data using Aquifer Test version 2015.1 software based on the empirical correlations presented by Bouwer-Rice (1976). The analyses were performed for partially penetrating, two-inch diameter monitoring wells. The table below summarizes the slug test results.

Monitoring Well Location	Average Hydraulic Conductivity (ft/day)
SH-1W	87
SH-2W	31
SH-3W	49

Results from each trial are tabulated and provided in Table 3. Trials from the monitoring well slug test analyses are provided in Appendix B

3.7 Soil Laboratory Tests

A total of three (3) soil samples were collected from the deep observation hole test pits SH-102, SH-201, and SH-203 where percolation tests were conducted in the area of the proposed leaching field. The samples were submitted to GeoTesting Express of Acton, MA for sieve (grain size) analysis in accordance with ASTM D422 and USDA soil textural

classification. Hydraulic conductivities were calculated using Kozeny-Carmen (1937) and Hazen (1893) correlations. Results of these calculations ranged from approximately 100 ft/d to over 200 ft/d, which fall within the range of typical hydraulic conductivities for similar soil conditions. A summary of the hydraulic conductivities is included in Table 5, and the soil laboratory results are provided in Appendix D.

4.0 HYDROGEOLOGICAL EVALUATION

This section presents our evaluation of the available subsurface data and describes the groundwater model that was used for the mounding analysis. We provide an opinion regarding the hydraulic capacity of the subsurface soils to accept the proposed wastewater design flow and our design recommendations for the soil absorption system.

4.1 Subsurface Soil Conditions

The deep observation hole test pits completed by Sanborn Head within the footprint of the proposed leaching field (SHTP-102 and SHTP-103, and SHTP-200 through SHTP-203) encountered approximately 8 to 30 inches of granular fill or topsoil material. The granular fill and topsoil layers are not suitable materials for leaching and will be excavated and removed during construction of the proposed leaching fields. The fill and topsoil horizons overlie natural sand layer with varying amounts of gravel. The test pits were terminated in natural sand at depths between approximately 132 to 192 inches below existing ground surface. In general, the subsurface conditions observed in the recent test pits are consistent with the previous subsurface explorations completed by others. A layer of naturally occurring sand greater than four feet thick was observed in the test pits.

4.2 Groundwater Levels and Flow Directions

Based on gauging data collected at the Site on June 26, 2018, groundwater levels in the area of the proposed leaching fields range from approximately El. 74.2 feet at the upgradient edge of the fields to approximately El. 72 feet at the downgradient edge. The data indicate that groundwater flows northwesterly toward the Whetstone Brook and associated wetlands and away from the public water wells shown on Figure 4.

Groundwater levels measured in deep observation hole test pits SHTP-200 through SHTP-203, within the footprint of the proposed leaching fields, on June 26, 2018 ranged from El. 73.5 feet to 72 feet and corroborate with the monitoring well data.

Based on the observed groundwater flow, the former wastewater treatment facility located approximately 600 feet to the northeast is cross-gradient from the proposed system.

4.3 Estimated Depth to Seasonal High Groundwater

Visual evidence of estimated seasonal high groundwater (ESHGW) (i.e., soil mottling) was not observed within the official deep hole observation test pit excavations completed within the proposed leaching field. With no clear observations or evidence of ESHGW, Sanborn Head estimated a potential increase in groundwater levels during seasonal high

groundwater conditions using the Frimpter[1] method. The Frimpter analysis compares the Site wells, located in a sand terrace, to a local USGS reference well located in a similar lithologic setting. The results of the Frimpter method suggests seasonal high groundwater may be up to 6.8 feet above the conditions measured on June 26, 2018. The ESHGW values calculated with the Frimpter Method were higher than groundwater elevations observed in the monitoring wells at the Site; therefore, Sanborn Head used the ESHGW calculated with the Frimpter method for modeling purposes. Based on the Frimpter Method, ESHGW elevations within the proposed leaching system are expected to range from approximately El. 80.8 feet at the upgradient edge near the southeast corner, El. 79.8 in the middle of the leaching system, and down to approximately and down to El. 79.3 feet at the downgradient edge near the northwestern corner. A copy of the Frimpter method evaluation is included in Table 4.

4.4 Hydraulic Conductivity of Receiving Layer Soil

Two methods were used to evaluate hydraulic conductivity of the proposed receiving layer of soil. Hydraulic conductivities were estimated from the soil grain-size analysis results using the Kozeny-Carmen and Hazen equations. Based on the correlations, the estimated hydraulic conductivities for the natural sand deposits in the proposed leaching system area range from approximately 100 feet per day (fpd) to 200 fpd.

Hydraulic conductivity was also evaluated using in situ rising-head slug testing data collected from monitoring wells SH-1W, SH-2W, and SH-3W. As discussed herein, the hydraulic conductivities of the soil surrounding these wells ranged from 31 fpd to 87 fpd. As a conservative measure, Sanborn Head used the average value of 55 feet per day (fpd), calculated from the slug testing data, for the sand layer.

4.5 Groundwater Mounding Analysis

A groundwater mounding analysis was completed using Visual MODFLOW software (Version 2011.1 Pro) developed by Schlumberger Water Services of Ontario, Canada and the subsurface information obtained by MGA and Sanborn Head. The proposed rate of groundwater recharge below the proposed leaching fields is approximately 3.0 gallons per day per square foot (gpd/sf) based on a design flow rate of 40,000 gpd distributed over the proposed primary leaching field area of approximately 13,300 sf, as shown on the Soil Absorption System Plan provided in Figure 7. Figure 7 outlines the 30,000 sf limits of construction for the proposed 13,300 sf primary and 6,700 sf reserve leaching field areas. The groundwater mounding analysis was run at 80 percent of the design recharge rate, or approximately 2.4 gpd/sf in accordance with MassDEP's *Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal* revised November 2014.

Based on information from subsurface investigations in the area of the proposed disposal field, the subsurface profile and hydraulic soil properties listed below were adopted for the computer model for the groundwater mounding analysis.

[1] Frimpter, 1981, "*Probable High Ground-Water Levels in Massachusetts*" Prepared in cooperation with the Commonwealth of Massachusetts Department of Environmental Quality Engineering.

- We assumed the surface layer of fill material would be removed and replaced with Title 5 sand.
- The underlying natural soil consists of natural sand to at least a depth of 30 feet below ground surface, based on the test borings.
- The soil properties used in the groundwater model for the natural sand included a specific yield (drainable porosity) of 0.2, a total porosity of 0.3 taken from typical values used by Heath (1983)[2], and a hydraulic conductivity of 55 fpd based on slug testing and grain size testing data as discussed in Section 4.4 above.

The groundwater mounding analysis was run in a transient flow condition for 90 days at 80 percent of the design flow rate in accordance with MassDEP's *Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal* revised November 2014. Steady-state flow conditions were set prior to running the transient model. The steady-state condition was used to calibrate the model to approximate the groundwater contours developed from the June 26, 2018 groundwater gauging data.

Appendix D includes four figures from computer model output; (1) a plot showing the boundary conditions and the area of recharge of the proposed leaching fields; (2) a plot of the calibrated model output for ambient groundwater conditions without an operating leaching field (groundwater was modeled to be within 0.3 feet of the ambient groundwater contours shown on Figure 6; (3) a plot showing a cross-sectional view of condition described from (2) above; (4) mounded groundwater from the applied recharge; (5) and a plot showing a cross-sectional view of the described conditions from (4) above.

The results from the mounding analysis indicate a peak groundwater mound height of approximately 1.1 feet in the center of the leaching fields and a mound height of approximately 0.9 feet at the upgradient and downgradient edges of the leaching field. By applying superposition of the ESHGW (from Table 4) and the mounded groundwater to the ambient conditions, the mounded groundwater level superimposed onto the seasonal high groundwater conditions is predicted to be as high as El. 81.8 feet at its peak (at the upgradient edge), 81.4 feet at the center of the system, and 80.6 feet at the downgradient edge. Also, based on our review of the mounding analysis, the influence from the induced mound is negligible at a distance of approximately 420 feet from the edge of the leaching field, well before it reaches the Whetstone Brook and associated wetlands (approximately 1,300 feet west), and as such, it is our opinion that potential surficial break-out is not expected to occur.

4.6 Proposed Soil Absorption System

Design of the proposed wastewater effluent distribution to the soil absorption system has not yet been finalized by WP, but we recommend that the bottom of the system be constructed at or above El. 85.8 feet to provide a minimum of four (4) feet of vertical separation as required between the bottom of the system and top of the mounded,

[2] Heath, 1983, "*Basic Ground-Water Hydrology"* Prepared in cooperation with the North Carolina Department of Natural Resources and Community Development

seasonal-high groundwater elevation. The system will be constructed on either imported Title V Sand placed on the naturally occurring sand soils after the surficial fill and topsoil materials have been removed or directly on the naturally occurring sand soils. A reserve area of 50 percent has been provided in an area immediately adjacent to the primary area.

Figures 8 and 9 include subsurface profiles (one parallel to groundwater flow, and one perpendicular to groundwater flow) that show the existing ground surface, the proposed horizontal extents of the leaching fields, estimated seasonal high groundwater, and the estimated mounded seasonal high groundwater level. Proposed grades have not been finalized but are anticipated to be above the existing grades.

5.0 GROUNDWATER MONITORING PLAN

A proposed Groundwater Monitoring Plan is included in Appendix E for use during long-term groundwater monitoring after construction, and during operation of, the proposed leaching fields. The plan identifies the proposed locations for one upgradient and two downgradient monitoring wells to be used for long term groundwater monitoring. The plan also describes groundwater sampling procedures, the sampling frequency, the list of analytical parameters, and reporting requirements which are expected to be consistent with standard MassDEP permit conditions for a Groundwater Discharge Permit.

6.0 SUMMARY AND CONCLUSIONS

This hydrogeological evaluation has been prepared to support an application for a Groundwater Discharge Permit for subsurface disposal of up to 40,000 gpd of treated wastewater for the proposed North Carver Development in Carver, Massachusetts. The GWDP application for the permit modification is being prepared by WP and will be submitted to MassDEP under separate cover.

It is our opinion that the natural subsurface soils within the area of the proposed soil absorption system shown on Figure 7 have sufficient hydraulic capacity to accept the treated wastewater at the design flow rate of 40,000 gpd. This assumes that organic topsoil and existing fill material will be removed from the surface of the proposed soil absorption area to expose the top of the natural sand deposit, then backfilled up to the underside of the proposed soil absorption system using Title 5 Sand. According to the soil absorption plan shown on Figure 7, the proposed bottom elevation of the soil absorption system is El. 85.8 feet or higher. The results of our hydrogeologic evaluation indicate the design provides 4 feet, or more, of separation between the mounded groundwater table at seasonal high groundwater conditions which satisfies DEP design requirements.

The direction of groundwater flow at the site is towards the northwest, away from the non-community public water supply wells shown on Figure 4. The private wells to the north, across Whetstone Brook, are not anticipated to be impacted by the treated effluent as the ambient groundwater is expected to be intercepted by the Whetstone Brook.

In addition, based on the results of the mounding analysis, the influence from the proposed soil absorption system (recharge) is negligible at a distance of approximately 420 feet from the edges of the leaching field, and well before the mounded water table reaches the

Whetstone Brook and associated wetlands (1,300 feet west)or the private supply wells (2,000 feet northwest), as shown on Figure 4.

A proposed Groundwater Monitoring Plan is included in Appendix E which outlines the proposed long-term groundwater monitoring to be performed after construction and during operation of the proposed leaching fields.

P:\4200s\4250.01\Source Files\HG Report\20180831 North Carver Development HG Rpt.docx

TABLES

Table 1
Summary of Groundwater Monitoring Well Data
North Carver Development
Carver, Massachusetts

Monitoring Well	SH-1(W)	SH-2(W)	SH-3(W)
Ground Surface Elevation	85.0	83.0	87.6
Top of PVC Elevation	87.9	86.2	91.1
Top of Casing Elevation	88.3	86.6	91.4
June 15, 2018			
Depth to Water	15.6	13.8	16.6
Groundwater Elevation	72.3	72.4	74.5
June 26, 2018			
Depth to Water	15.9	14.1	16.9
Groundwater Elevation	72.0	72.1	74.2

Notes:
1. Depth to water measurements in monitoring wells SH-1W through SH-3W were collected by Sanborn Head on the dates shown.
2.Top of casing and Top of PVC are based on tape measurements by Sanborn Head.
3. Ground Surface elevations were estimated by interpolating topographic contours from the plan entitled "Basemap - Existing Conditions" prepared by VHB, received on September 25, 2017, and should be considered approximate.

Table 2
Summary of Test Pit Groundwater Observations
North Carver Development
Carver, Massachusetts

	SHTP-102	SHTP-103	SHTP-200	SHTP-201	SHTP-202	SHTP-203
Ground Surface Elevation	85.0	86.5	85.0	86.5	86.5	87.0
Depth to Observed Groundwater	>11	14.5	13.0	14.0	13.0	>13
Observed Groundwater Elevation (ft)	<74.0	72.0	72.0	72.5	73.5	<74.0

1. Groundwater observations in test pits SHTP-102 and SHTP-103 were made on March 9, 2018 and SHTP-200 through SHTP-203 were made on June 26, 2018 by Sanborn Head. Groundwater was not observed in test pits SHTP-102 or SHTP-203. Logs of the test pits are provided in Appendix C. Ground surface elevations were estimated based on the plan provided by Vanasse Hangen Brustlin, Inc. and should be considered approximate.

Table 3
Summary of Slug Test Data
North Carver Development
Carver, Massachusetts

Monitoring Well		SH-1W	SH-2W	SH-3W
Trial 1	Hydraulic Conductivity - K (ft/d)	73.3	32.8	55.5
Trial 2		114	38.5	70.2
Trial 3		35.2	39.3	35
Trial 4		96.7	33.9	52.2
Trial 5		90	25.8	22.3
Trial 6		100.0	26.6	60.9
Average K (ft/d)		85	33	49
Design K (ft/d)		**55**		

Notes:
1. Slug tests were performed by Sanborn Head using a bailer to drawdown the head of the monitoring well and a Mini Troll Pressure Transducer to measure the pressure difference on June 26, 2018.
2. The hydraulic conductivity from the slug tests was determined using the Bouwer and Rice (1976) straight-line analysis. The average of six trials were taken for each monitoring well to produce an average hydraulic conductivity. An overall average of these three values was taken as the design value for the MODFLOW model.

Table 4
Seasonal High Groundwater Evaluation (Frimpter)

North Carver Development
Carver, Massachusetts

$S_h = S_c - S_{r*}(OW_c - OW_{max})/Ow_r$

S_c	Measured depth to water at the site
S_h	Estimated depth to probable high water level at the site
OW_c	Measured depth to water in the observation well which is used to correlate with the water levels at the site
OW_{max}	Depth to recorded maximum water level at the observation well which is used to correlate with water levels at the site
S_r	Range of water level where the site is located.
OW_r	Recorded upper limit of annual range of water level at the observation well which is used to correlate with the water levels at the site.

Using USGS well MA-PWW 22 Plymouth, MA, record from 1956 to present
Well is located in SAND TERRACE setting, similar to Lithology of subject Site.

OW_{max}	18.3 ft
OW_r	6.82 ft
OW_c (6/26/2018)	22.95 ft

From WRI 80-1205, Figure 11 (sand and gravel on a valley), 5% exceedence rate:

$S_{r(5\%)}$	10.0 ft

Monitoring Well ID	SH-1W	SH-2W	SH-3W
Depth to Groundwater (S_c) (ft) (6/26/2018)	15.9	14.1	16.9
Depth to Seasonal High Groundwater (S_h) (ft)	9.1	7.3	10.0
Delta due to Seasonal High Groundwater (ft)	6.8	6.8	6.8
Elevation of Seasonal High Groundwater (ft)	78.8	78.9	81.1

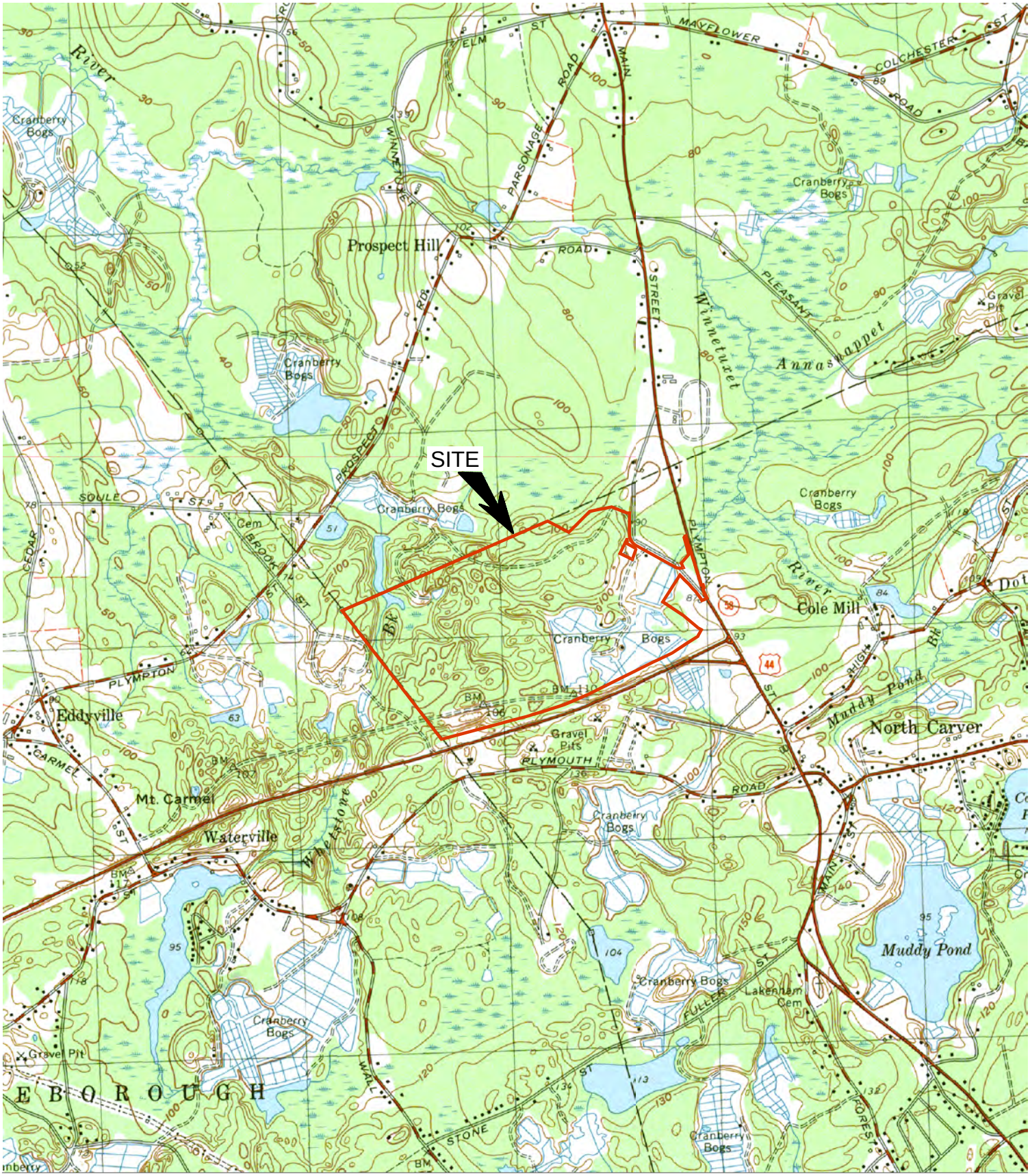
Notes:
1. Calculations follow guidelines presented in US Geological Survey Water-Resources Investigations Open-File Report 80-1205, entitled "Probable High Ground-water Levels in Massachusetts," dated March 1981.

Table 5
Summary of Grain Size Distribution Analysis
North Carver Development
Carver, Massachusetts

Test Pit	**SHTP-102**	**SHTP-201**	**SHTP-203**
Hydraulic Conductivity K (ft/d)			
Kozeny-Carmen	198.9	102.5	222.3
Hazen (1893)	194.3	124.4	195.2

Notes:
1. Soil samples from deep observation hole test pits SHTP-102, SHTP-201, and SHTP-203 were submitted to GeoTesting Express of Acton, Massachusetts for sieve (grain-size) analysis in accordance with ASTM D422.
2. Empirical correlations by both Kozeny Carmen (1937) and Hazen (1893) were used to determine estimated hydraulic conductivities of the soil samples.

FIGURES



N
W E
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NOTES:
Base map was taken from the "Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Information Technology Division"
7.5 minute USGS Quadrangle Maps: Plympton, Massachusetts, REV: 1977

Drawn By: C.Green
Designed By: M.Ruberti
Reviewed By: S.Sadkowski
Project No: 4250.01
Date: August 2018

SCALE: 1:25,000

SANBORN HEAD

Figure 1

Locus Plan

Hydrogeological Evaluation Report

North Carver Development
Carver, Massachusetts

NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "BASEMAP - EXISTING CONDITIONS", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, RECEIVED SEPTEMBER 25, 2017 WITH AN ORIGINAL SCALE OF 1" = 20'.

WHETSTONE BROOK

PLYMPTON

CARVER

SITE BOUNDARY

MORELLO STREET

APPROX FEMA ZONE A LIMITS

SEE SHEETS 5, 6 AND 7 FOR EXTENDED VIEW EXPLORATION LOCATION PLAN

APPROXIMATE LOCATIONS OF WETLANDS

WETLANDS PER VHB GPS

WETLANDS PER VHB OPS

CRANBERRY BOG

CRANBERRY BOG

CRANBERRY BOG

CRANBERRY BOG

CRANBERRY BOG

OPEN WATER

MAIN STREET (ROUTE 58)

MIDDLEBOROUGH

CARVER

WETLAND SERIES #3 (RESOURCE AREA) BVW PER ORAD DEP#SE136-527

WETLAND SERIES #3 (RESOURCE AREA) BVW PER ORAD DEP#SE136-527

ROUTE 44

SANBORN HEAD

GRAPHICAL SCALE

200' 100' 0' 200' 400'

NO	DATE	DESCRIPTION	BY

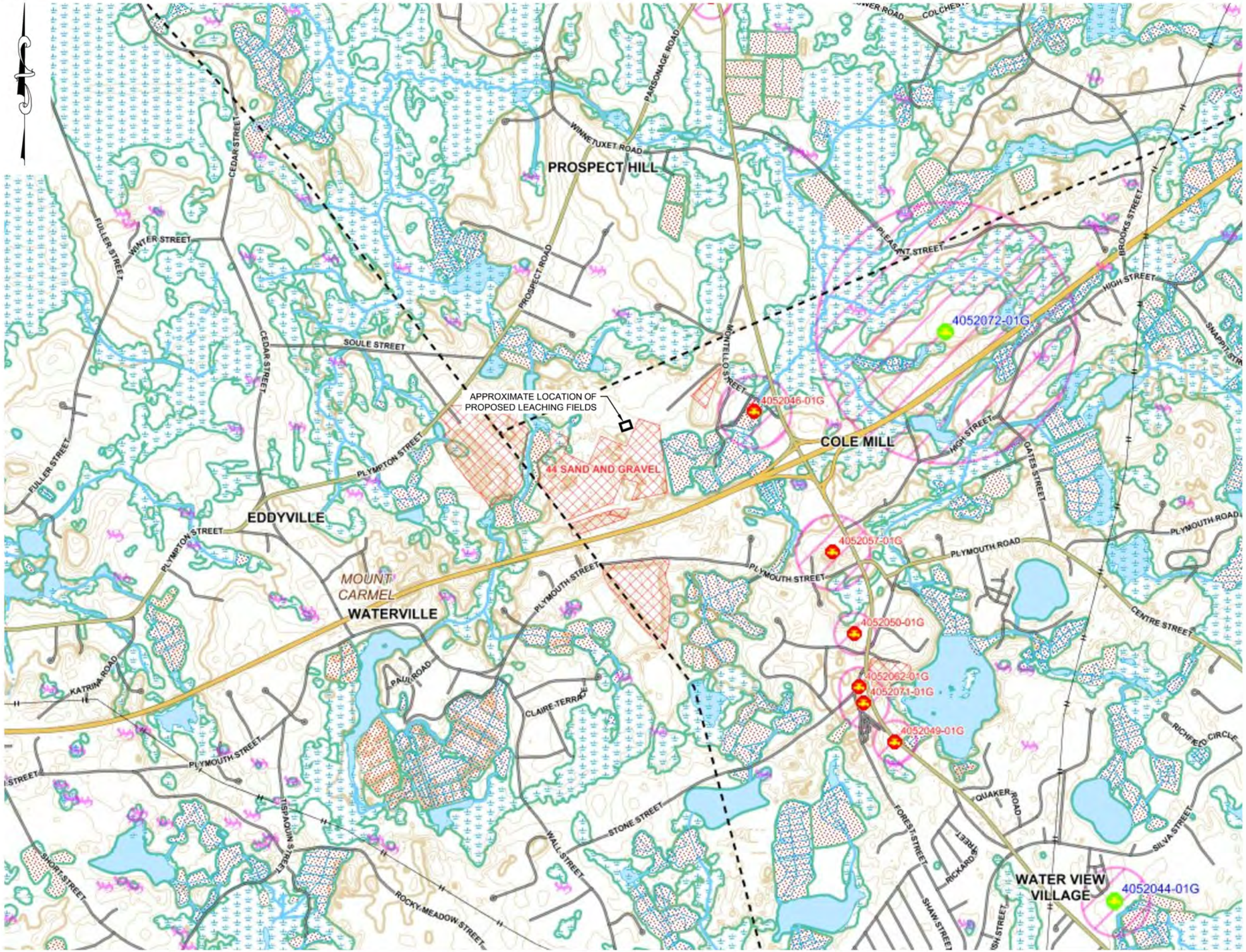
DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

EXISTING CONDITIONS PLAN

PROJECT NUMBER: 4250.01

SHEET NUMBER: 2



NOTES:

1. THE BASE MAP WAS TAKEN FROM OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS) MASS DEP ONLINE MAP VIEWER ENTITLED, "TITLE 5 SETBACK AREAS MAP", DOWNLOADED ON JULY 17, 2018.

LEGEND:

- Title 5 Buffers
- Contours 3m Lines
  - 15M INTERVAL
- Surface Water Supply Protection Zones
- Interim Water Protection Areas IWPA Dissolved
  - Zone IIs
- Openspace
- USGS 25K Lakes and Ponds
  - LAKE, POND, OCEAN
  - RESERVOIR
  - Submerged Wetland
  - Tidal Flat
  - Inundated Area
- Title 5 Wetlands Polygons
  - WETLAND
  - SALT WETLAND
  - Cranberry Bog
- USGS 25K Rivers and Streams
  - Perennial Stream
  - Shoreline
  - Intermittent Stream
  - Intermittent Shoreline
  - Manmade Shoreline
  - Ditch/Canal
  - Aquaduct
  - Dam
  - Channel in Water
- Surface Water Supply Watersheds
  - Zone IIs
- Interim Water Protection Areas IWPA Dissolved
- Public Water Supplies
  - Community Groundwater Well
  - Non-Community Groundwater Well
  - Surface Water Intake
  - Emergency Surface Water Intake
  - Community Labels
  - Non-Community Labels

SANBORN HEAD

GRAPHICAL SCALE
1000' 500' 0' 1000' 2000'

NO	DATE	DESCRIPTION	BY

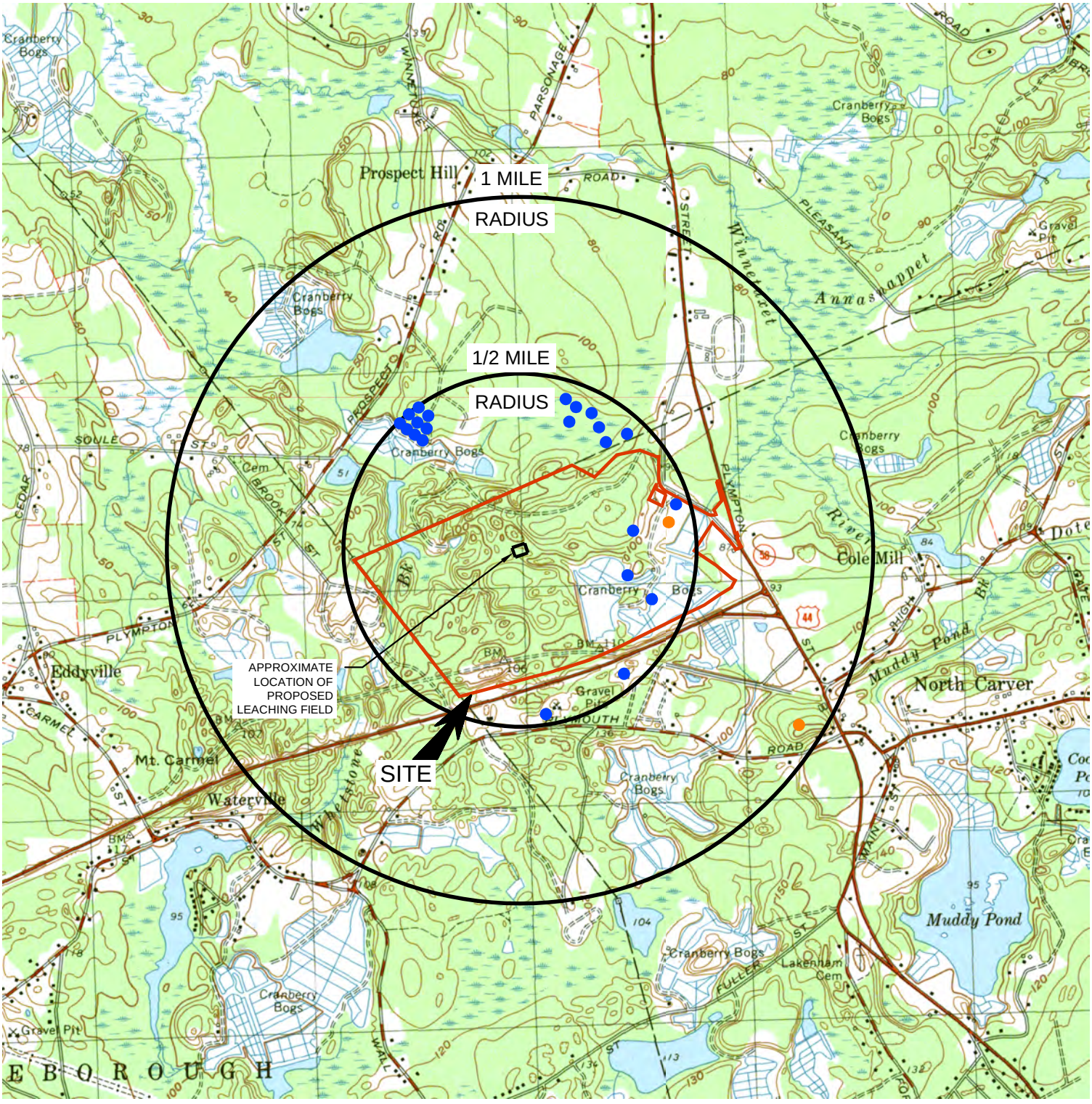
DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

PROJECT NUMBER: 4250.01

TITLE 5 PLAN

SHEET NUMBER: 3



Legend:

- Public Water Supply Wells within 1-mile radius of leaching fields (MassGIS)
- Private Water Supply Wells within ½-mile radius of leaching fields

NOTES:
Base map was taken from the "Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Information Technology Division"
7.5 minute USGS Quadrangle Maps: Plympton, Massachusetts, REV: 1977

Drawn By: C.Green
Designed By: M.Ruberti
Reviewed By: S.Sadkowski
Project No: 4250.01
Date: August 2018

SCALE: 1:25,000

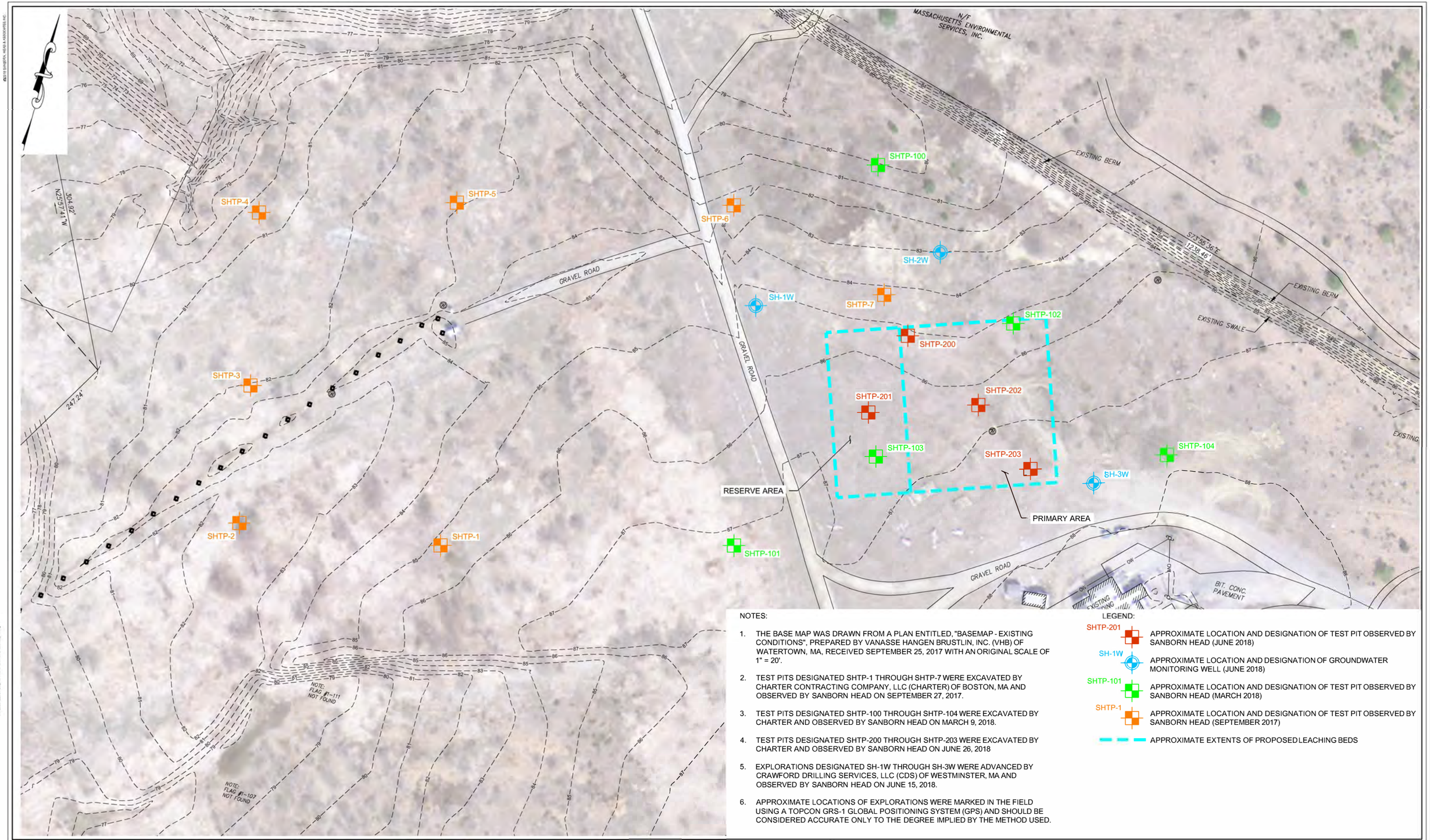
SANBORN HEAD

Figure 4

Water Well Supply Plan

Hydrogeological Evaluation Report

North Carver Development
Carver, Massachusetts



NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "BASEMAP - EXISTING CONDITIONS", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, RECEIVED SEPTEMBER 25, 2017 WITH AN ORIGINAL SCALE OF 1" = 20'.
2. TEST PITS DESIGNATED SHTP-1 THROUGH SHTP-7 WERE EXCAVATED BY CHARTER CONTRACTING COMPANY, LLC (CHARTER) OF BOSTON, MA AND OBSERVED BY SANBORN HEAD ON SEPTEMBER 27, 2017.
3. TEST PITS DESIGNATED SHTP-100 THROUGH SHTP-104 WERE EXCAVATED BY CHARTER AND OBSERVED BY SANBORN HEAD ON MARCH 9, 2018.
4. TEST PITS DESIGNATED SHTP-200 THROUGH SHTP-203 WERE EXCAVATED BY CHARTER AND OBSERVED BY SANBORN HEAD ON JUNE 26, 2018
5. EXPLORATIONS DESIGNATED SH-1W THROUGH SH-3W WERE ADVANCED BY CRAWFORD DRILLING SERVICES, LLC (CDS) OF WESTMINSTER, MA AND OBSERVED BY SANBORN HEAD ON JUNE 15, 2018.
6. APPROXIMATE LOCATIONS OF EXPLORATIONS WERE MARKED IN THE FIELD USING A TOPCON GRS-1 GLOBAL POSITIONING SYSTEM (GPS) AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

- SHTP-201 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (JUNE 2018)
- SH-1W — APPROXIMATE LOCATION AND DESIGNATION OF GROUNDWATER MONITORING WELL (JUNE 2018)
- SHTP-101 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (MARCH 2018)
- SHTP-1 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (SEPTEMBER 2017)
- APPROXIMATE EXTENTS OF PROPOSED LEACHING BEDS

SANBORN HEAD

GRAPHICAL SCALE
40' 20' 0' 40' 80'

NO	DATE	DESCRIPTION	BY

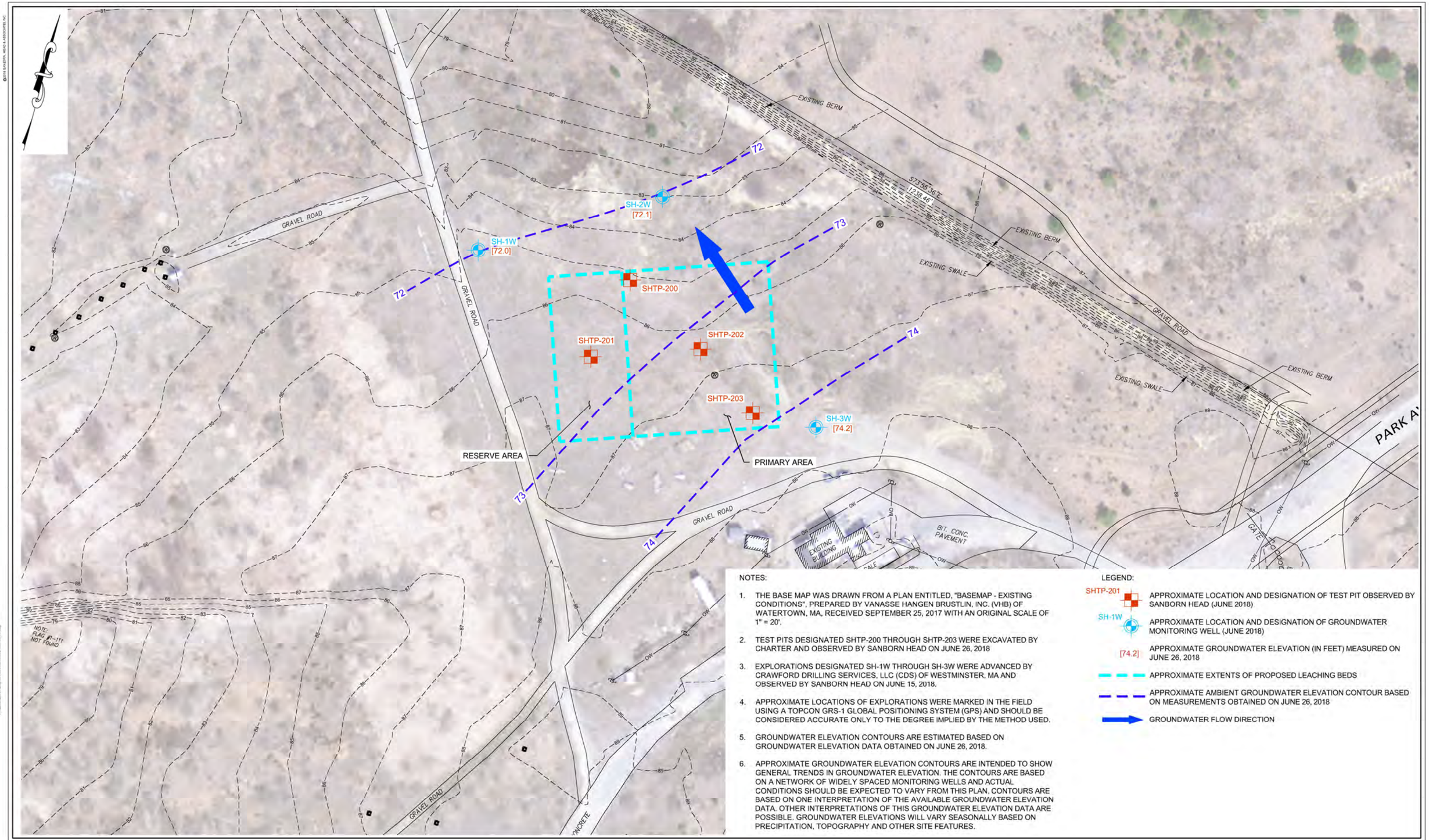
DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

PROJECT NUMBER: 4250.01

EXPANDED VIEW EXPLORATION LOCATION PLAN

SHEET NUMBER: 5



NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "BASEMAP - EXISTING CONDITIONS", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, RECEIVED SEPTEMBER 25, 2017 WITH AN ORIGINAL SCALE OF 1" = 20'.
2. TEST PITS DESIGNATED SHTP-200 THROUGH SHTP-203 WERE EXCAVATED BY CHARTER AND OBSERVED BY SANBORN HEAD ON JUNE 26, 2018
3. EXPLORATIONS DESIGNATED SH-1W THROUGH SH-3W WERE ADVANCED BY CRAWFORD DRILLING SERVICES, LLC (CDS) OF WESTMINSTER, MA AND OBSERVED BY SANBORN HEAD ON JUNE 15, 2018.
4. APPROXIMATE LOCATIONS OF EXPLORATIONS WERE MARKED IN THE FIELD USING A TOPCON GRS-1 GLOBAL POSITIONING SYSTEM (GPS) AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. GROUNDWATER ELEVATION CONTOURS ARE ESTIMATED BASED ON GROUNDWATER ELEVATION DATA OBTAINED ON JUNE 26, 2018.
6. APPROXIMATE GROUNDWATER ELEVATION CONTOURS ARE INTENDED TO SHOW GENERAL TRENDS IN GROUNDWATER ELEVATION. THE CONTOURS ARE BASED ON A NETWORK OF WIDELY SPACED MONITORING WELLS AND ACTUAL CONDITIONS SHOULD BE EXPECTED TO VARY FROM THIS PLAN. CONTOURS ARE BASED ON ONE INTERPRETATION OF THE AVAILABLE GROUNDWATER ELEVATION DATA. OTHER INTERPRETATIONS OF THIS GROUNDWATER ELEVATION DATA ARE POSSIBLE. GROUNDWATER ELEVATIONS WILL VARY SEASONALLY BASED ON PRECIPITATION, TOPOGRAPHY AND OTHER SITE FEATURES.

LEGEND:

- SHTP-201 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (JUNE 2018)
- SH-1W — APPROXIMATE LOCATION AND DESIGNATION OF GROUNDWATER MONITORING WELL (JUNE 2018)
- [74.2] — APPROXIMATE GROUNDWATER ELEVATION (IN FEET) MEASURED ON JUNE 26, 2018
- APPROXIMATE EXTENTS OF PROPOSED LEACHING BEDS
- APPROXIMATE AMBIENT GROUNDWATER ELEVATION CONTOUR BASED ON MEASUREMENTS OBTAINED ON JUNE 26, 2018
- GROUNDWATER FLOW DIRECTION

SANBORN HEAD

GRAPHICAL SCALE
40' 20' 0' 40' 80'

NO.	DATE	DESCRIPTION	BY

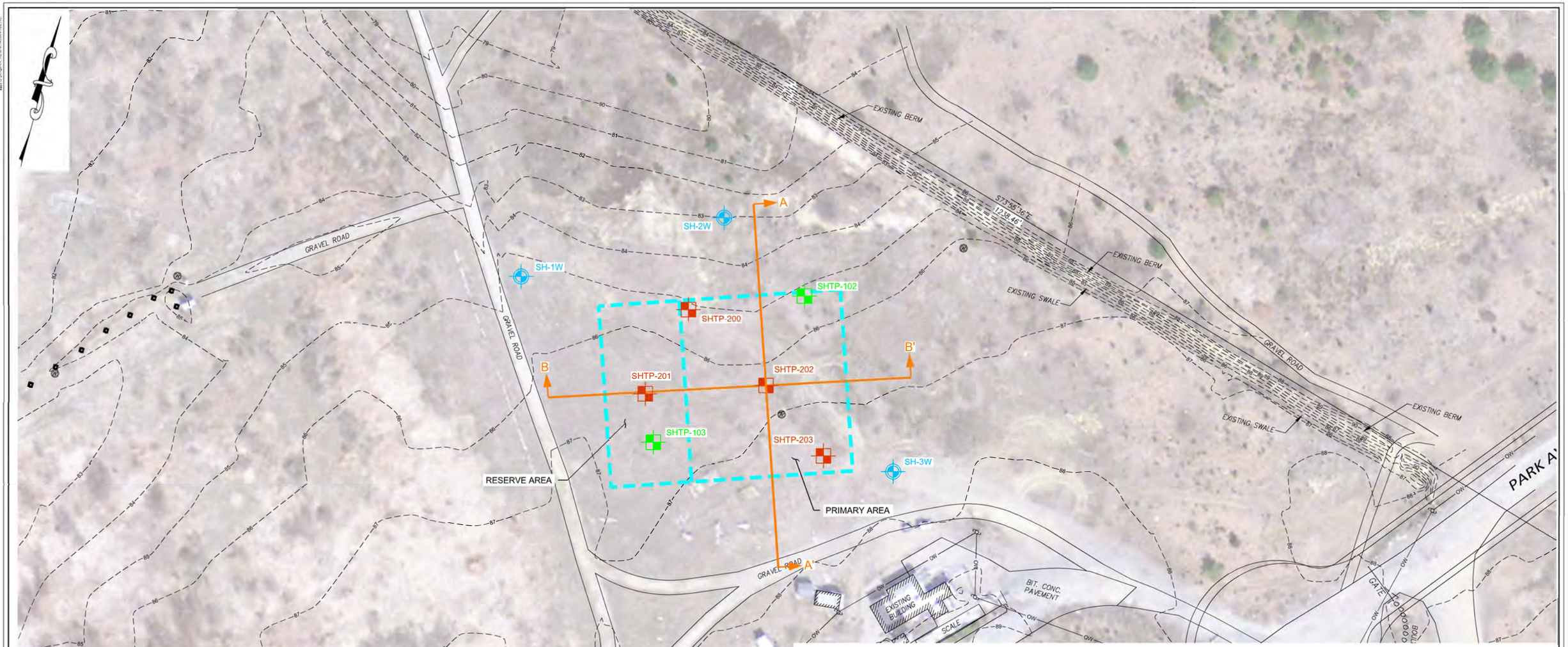
DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

GROUNDWATER CONTOUR PLAN
(BASED ON CONDITIONS OBSERVED JUNE 26, 2018)

PROJECT NUMBER: 4250.01

SHEET NUMBER: 6



NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED,"BASEMAP - EXISTING CONDITIONS", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, RECEIVED SEPTEMBER 25, 2017 WITH AN ORIGINAL SCALE OF 1" = 20'.
2. TEST PITS DESIGNATED SHTP-102 THROUGH SHTP-103 WERE EXCAVATED BY CHARTER AND OBSERVED BY SANBORN HEAD ON MARCH 9, 2018.
3. TEST PITS DESIGNATED SHTP-200 THROUGH SHTP-203 WERE EXCAVATED BY CHARTER AND OBSERVED BY SANBORN HEAD ON JUNE 26, 2018
4. EXPLORATIONS DESIGNATED SH-1W THROUGH SH-3W WERE ADVANCED BY CRAWFORD DRILLING SERVICES, LLC (CDS) OF WESTMINSTER, MA AND OBSERVED BY SANBORN HEAD ON JUNE 15, 2018.
5. APPROXIMATE LOCATIONS OF EXPLORATIONS WERE MARKED IN THE FIELD USING A TOPCON GRS-1 GLOBAL POSITIONING SYSTEM (GPS) AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

PROPOSED SOIL ABSORPTION FIELD:

- DESIGN FLOW RATE = 40,000 GPD
- SOIL ABSORPTION AREA PROVIDED = 30,000 SF
- DESIGN APPLICATION RATE = 1.33 GPD/SF
- BOTTOM OF PROPOSED BED = EL. 86 FT

LEGEND:

- SHTP-101 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (MARCH 2018)
- SHTP-201 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (JUNE 2018)
- SH-1W — APPROXIMATE LOCATION AND DESIGNATION OF GROUNDWATER MONITORING WELL (JUNE 2018)
- APPROXIMATE EXTENTS OF PROPOSED LEACHING BEDS
- A A' — SUBSURFACE PROFILE (REFER TO FIGURES 8 AND 9)

SANBORN HEAD

GRAPHICAL SCALE
40' 20' 0' 40' 80'

NO	DATE	DESCRIPTION	BY

DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

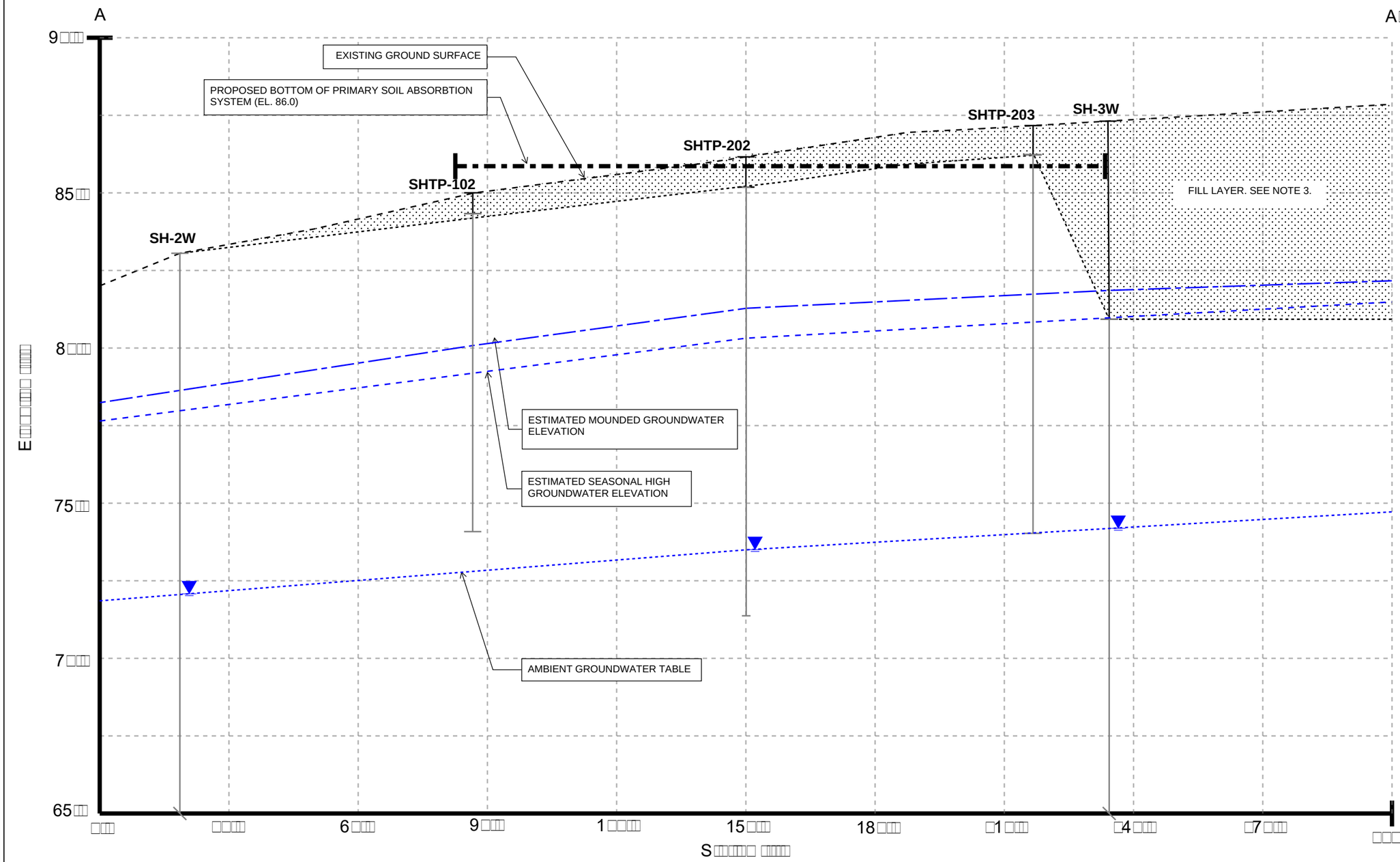
PROJECT NUMBER: 4250.01

SOIL ABSORPTION SYSTEM PLAN

SHEET NUMBER: 7

SECTION A-A□

□ERTICAL SCALE□1 □□□□□□
HORI□ONTAL SCALE□1"□□4□



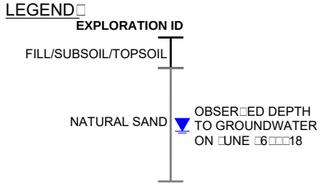
NOTES□

1□ELE□ATIONS OF THE E□ISTING GRADE WERE TA□EN FROM THE DRAWING TITLED "BASEMAP - E□ISTING CONDITIONS" BY □ANASSE HANGEN BRUSTLIN□INC□□□HB□ OF WATERTOWN□MA DATED 11/□9/17□

□□THE AMBIENT GROUNDWATER TABLE ELE□ATIONS ARE BASED ON THE □UNE □6□□□18 GUAGING ROUND□THE ESTIMATED SEASONAL HIGH GROUNDWATER IS BASED ON THE FRIMPTER METHOD AND IS APPRO□IMATELY 6□8□HIGHER THAN THE AMBIENT GROUNDWATER TABLE□

□□ALL TOPSOIL□SUBSOIL□FILL AND DELETERIOUS MATERIAL IN AND WITHIN 5□OF THE SOIL ABSORPTION SYSTEM SHALL BE STRIPPED AND REPLACED WITH A CLEAN GRANULAR SAND GRADED SUCH THAT NOT MORE THAN 15□ SHALL BE RETAINED ON THE □4 SIE□E□OF THE FRACTION OF THE SAMPLE PASSING THE □4 SIE□E□1□□ OR LESS SHALL PASS THE □1□□ SIE□E AND 5□ OR LESS SHALL PASS THE □□□□ SIE□E□NOT MORE THAN 9□□ SHALL BE RETAINED ON THE □5□ SIE□E□ THE UNIFORMITY COEFFICIENT OF THE SOIL RETAINED ON THE □4 SIE□E SHALL BE NO GREATER THAN SI□□ PERCOLATION RATE MUST BE TWO MINUTES PER INCH OR LESS BEFORE AND AFTER PLACEMENT□

LEGEND□



SANBORN HEAD

NO□	DATE	DESCRIPTION	BY

DRAWN BY□ K. LE
DESIGNED BY□ K. LE
RE□IEWED BY□ M. HEIL
PRO□ECT MGR□ Q. PRATT
PIC□ S. SADKOWSKI
DATE□ JULY 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

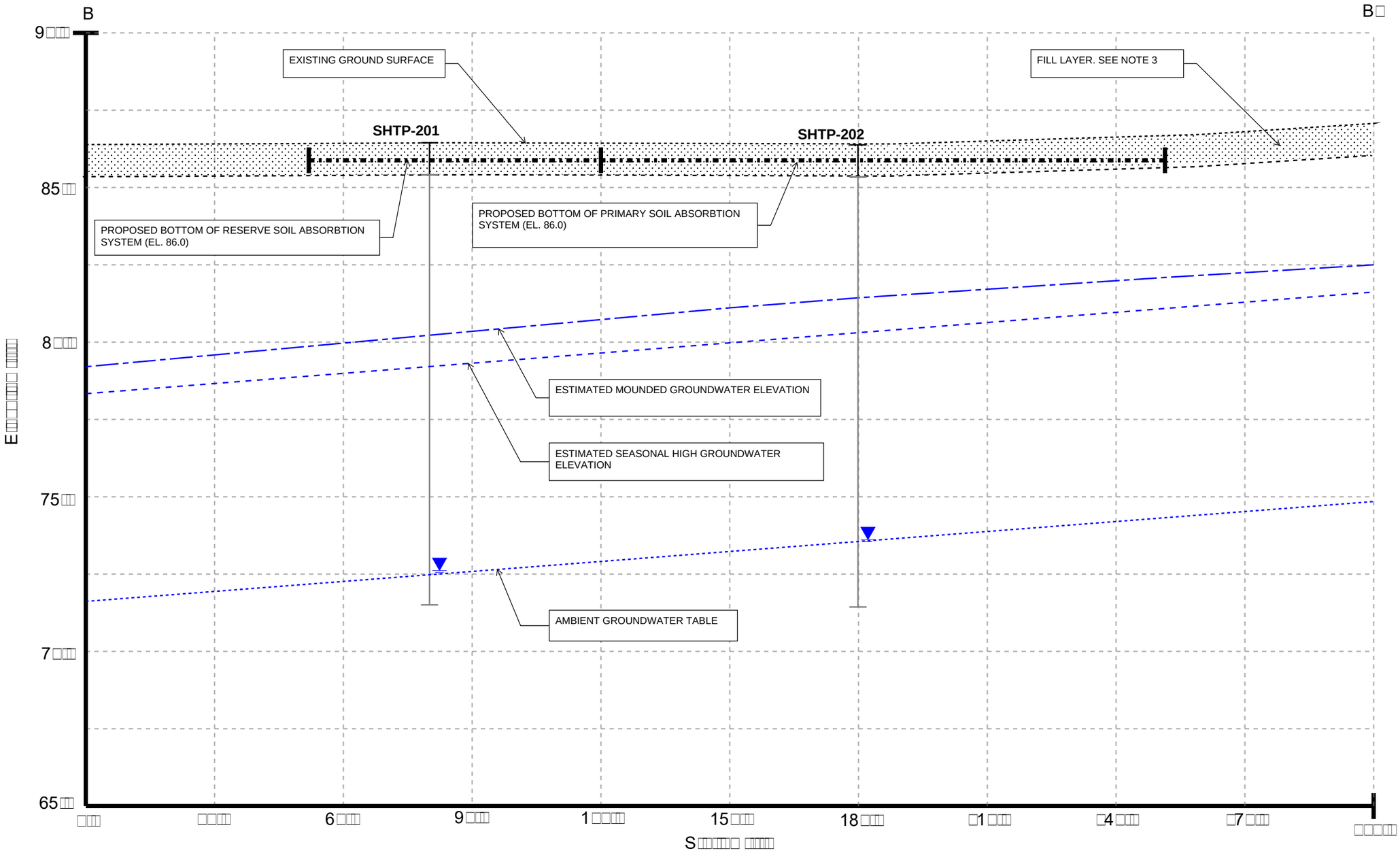
SUBSURFACE PROFILE A-A'

PRO□ECT NUMBER□ 4250.01

SHEET NUMBER□ 8 OF 9

SECTION B-B□

□ERTICAL SCALE□1 (□□□□□□)
HORI□ONTAL SCALE□1"□□4□



NOTES□

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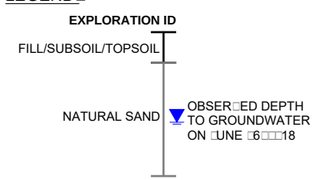
□□THE AMBIENT GROUNDWATER TABLE ELE□ATIONS ARE BASED ON THE □UNE □6□□□18 GAUGING ROUND□THE ESTIMATED SEASONAL HIGH GROUNDWATER IS BASED ON THE FRIMPTER METHOD AND IS APPRO□IMATELY 6□8□HIGHER THAN THE AMBIENT GROUNDWATER TABLE□

□□ALL TOPSOIL□SUBSOIL□FILL AND DELETERIOUS MATERIAL IN AND WITHIN 5□OF THE SOIL ABSORPTION SYSTEM SHALL BE STRIPPED AND REPLACED WITH A CLEAN GRANULAR SAND GRADED SUCH THAT NOT MORE THAN 15□ SHALL BE RETAINED ON THE □4 SIE□E□OF THE FRACTION OF THE SAMPLE PASSING THE □4 SIE□E□1□□ OR LESS SHALL PASS THE □1□□ SIE□E AND 5□ OR LESS SHALL PASS THE □□□□ SIE□E□NOT MORE THAN 9□□ SHALL BE RETAINED ON THE □5□ SIE□E□ THE UNIFORMITY COEFFICIENT OF THE SOIL RETAINED ON THE □4 SIE□E SHALL BE NO GREATER THAN SI□□ PERCOLATION RATE MUST BE TWO MINUTES PER INCH OR LESS BEFORE AND AFTER PLACEMENT□

LEGEND□



SANBORN HEAD

NO□	DATE	DESCRIPTION	BY

DRAWN BY□ K. LE
DESIGNED BY□ K. LE
RE□IEWED BY□ M. HEIL
PRO□ECT MGR□ Q. PRATT
PIC□ S. SADKOWSKI
DATE□ JULY 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

SUBSURFACE PROFILE B-B'

PRO□ECT NUMBER□ 4250.01

SHEET NUMBER□ 9 OF 9

APPENDIX A

LIMITATIONS

APPENDIX A
LIMITATIONS

1. The conclusions and recommendations described in this report are based in part on the data obtained from a limited number of soil samples from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until further investigation is initiated. If variations or other latent conditions then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the exploration logs.

3. Water level measurements have been made in the observation wells at times and under conditions stated within the text of the report and indicated on the exploration logs and in the report. Note that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors not evident at the time measurements were made.

4. The conclusions and recommendations contained in this report are based in part upon various types of historical and hydrogeologic information developed by previous investigators. While Sanborn Head has reviewed that data and information as stated in this report, any of Sanborn Head's interpretations, conclusions, and recommendations that have relied on that information will be contingent on its validity. Should additional chemical data, historical information, or hydrogeologic information become available in the future, such information should be reviewed by Sanborn Head and the interpretations, conclusions and recommendations presented herein should be modified accordingly.

5. This report has been prepared for the exclusive use of Route 44 Development, LLC c/o Charter and their consultants to support their application for a Groundwater Discharge Permit for the subsurface disposal of treated sanitary wastewater at the North Carver Development in Carver, Massachusetts, in accordance with generally accepted hydrogeologic practices. No other warranty, express or implied, is made.

APPENDIX B

SUBSURFACE DATA BY SANBORN HEAD

APPENDIX B.1

USDA TEST PIT LOGS

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/25/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	7:50
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	85 ± feet			Weather :	Overcast,75°F

Test Pit Number: SHTP-01

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 36	$Fill_1$	10 YR 6/3	--	--	--	Loamy Sand	15	5	Single Grain	Loose	
36 - 72	$Fill_2$	5 YR 5/1	--	--	--	Silt Loam	15	5	Blocky Subangular	Very Friable	
72 - 84	$Fill_3$	2.5 YR 6/6	--	--	--	Sandy Loam	10	0	Blocky Subangular	Friable	
84 - 192	C_1	2.5 YR 7/6	--	--	--	Sand	5	0	Single Grain	Loose	
-											
-											
-											

Test Pit Termination Depth (in.): 192 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	Yes	Depth (in.):	84
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	N/A	Depth (in.):	
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:

1. Observed previous test pit east of test pit. Offset test pit to the west.
2. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name: Route 44 Development, LLC	Date: 9/25/2017
Site Address:	Montello Street, Carver, MA	Client Address: 500 Harrison Avenue, Suite 4R	Time: 8:45
Project No.:	4250.01	Boston, MA 02118	
Ground Surface Elev. (ft.):	82.5 ± feet	Weather : Overcast,75°F	

Test Pit Number: SHTP-02

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 48	$Fill_1$	10 YR 6/5	--	--	--	Sandy Loam	15	5	Single Grain	Loose	
48 - 96	$Fill_2$	10 YR 4/1	--	--	--	Clay Loam	0	0	Blocky	Soft	1
96 - 192	C	10 YR 5/4	132	7.5 YR 5/8 10 YR 6/2	20	Gravelly Loamy Sand	25	5	Single Grain	Loose in hand Very Friable in Hole	
-											
-											
-											
-											

Test Pit Termination Depth (in.): 192 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	162			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	184	Stabilization Time:	5 Minutes	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	132	Basis for SHGW estimate:	Redoximorphic features	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:
1. Pockets of organic material observed.
2. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/25/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	10:20
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	82 ± feet			Weather :	Overcast,75°F

Test Pit Number: SHTP-03

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 84	$Fill_1$	10 YR 4/1	--	--	--	Clay Loam	10	5	Blocky	Soft	1
84 - 120	$Fill_2$	10 YR 5/5	--	--	--	Sandy Loam	15	10	Single Grain	Loose	
120 - 168	$Fill_3$	10 YR 4/1	--	--	--	Clay Loam	10	5	Blocky	Soft	1
-											
-											
-											
-											

Test Pit Termination Depth (in.): 168 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:
1. Pockets of organic material observed.
2. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/25/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	11:00
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	80.5 ± feet			Weather :	Overcast,75°F

Test Pit Number: SHTP-04

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 112	$Fill_1$	10 YR 5/1	--	--	--	Silt Loam	15	10	Single Grain	Loose	
112 - 156	C_1	2.5 YR 7/3	--	--	--	Gravelly Sandy Loam	30	15	Subangular Blocky	Friable	
156 - 216	C_{d2}	10 YR 6/4	156	7.5 YR 6/8	50	Very Gravelly Loamy Sand	50	20	Single Grain	Firm in Place Loose in Hand	
-											
-											
-											
-											

Test Pit Termination Depth (in.): 216 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	186			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	204	Stabilization Time:	20 Minutes	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	156	Basis for SHGW estimate:	Redoximorphic features	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:
1. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/27/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	11:30
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	83 ± feet			Weather :	Partly Cloudy, 85°F

Test Pit Number: SHTP-05

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 54	Fill	10 YR 5/1	--	--	--	Silt Loam	15	10	Single Grain	Loose	
54 - 126	C_{d1}	2.5 YR 7/3	--	--	--	Gravelly Loamy Sand	30	10	Subangular Blocky	Friable in Place Loose in Hand	
126 - 174	C_{d2}	10 YR 6/4	150	5 YR 6/8	5	Gravelly Loamy Sand	30	15	Subangular Blocky	Firm in Place Loose in Hand	
-											
-											
-											
-											

Test Pit Termination Depth (in.): 174 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	Yes	Depth (in.):	60
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	N/A	Depth (in.):	
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:
1. Fill on north side of test pit extends to 126".
2. Horizons measured on south side.
3. Redoximorphic features due to hang water.
4. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/27/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	12:45
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	82.5 ± feet			Weather :	Partly Cloudy, 85°F

Test Pit Number: SHTP-06

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 138	Fill	2.5 YR 6/6	--	--	--	Loamy Sand	10	0	Single Grain	Loose	
138 - 228	C	2.5 YR 6/4	15	10 YR 2/1 2.5 YR 5/8	25	Gravelly Loamy Sand	20	5	Single Grain	Very Friable	
-											
-											
-											
-											
-											

Test Pit Termination Depth (in.): 228 **Reason for Termination:** Excavator reach

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	16			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	18.5	Stabilization Time:	5 Minutes	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	15	Basis for SHGW estimate:	Redoximorphic features	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:
1. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	9/27/2017
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	13:30
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	84 ± feet			Weather :	Partly Cloudy, 85°F

Test Pit Number: SHTP-07

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 4	A	10 YR 4/4	--	--	--	Loamy Sand	10	0	Granular	Very Friable	
4 - 20	B	10 YR 6/6	--	--	--	Loamy Sand	5	0	Single Grain	Loose	
20 - 60	C_1	10 YR 7/3	--	--	--	Loamy Sand	5	0	Single Grain	Loose	1
60 - 84	C_2	10 YR 6/8	60	2.5 YR 4/8	50	Gravelly Loamy Sand	20	5	Single Grain	Loose	1
84 - 216	C_3	10 YR 7/3	192	5 YR 5/8	50	Loamy Sand	5	0	Single Grain	Loose	1
-											
-											

Test Pit Termination Depth (in.): 216 **Reason for Termination:** Excavator reach

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	200			Percolation Test:	Yes	Depth (in.):	66
Depth to standing water in hole (in.):	216	Stabilization Time:	<5 Minutes	Permeameter Test:	N/A	Depth (in.):	
Depth to estimated seasonal high groundwater [ESHGW] (in.):	192	Basis for SHGW estimate:	Redoximorphic features	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:
1. Stratified deposit.
2. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	3/9/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	9:30
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	80 ± feet			Weather :	Clear, 40°F

Test Pit Number: SHTP-100

Logged by: M. Ruberti
Soil Evaluator #: SE14152
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 8	A_p	10 YR 2/1	--	--	--	Sandy Loam	5	0	Granular	Very Friable	
8 - 36	$Fill_1$	10 YR 4/3	--	--	--	Sandy Loam	15	3	Structureless	Very Friable	1
36 - 96	$Fill_2$	2.5 YR 6/4	--	--	--	Gravelly Loamy Sand	20	5	Structureless	Very Friable	2,3
-											
-											
-											
-											

Test Pit Termination Depth (in.): 96 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:
1. Roots observed.
2. Debris observed (metal and tire).
3. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	3/9/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	7:40
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	87 ± feet			Weather :	Clear, 40°F

Test Pit Number: SHTP-101

Logged by: M. Ruberti
Soil Evaluator #: SE14152
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 8	A_p	10 YR 4/2	--	--	--	Loamy Sand	0	0	Granular	Very Friable	
8 - 24	B_w	2.5 YR 6/4	--	--	--	Loamy Sand	5	0	Single Grained	Very Friable	
24 - 132	C_1	2.5 YR 5/4	36	10 YR 5/8	10	Sand	17	0	Single Grained	Very Friable	1,2,3
-											
-											
-											
-											

Test Pit Termination Depth (in.): 132 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	Yes	Depth (in.):	66
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	Yes	Depth (in.):	57
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:

1. Stratified deposit with pockets of gravelly coarse sand.
2. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.
3. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	3/9/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	10:00
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	85 ± feet			Weather :	Clear, 40°F

Test Pit Number: SHTP-102

Logged by: M. Ruberti
Soil Evaluator #: SE14152
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 8	A_p	10 YR 2/1	--	--	--	Loamy Sand	5	0	Granular	Very Friable	
8 - 36	C_1	2.5 YR 5/4	12	10 YR 5/8	25	Extremely Gravelly Sand	30	5	Single Grained	Very Friable	1, 2
36 - 132	C_2	2.5 YR 5/4	--	--	--	Sand	0	0	Single Grained	Very Friable	1,3,4
-											
-											
-											
-											

Test Pit Termination Depth (in.): 132 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	Yes	Depth (in.):	60
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	Yes	Depth (in.):	54
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:

1. Stratified deposits with layers of sand with varying coarseness.
2. Log represents western sidewall of the test pit. The depth to the C_1 layer on the eastern sidewall was measured between 8-12 inches.
3. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.
4. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name: Route 44 Development, LLC	Date: 3/9/2018
Site Address:	Montello Street, Carver, MA	Client Address: 500 Harrison Avenue, Suite 4R	Time: 11:00
Project No.:	4250.01	Boston, MA 02118	
Ground Surface Elev. (ft.):	86.5 ± feet	Weather : Clear, 40°F	

Test Pit Number: SHTP-103

Logged by: M. Ruberti
Soil Evaluator #: SE14152
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 5	A_p	10 YR 3/2	--	--	--	Gravelly Loamy Sand	15	0	Granular	Very Friable	
5 - 30	Fill	10 YR 5/3	--	--	--	Gravelly Sand	20	3	Structureless	Very Friable	1
30 - 174	C_1	2.5 YR 6/4	30	10 YR 5/8	15	Sand	10	0	Single Grained	Very Friable	2
-											
-											
-											
-											

Test Pit Termination Depth (in.): 174 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	174			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	174	Stabilization Time:	<5min	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	NE	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:

1. A patch of buried topsoil was observed at bottom of fill layer in north portion of test pit.
2. Stratified deposits with layers of sand with varying coarseness.
3. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.
4. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name: Route 44 Development, LLC	Date: 3/9/2018
Site Address:	Montello Street, Carver, MA	Client Address: 500 Harrison Avenue, Suite 4R	Time: 12:15
Project No.:	4250.01	Boston, MA 02118	
Ground Surface Elev. (ft.):	88 ± feet	Weather : Clear, 40°F	

Test Pit Number: SHTP-104

Logged by: M. Ruberti
Soil Evaluator #: SE14152
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 36	Fill	10 YR 5/3	--	--	--	Gravelly Loamy Sand	25	10	Structureless	Very Friable	1
36 - 162	C_1	2.5 YR 6/4	36	10 YR 5/8	20	Gravelly Sand	13	0	Single Grain	Very Friable	2,3
-											
-											
-											
-											
-											

Test Pit Termination Depth (in.): 162 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	162			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	162	Stabilization Time:	<15 Minutes	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	162	Basis for SHGW estimate:	Observed GW	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:

1. Large cobbles observed within the fill layer. Approximately 10/A and 2/B sized boulders.
2. Stratified deposits with layers of sand with varying coarseness.
3. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.
4. "N/A" - Not applicable.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	6/26/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	8:15
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	85 ± feet			Weather :	Clear, 70°F

Test Pit Number: SHTP-200

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 12	Fill	10 YR 6/1	--	--	--	Loamy Sand	10	0	Structureless	Loose	
12 - 108	C_1	10 YR 6/2	--	--	--	Sand	5	0	Single Grain	Loose	
108 - 192	C_2	10 YR 6/1	108	5 YR 5/6	20	Very Gravelly Loamy Sand	30	0	Single Grain	Loose	1
-											
-											
-											
-											

Test Pit Termination Depth (in.): 192 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	156			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	156	Stabilization Time:	<5 Minutes	Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	156	Basis for SHGW estimate:	Observed GW	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:

1. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	6/26/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	8:00
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	86.5 ± feet			Weather :	Clear, 70°F

Test Pit Number: SHTP-201

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 12	Fill	10 YR 6/1	--	--	--	Gravelly Loamy Sand	20	0	Structureless	Loose	
12 - 180	C_1	10 YR 6/3	12	10 YR 6/8	5	Loamy Sand	1	0	Single Grain	Loose	1
-											
-											
-											
-											
-											

Test Pit Termination Depth (in.): 180 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	168			Percolation Test:	Yes	Depth (in.):	48
Depth to standing water in hole (in.):	168	Stabilization Time:	<5 Minutes	Permeameter Test:	N/A	Depth (in.):	
Depth to estimated seasonal high groundwater [ESHGW] (in.):	168	Basis for SHGW estimate:	Depth to GW	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:

1. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	6/26/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	7:45
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	86.5 ± feet			Weather :	Clear, 70°F

Test Pit Number: SHTP-202

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 12	Fill	10 YR 6/1	--	--	--	Gravelly Loamy Sand	20	5	Structureless	Loose	
12 - 180	C_1	10 YR 6/3	12	10 YR 5/8	20	Gravelly Loamy Sand	25	0	Single Grain	Loose	1
-											
-											
-											
-											
-											

Test Pit Termination Depth (in.): 180 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**		
Depth to water weeping from pit face (in.):	156			Percolation Test:	N/A	Depth (in.):
Depth to standing water in hole (in.):	156	Stabilization Time:		Permeameter Test:	N/A	Depth (in.):
Depth to estimated seasonal high groundwater [ESHGW] (in.):	156	Basis for SHGW estimate:	Observed GW	Falling Head Test:	N/A	Depth (in.):
				Other Test:	N/A	Depth (in.):

Additional Notes:

1. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.

Deep Observation Hole

Site Name:	North Carver Development	Client Name:	Route 44 Development, LLC	Date:	6/26/2018
Site Address:	Montello Street, Carver, MA	Client Address:	500 Harrison Avenue, Suite 4R	Time:	7:30
Project No.:	4250.01		Boston, MA 02118		
Ground Surface Elev. (ft.):	87 ± feet			Weather :	Clear, 70°F

Test Pit Number: SHTP-203

Logged by: Q. Pratt
Soil Evaluator #: I3768
Signature:

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color (Moist)	Redoximorphic Features			Soil Texture (NRCS)	Coarse Fragments (% by Volume)		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0 - 12	Fill	10 YR 6/1	--	--	--	Gravelly Loamy Sand	30	10	Structureless	Loose	
12 - 156	C_1	10 YR 6/3	12	10 YR 5/8	10	Loamy Sand	6	0	Single Grain	Loose	1
-											
-											
-											
-											
-											

Test Pit Termination Depth (in.): 156 **Reason for Termination:** Repeated collapse

Groundwater Observations:				**In-Situ Testing:**			
Depth to water weeping from pit face (in.):	N/A			Percolation Test:	Yes	Depth (in.):	48
Depth to standing water in hole (in.):	N/A	Stabilization Time:	N/A	Permeameter Test:	N/A	Depth (in.):	
Depth to estimated seasonal high groundwater [ESHGW] (in.):	N/A	Basis for SHGW estimate:	N/A	Falling Head Test:	N/A	Depth (in.):	
				Other Test:	N/A	Depth (in.):	

Additional Notes:

1. Redoximorphic features are likely due to hanging groundwater and are not representative of seasonal high groundwater.

APPENDIX B.2

MONITORING WELL LOGS

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-1W

Ground Elevation: 85 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	08:10	14.00'	Ground Surface	25'	25'	<15 Minutes
06/15/18	10:45	12.79'	Ground Surface	25'	25'	~150 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
-2										6" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-3.2 to 2.2')
										2" Dia. Sch. 40 PVC Riser (-2.8 to 10')
0	S-1	0 - 2	2 8 12 12	24/20			-----0'-----	S-1 (0 to 2'): Medium dense, light brown, fine to coarse SAND, little Gravel, trace Silt. Moist.		Concrete (0 to 0.5')
2										Soil Cuttings (0.5 to 3.5')
4										Bentonite Chips (3.5 to 4')
	S-2	5 - 7	7 4 5 5	24/19				S-2 (5 to 7'): Loose, light brown, fine to coarse SAND, little Gravel, trace Silt. Moist.		
6										
8										
10	S-3	10 - 12	7 6 6 8	24/20			SAND	S-3 (10 to 12'): Medium dense, light brown, fine to coarse SAND, little Gravel, trace Silt. Moist.		2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (10 to 25')
12	S-4	12 - 14	12 8 8 10	24/22				S-4 (12 to 14'): Medium dense, light brown, fine to coarse SAND, little Gravel, trace Silt. Wet.		
14										Filter Sand (4 to 25')
	S-5	15 - 17	5 5 4 5	24/16				S-5 (15 to 17'): Loose, light brown, fine to coarse SAND, little Gravel, trace Silt. Wet.		
16										
18										
20	S-6	20 - 22	3 4 6 11	24/24				S-6 (20 to 22'): Medium dense, reddish brown, fine to coarse SAND, little Gravel, trace Silt. Wet.		

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SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-1W

Ground Elevation: 85 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	08:10	14.00'	Ground Surface	25'	25'	<15 Minutes
06/15/18	10:45	12.79'	Ground Surface	25'	25'	~150 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
22	S-7	23 - 25	5 7 6 9	24/23			SAND	S-7 (23 to 25'): Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt. Wet.		
24							-----25'-----	Boring terminated at 25 feet. No refusal encountered.		
26										
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

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SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-2W

Ground Elevation: 83 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

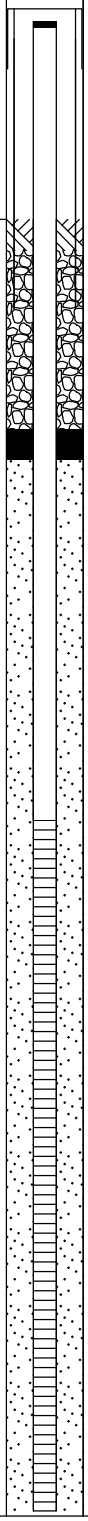
Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	09:35	11.50'	Ground Surface	25'	25'	<15 Minutes
06/15/18	10:55	10.64'	Ground Surface	25'	25'	~60 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Stratum: Description	Geologic Description
-2								
0	S-1	0 - 2	1 3 4 8	24/19			-----0'-----	S-1 (0 to 2'): Loose, light brown, fine to coarse SAND, little Gravel, trace Silt. Moist.
2								
4	S-2	5 - 7	4 3 3 4	24/15				S-3 (5 to 7'): Loose, light brown, fine to coarse SAND, little Gravel, trace Silt. Moist.
6								
8								
10	S-3	10 - 12	2 3 5 6	24/18			SAND	S-4 (10 to 12'): Loose, light brown, fine to coarse SAND, little Gravel, trace Silt. Wet.
12								
14								
16	S-4	15 - 17	4 4 4 5	24/18				S-5 (15 to 17'): Loose, brown, fine to coarse SAND, little Gravel, trace Silt. Wet.
18								
20	S-5	20 - 22	2 1 1 8	24/22				S-6 (20 to 22'): Very loose, reddish brown, fine to coarse SAND, little Gravel, trace Silt. Wet.



Well Description

6" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-3.5 to 1.5')

2" Dia. Sch. 40 PVC Riser (-3.2 to 10')

Concrete (0 to 0.5')

Soil Cuttings (0.5 to 3.5')

Bentonite Chips (3.5 to 4')

2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (10 to 25')

Filter Sand (4 to 25')

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SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-2W

Ground Elevation: 83 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	09:35	11.50'	Ground Surface	25'	25'	<15 Minutes
06/15/18	10:55	10.64'	Ground Surface	25'	25'	~60 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
22										
	S-6	23 - 25	1 2 2 1	24/6			SAND	S-7 (23 to 25'): Loose, brown, fine to coarse SAND, little Gravel, trace Silt. Wet.		
24							-----25'-----			
								Boring terminated at 25 feet. No refusal encountered.		
26										
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

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SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-3W

Ground Elevation: 87.5 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	11:35	13.30'	Ground Surface	25'	25'	<15 Minutes
06/15/18	12:45	15.16'	Ground Surface	25'	25'	~60 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
-2										6" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-3.3 to 2.3')
										2" Dia. Sch. 40 PVC Riser (-2.9 to 10')
0	S-1	0 - 2	4 11 19 19	24/19			-----0'-----	S-1 (0 to 2'): Dense, light brown, fine to coarse SAND and Gravel, little Silt. Moist. FILL.		Concrete (0 to 0.5')
2										Soil Cuttings (0.5 to 3.5')
							FILL			
4										Bentonite Chips (3.5 to 4')
	S-2	5 - 7	12 17 7 9	24/13				S-2A (5 to 6.5'): Medium dense, light brown, fine to coarse SAND and Gravel, little Silt. Moist. FILL.		
6							-----6.5'-----	S-2B (6.5 to 7'): Medium dense, light brown, fine to coarse SAND, some Gravel, trace Silt. Moist.		
8										
10	S-3	10 - 12	6 4 4 3	24/12				S-3 (10 to 12'): Loose, light brown with orange, fine to coarse SAND, some Gravel, trace Silt. Moist.		2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (10 to 25')
12	S-4	12 - 14	7 4 3 4	24/19				S-4 (12 to 14'): Loose, brown, fine to coarse SAND, some Gravel, trace Silt. Wet.		
14							SAND			Filter Sand (4 to 25')
	S-5	15 - 17	5 2 2 3	24/14				S-5 (15 to 17'): Loose, brown, fine to coarse SAND, some Gravel, trace Silt. Wet.		
16										
18										
20	S-6	20 - 22	2 4 4 6	24/24				S-6 (20 to 22'): Loose, reddish brown, fine to coarse SAND, some Gravel, trace Silt. Wet.		

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SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: North Carver Development
Location: Carver, MA
Project No.: 4250.01

Log of Monitoring Well SH-3W

Ground Elevation: 87.5 ± feet
Datum: Unknown

Drilling Method: Mobile Drill Int'l B57 Truck Rig with 4¼" ID H.S.A.

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Crawford Drilling Services, LLC
Foreman: T. Martinelli
Date Started: 06/15/18 **Date Finished: 06/15/18**
Logged By: M. Ruberti **Checked By: Q. Pratt**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
06/15/18	11:35	13.30'	Ground Surface	25'	25'	<15 Minutes
06/15/18	12:45	15.16'	Ground Surface	25'	25'	~60 Minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
22										
	S-7	23 - 25	14 8 10 25	24/			SAND	S-7A (23 to 24.5'): Medium dense, reddish brown, fine to coarse SAND, some Gravel, trace Silt. Wet.		
24								S-7B (24.5 to 25'): Medium dense, gray, fine to coarse SAND, trace Silt. Wet.		
							-----25'-----			
26								Boring terminated at 25 feet. No refusal encountered.		
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

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APPENDIX B.3

PERCOLATION TEST LOGS

Percolation Test Summary

Site Location: North Carver Development
Site Address: Carver, MA
Project Number: 4250.01

Client Name : Route 44 Development, LLC
Client Address: 500 Harrison Avenue
Boston, MA 02118

Test pit ID	SHTP - 02	**Test pit ID**	SHTP-05	**Test pit ID**	SHTP-07
Date	9/27/2017	**Date**	9/27/2017	**Date**	9/27/2017
Ground Surface Elev. (ft.):	82.5 ± feet	Ground Surface Elev. (ft.):	83 ± feet	Ground Surface Elev. (ft.):	84 ± feet
Depth to Top of Perc hole (in)	98	Depth to Top of Perc hole (in)	60	Depth to Top of Perc hole (in)	66
Depth to bottom of Perc hole (in)	122	Depth to bottom of Perc hole (in)	80	Depth to bottom of Perc hole (in)	86
Start of Pre-soak	9:40	Start of Pre-soak	12:18	Start of Pre-soak	13:47
End of Pre-soak	9:55	End of Pre-soak	12:33	End of Pre-soak	13:58
Time at 12"	9:55	Time at 12"	-	Time at 12"	13:58
Time at 9"	9:58	Time at 9"	-	Time at 9"	13:59
Time at 6"	10:05	Time at 6"	-	Time at 6"	14:00
Time (12"-9")	0:03:00	Time (12"-9")	-	Time (12"-9")	0:01:00
Time (9"-6")	0:07:00	Time (9"-6")	-	Time (9"-6")	0:01:00
Rate - min./inch (12"-9")	0:01:00	Rate - min./inch (12"-9")	-	Rate - min./inch (12"-9")	0:00:20
Rate - min./inch (9"-6")	0:02:20	Rate - min./inch (9"-6")	-	Rate - min./inch (9"-6")	0:00:20
Comments: 1. ~12.5 gallons of water used for presoak,		Comments: 1. Time at 11" =~14:07. Test abandoned due to perc rate >1hr/in.		Comments: 1. ~20 gallons of water used for presoak. Ran out of water and started test at 13:58.	

Percolation Test Summary

Site Location: North Carver Development
Site Address: Carver, MA
Project Number: 4250.01

Client Name : Route 44 Development, LLC
Client Address: 500 Harrison Avenue
Boston, MA 02118

Test pit ID	SHTP-101	**Test pit ID**	SHTP-102
Date	3/9/2018	**Date**	3/9/2018
Ground Surface Elev. (ft.):	87 ± feet	Ground Surface Elev. (ft.):	85 ± feet
Depth to Top of Perc hole (in)	48	Depth to Top of Perc hole (in)	42
Depth to bottom of Perc hole (in)	66	Depth to bottom of Perc hole (in)	60
Start of Pre-soak	8:01	Start of Pre-soak	10:21
End of Pre-soak	8:09	End of Pre-soak	10:24
Time at 12"	-	Time at 12"	-
Time at 9"	-	Time at 9"	-
Time at 6"	-	Time at 6"	-
Time (12"-9")	-	Time (12"-9")	-
Time (9"-6")	-	Time (9"-6")	-
Rate - min./inch (12"-9")	-	Rate - min./inch (12"-9")	-
Rate - min./inch (9"-6")	-	Rate - min./inch (9"-6")	-
Comments: 1. >24 gallons of water used for presoak and unable to maintain liquid depth of 9 inches, therefore rate taken to be <2min/in.		Comments: 1. >24 gallons of water used for presoak and unable to maintain liquid depth of 9 inches, therefore rate taken to be <2min/in.	

Percolation Test Summary

Site Location: North Carver Development
Site Address: Carver, MA
Project Number: 4250.01

Client Name : Route 44 Development, LLC
Client Address: 500 Harrison Avenue
Boston, MA 02118

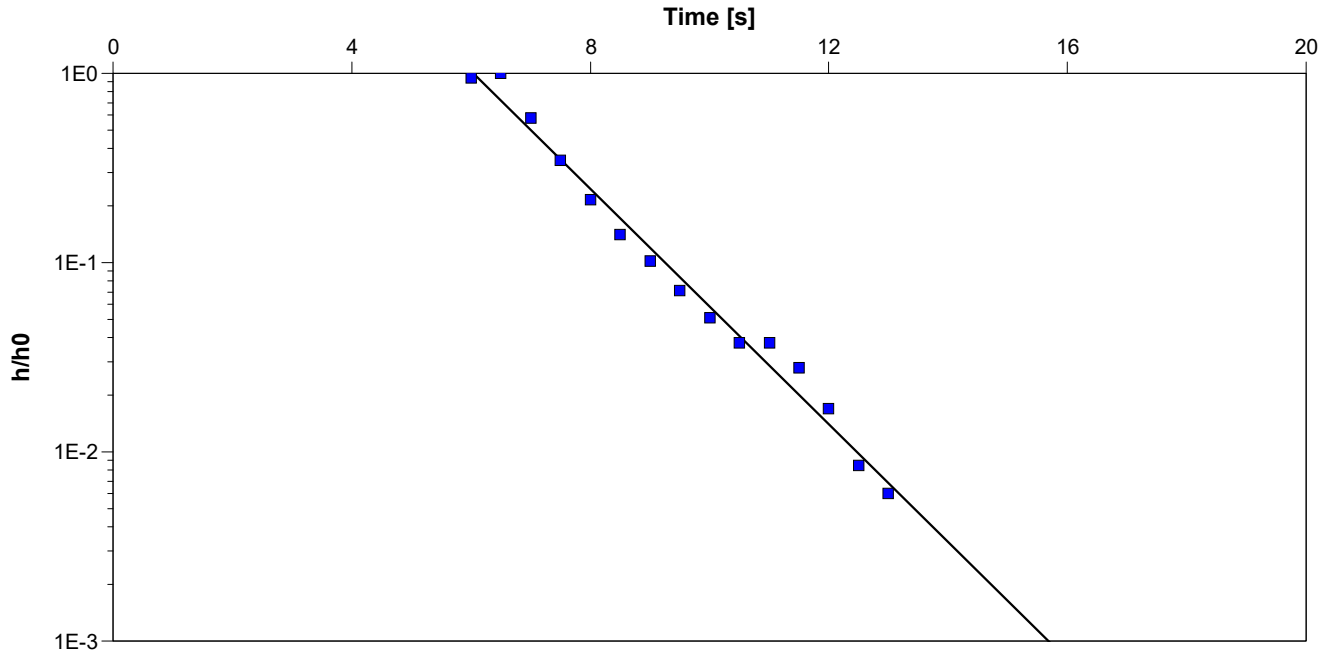
Test pit ID	SHTP-203	**Test pit ID**	SHTP-201
Date	6/26/2018	**Date**	6/26/2018
Ground Surface Elev. (ft.):	87 ± feet	Ground Surface Elev. (ft.):	86.5 ± feet
Depth to Top of Perc hole (in)	48	Depth to Top of Perc hole (in)	48
Depth to bottom of Perc hole (in)	66	Depth to bottom of Perc hole (in)	66
Start of Pre-soak	10:17	Start of Pre-soak	11:19
End of Pre-soak	10:22	End of Pre-soak	11:26
Time at 12"	-	Time at 12"	-
Time at 9"	-	Time at 9"	-
Time at 6"	-	Time at 6"	-
Time (12"-9")	-	Time (12"-9")	-
Time (9"-6")	-	Time (9"-6")	-
Rate - min./inch (12"-9")	-	Rate - min./inch (12"-9")	-
Rate - min./inch (9"-6")	-	Rate - min./inch (9"-6")	-
Comments: 1. >24 gallons of water used for presoak and unable to maintain liquid depth of 9 inches, therefore rate taken to be <2min/in.		Comments: 1. >24 gallons of water used for presoak and unable to maintain liquid depth of 9 inches, therefore rate taken to be <2min/in.	

APPENDIX B.4

SLUG TEST ANALSYS PLOTS

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 1	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

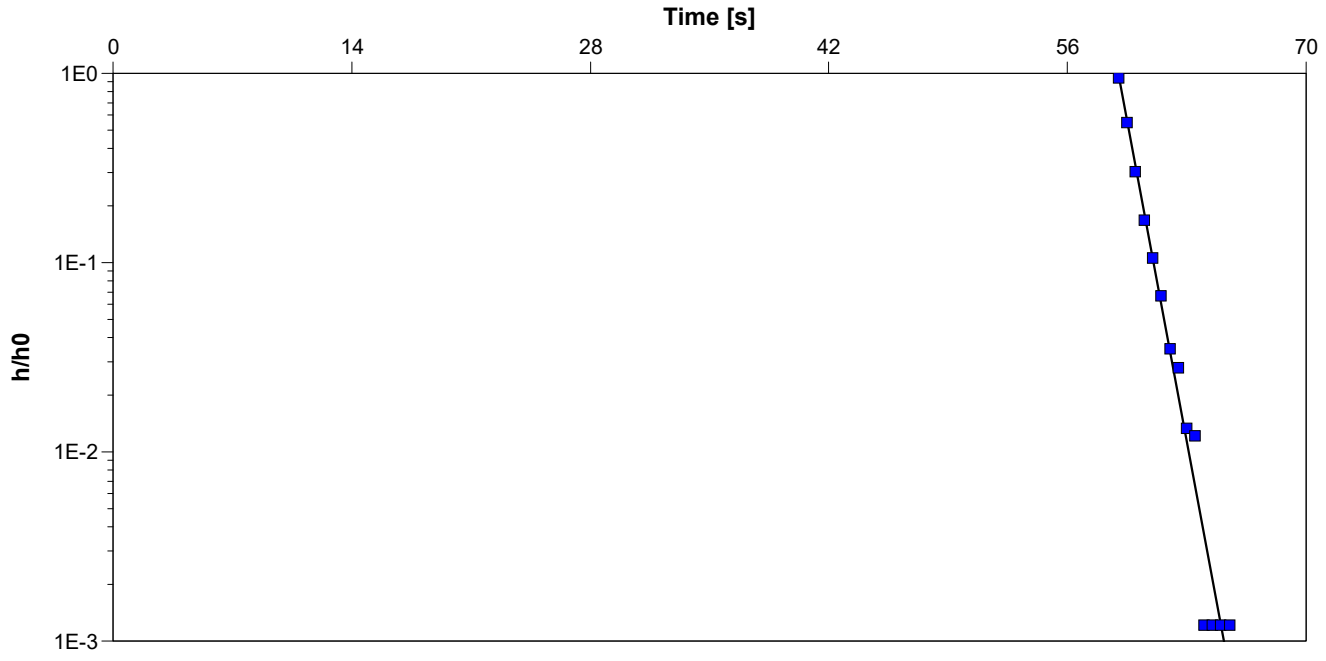


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	7.33×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 2	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

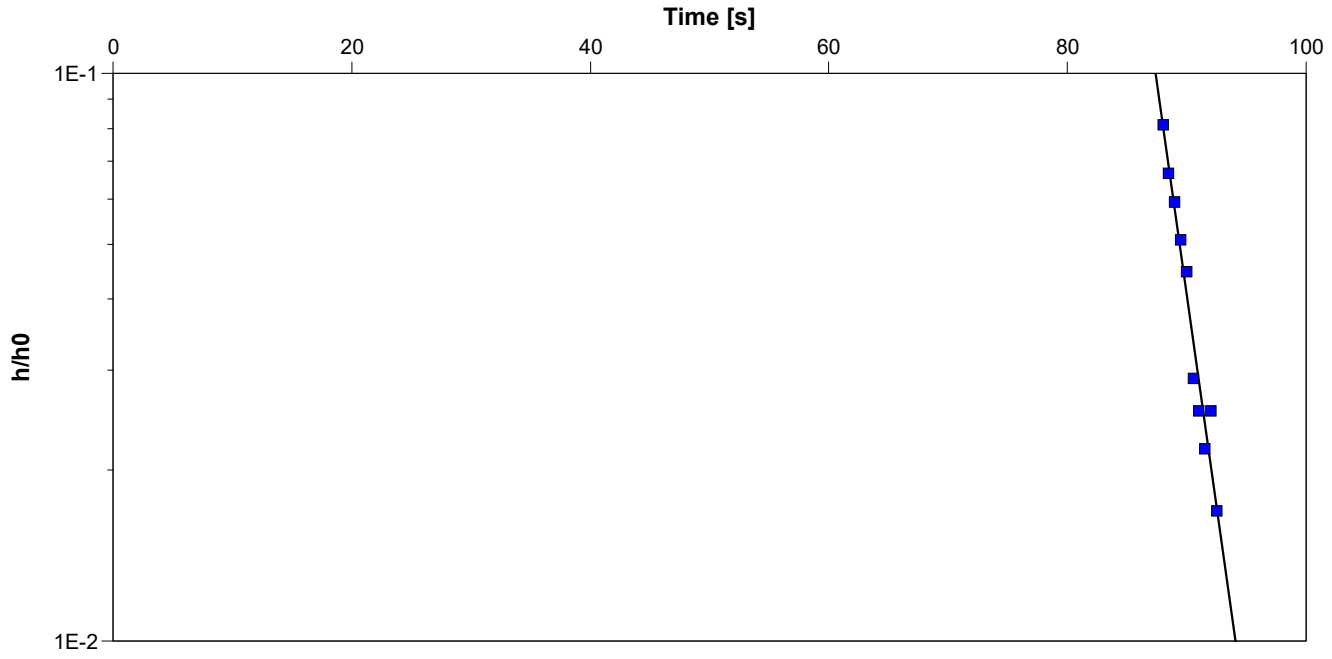


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	1.14×10^{2}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 3	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

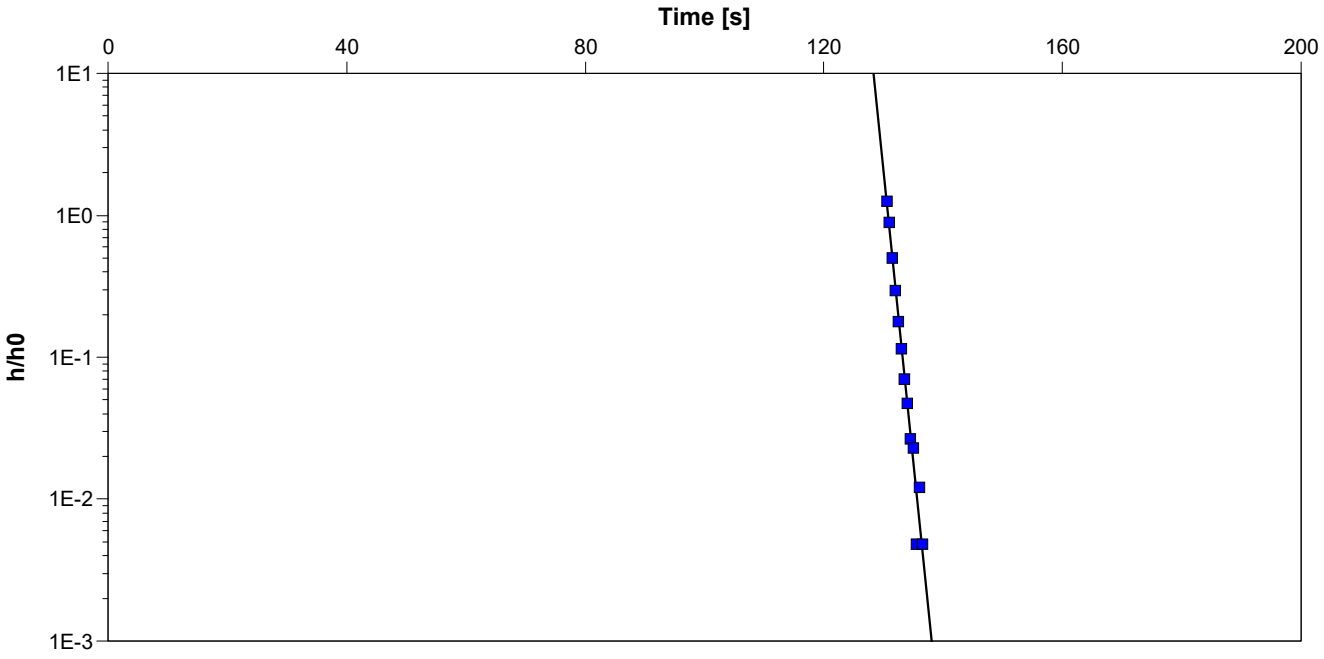


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	3.52×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 4	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

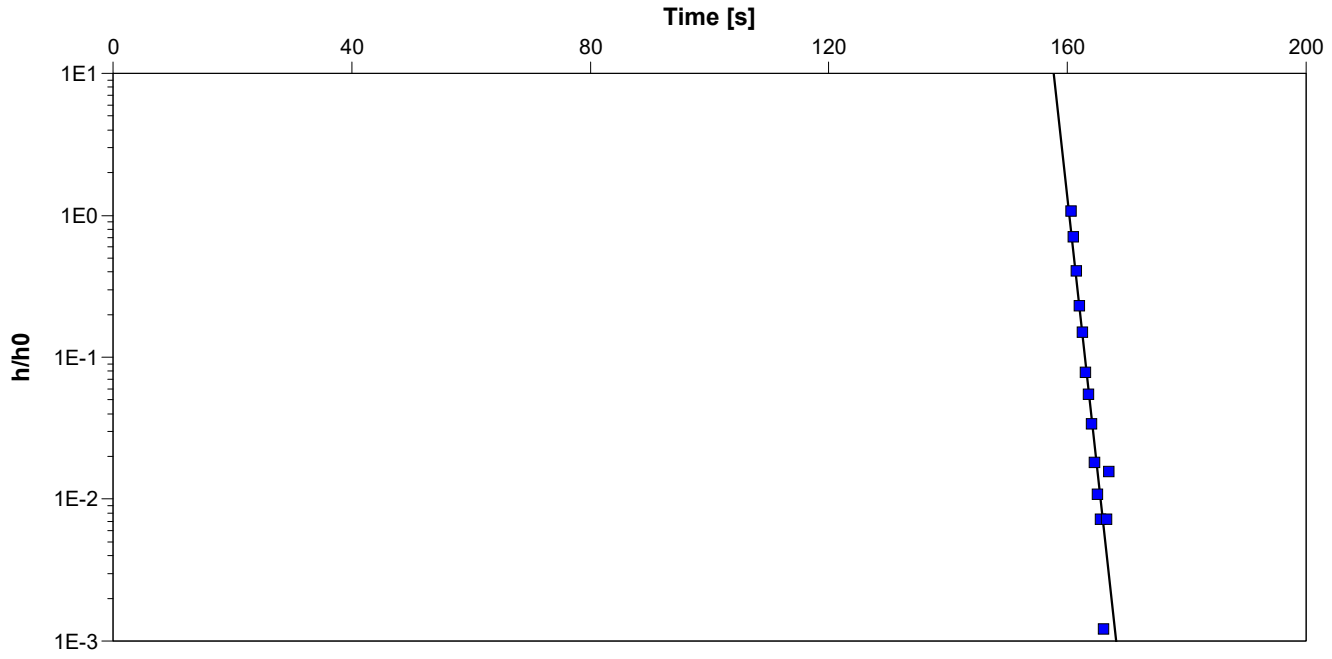


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	9.67×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 5	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

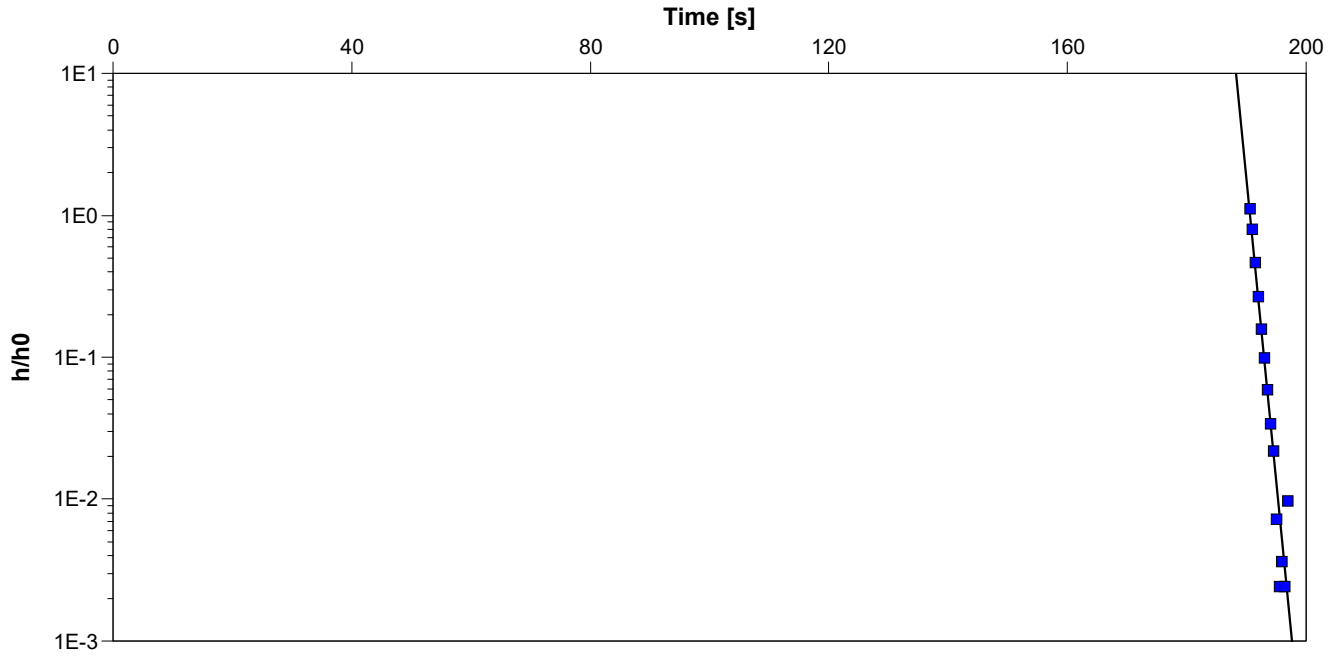


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	9.00×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-1W	Test Well: SH-1W
Test Conducted by:		Test Date: 7/19/2018
Analysis Performed by: M. Ruberti	Trial 6	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

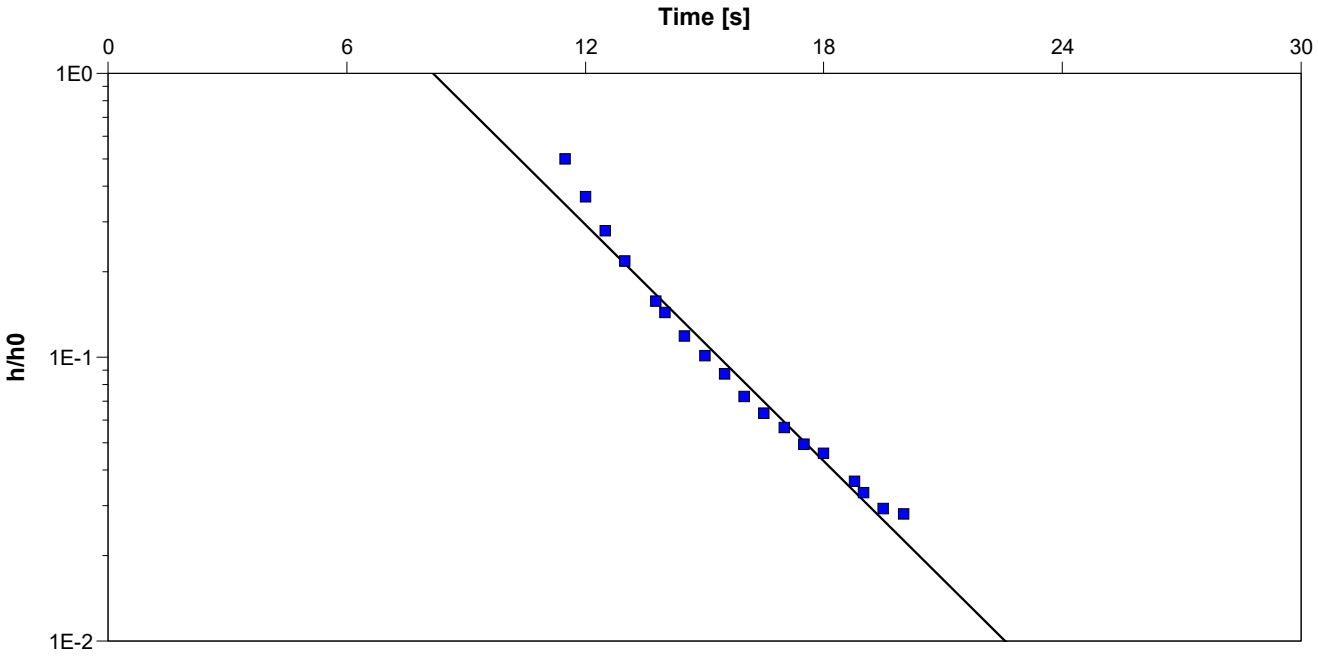


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-1W	1.00×10^{2}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 1	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

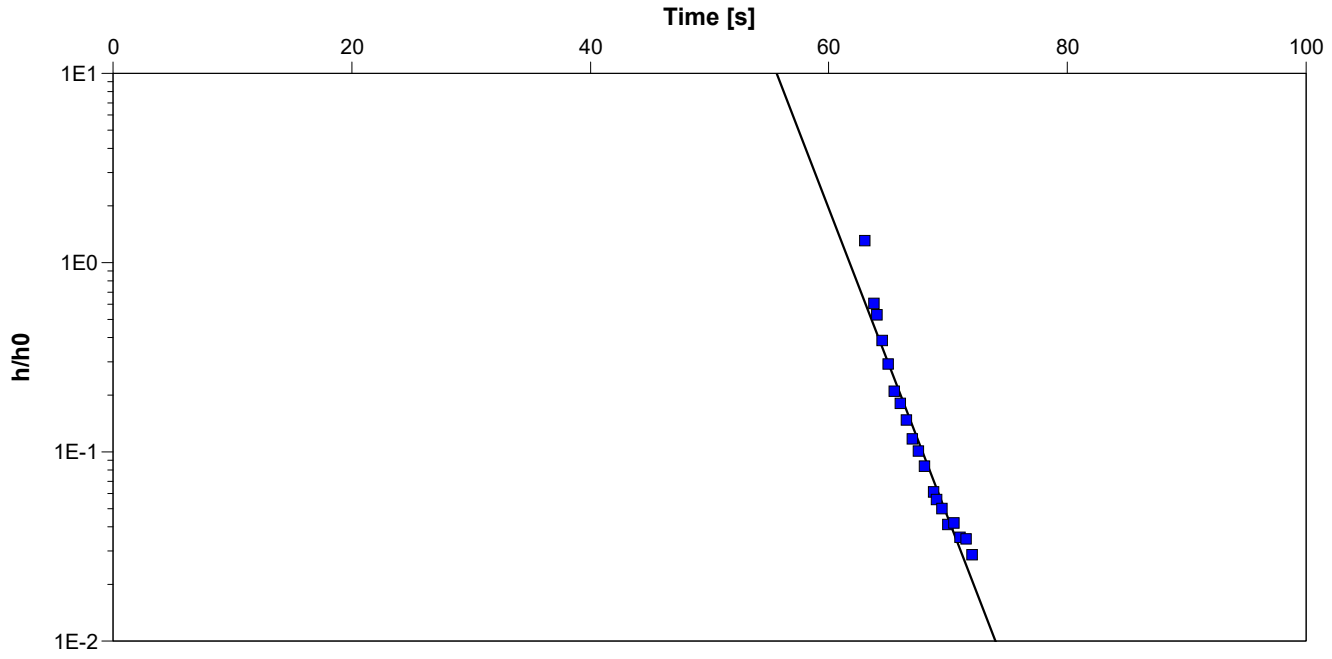


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	3.28×10^{1}	

	Slug Test Analysis Report	C.3
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 2	Analysis Date: 7/19/2018
Aquifer Thickness: 30.00 ft		

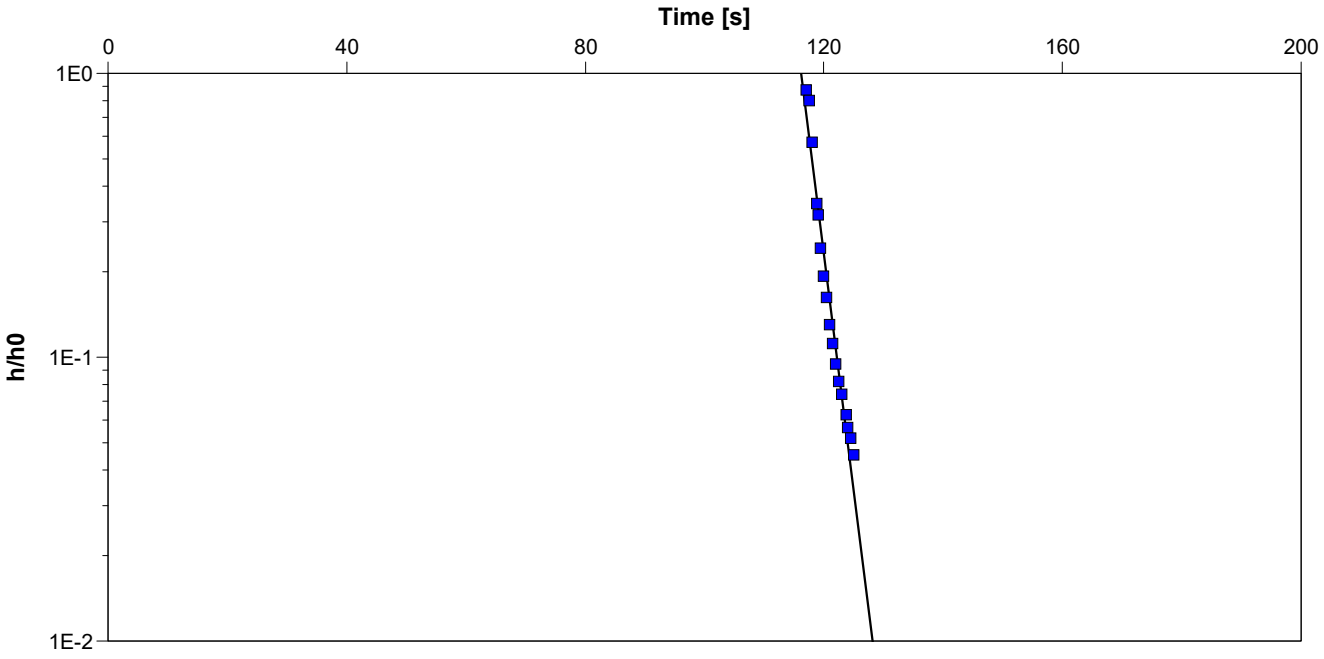


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	3.85×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 3	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

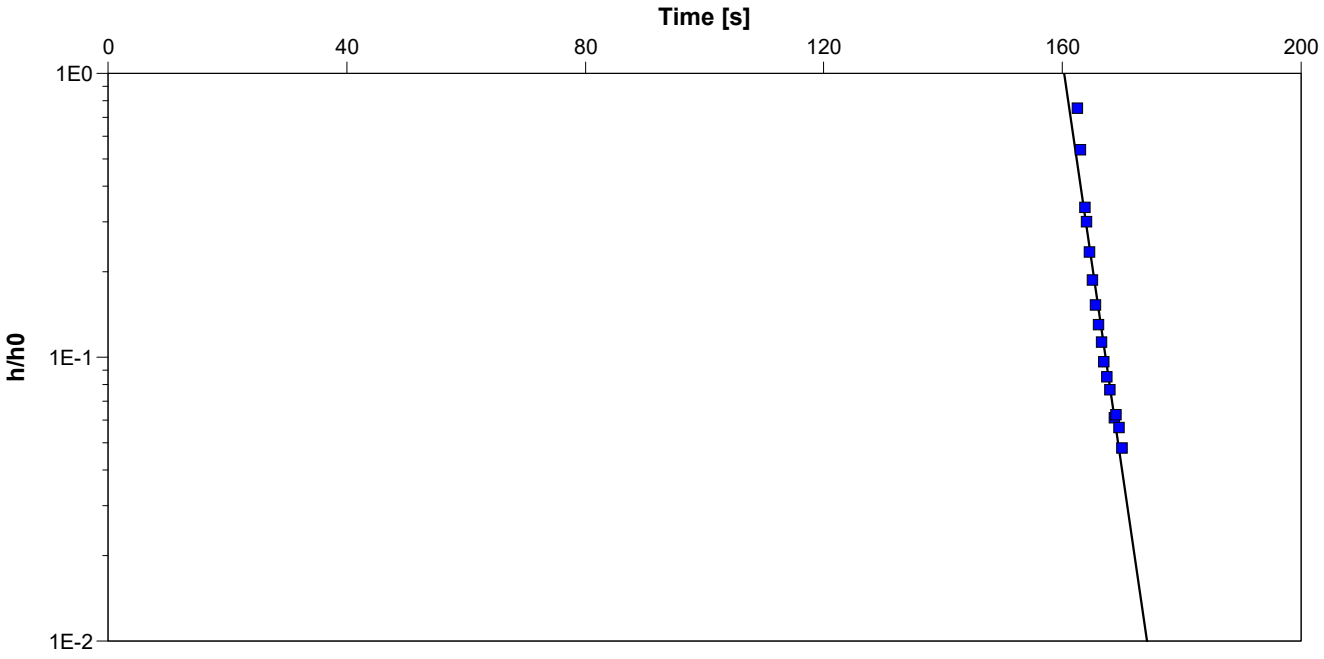


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	3.93×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 4	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

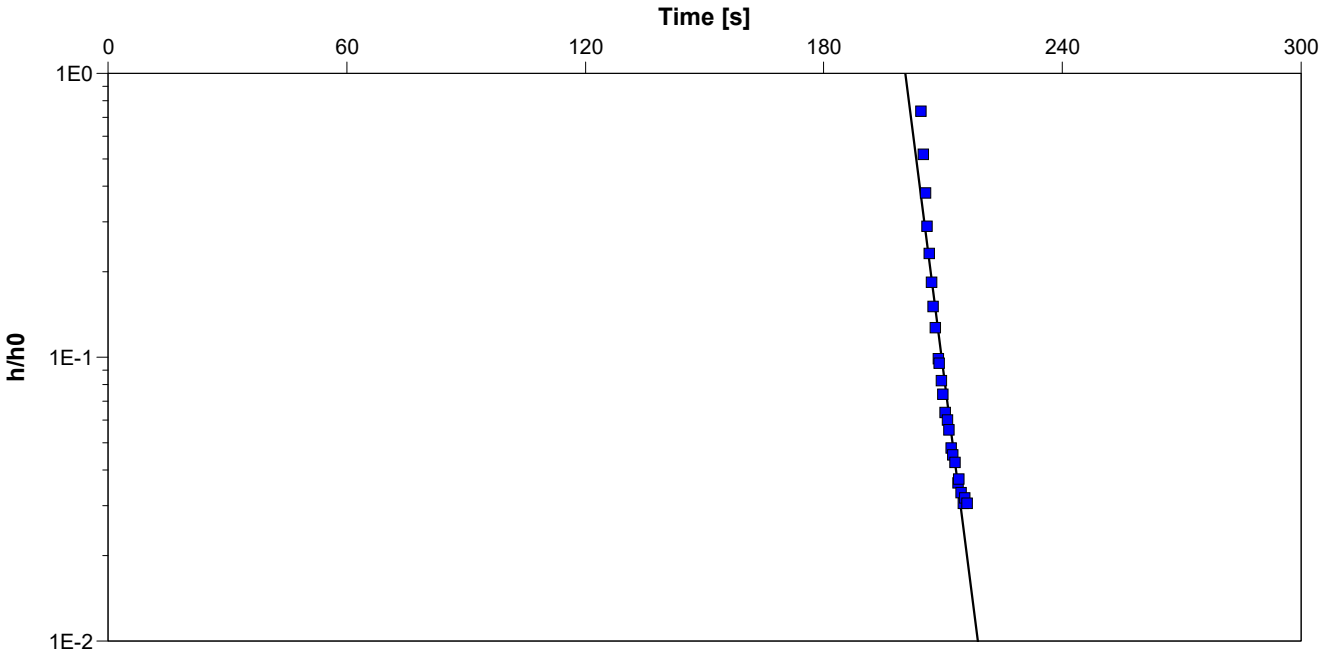


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	3.39×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 5	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

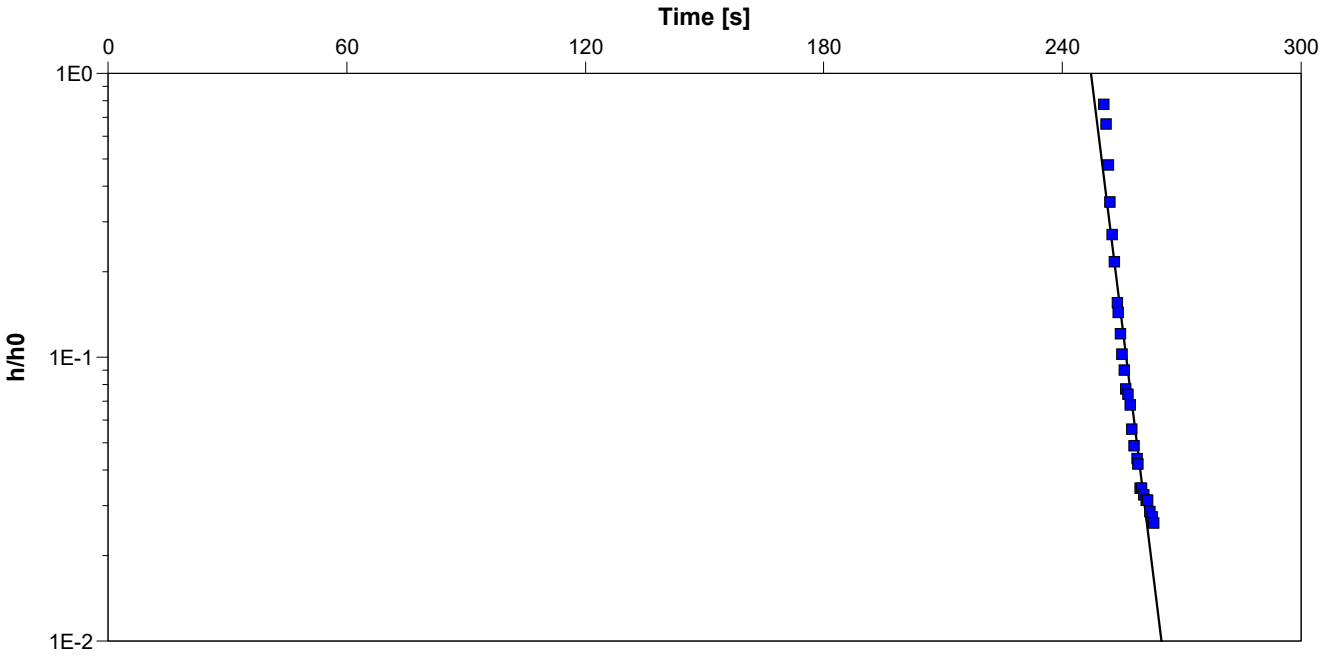


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	2.58×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development, LLC	

Location: Carver, Massachusetts	Slug Test: SH-2W	Test Well: SH-2W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 6	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

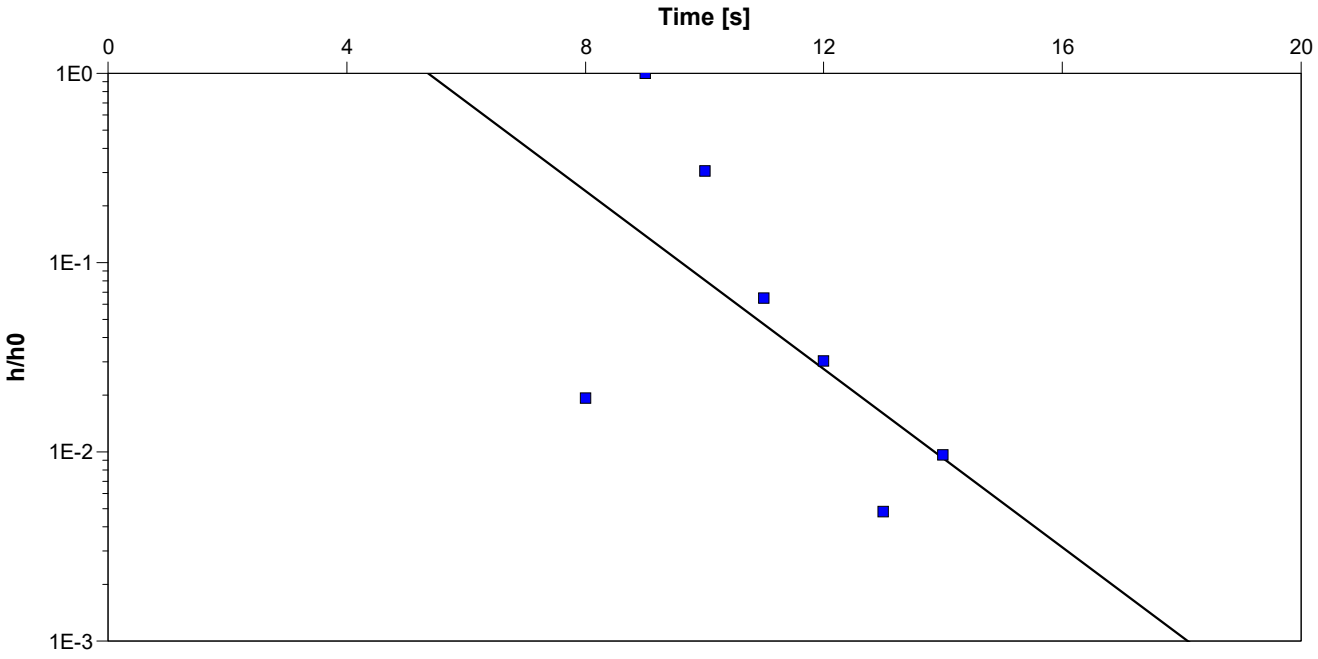


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-2W	2.66×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 1	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

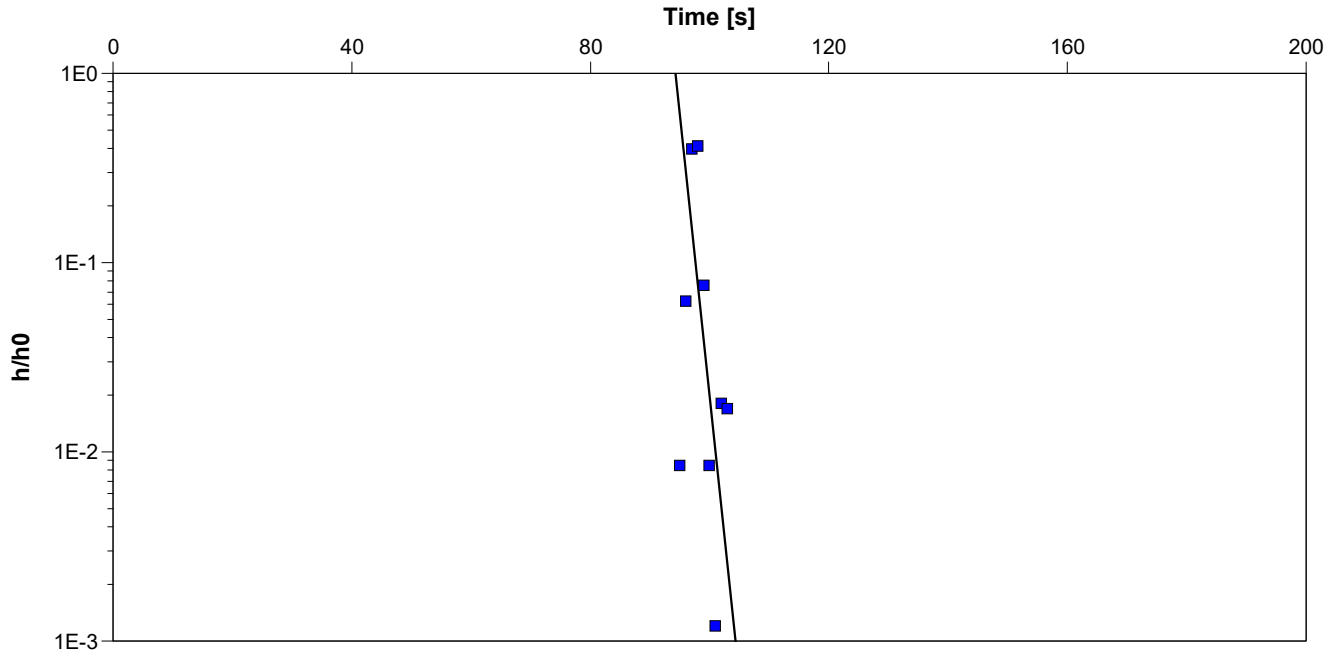


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	5.55×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 2	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

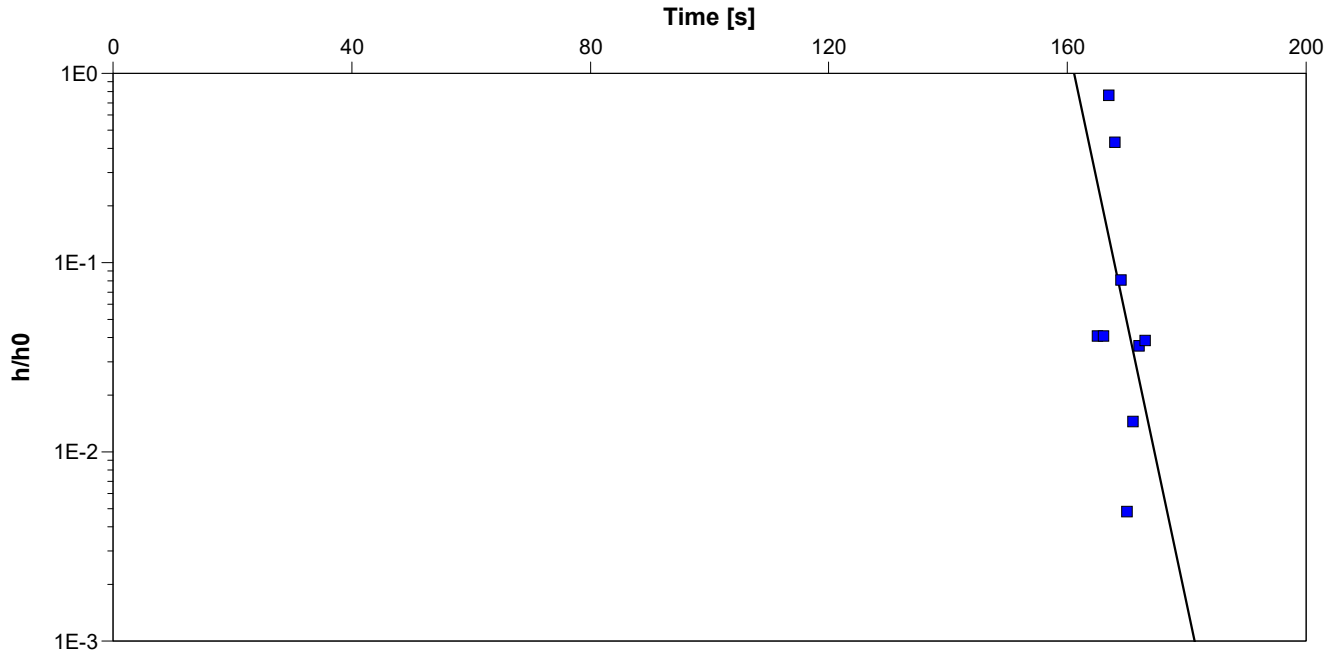


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	7.02×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 3	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

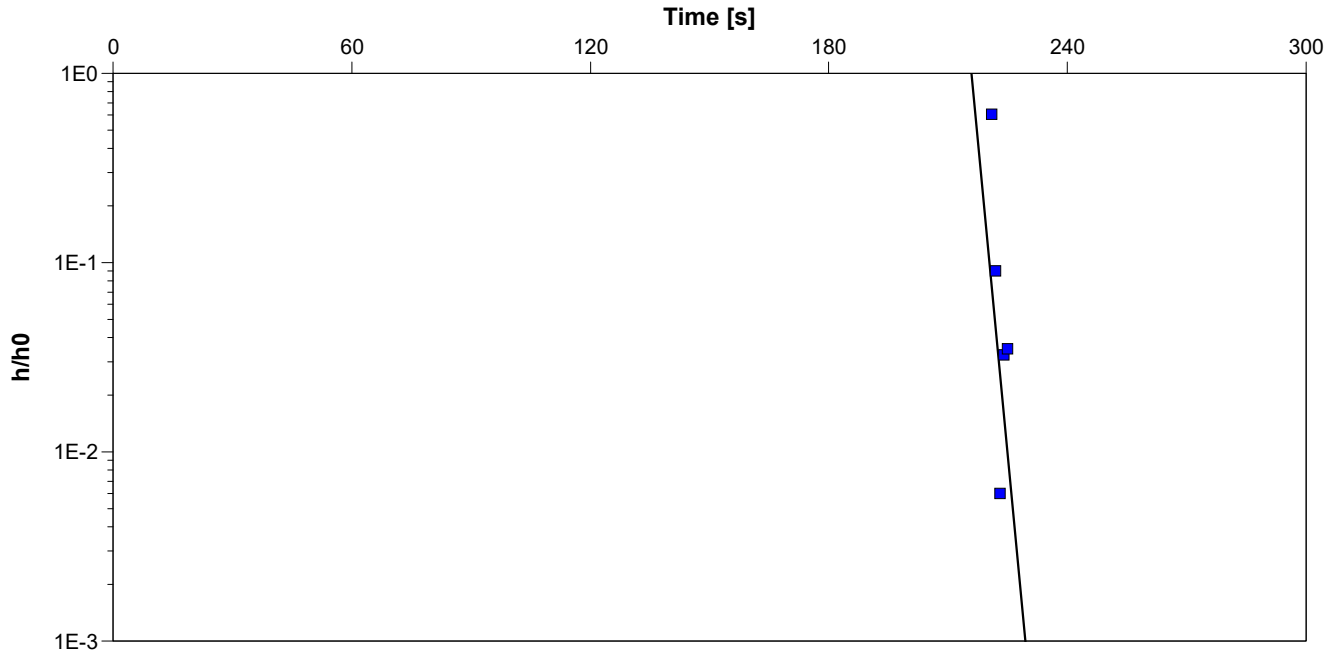


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	3.50×10^{1}	

	Slug Test Analysis Report	C.3
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 4	Analysis Date: 7/19/2018
Aquifer Thickness: 30.00 ft		

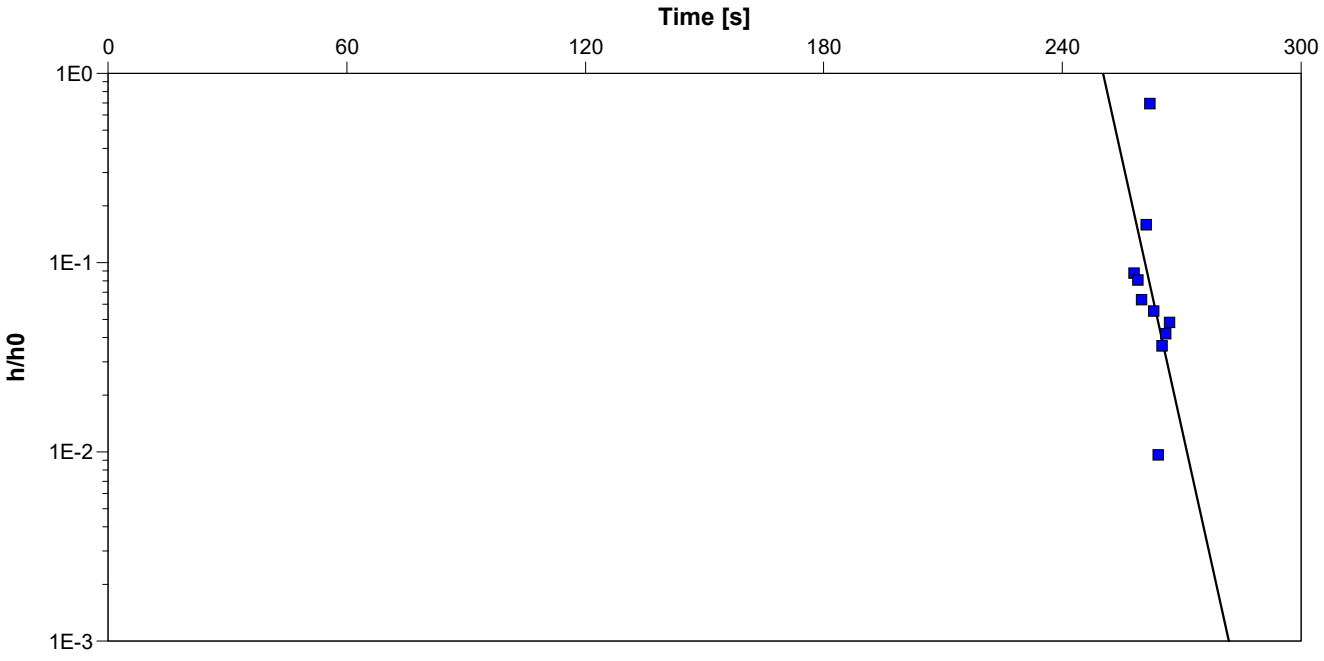


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	5.22×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 5	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		

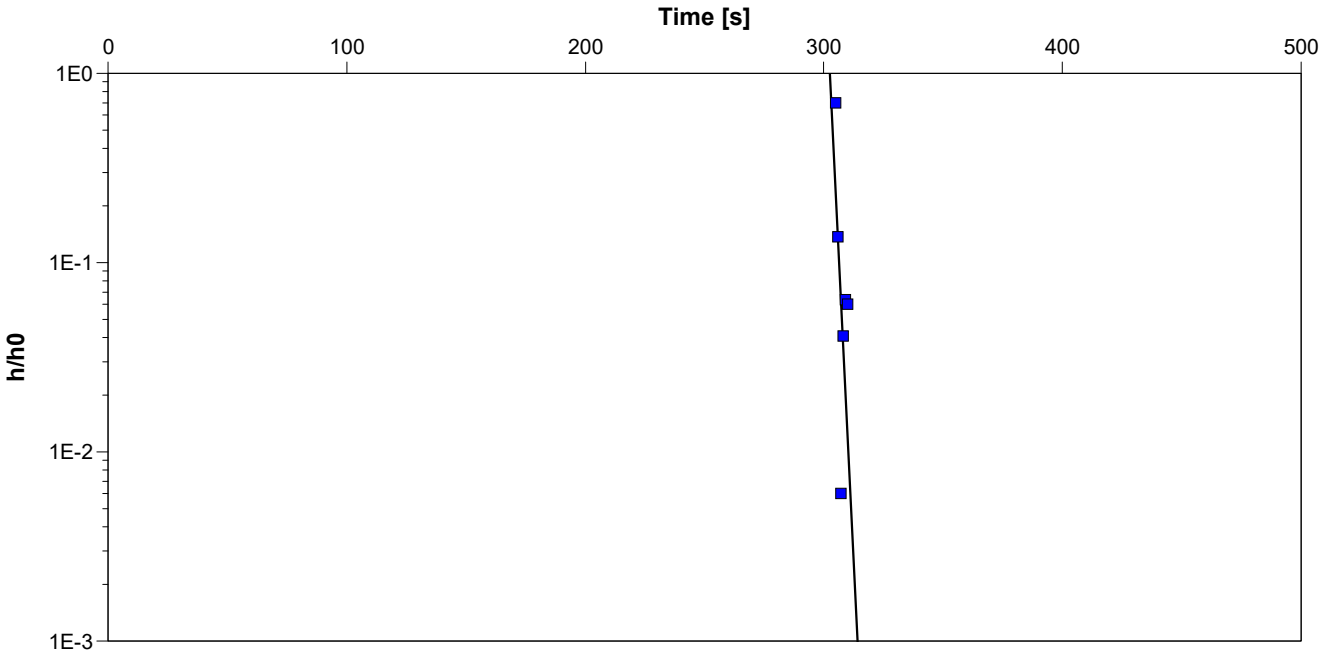


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	2.23×10^{1}	

	Slug Test Analysis Report	B.4
	Project: North Carver Urban Renewal Area	
	Number: 4250.01	
	Client: Route 44 Development. LLC	

Location: Carver, Massachusetts	Slug Test: SH-3W	Test Well: SH-3W
Test Conducted by: Q. Pratt		Test Date: 6/26/2018
Analysis Performed by: M. Ruberti	Trial 6	Analysis Date: 8/1/2018
Aquifer Thickness: 30.00 ft		



Calculation using Bouwer & Rice

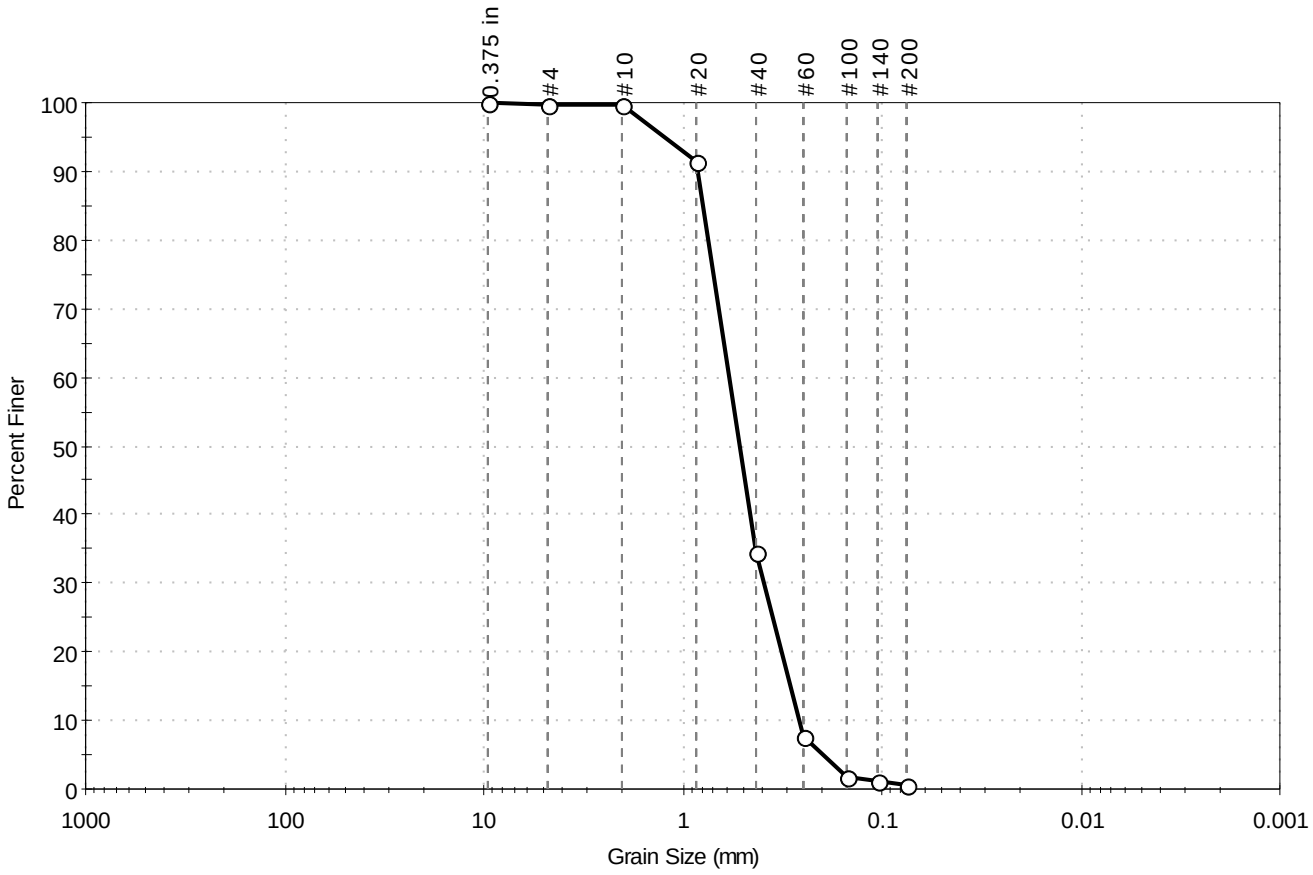
Observation Well	Hydraulic Conductivity [ft/d]	
SH-3W	6.09×10^{1}	

APPENDIX C

GEOTECHNICAL LABORATORY REPORTS

Client:	Sanborn, Head & Associates, Inc.				
Project:	North Carver Development				
Location:	Carver, MA			Project No:	GTX-307798
Boring ID:	SHTP-102	Sample Type:	bag	Tested By:	jbr
Sample ID:	C2	Test Date:	03/14/18	Checked By:	emm
Depth :	36-132 in	Test Id:	445829		
Test Comment:	---				
Visual Description:	Moist, brownish yellow sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.2	99.2	0.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	92		
#40	0.42	34		
#60	0.25	8		
#100	0.15	2		
#140	0.11	1		
#200	0.075	0.6		

Coefficients

D_{85} = 0.7854 mm	D_{30} = 0.3893 mm
D_{60} = 0.5798 mm	D_{15} = 0.2891 mm
D_{50} = 0.5135 mm	D_{10} = 0.2618 mm
C_u = 2.215	C_c = 0.998

Classification

ASTM — Poorly graded SAND (SP)

AASHTO — Stone Fragments, Gravel and Sand (A-1-b (1))

Sample / Test Description

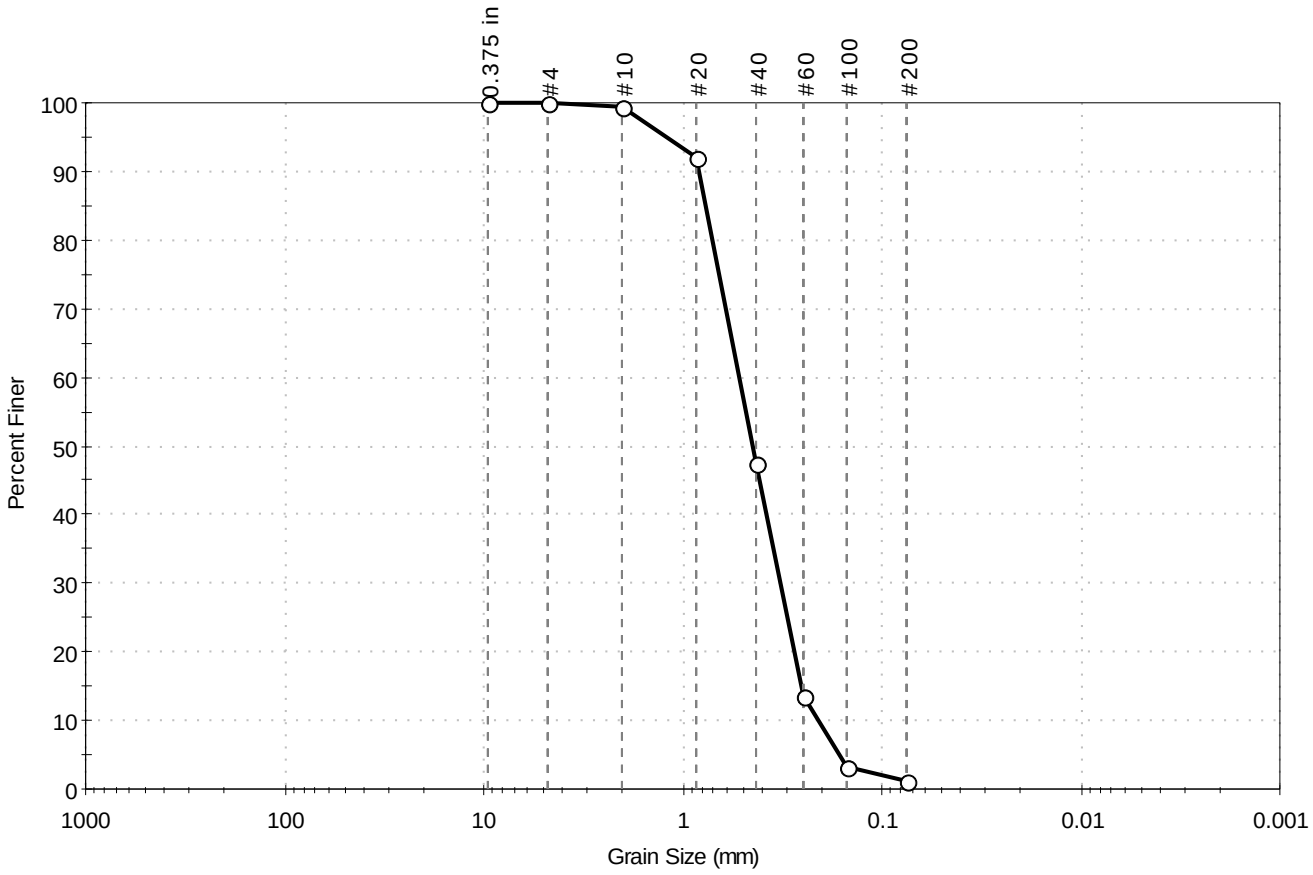
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	Sanborn, Head & Associates, Inc.				
Project:	North Carver Development				
Location:	Carver, MA			Project No:	GTX-307798
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	SHTP-201	Test Date:	07/06/18	Checked By:	emm
Depth :	---	Test Id:	461201		

Test Comment: ---
Visual Description: Moist, yellowish brown sand
Sample Comment: ---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	98.7	1.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	92		
#40	0.42	48		
#60	0.25	14		
#100	0.15	3		
#200	0.075	1.2		

Coefficients

D_{85} = 0.7620 mm
D_{30} = 0.3229 mm
D_{60} = 0.5156 mm
D_{15} = 0.2556 mm
D_{50} = 0.4410 mm
D_{10} = 0.2095 mm
C_u = 2.461
C_c = 0.965

Classification

ASTM: Poorly graded SAND (SP)

AASHTO: Stone Fragments, Gravel and Sand (A-1-b (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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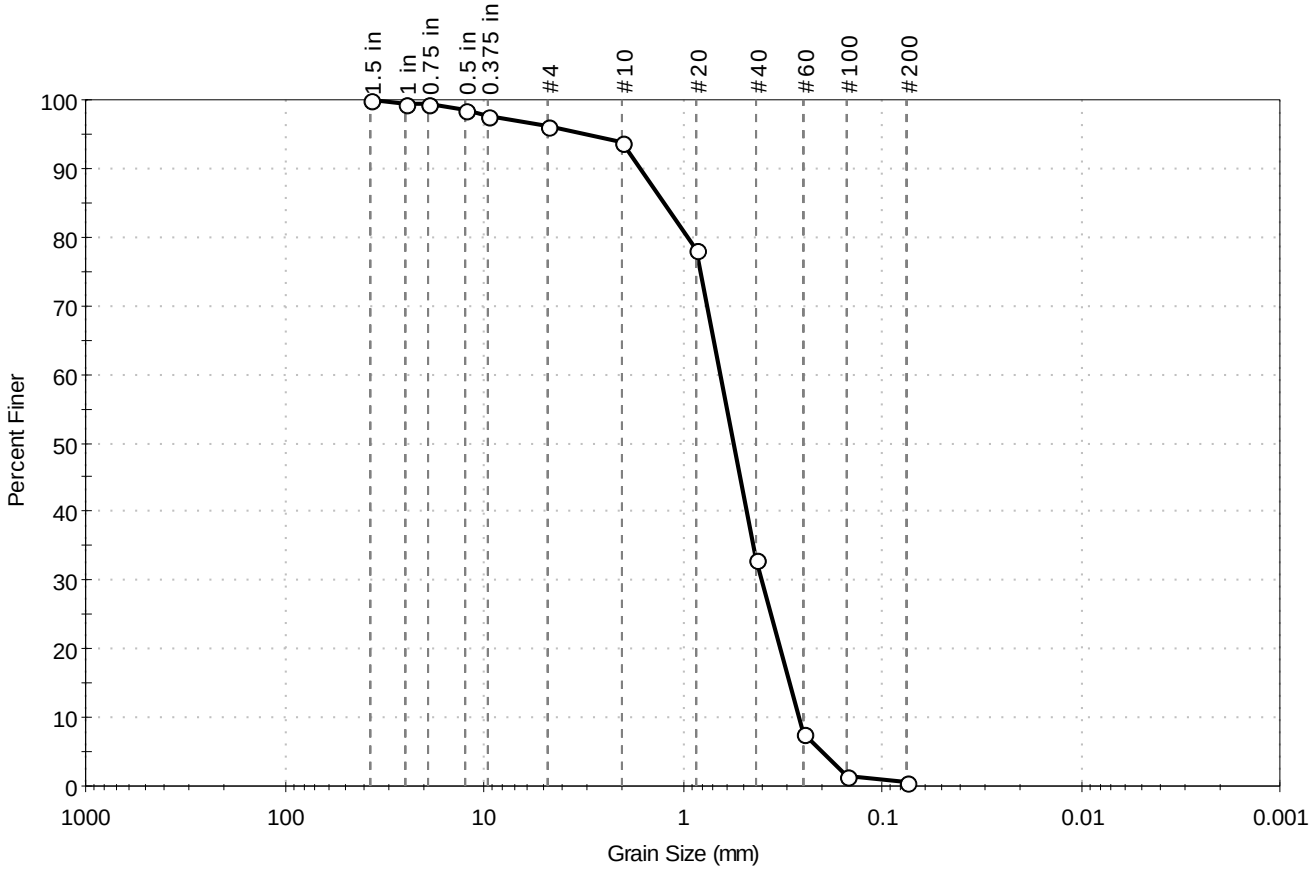
Client:	Sanborn, Head & Associates, Inc.				
Project:	North Carver Development				
Location:	Carver, MA			Project No:	GTX-307798
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	SHTP-203	Test Date:	07/06/18	Checked By:	emm
Depth :	---	Test Id:	461200		
Test Comment:	---				
Visual Description:	Moist, yellowish brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	3.7	95.7	0.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	100		
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	96		
#10	2.00	94		
#20	0.85	78		
#40	0.42	33		
#60	0.25	8		
#100	0.15	2		
#200	0.075	0.6		

Coefficients

D_{85} = 1.2310 mm	D_{30} = 0.3983 mm
D_{60} = 0.6423 mm	D_{15} = 0.2913 mm
D_{50} = 0.5509 mm	D_{10} = 0.2624 mm
C_u = 2.448	C_c = 0.941

Classification

ASTM — Poorly graded SAND (SP)

AASHTO — Stone Fragments, Gravel and Sand (A-1-b (1))

Sample / Test Description

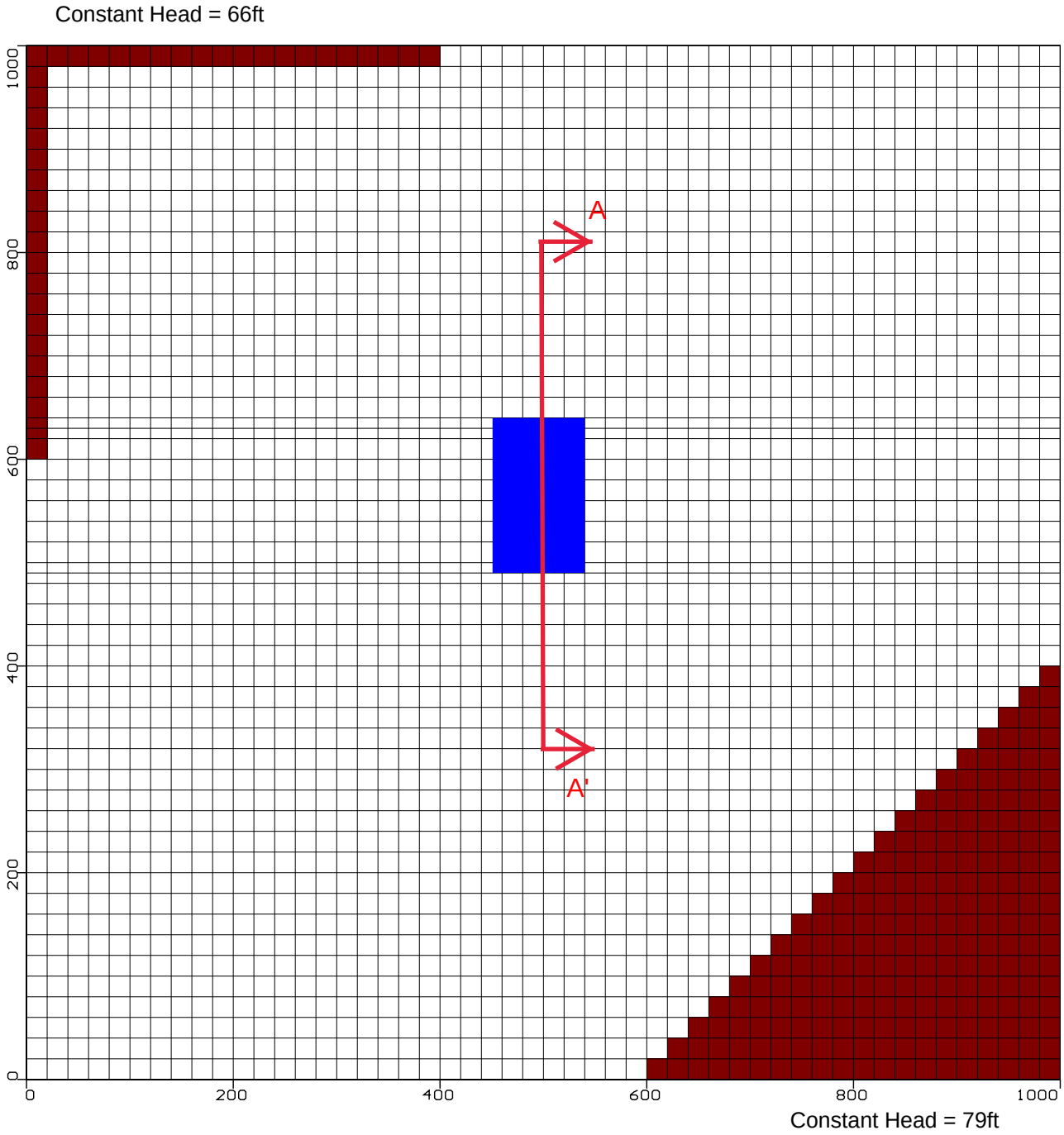
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

APPENDIX D

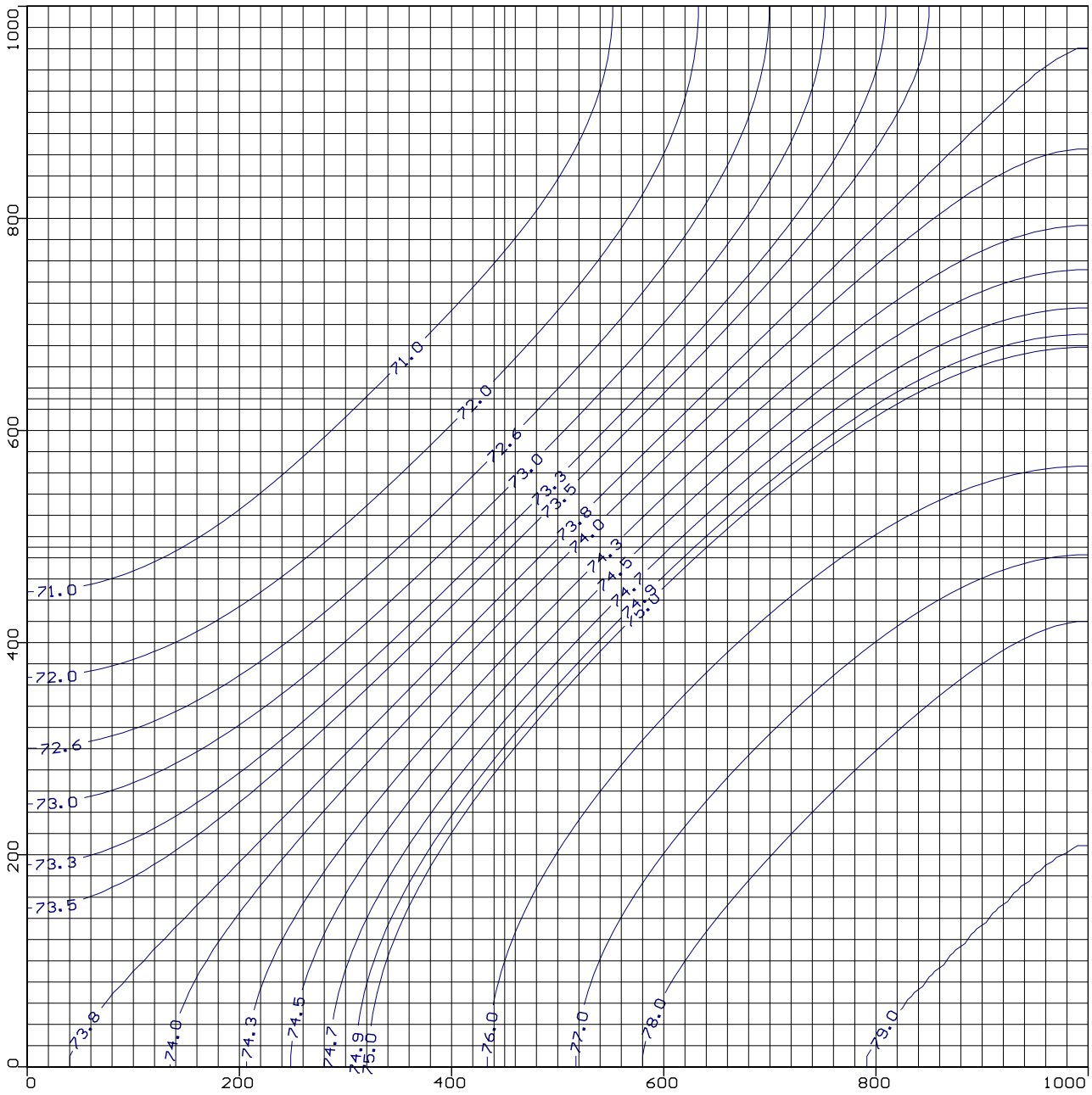
MODFLOW MOUNDING ANALYSIS OUTPUT

Mounding Analysis
Boundary Conditions
North Carver Development
Carver, MA

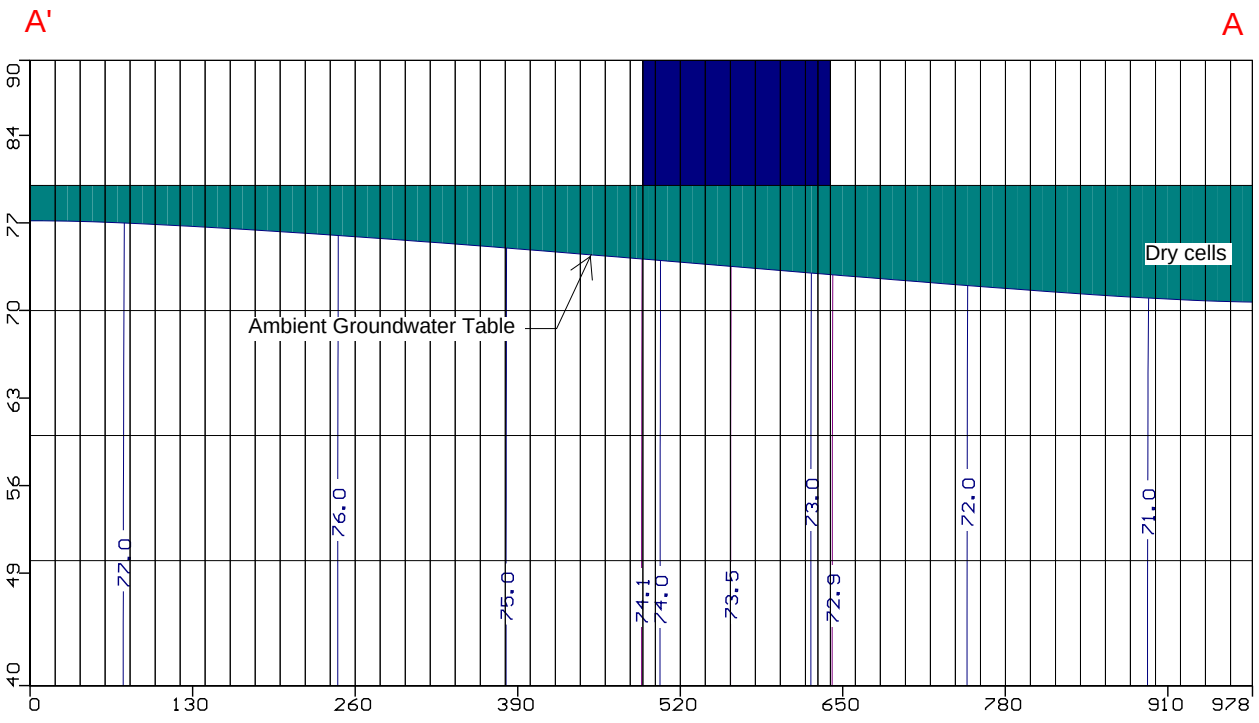


Assumptions:
40,000 gpd
2.4 gpd/sf loading rate
13,300 sf bed area

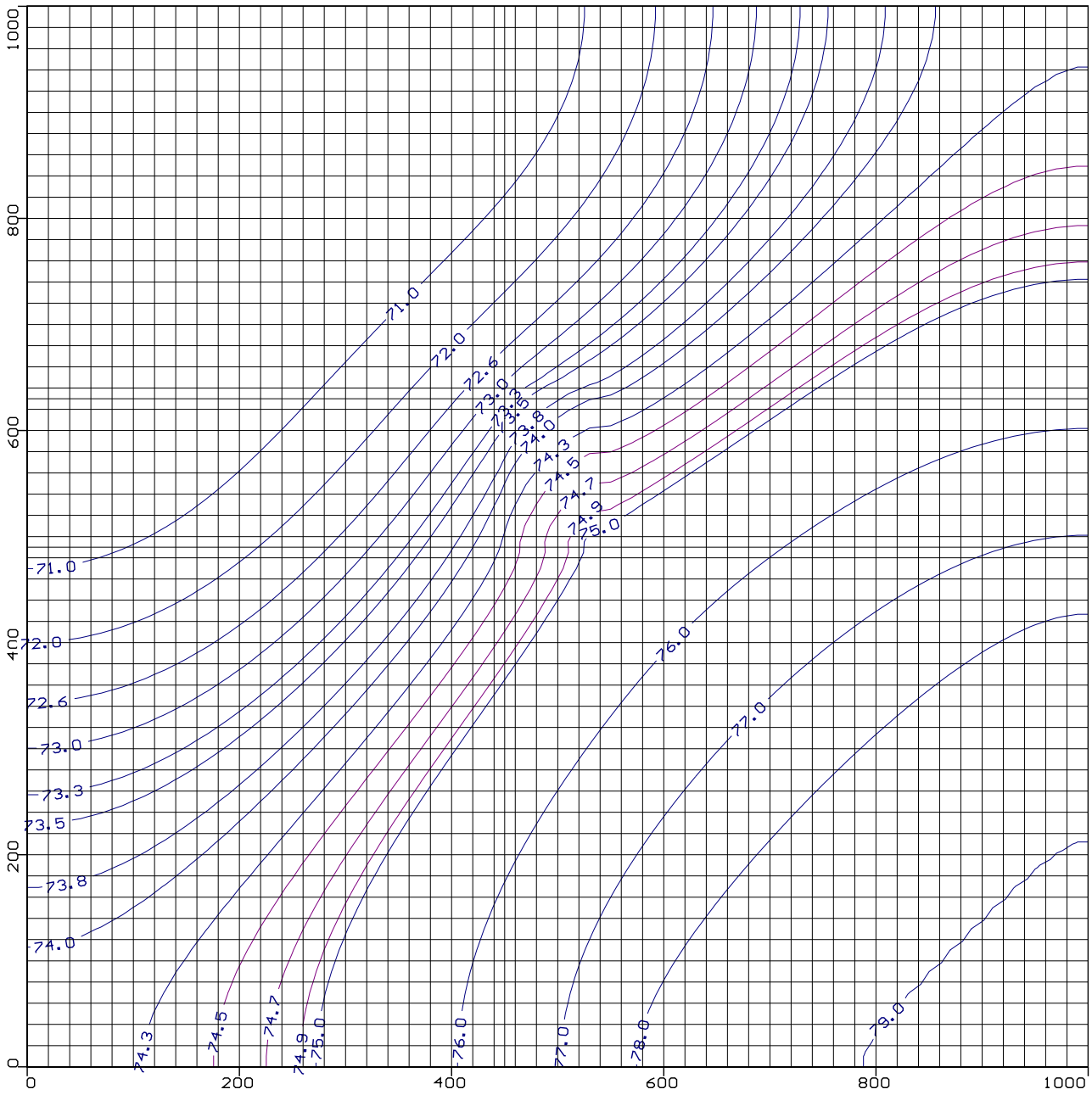
Mounding Analysis
Ambient Groundwater Conditions
North Carver Development
Carver, MA



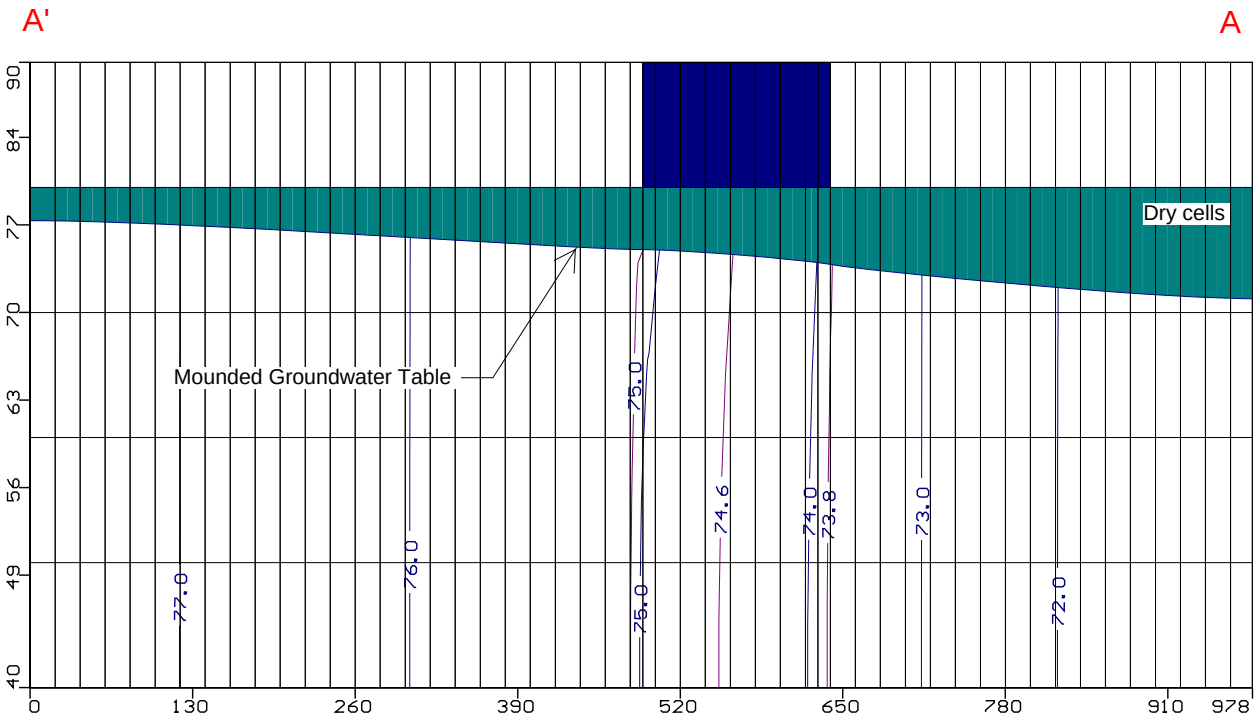
Mounding Analysis
Ambient Groundwater Conditions
Cross-Section
North Carver Development
Carver, MA



Mounding Analysis
Ambient Groundwater Conditions with Mound
North Carver Development
Carver, MA



Mounding Analysis
Mounded Groundwater Conditions
Cross-Section
North Carver Development
Carver, MA



APPENDIX E

GROUNDWATER MONITORING WELL PLAN

GROUNDWATER MONITORING PLAN

North Carver Development
Carver, Massachusetts

This Groundwater Monitoring Plan (GMP) outlines the proposed long-term groundwater sampling and water quality monitoring after construction, and during operation of, the proposed leaching fields for subsurface disposal of treated sanitary wastewater. This GMP has been prepared by Sanborn, Head & Associates, Inc. as an appendix to the *Hydrogeologic Evaluation Report, North Carver Development, Carver, MA* dated August 2018.

Monitoring Well Network

One upgradient and two downgradient monitoring well have been installed at the approximate locations shown on the attached Figure F-1. These locations are considered representative of conditions upgradient (SH-3W) and downgradient (SH-1W and SH-2W) of the proposed leaching field for the long-term groundwater quality monitoring required by the Groundwater Discharge Permit.

Proposed Monitoring Well Sampling Details

The monitoring wells will be developed and sampled in general accordance with the MassDEP *Standard References for Monitoring Wells (#WSC-310-91)*. Development water will be discharged to the ground surface via small diameter, dedicated polyethylene tubing. The pump will be raised and lowered over the well screen for thorough development until sediment is no longer visible in the development water.

Prior to each groundwater sampling event, static groundwater levels will be measured and recorded in each well. Each well will then be purged of approximately 3 to 5 well bore volumes of water, or until dry. Purging will be completed with a submersible pump or a dedicated or disposable, high density polyethylene (HDPE) bailer tied to a dedicated nylon rope. Purge water will be collected in a bucket and discharged to the ground surface adjacent to the well. After each well has been allowed sufficient time to recover, groundwater samples will be carefully collected using either a disposable or pre-cleaned bailer and placed in laboratory supplied containers. An additional sample will be obtained concurrently for field measurement of pH and specific conductance at the time of sample collection. The laboratory samples will be placed on ice in coolers and transported to a Massachusetts certified analytical laboratory under a valid chain-of-custody. Clean, disposable latex or nitrile gloves shall be worn by the sampler and changed between wells.

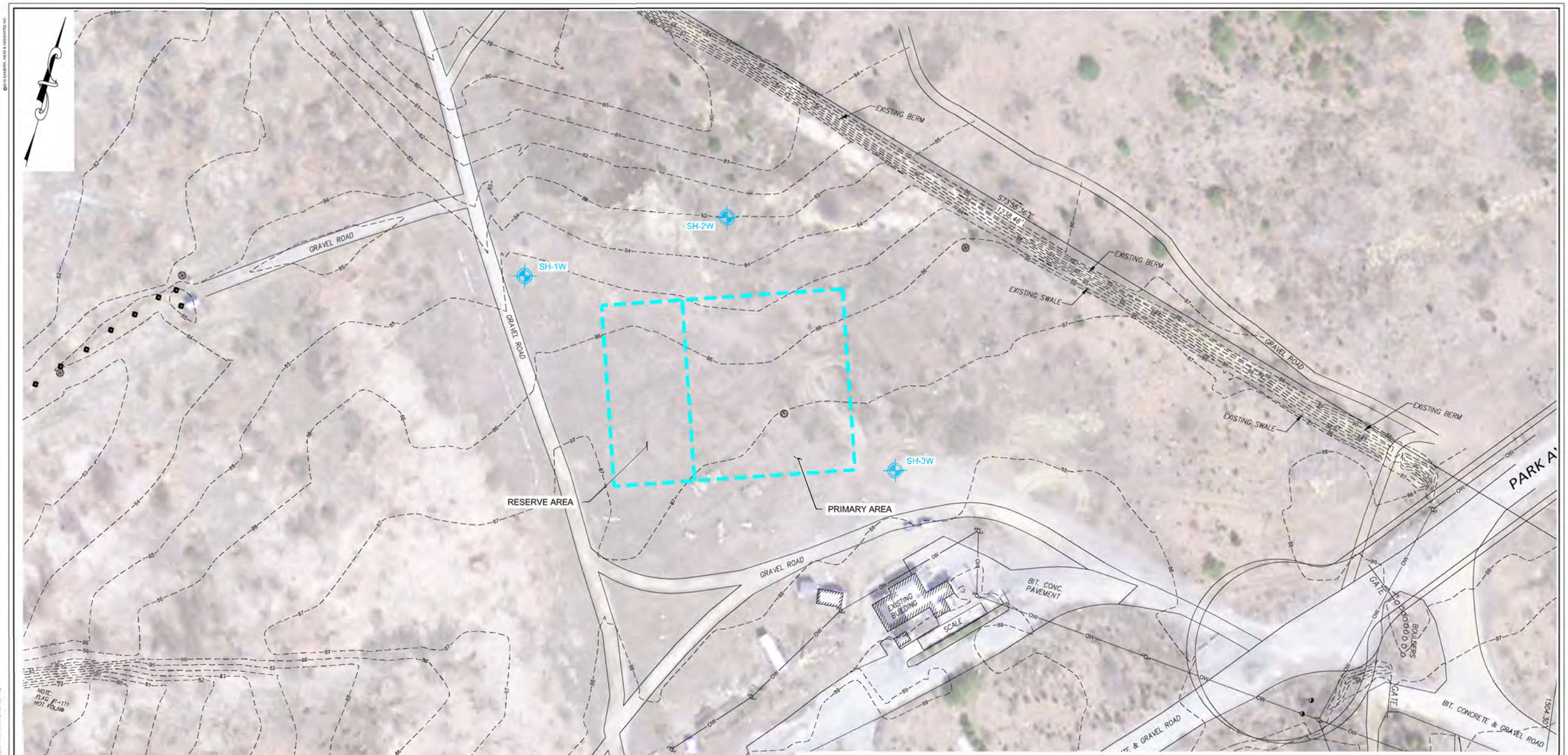
Groundwater Monitoring Reports Submitted to MassDEP

An Initial Groundwater Monitoring Report will be submitted to DEP before treated wastewater is introduced to the proposed leaching field. The report will include the

logs of the test borings with monitoring well construction details, a surveyed site plan that includes the as-built location of the leaching field, the locations of the monitoring wells to be used for long-term monitoring, the elevation of the top of monitoring well protective casings, the elevation of the top of PVC well casings, the ground elevation at each monitoring well, and the results of the initial round of groundwater quality sampling performed before wastewater is introduced to the leaching field.

After the wastewater treatment plant is operating, groundwater samples will be collected from the monitoring wells monthly and analyzed for pH, specific conductance, quarterly for nitrate nitrogen, total nitrogen, total phosphorus, orthophosphate, and annually for VOCs by EPA Method 624, or another list of parameters as specified in the Groundwater Discharge Permit Conditions. The treatment plant operator will forward the quarterly laboratory reports to MassDEP within 10 days of receipt from the laboratory.

Each year, an Annual Groundwater Monitoring Summary Report will be prepared and submitted to MassDEP to keep the files organized, identify significant data trends or permit exceedances, and any corrective actions taken. Each annual report will include summary tables that compare the analytical data for the current year to historical data previously obtained. Quarterly laboratory analytical reports for the prior year will be included as appendices to the report.



NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "BASEMAP - EXISTING CONDITIONS", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, RECEIVED SEPTEMBER 25, 2017 WITH AN ORIGINAL SCALE OF 1" = 20'.
2. EXPLORATIONS DESIGNATED SH-1W THROUGH SH-3W WERE ADVANCED BY CRAWFORD DRILLING SERVICES, LLC (CDS) OF WESTMINSTER, MA AND OBSERVED BY SANBORN HEAD ON JUNE 15, 2018.
3. APPROXIMATE LOCATIONS OF EXPLORATIONS WERE MARKED IN THE FIELD USING A TOPCON GRS-1 GLOBAL POSITIONING SYSTEM (GPS) AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

SH-1W — APPROXIMATE LOCATION AND DESIGNATION OF GROUNDWATER MONITORING WELL (JUNE 2018)

APPROXIMATE EXTENTS OF PROPOSED LEACHING BEDS

SANBORN HEAD

GRAPHICAL SCALE
40' 20' 0' 40' 80'

DRAFT

NO	DATE	DESCRIPTION	BY

DRAWN BY: C.GREEN
DESIGNED BY: M.RUBERTI
REVIEWED BY: M.HEIL
PROJECT MGR: Q.PRATT
PIC: S.SADKOWSKI
DATE: AUGUST 2018

HYDROGEOLOGICAL EVALUATION REPORT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

PROPOSED GROUNDWATER MONITORING WELL PLAN

PROJECT NUMBER: 4250.01

SHEET NUMBER: E.1

APPENDIX B: Transportation Supporting Documentation

1. NCHRP: Development of Left-Turn Lane Warrants for Unsignalized Intersections
2. Synchro Results
3. Concept Plans

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NCHRP

Web-Only Document 193:

Development of Left-Turn Lane Warrants for Unsignalized Intersections

Kay Fitzpatrick
Marcus A. Brewer
Jerome S. Gluck
William L. Eisele
Yunlong Zhang
Herbert S. Levinson
Wyndylyn von Zharen
Matthew R. Lorenz
Vichika Iragavarapu
Eun Sug Park

Texas Transportation Institute
College Station, TX

Contractor's Final Report for NCHRP Project 03-91
Submitted November 2010

National Cooperative Highway Research Program
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

2025 BD-NIT XX(XX)=AM(PM)
2018 EX XX(XX) = AM(PM)

(5%) 10% (10%) 20%

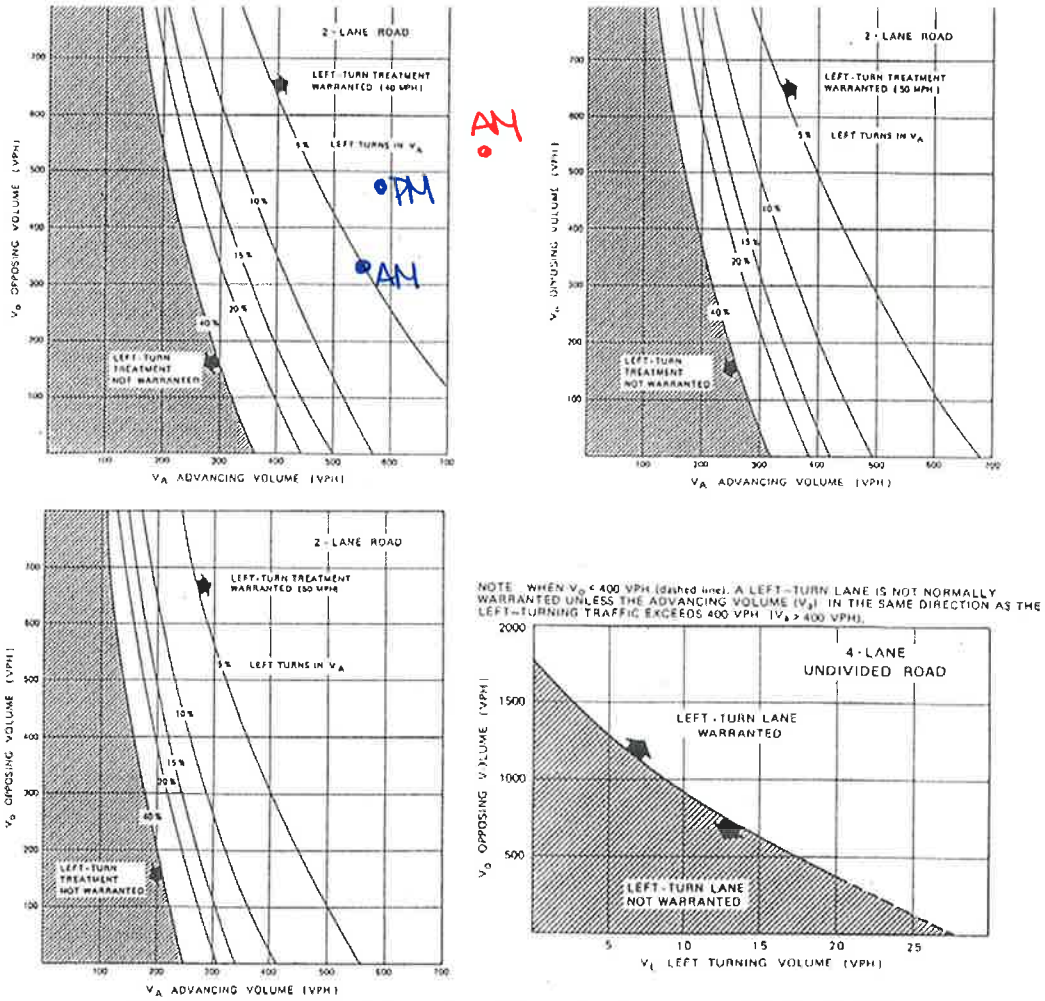
Table 2. AASHTO (5) guide for left-turn lanes on two-lane highways, 2004.

Operating Speed (mph)	Opposing Volume (veh/hr)	Advancing Volume (veh/hr)			
		5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
40	800	330	240	180	160
	600	410	305	225	200
	400	510	380	275	245
	200	640	470	350	305
	100	720	515	390	340
50	800	280	210	165	135
	600	350	260	195	170
	400	430	320	240	210
	200	550	400	300	270
	100	615	445	335	295
60	800	230	170	125	115
	600	290	210	160	140
	400	365	270	200	175
	200	450	330	250	215
	100	505	370	275	240

NCHRP Report 279

In 1985, the Transportation Research Board published *NCHRP Report 279, Intersection Channelization Design Guide (10).* In that report, data from Harmelink's work are used to establish guidelines for determining the need for a left-turn lane. The following advice is provided for unsignalized intersections within new construction:

1. Left-turn lanes should be considered at all median crossovers on divided, high-speed highways.
2. Left-turn lanes should be provided at all unstopped (i.e., through) approaches of primary, high-speed rural highway intersections with other arterials or collectors.
3. Left-turn lanes are recommended at approaches to intersections for which the combination of through, left, and opposing volumes exceeds the warrants shown in Figure 3.
4. Left-turn lanes on stopped or secondary approaches should be provided based on analysis of the capacity and operations of the unsignalized intersection. Considerations include minimizing delays to right-turning or through vehicles and total approach capacity.



Source: Neuman, T., *Intersection Channelization Design Guide, NCHRP Report 279*. Copyright, National Academy of Sciences, Washington, D.C., 1985.

Figure 3. *NCHRP Report 279* (*10*) left-turn lane guidelines, 1985.

NCHRP Report 279 also provides guidance for reconstruction/rehabilitation. The report states:

> Addition of left-turn lanes at existing intersections should be considered if safety or capacity problems occur, or if land-use changes are expected to produce significant shifts in local traffic patterns (such as increases in left-turn demand). Left-turn lanes can often be added within existing street widths by removing parking, narrowing of lanes or a combination of the two.

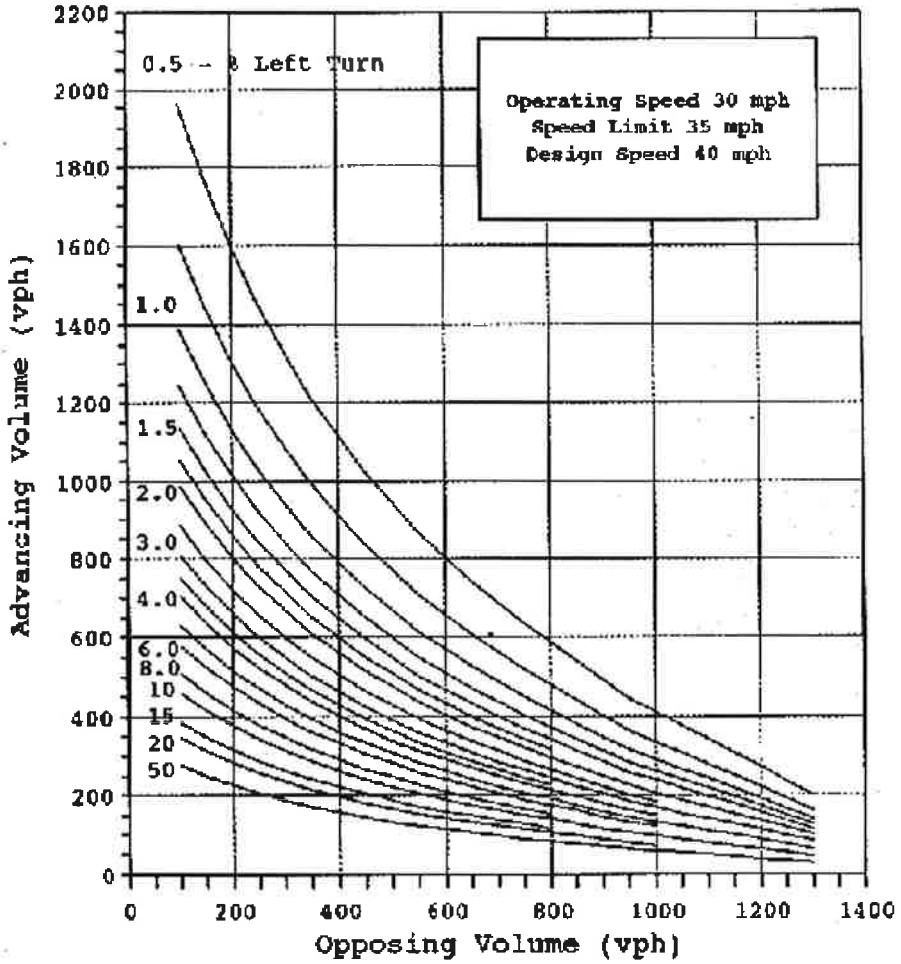
The traffic volume guidelines described for new intersections are also appropriate for evaluating the need for left-turn lanes at existing intersections. In terms of safety, the following guidelines are suggested:

- Left-turn lanes should be considered at intersection approaches that experience a significant number of left-turn-involved (rear-end, left-turn angle, or same direction sideswipe) accidents. A total of four or more such accidents in 12 months, or six or more in 24 months, is considered appropriate.

- When room for separate left-turn lanes is not available, traffic control alternatives should be investigated. Such alternatives to left-turn lane implementation include split phasing at signalized intersections (i.e., operating each approach individually) or prohibition of left turns.

Oppenlander and Bianchi (ITE Technical Committee)

Institute of Transportation Engineers (ITE) Technical Committee 4A-22 (*11*) in the 1980s undertook the task of developing criteria for the provision of separate left-turn lanes at unsignalized and signalized intersections. The work performed by ITE Committee 4A-22 expanded the Harmelink model to include additional speeds (30- and 70-mph roadways) and to include additional left-turn percentages. An example of one of the guideline graphs produced is shown in Figure 4.



Source: Copyright, Institute of Transportation Engineers, Washington, D.C., www.ite.org, 1990. Reproduced with permission.

Figure 4. Oppenlander and Bianchi (*11*) left-turn lane guidelines; unsignalized, two-lane, 30-mph operating speed, 1990.

NCHRP Report 457

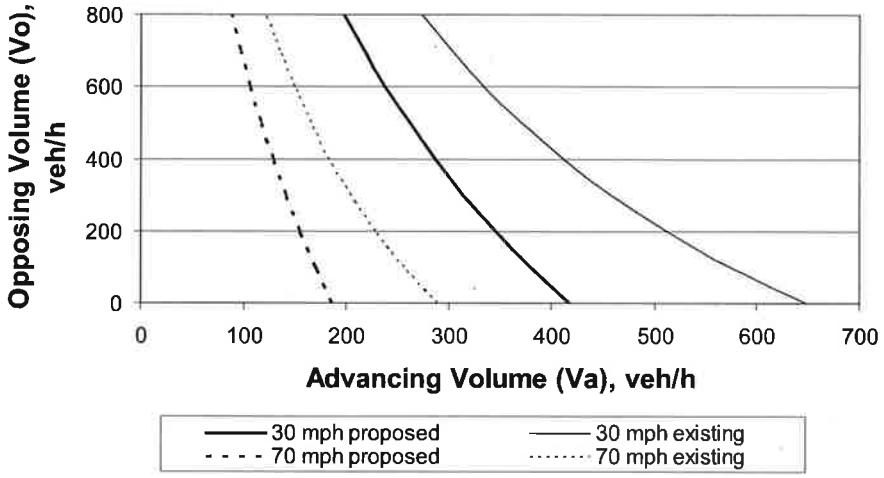
In 2001, Bonneson and Fontaine (*12*) in *NCHRP Report 457* discussed the determination of when to consider a left-turn lane. They cited work by Neuman (*10*) (which was based on the Harmelink model) and re-created the Harmelink model as an interactive spreadsheet (available on the Internet in the NCHRP report at http://trb.org/publications/nchrp/esg/esg.pdf).

Fitzpatrick and Wolff

In 2003, Fitzpatrick and Wolff (*13*) used the following findings from current research in the Harmelink model:

- Critical gap of 5.5 sec (rather than 5.0 sec),
- Time to make a left turn of 4.3 sec (rather than 3.0 sec), and
- Time to clear the lane of 3.2 sec (rather than 1.9 sec).

Table 3 lists the developed suggested guidelines for installing left-turn lanes for operating speeds of 30, 50, and 70 mph. Figure 5 illustrates the changes in the curves for 30 and 70 mph between Fitzpatrick and Wolff and AASHTO.



Source: Fitzpatrick, K., and T. Wolff, "Left-Turn Lane Installation Guidelines," in *2nd Urban Street Symposium,* sponsored by Transportation Research Board, July 2003. Reproduced with permission of the authors.

Figure 5. Fitzpatrick and Wolff (*13*) comparison of existing to proposed guidelines (example uses 10 percent left turns), 2003.

Table 3. Fitzpatrick and Wolff (*13*) guidelines for installing left-turn lanes on two-lane highways, 2003.

Speed (mph)	V_o	Percent Left Turns		
		10	20	40
30	800	197	148	121
	700	217	162	133
	600	238	178	146
	500	261	196	160
	400	286	215	175
	300	314	236	193
	200	345	259	211
	100	380	285	232
	0	418	313	256
50	800	153	115	94
	700	168	126	103
	600	184	138	113
	500	202	152	124
	400	222	166	136
	300	244	183	149
	200	268	201	164
	100	294	221	180
	0	323	243	198
70	800	88	66	54
	700	97	73	59
	600	106	80	65
	500	117	88	71
	400	128	96	78
	300	141	105	86
	200	154	116	95
	100	170	127	104
	0	187	140	114

Van Schalkwyk and Stover

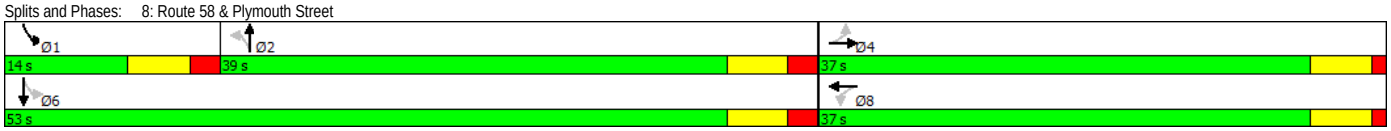
In 2007, Van Schalkwyk and Stover (*14*) discussed additional refinements to the Harmelink curves with a focus on the needs of older drivers. Their paper includes a table of recommended left-turn warrants (see Table 4). They concluded that the left-turn warrants based on Harmelink's 1967 work substantially overestimate the volumes that warrant left-turn lanes. In addition to older driver consideration, they recommended additional research into the differences between positioned and unpositioned drivers.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	280	50	20	30	265	20	675	10	100	360	95
Future Volume (vph)	160	280	50	20	30	265	20	675	10	100	360	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	110		0	220		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	1767	0	0	1656	0	1626	1842	0	1752	1718	0
Flt Permitted		0.649			0.955		0.483			0.096		
Satd. Flow (perm)	0	1166	0	0	1586	0	827	1842	0	177	1718	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			274			1			22	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		725			635			540			741	
Travel Time (s)		16.5			14.4			12.3			16.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	7%	10%	0%	1%	11%	3%	0%	3%	8%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	532	0	0	343	0	22	745	0	109	494	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		15.0	15.0		8.0	15.0	
Minimum Split (s)	13.0	13.0		13.0	13.0		21.0	21.0		14.0	21.0	
Total Split (s)	37.0	37.0		37.0	37.0		39.0	39.0		14.0	53.0	
Total Split (%)	41.1%	41.1%		41.1%	41.1%		43.3%	43.3%		15.6%	58.9%	
Maximum Green (s)	32.0	32.0		32.0	32.0		33.0	33.0		8.0	47.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		Max	Max		Max	Max		None	Max	
Act Effct Green (s)		32.0			32.0		35.8	35.8		47.0	47.0	
Actuated g/C Ratio		0.36			0.36		0.40	0.40		0.52	0.52	
v/c Ratio		1.27			0.46		0.07	1.02		0.47	0.54	
Control Delay		167.1			7.4		19.4	67.6		18.8	16.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		167.1			7.4		19.4	67.6		18.8	16.4	
LOS		F			A		B	E		B	B	
Approach Delay		167.1			7.4			66.2			16.9	
Approach LOS		F			A			E			B	
Queue Length 50th (ft)		~386			26		8	~488		30	169	
Queue Length 95th (ft)		#585			92		25	#709		63	260	
Internal Link Dist (ft)		645			555			460			661	
Turn Bay Length (ft)							110			220		
Base Capacity (vph)		419			740		329	733		232	907	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		1.27			0.46		0.07	1.02		0.47	0.54	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.27
Intersection Signal Delay: 67.9 Intersection LOS: E
Intersection Capacity Utilization 106.8% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Route 58 & Plymouth Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	785	10	135	650	15	30	180	235	40	115	0
Future Volume (vph)	30	785	10	135	650	15	30	180	235	40	115	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	700		700	750		750	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1805	1827	1615	1787	1845	1615	0	1731	0	0	1847	0
Flt Permitted	0.950			0.950				0.969			0.538	
Satd. Flow (perm)	1805	1827	1615	1787	1845	1615	0	1682	0	0	1007	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			97			97		59				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1956			1829			496			994	
Travel Time (s)		44.5			41.6			11.3			22.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	0%	1%	3%	0%	3%	1%	2%	3%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	33	853	11	147	707	16	0	484	0	0	168	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Detector Phase	5	2	2	1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	8.0	10.0	10.0	8.0	10.0	10.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	13.0	16.0	16.0	13.0	16.0	16.0	14.0	14.0		14.0	14.0	
Total Split (s)	13.0	49.0	49.0	13.0	49.0	49.0	28.0	28.0		28.0	28.0	
Total Split (%)	14.4%	54.4%	54.4%	14.4%	54.4%	54.4%	31.1%	31.1%		31.1%	31.1%	
Maximum Green (s)	8.0	43.0	43.0	8.0	43.0	43.0	22.0	22.0		22.0	22.0	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0		6.0			6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Min	Min	None	Min	Min	None	None		None	None	
Act Effct Green (s)	8.0	42.9	42.9	8.0	48.1	48.1		22.0			22.0	
Actuated g/C Ratio	0.09	0.48	0.48	0.09	0.54	0.54		0.24			0.24	
v/c Ratio	0.21	0.98	0.01	0.93	0.72	0.02		1.06			0.68	
Control Delay	41.5	50.6	0.0	98.4	22.7	0.1		90.8			46.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	41.5	50.6	0.0	98.4	22.7	0.1		90.8			46.9	
LOS	D	D	A	F	C	A		F			D	
Approach Delay		49.6			35.1			90.8			46.9	
Approach LOS		D			D			F			D	
Queue Length 50th (ft)	18	456	0	85	326	0		~279			87	
Queue Length 95th (ft)	47	#723	0	#199	#491	0		#472			#179	
Internal Link Dist (ft)		1876			1749			416			914	
Turn Bay Length (ft)	700		700	750		750						
Base Capacity (vph)	160	873	823	158	987	909		455			246	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	
Storage Cap Reductn	0	0	0	0	0	0		0			0	
Reduced v/c Ratio	0.21	0.98	0.01	0.93	0.72	0.02		1.06			0.68	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 89.9
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 52.5 Intersection LOS: D
Intersection Capacity Utilization 90.0% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

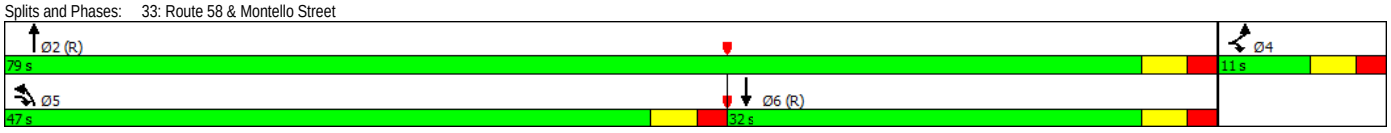
Splits and Phases: 11: Route 105 & Route 44

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	20	155	520	435	380	75
Future Volume (vph)	20	155	520	435	380	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175	0	0			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Satd. Flow (prot)	1805	1442	1752	1845	1784	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1442	1752	1845	1784	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		168			11	
Link Speed (mph)	30			30	30	
Link Distance (ft)	491			461	2309	
Travel Time (s)	11.2			10.5	52.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	12%	3%	3%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	168	565	473	495	0
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 5	5	2	6	
Permitted Phases						
Detector Phase	4	4 5	5	2	6	
Switch Phase						
Minimum Initial (s)	6.0		6.0	10.0	10.0	
Minimum Split (s)	11.0		11.0	15.0	15.0	
Total Split (s)	11.0		47.0	79.0	32.0	
Total Split (%)	12.2%		52.2%	87.8%	35.6%	
Maximum Green (s)	6.0		42.0	74.0	27.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		None	C-Min	C-Min	
Act Effct Green (s)	6.0	45.8	34.8	74.0	34.2	
Actuated g/C Ratio	0.07	0.51	0.39	0.82	0.38	
v/c Ratio	0.18	0.21	0.83	0.31	0.72	
Control Delay	43.5	2.1	27.0	1.9	33.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	43.5	2.1	27.0	1.9	33.1	
LOS	D	A	C	A	C	
Approach Delay	6.9			15.6	33.1	
Approach LOS	A			B	C	
Queue Length 50th (ft)	12	0	177	72	237	
Queue Length 95th (ft)	36	24	217	31	#454	
Internal Link Dist (ft)	411			381	2229	
Turn Bay Length (ft)	175					
Base Capacity (vph)	120	918	817	1517	684	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.18	0.18	0.69	0.31	0.72	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 19.7 Intersection LOS: B
Intersection Capacity Utilization 70.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 33: Route 58 & Montello Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	45	60	30	25	135	30	500	20	255	865	80
Future Volume (vph)	140	45	60	30	25	135	30	500	20	255	865	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	110		0	220		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		725			635			540			741	
Travel Time (s)		16.5			14.4			12.3			16.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	0%	2%	0%	0%	0%	0%	2%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	266	0	0	207	0	33	565	0	277	1027	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		15.0	15.0		8.0	15.0	
Minimum Split (s)	13.0	13.0		13.0	13.0		21.0	21.0		14.0	21.0	
Total Split (s)	25.0	25.0		25.0	25.0		40.0	40.0		15.0	55.0	
Total Split (%)	31.3%	31.3%		31.3%	31.3%		50.0%	50.0%		18.8%	68.8%	
Maximum Green (s)	20.0	20.0		20.0	20.0		34.0	34.0		9.0	49.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	None	None		Max	Max		Max	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.0			20.0		34.2	34.2		49.0	49.0	
Actuated g/C Ratio		0.25			0.25		0.43	0.43		0.61	0.61	
v/c Ratio		0.87			0.41		0.34	0.71		0.68	0.90	
Control Delay		56.7			11.2		27.7	24.9		16.8	26.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		56.7			11.2		27.7	24.9		16.8	26.1	
LOS		E			B		C	C		B	C	
Approach Delay		56.7			11.2			25.1			24.1	
Approach LOS		E			B			C			C	
Queue Length 50th (ft)		119			23		11	224		57	395	
Queue Length 95th (ft)		#257			78		39	344		#98	#710	
Internal Link Dist (ft)		645			555			460			661	
Turn Bay Length (ft)							110			220		
Base Capacity (vph)		305			506		96	793		408	1142	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.87			0.41		0.34	0.71		0.68	0.90	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 106.3% ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Route 58 & Plymouth Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	655	55	170	745	40	25	140	210	20	180	0
Future Volume (vph)	105	655	55	170	745	40	25	140	210	20	180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	700		700	750		750	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1956			1829			496			994	
Travel Time (s)		44.5			41.6			11.3			22.6	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	3%	0%	0%	3%	0%	0%	2%	2%	5%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	114	712	60	185	810	43	0	407	0	0	218	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Detector Phase	5	2	2	1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	8.0	10.0	10.0	8.0	10.0	10.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	13.0	16.0	16.0	13.0	16.0	16.0	14.0	14.0		14.0	14.0	
Total Split (s)	13.0	47.0	47.0	16.0	50.0	50.0	27.0	27.0		27.0	27.0	
Total Split (%)	14.4%	52.2%	52.2%	17.8%	55.6%	55.6%	30.0%	30.0%		30.0%	30.0%	
Maximum Green (s)	8.0	41.0	41.0	11.0	44.0	44.0	21.0	21.0		21.0	21.0	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0		6.0			6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	2.0	2.0	3.0	2.0	2.0	3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min	Min	None	Min	Min	None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	8.1	37.5	37.5	10.8	40.2	40.2		20.2			20.2	
Actuated g/C Ratio	0.09	0.44	0.44	0.13	0.47	0.47		0.24			0.24	
v/c Ratio	0.67	0.88	0.08	0.81	0.94	0.05		0.92			0.57	
Control Delay	60.4	36.5	1.4	66.2	41.0	0.1		55.6			36.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	60.4	36.5	1.4	66.2	41.0	0.1		55.6			36.8	
LOS	E	D	A	E	D	A		E			D	
Approach Delay		37.2			43.8			55.6			36.8	
Approach LOS		D			D			E			D	
Queue Length 50th (ft)	64	346	0	105	401	0		194			110	
Queue Length 95th (ft)	#147	#563	9	#220	#650	1		#372			185	
Internal Link Dist (ft)		1876			1749			416			914	
Turn Bay Length (ft)	700		700	750		750						
Base Capacity (vph)	169	890	829	233	956	883		461			398	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	
Storage Cap Reductn	0	0	0	0	0	0		0			0	
Reduced v/c Ratio	0.67	0.80	0.07	0.79	0.85	0.05		0.88			0.55	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 85.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 42.8 Intersection LOS: D
Intersection Capacity Utilization 86.1% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Route 105 & Route 44

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	65	470	175	585	525	25
Future Volume (vph)	65	470	175	585	525	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)	175	0	0			0
Storage Lanes	1	1	1			0
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			30	30	
Link Distance (ft)	709			461	2309	
Travel Time (s)	16.1			10.5	52.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	4%	10%	2%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	71	511	190	636	598	0
Turn Type	Prot	pt+ov	Prot	NA	NA	
Protected Phases	4	4 5	5	2	6	
Permitted Phases						
Detector Phase	4	4 5	5	2	6	
Switch Phase						
Minimum Initial (s)	6.0		6.0	10.0	10.0	
Minimum Split (s)	11.0		11.0	15.0	15.0	
Total Split (s)	21.0		25.0	69.0	44.0	
Total Split (%)	23.3%		27.8%	76.7%	48.9%	
Maximum Green (s)	16.0		20.0	64.0	39.0	
Yellow Time (s)	3.0		3.0	3.0	3.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Minimum Gap (s)	3.0		3.0	3.0	3.0	
Time Before Reduce (s)	0.0		0.0	0.0	0.0	
Time To Reduce (s)	0.0		0.0	0.0	0.0	
Recall Mode	None		None	C-Min	C-Min	
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	16.7	37.0	15.4	63.3	43.0	
Actuated g/C Ratio	0.19	0.41	0.17	0.70	0.48	
v/c Ratio	0.21	0.68	0.68	0.49	0.67	
Control Delay	32.5	17.2	48.2	4.9	24.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	32.5	17.2	48.2	4.9	24.0	
LOS	C	B	D	A	C	
Approach Delay	19.1			14.9	24.0	
Approach LOS	B			B	C	
Queue Length 50th (ft)	33	128	88	72	276	
Queue Length 95th (ft)	73	237	m153	91	405	
Internal Link Dist (ft)	629			381	2229	
Turn Bay Length (ft)	175					
Base Capacity (vph)	350	820	364	1341	897	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.20	0.62	0.52	0.47	0.67	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 18.8 Intersection LOS: B
Intersection Capacity Utilization 66.6% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 33: Route 58 & Montello Street

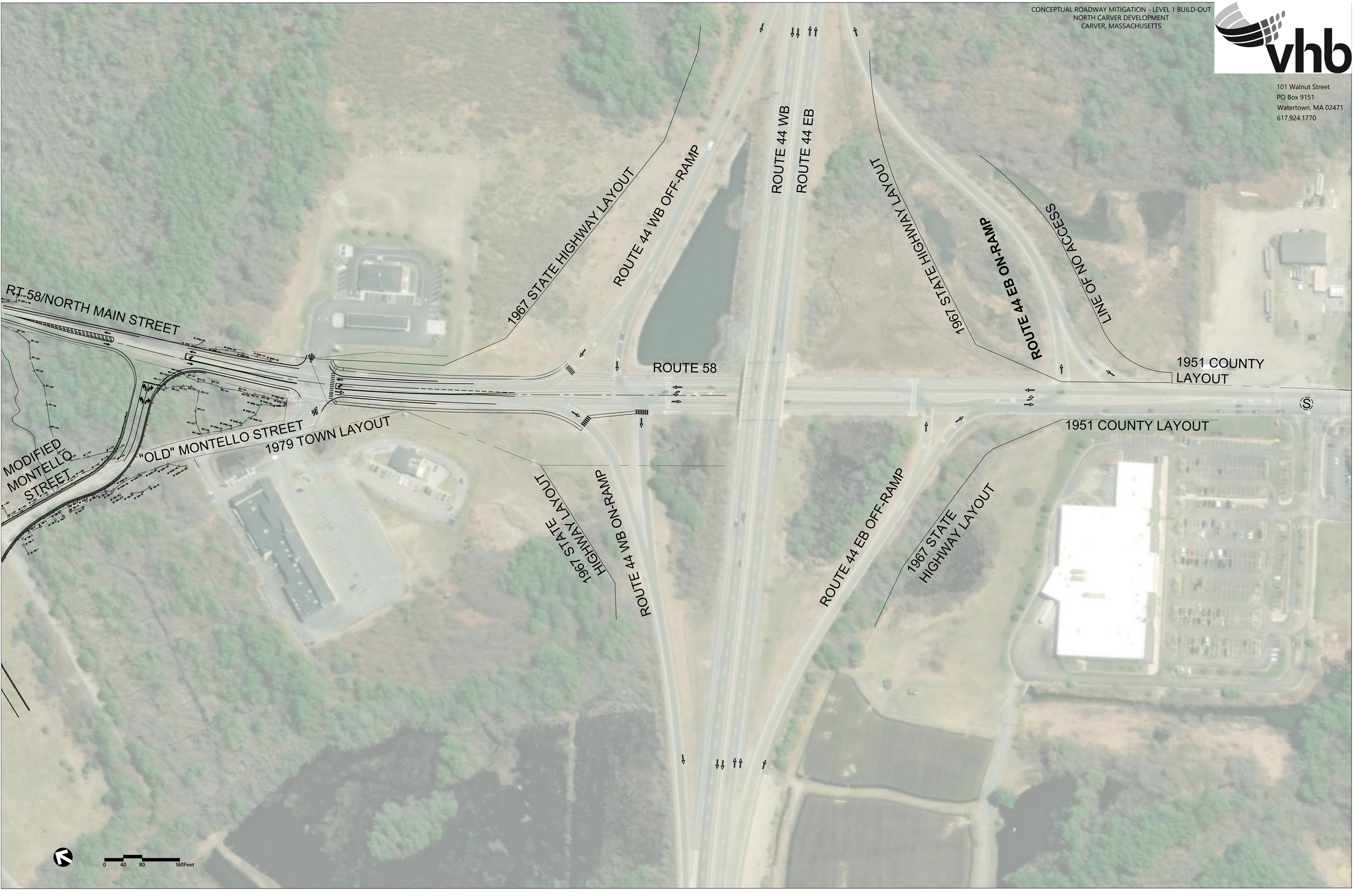
CONCEPTUAL ROADWAY MITIGATION - FULL BUILD-OUT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

vhb
101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

RT 58/NORTH MAIN STREET
MODIFIED MONTELLO STREET
"OLD" MONTELLO STREET
1979 TOWN LAYOUT
1967 STATE HIGHWAY LAYOUT
ROUTE 44 WB OFF-RAMP
ROUTE 44 WB
ROUTE 44 EB
1967 STATE HIGHWAY LAYOUT
ROUTE 44 EB ON-RAMP
LINE OF NO ACCESS
1951 COUNTY LAYOUT
ROUTE 58
5' SHOULDER
5' SHOULDER
1951 COUNTY LAYOUT
1967 STATE HIGHWAY LAYOUT
ROUTE 44 WB ON-RAMP
ROUTE 44 EB OFF-RAMP
1967 STATE HIGHWAY LAYOUT
23'
22'
30'
58'
58'
30'
58'
58'
30'
24'
20'
20'
20'
20'
0 40 80 160 Feet

CONCEPTUAL ROADWAY MITIGATION - LEVEL 1 BUILD-OUT
NORTH CARVER DEVELOPMENT
CARVER, MASSACHUSETTS

vhb
101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770



APPENDIX C: AIR QUALITY AND GREENHOUSE GAS SUPPORTING DOCUMENTATION

MOVES Emissions Factor Output
Mobile Source Mesoscale Analysis
Energy Modeling
Stationary Source Analysis
Solar Feasibility Analysis

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MOVES Emissions Factor Output

Route 44 Carver Emission Factors from MOVES2014a							
		2017 Emission Factors			2025 Emission Factors		
#	Link	NOx	VOC	CO2	NOx	VOC	CO2
1	Route 58 (Palmer/Mayflower)	0.36	0.34	488.8	0.19	0.24	404.1
2	Parsonage Rd (Winnetuxet/Route58)	0.34	0.19	442.0	0.19	0.13	365.1
3	Mayflower Rd (Route58/Colchester)	0.31	0.18	416.9	0.17	0.13	344.2
4	Route 58 (Mayflower/Montello)	0.30	0.14	399.8	0.17	0.10	330.1
5	Montello St (Route58/ProjDwy)	0.31	0.34	444.8	0.16	0.24	367.5
6	Route 58 (Montello N/Montello S)	0.29	0.22	391.7	0.16	0.16	323.3
7	Montello St (Proj Drwy/North Plaza Dwy)	0.34	0.40	467.5	0.18	0.29	386.4
8	N Plaza Dwy (Montello/End)	0.53	1.07	859.2	0.26	0.78	708.3
9	Montello St (N Plaza Dwy/S Plaza Dwy)	0.33	2.00	462.8	0.17	1.51	382.5
10	S Plaza Dwy (Montello/End)	0.52	1.18	855.0	0.26	0.86	704.7
11	Montello St (S Plaza Dwy/Route 58)	0.41	3.91	529.4	0.22	2.97	438.1
12	Gas Station Dwy (Route58/End)	0.54	1.75	863.8	0.27	1.30	712.2
13	Route 58 (Montello S/ Rt44WBRamps)	0.33	0.67	424.2	0.18	0.50	350.4
14	Route 44 WB On-Ramp (Route58/Route44)	0.37	0.41	461.4	0.20	0.30	381.2
15	Route 44 WB Off-Ramp (Route58/Route44)	0.29	0.39	420.3	0.15	0.28	347.0
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	0.30	0.71	396.2	0.16	0.53	327.1
17	Route 44 EB On-Ramp (Route58/Route44)	0.33	0.36	429.0	0.18	0.26	354.2
18	Route 44 EB Off-Ramp (Route58/Route44)	0.25	0.40	391.1	0.13	0.29	322.6
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	0.31	1.61	431.3	0.17	1.22	356.0
20	Route 58 (Rt44EBOnRamps/High)	0.39	0.50	496.3	0.21	0.37	410.3
21	High St (Route58/Gate)	0.31	0.20	442.7	0.16	0.14	365.7
22	Route 58 (High/Plymouth)	0.33	0.64	445.1	0.18	0.47	367.5
23	Plymouth St (Wall/Route58)	0.31	0.15	442.7	0.16	0.10	365.7
24	Plymouth St (Route58/Braddock)	0.42	0.73	601.9	0.21	0.53	496.9
25	Route 58 (Plymouth/Forest)	0.37	0.27	451.4	0.20	0.19	373.0
26	Route 44 (Route105/Route58)	0.29	0.09	377.4	0.16	0.06	311.4
27	Route 105 (Thompson/Route44)	0.32	0.22	435.3	0.17	0.15	359.3
28	Route 105 (Rt44/Plymouth)	0.31	0.34	425.5	0.16	0.25	351.2
29	Route 44 (Rotary/Rt105)	0.30	0.09	388.0	0.17	0.06	320.2
30	Route 28 (Leona/Rotary)	0.35	0.21	438.9	0.20	0.15	362.6
31	Route 44 (I495 Ramps/Rotary)	0.35	0.44	423.4	0.19	0.33	349.8
32	Route 18 (Rotary/I495 Ramps)	0.33	0.44	419.5	0.18	0.33	346.5
33	Route 28 (Rotary/Anderson)	0.32	0.18	408.5	0.17	0.12	337.3
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	0.29	0.22	391.7	0.16	0.16	323.3
35	Project Driveway [BDMIT Only]	0.34	0.19	442.0	0.19	0.13	365.1
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	0.29	0.22	391.7	0.16	0.16	323.3
37	Idle Link	2.29	1.51	4102.9	0.93	0.95	3349.6

2018 NOx MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits	Emission Factor
2018	7	5	16	25	25023	250230	1	3	0.11985904	0.363209197	g	mi	
2018	7	5	16	25	25023	250230	2	3	0.256366044	0.341821392	g	mi	
2018	7	5	16	25	25023	250230	3	3	0.245962471	0.311344891	g	mi	
2018	7	5	16	25	25023	250230	4	3	0.363303304	0.302752741	g	mi	
2018	7	5	16	25	25023	250230	5	3	0.100160614	0.313001925	g	mi	
2018	7	5	16	25	25023	250230	6	3	0.152408406	0.293093099	g	mi	
2018	7	5	16	25	25023	250230	7	3	0.088085048	0.338788658	g	mi	
2018	7	5	16	25	25023	250230	8	3	0.047610302	0.529003329	g	mi	
2018	7	5	16	25	25023	250230	9	3	0.013326671	0.333166782	g	mi	
2018	7	5	16	25	25023	250230	10	3	0.041942019	0.524275249	g	mi	
2018	7	5	16	25	25023	250230	11	3	0.008189834	0.409491695	g	mi	
2018	7	5	16	25	25023	250230	12	3	0.02681417	0.536283396	g	mi	
2018	7	5	16	25	25023	250230	13	3	0.043527927	0.334830222	g	mi	
2018	7	5	16	25	25023	250230	14	3	0.087642677	0.36517783	g	mi	
2018	7	5	16	25	25023	250230	15	3	0.074364096	0.286015764	g	mi	
2018	7	5	16	25	25023	250230	16	3	0.03579532	0.298294339	g	mi	
2018	7	5	16	25	25023	250230	17	3	0.09140759	0.326455676	g	mi	
2018	7	5	16	25	25023	250230	18	3	0.062961899	0.251847595	g	mi	
2018	7	5	16	25	25023	250230	19	3	0.015620262	0.312405243	g	mi	
2018	7	5	16	25	25023	250230	20	3	0.074093394	0.389965236	g	mi	
2018	7	5	16	25	25023	250230	21	3	0.239259079	0.310726084	g	mi	
2018	7	5	16	25	25023	250230	22	3	0.046074983	0.329107018	g	mi	
2018	7	5	16	25	25023	250230	23	3	0.506483138	0.310725852	g	mi	
2018	7	5	16	25	25023	250230	24	3	0.054584149	0.419878087	g	mi	
2018	7	5	16	25	25023	250230	25	3	0.1543511	0.367502631	g	mi	
2018	7	5	16	25	25023	250230	26	3	1.20468688	0.294544458	g	mi	
2018	7	5	16	25	25023	250230	27	3	0.193401054	0.3170509	g	mi	
2018	7	5	16	25	25023	250230	28	3	0.091659091	0.305530293	g	mi	
2018	7	5	16	25	25023	250230	29	3	1.207123756	0.299534415	g	mi	
2018	7	5	16	25	25023	250230	30	3	0.211284757	0.352141247	g	mi	
2018	7	5	16	25	25023	250230	31	3	0.072474368	0.345116048	g	mi	
2018	7	5	16	25	25023	250230	32	3	0.069098331	0.329039682	g	mi	
2018	7	5	16	25	25023	250230	33	3	0.245831653	0.315168798	g	mi	
2018	7	5	16	25	25023	250230	37	3	2.291406393	NULL	g	mi	

2018 VOC MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits	Emission Factor
2018	7	5	16	25	25023	250230	1	87	0.111234441	0.337074051	g	mi	
2018	7	5	16	25	25023	250230	2	87	0.142708868	0.19027849	g	mi	
2018	7	5	16	25	25023	250230	3	87	0.143196702	0.181261643	g	mi	
2018	7	5	16	25	25023	250230	4	87	0.170214757	0.141845625	g	mi	
2018	7	5	16	25	25023	250230	5	87	0.108006209	0.337519411	g	mi	
2018	7	5	16	25	25023	250230	6	87	0.116139092	0.223344415	g	mi	
2018	7	5	16	25	25023	250230	7	87	0.102841221	0.395543171	g	mi	
2018	7	5	16	25	25023	250230	8	87	0.096365124	1.070723557	g	mi	
2018	7	5	16	25	25023	250230	9	87	0.080006704	2.000167638	g	mi	
2018	7	5	16	25	25023	250230	10	87	0.094047673	1.175595939	g	mi	
2018	7	5	16	25	25023	250230	11	87	0.078154743	3.907737223	g	mi	
2018	7	5	16	25	25023	250230	12	87	0.087297715	1.745954279	g	mi	
2018	7	5	16	25	25023	250230	13	87	0.086611636	0.666243378	g	mi	
2018	7	5	16	25	25023	250230	14	87	0.098057158	0.408571502	g	mi	
2018	7	5	16	25	25023	250230	15	87	0.10106799	0.388723053	g	mi	
2018	7	5	16	25	25023	250230	16	87	0.085261375	0.710511472	g	mi	
2018	7	5	16	25	25023	250230	17	87	0.100246064	0.358021657	g	mi	
2018	7	5	16	25	25023	250230	18	87	0.099048965	0.396195859	g	mi	
2018	7	5	16	25	25023	250230	19	87	0.080517486	1.610349691	g	mi	
2018	7	5	16	25	25023	250230	20	87	0.095398001	0.50209475	g	mi	
2018	7	5	16	25	25023	250230	21	87	0.152894691	0.198564538	g	mi	
2018	7	5	16	25	25023	250230	22	87	0.089120924	0.636578029	g	mi	
2018	7	5	16	25	25023	250230	23	87	0.238899201	0.146563928	g	mi	
2018	7	5	16	25	25023	250230	24	87	0.094253272	0.725025194	g	mi	
2018	7	5	16	25	25023	250230	25	87	0.112513572	0.267889465	g	mi	
2018	7	5	16	25	25023	250230	26	87	0.363624722	0.088905797	g	mi	
2018	7	5	16	25	25023	250230	27	87	0.132651553	0.217461556	g	mi	
2018	7	5	16	25	25023	250230	28	87	0.103368975	0.344563237	g	mi	
2018	7	5	16	25	25023	250230	29	87	0.374142647	0.092839362	g	mi	
2018	7	5	16	25	25023	250230	30	87	0.12696518	0.211608625	g	mi	
2018	7	5	16	25	25023	250230	31	87	0.0926468	0.441175252	g	mi	
2018	7	5	16	25	25023	250230	32	87	0.09305276	0.443108394	g	mi	
2018	7	5	16	25	25023	250230	33	87	0.138292015	0.177297461	g	mi	
2018	7	5	16	25	25023	250230	37	87	1.513607621	NULL	g	mi	

2018 CO_2 MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits
2018	7	5	16	25	25023	250230	1	90	161.2890015	488.7545305	g	mi
2018	7	5	16	25	25023	250230	2	90	331.5239868	442.0319824	g	mi
2018	7	5	16	25	25023	250230	3	90	329.32901	416.8721532	g	mi
2018	7	5	16	25	25023	250230	4	90	479.7669983	399.805816	g	mi
2018	7	5	16	25	25023	250230	5	90	142.345993	444.8312382	g	mi
2018	7	5	16	25	25023	250230	6	90	203.6679993	391.6692437	g	mi
2018	7	5	16	25	25023	250230	7	90	121.5410004	467.4654032	g	mi
2018	7	5	16	25	25023	250230	8	90	77.33200073	859.2444184	g	mi
2018	7	5	16	25	25023	250230	9	90	18.51049995	462.7625092	g	mi
2018	7	5	16	25	25023	250230	10	90	68.39880371	854.9850655	g	mi
2018	7	5	16	25	25023	250230	11	90	10.58790016	529.3950199	g	mi
2018	7	5	16	25	25023	250230	12	90	43.19049835	863.8099542	g	mi
2018	7	5	16	25	25023	250230	13	90	55.14550018	424.1961708	g	mi
2018	7	5	16	25	25023	250230	14	90	110.7369995	461.4041749	g	mi
2018	7	5	16	25	25023	250230	15	90	109.2809982	420.3115471	g	mi
2018	7	5	16	25	25023	250230	16	90	47.54389954	396.1991717	g	mi
2018	7	5	16	25	25023	250230	17	90	120.1060028	428.9500082	g	mi
2018	7	5	16	25	25023	250230	18	90	97.77890015	391.1156006	g	mi
2018	7	5	16	25	25023	250230	19	90	21.56489944	431.2979825	g	mi
2018	7	5	16	25	25023	250230	20	90	94.30490112	496.3415911	g	mi
2018	7	5	16	25	25023	250230	21	90	340.8410034	442.6506648	g	mi
2018	7	5	16	25	25023	250230	22	90	62.31079865	445.0771313	g	mi
2018	7	5	16	25	25023	250230	23	90	721.5209961	442.6509191	g	mi
2018	7	5	16	25	25023	250230	24	90	78.24389648	601.8761489	g	mi
2018	7	5	16	25	25023	250230	25	90	189.5670013	451.3500173	g	mi
2018	7	5	16	25	25023	250230	26	90	1543.609985	377.4107403	g	mi
2018	7	5	16	25	25023	250230	27	90	265.5450134	435.3196839	g	mi
2018	7	5	16	25	25023	250230	28	90	127.6520004	425.5066512	g	mi
2018	7	5	16	25	25023	250230	29	90	1563.439941	387.9503375	g	mi
2018	7	5	16	25	25023	250230	30	90	263.3569946	438.9283069	g	mi
2018	7	5	16	25	25023	250230	31	90	88.92389679	423.4471408	g	mi
2018	7	5	16	25	25023	250230	32	90	88.08470154	419.4509728	g	mi
2018	7	5	16	25	25023	250230	33	90	318.6149902	408.4807717	g	mi
2018	7	5	16	25	25023	250230	37	90	4102.850098	NULL	g	mi

2025 NOx MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits	Emission Factor
2025	7	5	16	25	25023	250230	1	3	0.062659979	0.189878716	g	mi	
2025	7	5	16	25	25023	250230	2	3	0.1397416	0.186322133	g	mi	0.318688979
2025	7	5	16	25	25023	250230	3	3	0.133148685	0.168542635	g	mi	
2025	7	5	16	25	25023	250230	4	3	0.198706612	0.165588837	g	mi	
2025	7	5	16	25	25023	250230	5	3	0.051891945	0.162162333	g	mi	
2025	7	5	16	25	25023	250230	6	3	0.083186358	0.159973772	g	mi	
2025	7	5	16	25	25023	250230	7	3	0.0458147	0.176210393	g	mi	323.5165942
2025	7	5	16	25	25023	250230	8	3	0.023527177	0.261413068	g	mi	
2025	7	5	16	25	25023	250230	9	3	0.006921815	0.173045373	g	mi	
2025	7	5	16	25	25023	250230	10	3	0.020714248	0.258928101	g	mi	
2025	7	5	16	25	25023	250230	11	3	0.004306026	0.215301318	g	mi	
2025	7	5	16	25	25023	250230	12	3	0.01327276	0.265455186	g	mi	
2025	7	5	16	25	25023	250230	13	3	0.023978904	0.184453114	g	mi	
2025	7	5	16	25	25023	250230	14	3	0.048007675	0.200031982	g	mi	
2025	7	5	16	25	25023	250230	15	3	0.038479142	0.147996705	g	mi	
2025	7	5	16	25	25023	250230	16	3	0.019566776	0.163056472	g	mi	0.69513976
2025	7	5	16	25	25023	250230	17	3	0.049636357	0.177272701	g	mi	
2025	7	5	16	25	25023	250230	18	3	0.03240728	0.12962912	g	mi	
2025	7	5	16	25	25023	250230	19	3	0.008307909	0.166158171	g	mi	
2025	7	5	16	25	25023	250230	20	3	0.039950207	0.210264249	g	mi	
2025	7	5	16	25	25023	250230	21	3	0.12391483	0.160928355	g	mi	410.416727
2025	7	5	16	25	25023	250230	22	3	0.024575099	0.175536423	g	mi	
2025	7	5	16	25	25023	250230	23	3	0.262312502	0.160927916	g	mi	
2025	7	5	16	25	25023	250230	24	3	0.027884098	0.214493068	g	mi	
2025	7	5	16	25	25023	250230	25	3	0.08579158	0.204265674	g	mi	
2025	7	5	16	25	25023	250230	26	3	0.67147702	0.164175304	g	mi	
2025	7	5	16	25	25023	250230	27	3	0.102937944	0.168750724	g	mi	
2025	7	5	16	25	25023	250230	28	3	0.048661835	0.162206112	g	mi	
2025	7	5	16	25	25023	250230	29	3	0.666857243	0.165473253	g	mi	
2025	7	5	16	25	25023	250230	30	3	0.117076337	0.195127221	g	mi	0.344833184
2025	7	5	16	25	25023	250230	31	3	0.040471934	0.1927235	g	mi	
2025	7	5	16	25	25023	250230	32	3	0.038016152	0.181029299	g	mi	
2025	7	5	16	25	25023	250230	33	3	0.134770095	0.17278218	g	mi	
2025	7	5	16	25	25023	250230	37	3	0.932778597	NULL	g	mi	

2025 VOC MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits	Emission Factor
2025	7	5	16	25	25023	250230	1	87	0.079577066	0.241142615	g	mi	
2025	7	5	16	25	25023	250230	2	87	0.099275135	0.132366846	g	mi	
2025	7	5	16	25	25023	250230	3	87	0.099318728	0.125719905	g	mi	
2025	7	5	16	25	25023	250230	4	87	0.116068125	0.096723433	g	mi	674.523599
2025	7	5	16	25	25023	250230	5	87	0.077447921	0.242024759	g	mi	
2025	7	5	16	25	25023	250230	6	87	0.082792282	0.159215933	g	mi	
2025	7	5	16	25	25023	250230	7	87	0.074396953	0.286142137	g	mi	
2025	7	5	16	25	25023	250230	8	87	0.070458986	0.78287759	g	mi	
2025	7	5	16	25	25023	250230	9	87	0.060580682	1.514517084	g	mi	710.7570788
2025	7	5	16	25	25023	250230	10	87	0.069058217	0.863227733	g	mi	
2025	7	5	16	25	25023	250230	11	87	0.05947876	2.973938055	g	mi	
2025	7	5	16	25	25023	250230	12	87	0.064984888	1.299697737	g	mi	
2025	7	5	16	25	25023	250230	13	87	0.064727508	0.497903922	g	mi	351.3077993
2025	7	5	16	25	25023	250230	14	87	0.0717986	0.299160841	g	mi	
2025	7	5	16	25	25023	250230	15	87	0.073228441	0.281647861	g	mi	
2025	7	5	16	25	25023	250230	16	87	0.063849993	0.532083287	g	mi	
2025	7	5	16	25	25023	250230	17	87	0.07305149	0.260898177	g	mi	
2025	7	5	16	25	25023	250230	18	87	0.071944289	0.287777156	g	mi	677.2510415
2025	7	5	16	25	25023	250230	19	87	0.060910251	1.218205002	g	mi	
2025	7	5	16	25	25023	250230	20	87	0.070100948	0.368952364	g	mi	
2025	7	5	16	25	25023	250230	21	87	0.104483865	0.135693335	g	mi	
2025	7	5	16	25	25023	250230	22	87	0.066168234	0.472630239	g	mi	
2025	7	5	16	25	25023	250230	23	87	0.156296715	0.095887556	g	mi	368.2072971
2025	7	5	16	25	25023	250230	24	87	0.06916932	0.532071713	g	mi	
2025	7	5	16	25	25023	250230	25	87	0.080896616	0.192610996	g	mi	
2025	7	5	16	25	25023	250230	26	87	0.236903235	0.057922549	g	mi	
2025	7	5	16	25	25023	250230	27	87	0.092662618	0.151905927	g	mi	359.817281
2025	7	5	16	25	25023	250230	28	87	0.074791953	0.2493065	g	mi	
2025	7	5	16	25	25023	250230	29	87	0.242541686	0.060184038	g	mi	
2025	7	5	16	25	25023	250230	30	87	0.089823581	0.149705963	g	mi	
2025	7	5	16	25	25023	250230	31	87	0.06854099	0.326385679	g	mi	
2025	7	5	16	25	25023	250230	32	87	0.068701617	0.327150569	g	mi	696.7491626
2025	7	5	16	25	25023	250230	33	87	0.096549168	0.123780989	g	mi	
2025	7	5	16	25	25023	250230	37	87	0.951629102	NULL	g	mi	

2025 CO2 MOVES Output

yearID	monthID	dayID	hourID	stateID	countyID	zoneID	linkID	pollutantID	emissionQuant	emissionRate	massUnits	distanceUnits
2025	7	5	16	25	25023	250230	1	90	133.3659973	404.1393697	g	mi
2025	7	5	16	25	25023	250230	2	90	273.8210144	365.0946859	g	mi
2025	7	5	16	25	25023	250230	3	90	271.8959961	344.1721376	g	mi
2025	7	5	16	25	25023	250230	4	90	396.1069946	330.0891491	g	mi
2025	7	5	16	25	25023	250230	5	90	117.5979996	367.4937569	g	mi
2025	7	5	16	25	25023	250230	6	90	168.1369934	323.3403838	g	mi
2025	7	5	16	25	25023	250230	7	90	100.4599991	386.384626	g	mi
2025	7	5	16	25	25023	250230	8	90	63.74580002	708.2866387	g	mi
2025	7	5	16	25	25023	250230	9	90	15.29829979	382.4575033	g	mi
2025	7	5	16	25	25023	250230	10	90	56.3791008	704.7387757	g	mi
2025	7	5	16	25	25023	250230	11	90	8.761730194	438.0865195	g	mi
2025	7	5	16	25	25023	250230	12	90	35.60929871	712.1859635	g	mi
2025	7	5	16	25	25023	250230	13	90	45.55530167	350.4254103	g	mi
2025	7	5	16	25	25023	250230	14	90	91.49919891	381.2466707	g	mi
2025	7	5	16	25	25023	250230	15	90	90.2322998	347.0473197	g	mi
2025	7	5	16	25	25023	250230	16	90	39.25	327.0833406	g	mi
2025	7	5	16	25	25023	250230	17	90	99.18250275	354.2232226	g	mi
2025	7	5	16	25	25023	250230	18	90	80.65260315	322.6104126	g	mi
2025	7	5	16	25	25023	250230	19	90	17.80010033	356.0020012	g	mi
2025	7	5	16	25	25023	250230	20	90	77.94860077	410.2557987	g	mi
2025	7	5	16	25	25023	250230	21	90	281.5759888	365.6831114	g	mi
2025	7	5	16	25	25023	250230	22	90	51.44689941	367.4778514	g	mi
2025	7	5	16	25	25023	250230	23	90	596.0629883	365.682816	g	mi
2025	7	5	16	25	25023	250230	24	90	64.60119629	496.9322974	g	mi
2025	7	5	16	25	25023	250230	25	90	156.6589966	372.9976226	g	mi
2025	7	5	16	25	25023	250230	26	90	1273.780029	311.4376484	g	mi
2025	7	5	16	25	25023	250230	27	90	219.1940002	359.3344182	g	mi
2025	7	5	16	25	25023	250230	28	90	105.3560028	351.1866621	g	mi
2025	7	5	16	25	25023	250230	29	90	1290.550049	320.2357275	g	mi
2025	7	5	16	25	25023	250230	30	90	217.5740051	362.6233275	g	mi
2025	7	5	16	25	25023	250230	31	90	73.45069885	349.7652436	g	mi
2025	7	5	16	25	25023	250230	32	90	72.75990295	346.4757392	g	mi
2025	7	5	16	25	25023	250230	33	90	263.131012	337.3474636	g	mi
2025	7	5	16	25	25023	250230	37	90	3349.649902	NULL	g	mi

Mobile Source Mesoscale Analysis

Rt 44 Carver-FEIR

Mesoscale Analysis

	2018 Existing	2025 No-Build	2025 Build	2025 Build-Mit
OXIDES OF NITROGEN (NOx)				
Emissions (kg/d)	74.0	41.0	46.4	45.5
Project Contribution (kg/d)			5.4	-0.9
VOLATILE ORGANIC COMPOUNDS (VOC)				
Emissions (kg/d)	41.6	29.2	35.3	33.4
Project Contribution (kg/d)			6.1	-1.9
GREENHOUSE GAS (CO_2)				
Emissions (short tons per year)	40,234	33,482	38,657	37,477
Project Contribution (short tons per year)			5,176	-1,180

Rt 44 Carver-FEIR

2025 Build With Mitigation

Link No.	Description	Roadway Link Length Speed	Roadway Link Length (miles)	Emission Factor (g/mi) NO_x	Emission Factor (g/mi) VOC	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Peak Period Factor	Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	Link Emissions NO_x (grams)	Link Emissions VOC (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	0.19	0.24	13,447	13,447	2,065	2,372	0.47	6,259	3	21,279	7,189	3	21,998	843	1,070
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	0.19	0.13	1,682	1,682	587	674	0.47	783	15	11,470	899	13	11,857	235	167
3	Mayflower Rd (Route58/Colchester)	40	0.79	0.17	0.13	4,361	4,361	1,604	1,842	0.47	2,030	11	22,429	2,332	10	23,187	581	433
4	Route 58 (Mayflower/Montello)	45	1.20	0.17	0.10	11,786	11,786	6,582	7,561	0.47	5,485	4	21,667	6,301	4	22,399	2,342	1,368
5	Montello St (Route58/ProjDwy)	30	0.32	0.16	0.24	208	208	31	36	0.47	97	12	1,170	111	11	1,209	11	16
6	Route 58 (Montello N/Montello S)	45	0.52	0.16	0.16	0	0	0	0	0.47	0	0	0	0	0	0	0	0
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	0.18	0.29	0	0	0	0	0.47	0	0	0	0	0	0	0	0
8	N Plaza Dwy (Montello/End)	10	0.09	0.26	0.78	0	0	0	0	0.47	0	6	0	0	5	0	0	0
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	0.17	1.51	0	0	0	0	0.47	0	0	0	0	0	0	0	0
10	S Plaza Dwy (Montello/End)	10	0.08	0.26	0.86	1,973	1,973	73	84	0.47	918	7	6,520	1,055	6	6,740	41	136
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	0.22	2.97	1,983	1,983	18	21	0.47	923	151	139,707	1,060	136	144,427	9	118
12	Gas Station Dwy (Route58/End)	10	0.05	0.27	1.30	1,464	1,464	34	39	0.47	681	0	0	783	0	0	19	95
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	0.18	0.50	19,366	19,366	1,172	1,346	0.47	9,013	9	83,823	10,353	8	86,655	464	1,254
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	0.20	0.30	2,856	2,856	319	366	0.47	1,329	0	0	1,527	0	0	137	205
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	0.15	0.28	5,036	5,036	609	700	0.47	2,344	40	92,820	2,692	36	95,956	194	369
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	0.16	0.53	19,574	19,574	1,093	1,256	0.47	9,110	14	124,806	10,464	12	129,023	383	1,250
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	0.18	0.26	3,998	3,998	521	598	0.47	1,861	0	0	2,137	0	0	198	292
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	0.13	0.29	3,686	3,686	429	493	0.47	1,716	31	53,529	1,971	28	55,337	119	265
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	0.17	1.22	20,561	20,561	478	550	0.47	9,569	7	70,811	10,991	7	73,203	171	1,252
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	0.21	0.37	20,716	20,716	1,832	2,104	0.47	9,642	0	1,446	11,075	0	1,495	828	1,452
21	High St (Route58/Gate)	30	0.77	0.16	0.14	1,246	1,246	447	513	0.47	580	39	22,821	666	35	23,592	154	130
22	Route 58 (High/Plymouth)	35	0.14	0.18	0.47	20,509	20,509	1,336	1,535	0.47	9,545	12	115,016	10,964	11	118,902	504	1,357
23	Plymouth St (Wall/Route58)	30	1.63	0.16	0.10	3,946	3,946	2,993	3,438	0.47	1,836	28	52,064	2,109	26	53,823	1,035	617
24	Plymouth St (Route58/Braddock)	20	0.13	0.21	0.53	5,296	5,296	320	368	0.47	2,465	6	13,803	2,831	5	14,269	148	366
25	Route 58 (Plymouth/Forest)	45	0.42	0.20	0.19	15,628	15,628	3,055	3,509	0.47	7,273	13	91,282	8,355	11	94,366	1,341	1,264
26	Route 44 (Route105/Route58)	55	4.09	0.16	0.06	19,107	19,107	36,370	41,777	0.47	8,892	22	194,745	10,214	20	201,324	12,830	4,526
27	Route 105 (Thompson/Route44)	35	0.61	0.17	0.15	5,036	5,036	1,430	1,642	0.47	2,344	18	43,128	2,692	17	44,585	518	467
28	Route 105 (Rt44/Plymouth)	35	0.30	0.16	0.25	8,100	8,100	1,131	1,299	0.47	3,770	28	104,796	4,330	25	108,336	394	606
29	Route 44 (Rotary/Rt105)	50	4.03	0.17	0.06	19,055	19,055	35,739	41,052	0.47	8,868	169	1,495,193	10,187	152	1,545,708	12,707	4,622
30	Route 28 (Leona/Rotary)	45	0.60	0.20	0.15	17,757	17,757	4,959	5,696	0.47	8,264	25	210,323	9,493	23	217,429	2,079	1,595
31	Route 44 (I495 Ramps/Rotary)	50	0.21	0.19	0.33	27,829	27,829	2,720	3,124	0.47	12,952	98	1,270,596	14,877	88	1,313,523	1,126	1,907
32	Route 18 (Rotary/I495 Ramps)	45	0.21	0.18	0.33	12,669	12,669	1,238	1,422	0.47	5,896	87	511,190	6,773	78	528,461	482	870
33	Route 28 (Rotary/Anderson)	45	0.78	0.17	0.12	12,565	12,565	4,561	5,239	0.47	5,848	18	104,382	6,717	16	107,909	1,693	1,213
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.40	0.16	0.16	12,253	12,253	2,281	2,620	0.47	5,703	12	68,433	6,550	11	70,745	784	780
35	Project Driveway [BDMIT Only]	30	0.14	0.16	0.24	7,632	7,632	484	556	0.47	3,552	10	33,923	4,080	9	35,069	169	252
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	0.16	0.16	18,224	18,224	1,018	1,169	0.47	8,482	8	63,612	9,742	7	65,762	350	348
							VMT (per day)	117,531	135,002								42.9	30.7
							VMT (per year)	42,898,785	49,275,680.3			Arterial	5,046,784			5,217,288	Daily Total (kg) NO_X	VOC

VMT Total (per year)	**92,174,464.90**

	NOx EF (g/s)	NOx Idle (g/day)	NOx Idle (kg/day)	VOC EF (g/s)	VOC Idle (g/day)	VOC Idle (kg/day)
Peak Period	0.0003	1,308	**1.31**	0.0003	1,334	**1.33**
Off-Peak Period	0.0003	1,352	**1.35**	0.0003	1,379	**1.38**
Total (Including Link)			**45.55**			**33.38**

Rt 44 Carver-FEIR

2025 Build

Link No.	Description	Roadway Link Length Speed	Roadway Link Length (miles)	Emission Factor (g/mi) NO_x	Emission Factor (g/mi) VOC	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Peak Period Factor	Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	Link Emissions NO_x (grams)	Link Emissions VOC (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	0.19	0.24	13,447	13,447	2,065	2,372	0.47	6,259	3	21,279	7,189	3	21,998	843	1,070
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	0.19	0.13	1,682	1,682	587	674	0.47	783	15	11,470	899	13	11,857	235	167
3	Mayflower Rd (Route58/Colchester)	40	0.79	0.17	0.13	4,361	4,361	1,604	1,842	0.47	2,030	11	22,429	2,332	10	23,187	581	433
4	Route 58 (Mayflower/Montello)	45	1.20	0.17	0.10	11,786	11,786	6,582	7,561	0.47	5,485	4	21,667	6,301	4	22,399	2,342	1,368
5	Montello St (Route58/ProjDwy)	30	0.32	0.16	0.24	52	52	8	9	0.47	24	12	292	28	11	302	3	4
6	Route 58 (Montello N/Montello S)	45	0.52	0.16	0.16	11,994	11,994	2,903	3,334	0.47	5,582	0	279	6,412	0	289	998	993
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	0.18	0.29	7,892	7,892	955	1,097	0.47	3,673	0	0	4,219	0	0	362	587
8	N Plaza Dwy (Montello/End)	10	0.09	0.26	0.78	21	21	1	1	0.47	10	6	58	11	5	60	0	1
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	0.17	1.51	7,902	7,902	147	169	0.47	3,678	0	0	4,225	0	0	55	479
10	S Plaza Dwy (Montello/End)	10	0.08	0.26	0.86	1,983	1,983	74	85	0.47	923	7	6,554	1,060	6	6,775	41	137
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	0.22	2.97	9,875	9,875	92	106	0.47	4,596	151	695,611	5,279	136	719,112	43	587
12	Gas Station Dwy (Route58/End)	10	0.05	0.27	1.30	1,464	1,464	34	39	0.47	681	150	102,215	783	135	105,668	19	95
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	0.18	0.50	19,366	19,366	1,172	1,346	0.47	9,013	2	13,520	10,353	1	13,977	464	1,254
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	0.20	0.30	2,856	2,856	319	366	0.47	1,329	0	0	1,527	0	0	137	205
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	0.15	0.28	5,036	5,036	609	700	0.47	2,344	300	703,180	2,692	270	726,937	194	369
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	0.16	0.53	19,574	19,574	1,093	1,256	0.47	9,110	1	6,377	10,464	1	6,592	383	1,250
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	0.18	0.26	3,998	3,998	521	598	0.47	1,861	0	0	2,137	0	0	198	292
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	0.13	0.29	3,686	3,686	429	493	0.47	1,716	300	514,699	1,971	270	532,088	119	265
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	0.17	1.22	20,561	20,561	478	550	0.47	9,569	1	6,220	10,991	1	6,430	171	1,252
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	0.21	0.37	20,716	20,716	1,832	2,104	0.47	9,642	0	1,446	11,075	0	1,495	828	1,452
21	High St (Route58/Gate)	30	0.77	0.16	0.14	1,246	1,246	447	513	0.47	580	39	22,821	666	35	23,592	154	130
22	Route 58 (High/Plymouth)	35	0.14	0.18	0.47	20,509	20,509	1,336	1,535	0.47	9,545	8	76,359	10,964	7	78,939	504	1,357
23	Plymouth St (Wall/Route58)	30	1.63	0.16	0.10	3,946	3,946	2,993	3,438	0.47	1,836	72	132,411	2,109	65	136,884	1,035	617
24	Plymouth St (Route58/Braddock)	20	0.13	0.21	0.53	5,296	5,296	320	368	0.47	2,465	7	17,869	2,831	7	18,473	148	366
25	Route 58 (Plymouth/Forest)	45	0.42	0.20	0.19	15,628	15,628	3,055	3,509	0.47	7,273	12	84,008	8,355	10	86,846	1,341	1,264
26	Route 44 (Route105/Route58)	55	4.09	0.16	0.06	19,107	19,107	36,370	41,777	0.47	8,892	23	200,525	10,214	20	207,299	12,830	4,526
27	Route 105 (Thompson/Route44)	35	0.61	0.17	0.15	5,036	5,036	1,430	1,642	0.47	2,344	18	41,605	2,692	16	43,010	518	467
28	Route 105 (Rt44/Plymouth)	35	0.30	0.16	0.25	8,100	8,100	1,131	1,299	0.47	3,770	27	100,649	4,330	24	104,049	394	606
29	Route 44 (Rotary/Rt105)	50	4.03	0.17	0.06	19,055	19,055	35,739	41,052	0.47	8,868	173	1,533,327	10,187	156	1,585,130	12,707	4,622
30	Route 28 (Leona/Rotary)	45	0.60	0.20	0.15	17,757	17,757	4,959	5,696	0.47	8,264	25	210,323	9,493	23	217,429	2,079	1,595
31	Route 44 (I495 Ramps/Rotary)	50	0.21	0.19	0.33	27,829	27,829	2,720	3,124	0.47	12,952	98	1,270,596	14,877	88	1,313,523	1,126	1,907
32	Route 18 (Rotary/I495 Ramps)	45	0.21	0.18	0.33	12,669	12,669	1,238	1,422	0.47	5,896	87	511,190	6,773	78	528,461	482	870
33	Route 28 (Rotary/Anderson)	45	0.78	0.17	0.12	12,565	12,565	4,561	5,239	0.47	5,848	18	104,382	6,717	16	107,909	1,693	1,213
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.40	0.16	0.16	0	0	0	0	0.47	0	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.14	0.16	0.24	0	0	0	0	0.47	0	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	0.16	0.16	0	0	0	0	0.47	0	0	0	0	0	0	0	0
							VMT (per day)	117,805	135,316								43.0	31.8
							VMT (per year)	42,998,648	49,390,387.9								Daily Total (kg)	
											Arterial	6,433,362				6,650,711	NO_X	VOC

VMT Total (per year)	92,389,035.43

	NOx EF (g/s)	NOx Idle (g/day)	NOx Idle (kg/day)	VOC EF (g/s)	VOC Idle (g/day)	VOC Idle (kg/day)
Peak Period	0.0003	1,667	**1.67**	0.0003	1,701	**1.70**
Off-Peak Period	0.0003	1,723	**1.72**	0.0003	1,758	**1.76**
Total (Including Link)			**46.42**			**35.26**

Rt 44 Carver-FEIR

2025 No Build

Link No.	Description	Roadway Link Length Speed	Roadway Link Length (miles)	Emission Factor (g/mi) NO_x	Emission Factor (g/mi) VOC	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Peak Period Factor	Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	Link Emissions NO_x (grams)	Link Emissions VOC (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	0.19	0.24	12,617	12,617	1,938	2,226	0.47	5,872	4	22,313	6,745	3	23,067	791	1,004
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	0.19	0.13	1,682	1,682	587	674	0.47	783	13	9,982	899	11	10,320	235	167
3	Mayflower Rd (Route58/Colchester)	40	0.79	0.17	0.13	4,309	4,309	1,584	1,820	0.47	2,006	9	18,552	2,304	8	19,179	574	428
4	Route 58 (Mayflower/Montello)	45	1.20	0.17	0.10	10,851	10,851	6,060	6,961	0.47	5,050	4	21,464	5,801	4	22,189	2,156	1,260
5	Montello St (Route58/ProjDwy)	30	0.32	0.16	0.24	52	52	8	9	0.47	24	11	262	28	10	271	3	4
6	Route 58 (Montello N/Montello S)	45	0.52	0.16	0.16	11,059	11,059	2,676	3,074	0.47	5,147	0	257	5,912	0	266	920	916
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	0.18	0.29	260	260	31	36	0.47	121	0	0	139	0	0	12	19
8	N Plaza Dwy (Montello/End)	10	0.09	0.26	0.78	21	21	1	1	0.47	10	4	40	11	4	41	0	1
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	0.17	1.51	270	270	5	6	0.47	126	0	31	144	0	32	2	16
10	S Plaza Dwy (Montello/End)	10	0.08	0.26	0.86	1,983	1,983	74	85	0.47	923	4	4,062	1,060	4	4,199	41	137
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	0.22	2.97	2,243	2,243	21	24	0.47	1,044	17	17,381	1,199	15	17,968	10	133
12	Gas Station Dwy (Route58/End)	10	0.05	0.27	1.30	1,464	1,464	34	39	0.47	681	23	15,673	783	21	16,202	19	95
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	0.18	0.50	12,669	12,669	766	880	0.47	5,896	0	2,653	6,773	0	2,743	304	820
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	0.20	0.30	1,558	1,558	174	200	0.47	725	0	0	833	0	0	75	112
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	0.15	0.28	4,621	4,621	559	642	0.47	2,151	66	142,156	2,470	59	146,959	178	338
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	0.16	0.53	14,590	14,590	815	936	0.47	6,790	1	4,753	7,800	1	4,914	285	932
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	0.18	0.26	3,011	3,011	392	451	0.47	1,402	0	0	1,610	0	0	149	220
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	0.13	0.29	3,219	3,219	375	430	0.47	1,498	31	47,043	1,721	28	48,632	104	232
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	0.17	1.22	16,043	16,043	373	429	0.47	7,467	0	2,613	8,577	0	2,702	133	977
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	0.21	0.37	17,186	17,186	1,520	1,746	0.47	7,998	0	1,200	9,187	0	1,240	687	1,205
21	High St (Route58/Gate)	30	0.77	0.16	0.14	1,090	1,090	391	449	0.47	507	20	10,200	583	18	10,544	135	114
22	Route 58 (High/Plymouth)	35	0.14	0.18	0.47	17,134	17,134	1,116	1,282	0.47	7,974	5	41,466	9,160	5	42,867	421	1,134
23	Plymouth St (Wall/Route58)	30	1.63	0.16	0.10	3,790	3,790	2,875	3,303	0.47	1,764	55	97,284	2,026	50	100,571	994	592
24	Plymouth St (Route58/Braddock)	20	0.13	0.21	0.53	4,465	4,465	270	310	0.47	2,078	8	15,586	2,387	7	16,113	125	309
25	Route 58 (Plymouth/Forest)	45	0.42	0.20	0.19	13,240	13,240	2,588	2,973	0.47	6,162	9	56,689	7,078	8	58,605	1,136	1,071
26	Route 44 (Route105/Route58)	55	4.09	0.16	0.06	17,341	17,341	33,010	37,917	0.47	8,071	16	130,748	9,271	15	135,165	11,644	4,108
27	Route 105 (Thompson/Route44)	35	0.61	0.17	0.15	5,036	5,036	1,430	1,642	0.47	2,344	17	40,433	2,692	16	41,799	518	467
28	Route 105 (Rt44/Plymouth)	35	0.30	0.16	0.25	8,100	8,100	1,131	1,299	0.47	3,770	25	95,372	4,330	23	98,594	394	606
29	Route 44 (Rotary/Rt105)	50	4.03	0.17	0.06	17,290	17,290	32,428	37,249	0.47	8,047	155	1,246,836	9,243	139	1,288,960	11,530	4,193
30	Route 28 (Leona/Rotary)	45	0.60	0.20	0.15	17,757	17,757	4,959	5,696	0.47	8,264	23	190,903	9,493	21	197,352	2,079	1,595
31	Route 44 (I495 Ramps/Rotary)	50	0.21	0.19	0.33	26,064	26,064	2,547	2,926	0.47	12,130	88	1,072,333	13,934	80	1,108,561	1,055	1,786
32	Route 18 (Rotary/I495 Ramps)	45	0.21	0.18	0.33	12,669	12,669	1,238	1,422	0.47	5,896	91	534,775	6,773	82	552,842	482	870
33	Route 28 (Rotary/Anderson)	45	0.78	0.17	0.12	12,565	12,565	4,561	5,239	0.47	5,848	17	96,780	6,717	15	100,050	1,693	1,213
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.40	0.16	0.16	0	0	0	0	0.47	0	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.14	0.16	0.24	0	0	0	0	0.47	0	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	0.16	0.16	0	0	0	0	0.47	0	0	0	0	0	0	0	0
							VMT (per day)	106,539	122,376								38.9	27.1
							VMT (per year)	38,886,784	44,667,296.3			Arterial	3,939,840			4,072,947	**Daily Total (kg)**	
																	NO_X	**VOC**

VMT Total (per year)	**83,554,079.99**

	NOx EF (g/s)	NOx Idle (g/day)	NOx Idle (kg/day)	VOC EF (g/s)	VOC Idle (g/day)	VOC Idle (kg/day)
Peak Period	0.0003	1,021	**1.02**	0.0003	1,041	**1.04**
Off-Peak Period	0.0003	1,055	**1.06**	0.0003	1,077	**1.08**
Total (Including Link)			**40.96**			**29.19**

Rt 44 Carver-FEIR

2018 Existing

Link No.	Description	Roadway Link Length Type	Roadway Link Length (miles)	Emission Factor (g/mi) NO_x	Emission Factor (g/mi) VOC	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Peak Period Factor	Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	Link Emissions NO_x (grams)	Link Emissions VOC (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	0.36	0.34	11,786	11,786	1,810	2,079	0.47	5,485	3	17,827	6,301	3	18,429	1,413	1,311
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	0.34	0.19	1,578	1,578	551	633	0.47	735	14	10,395	844	13	10,746	405	225
3	Mayflower Rd (Route58/Colchester)	40	0.79	0.31	0.18	3,998	3,998	1,470	1,688	0.47	1,861	10	18,606	2,137	9	19,235	983	572
4	Route 58 (Mayflower/Montello)	45	1.20	0.30	0.14	10,125	10,125	5,654	6,495	0.47	4,712	4	18,141	5,412	3	18,754	3,678	1,723
5	Montello St (Route58/ProjDwy)	30	0.32	0.31	0.34	52	52	8	9	0.47	24	12	278	28	10	287	5	6
6	Route 58 (Montello N/Montello S)	45	0.52	0.29	0.22	10,280	10,280	2,488	2,858	0.47	4,785	0	239	5,496	0	247	1,567	1,194
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	0.34	0.40	260	260	31	36	0.47	121	0	0	139	0	0	23	27
8	N Plaza Dwy (Montello/End)	10	0.09	0.53	1.07	21	21	1	1	0.47	10	4	41	11	4	42	1	2
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	0.33	2.00	270	270	5	6	0.47	126	0	31	144	0	32	4	22
10	S Plaza Dwy (Montello/End)	10	0.08	0.52	1.18	1,983	1,983	74	85	0.47	923	4	4,062	1,060	4	4,199	83	187
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	0.41	3.91	2,243	2,243	21	24	0.47	1,044	15	15,711	1,199	14	16,241	18	175
12	Gas Station Dwy (Route58/End)	10	0.05	0.54	1.75	1,464	1,464	34	39	0.47	681	20	13,935	783	18	14,406	39	128
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	0.33	0.67	11,786	11,786	713	819	0.47	5,485	0	2,468	6,301	0	2,552	513	1,021
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	0.37	0.41	1,454	1,454	162	187	0.47	677	0	0	777	0	0	127	143
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	0.29	0.39	4,309	4,309	521	599	0.47	2,006	19	37,305	2,304	17	38,565	320	436
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	0.30	0.71	13,603	13,603	760	873	0.47	6,331	1	4,432	7,272	1	4,581	487	1,160
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	0.33	0.36	2,804	2,804	365	420	0.47	1,305	0	0	1,499	0	0	256	281
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	0.25	0.40	3,011	3,011	350	402	0.47	1,402	21	29,432	1,610	19	30,426	190	298
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	0.31	1.61	14,953	14,953	348	400	0.47	6,959	0	2,784	7,994	0	2,878	234	1,204
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	0.39	0.50	15,992	15,992	1,414	1,624	0.47	7,443	0	1,116	8,549	0	1,154	1,185	1,526
21	High St (Route58/Gate)	30	0.77	0.31	0.20	1,090	1,090	391	449	0.47	507	17	8,677	583	15	8,971	261	167
22	Route 58 (High/Plymouth)	35	0.14	0.33	0.64	15,940	15,940	1,039	1,193	0.47	7,418	5	34,496	8,521	4	35,661	734	1,421
23	Plymouth St (Wall/Route58)	30	1.63	0.31	0.15	3,531	3,531	2,678	3,077	0.47	1,643	39	63,344	1,887	35	65,484	1,788	843
24	Plymouth St (Route58/Braddock)	20	0.13	0.42	0.73	4,154	4,154	251	289	0.47	1,933	8	15,465	2,221	7	15,988	227	391
25	Route 58 (Plymouth/Forest)	45	0.42	0.37	0.27	12,409	12,409	2,426	2,786	0.47	5,775	10	54,865	6,634	9	56,719	1,915	1,396
26	Route 44 (Route105/Route58)	55	4.09	0.29	0.09	16,199	16,199	30,836	35,419	0.47	7,539	15	111,581	8,660	13	115,351	19,515	5,890
27	Route 105 (Thompson/Route44)	35	0.61	0.32	0.22	4,725	4,725	1,341	1,541	0.47	2,199	16	35,843	2,526	15	37,054	914	627
28	Route 105 (Rt44/Plymouth)	35	0.30	0.31	0.34	7,580	7,580	1,058	1,216	0.47	3,528	21	73,558	4,052	19	76,044	695	784
29	Route 44 (Rotary/Rt105)	50	4.03	0.30	0.09	16,095	16,095	30,188	34,676	0.47	7,491	168	1,261,846	8,604	152	1,304,477	19,429	6,022
30	Route 28 (Leona/Rotary)	45	0.60	0.35	0.21	16,563	16,563	4,625	5,313	0.47	7,708	135	1,039,478	8,854	121	1,074,596	3,499	2,103
31	Route 44 (I495 Ramps/Rotary)	50	0.21	0.35	0.44	24,299	24,299	2,375	2,728	0.47	11,309	149	1,681,630	12,990	134	1,738,443	1,761	2,251
32	Route 18 (Rotary/I495 Ramps)	45	0.21	0.33	0.44	11,786	11,786	1,152	1,323	0.47	5,485	150	822,793	6,301	135	850,591	814	1,097
33	Route 28 (Rotary/Anderson)	45	0.78	0.32	0.18	11,734	11,734	4,260	4,893	0.47	5,461	150	819,169	6,273	135	846,844	2,885	1,623
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.40	0.29	0.22	0	0	0	0	0.47	0	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.14	0.31	0.34	0	0	0	0	0.47	0	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	0.29	0.22	0	0	0	0	0.47	0	0	0	0	0	0	0	0
							VMT (per day)	99,401	114,178								66.0	36.3
							VMT (per year)	36,281,545	41,674,789.2			Arterial	6,199,548			6,408,999	Daily Total (kg)	
																	NO_X	VOC

VMT Total (per year)	**77,956,334.10**

	NOx (g/s)	NOx (g/day)	NOx (kg/day)	VOC (g/s)	VOC (g/day)	VOC (kg/day)
Peak Period	0.0006	3,946	**3.95**	0.0004	2,607	**2.61**
Off-Peak Period	0.0006	4,079	**4.08**	0.0004	2,695	**2.69**
Total (Including Link)			**73.99**			**41.56**

Rt 44 Carver-FEIR

Build With Mitgation — **Weekday** — **Weekday** — **Link Emissions**

Link No.	Description	Roadway Link Length Speed	Roadway Link Length (miles)	Emission Factor (g/mi) CO_2	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Annual Weekday Trips (veh/yr)	Peak Period Factor	Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	CO_2 (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	404.1	13,447	13,447	753,842	865,900	4,908,309	0.47	2,284,369	3	7,766,854	2,623,940	3	8,029,256	654,601,442
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	365.1	1,682	1,682	214,325	246,184	614,012	0.47	285,767	15	4,186,481	328,246	13	4,327,920	168,129,484
3	Mayflower Rd (Route58/Colchester)	40	0.79	344.2	4,361	4,361	585,292	672,296	1,591,884	0.47	740,876	11	8,186,684	851,007	10	8,463,270	432,826,836
4	Route 58 (Mayflower/Montello)	45	1.2	330.1	11,786	11,786	2,402,556	2,759,696	4,301,877	0.47	2,002,130	4	7,908,414	2,299,746	4	8,175,599	1,704,003,354
5	Montello St (Route58/ProjDwy)	30	0.32	367.5	208	208	11,290	12,968	75,804	0.47	35,280	12	426,886	40,524	11	441,308	8,914,398
6	Route 58 (Montello N/Montello S)	45	0.52	323.3	0	0	0	0	0	0.47	0	0	0	0	0	0	0
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	386.4	0	0	0	0	0	0.47	0	0	0	0	0	0	0
8	N Plaza Dwy (Montello/End)	10	0.09	708.3	0	0	0	0	0	0.47	0	6	0	0	5	0	0
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	382.5	0	0	0	0	0	0.47	0	0	0	0	0	0	0
10	S Plaza Dwy (Montello/End)	10	0.08	704.7	1,973	1,973	26,813	30,798	720,138	0.47	335,158	7	2,379,624	384,980	6	2,460,020	40,600,730
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	438.1	1,983	1,983	6,738	7,740	723,928	0.47	336,922	151	50,993,197	387,006	136	52,715,993	6,342,863
12	Gas Station Dwy (Route58/End)	10	0.05	712.2	1,464	1,464	12,436	14,285	534,418	0.47	248,723	0	0	285,695	0	0	19,030,255
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	350.4	19,366	19,366	427,680	491,254	7,068,722	0.47	3,289,844	9	30,595,548	3,778,879	8	31,629,213	322,017,792
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	381.2	2,856	2,856	116,423	133,730	1,042,305	0.47	485,098	0	0	557,207	0	0	95,370,066
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	347.0	5,036	5,036	222,439	255,505	1,838,247	0.47	855,536	40	33,879,218	982,711	36	35,023,821	165,869,246
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	327.1	19,574	19,574	399,015	458,328	7,144,526	0.47	3,325,124	14	45,554,195	3,819,403	12	47,093,235	280,422,667
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	354.2	3,998	3,998	190,158	218,425	1,459,227	0.47	679,137	0	0	780,090	0	0	144,729,773
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	322.6	3,686	3,686	156,554	179,826	1,345,521	0.47	626,217	31	19,537,968	719,304	28	20,198,055	108,519,762
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	356.0	20,561	20,561	174,635	200,595	7,504,595	0.47	3,492,703	7	25,846,001	4,011,892	7	26,719,204	133,582,548
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	410.3	20,716	20,716	668,641	768,034	7,561,448	0.47	3,519,163	0	527,874	4,042,286	0	545,709	589,404,326
21	High St (Route58/Gate)	30	0.77	365.7	1,246	1,246	162,993	187,222	454,824	0.47	211,679	39	8,329,567	243,145	35	8,610,980	128,067,510
22	Route 58 (High/Plymouth)	35	0.14	367.5	20,509	20,509	487,744	560,247	7,485,644	0.47	3,483,883	12	41,980,789	4,001,761	11	43,399,103	385,113,190
23	Plymouth St (Wall/Route58)	30	1.63	365.7	3,946	3,946	1,092,616	1,255,033	1,440,276	0.47	670,317	28	19,003,479	769,959	26	19,645,508	858,495,144
24	Plymouth St (Route58/Braddock)	20	0.13	496.9	5,296	5,296	116,953	134,338	1,933,002	0.47	899,636	6	5,037,959	1,033,366	5	5,208,166	124,874,235
25	Route 58 (Plymouth/Forest)	45	0.42	373.0	15,628	15,628	1,115,019	1,280,766	5,704,251	0.47	2,654,807	13	33,317,828	3,049,444	11	34,443,465	893,622,188
26	Route 44 (Route105/Route58)	55	4.09	311.4	19,107	19,107	13,275,093	15,248,433	6,973,967	0.47	3,245,744	22	71,081,796	3,728,223	20	73,483,281	8,883,300,060
27	Route 105 (Thompson/Route44)	35	0.61	359.3	5,036	5,036	521,877	599,454	1,838,247	0.47	855,536	18	15,741,859	982,711	17	16,273,695	402,932,669
28	Route 105 (Rt44/Plymouth)	35	0.3	351.2	8,100	8,100	412,774	474,133	2,956,356	0.47	1,375,913	28	38,250,389	1,580,442	25	39,542,671	311,469,812
29	Route 44 (Rotary/Rt105)	50	4.03	320.2	19,055	19,055	13,044,804	14,983,912	6,955,016	0.47	3,236,924	169	545,745,409	3,718,092	152	564,183,320	8,975,796,282
30	Route 28 (Leona/Rotary)	45	0.6	362.6	17,757	17,757	1,809,855	2,078,890	6,481,241	0.47	3,016,425	25	76,768,022	3,464,816	23	79,361,616	1,410,149,602
31	Route 44 (I495 Ramps/Rotary)	50	0.21	349.8	27,829	27,829	992,774	1,140,350	10,157,735	0.47	4,727,497	98	463,767,439	5,430,238	88	479,435,738	746,092,766
32	Route 18 (Rotary/I495 Ramps)	45	0.21	346.5	12,669	12,669	451,935	519,115	4,624,044	0.47	2,152,069	87	186,584,422	2,471,974	78	192,888,143	336,444,974
33	Route 28 (Rotary/Anderson)	45	0.78	337.3	12,565	12,565	1,664,855	1,912,335	4,586,142	0.47	2,134,430	18	38,099,567	2,451,712	16	39,386,754	1,206,756,125
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.4	323.3	12,253	12,253	832,604	956,370	4,472,436	0.47	2,081,510	12	24,978,118	2,390,926	11	25,821,999	578,447,619
35	Project Driveway [BDMIT Only]	30	0.14	367.5	7,632	7,632	176,554	202,799	2,785,797	0.47	1,296,534	10	12,381,896	1,489,263	9	12,800,216	139,410,140
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	323.3	18,224	18,224	371,497	426,719	6,651,800	0.47	3,095,805	8	23,218,536	3,555,996	7	24,002,970	258,095,484
						VMT (per year)	42,898,785	49,275,680									33,634.74
												Arterial	1,842,076,019			1,904,310,226	**Total (tons/year)**

	Weekday	Total
VMT per year	**92,174,464.90**	**92,174,464.90**

	Weekday Idle EF (g/s)	Weekday Idle Idle (g/year)	Weekday Idle Idle (tons/year)	Total Idle EF (g/s)	Total Idle Idle (g/year)	Total Idle Idle (tons/year)
Peak Period	0.9305	1,713,974,933	**1,889.30**			**1,889.30**
Off-Peak Period	0.9305	1,771,881,267	**1,953.13**			**1,953.13**
Total			**3,842.43**		Total (Including Link)	**37,477.17**

Rt 44 Carver-FEIR

Build		Weekday									Weekday						Link Emissions
												Peak Traffic Data			Off-Peak Traffic Data		
Link No.	Description	Roadway Link Length Speed	(miles)	Emission Factor (g/mi) CO_2	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Annual Weekday Trips (veh/yr)	Peak Period Factor	Period Volume (vehicles)	Average Delay (sec)	Adjusted Delay (veh-sec)	Period Volume (vehicles)	Average Delay (sec)	Adjusted Delay (veh-sec)	CO_2 (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	404.1	13,447	13,447	753,842	865,900	4,908,309	0.47	2,284,369	3	7,766,854	2,623,940	3	8,029,256	654,601,442
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	365.1	1,682	1,682	214,325	246,184	614,012	0.47	285,767	15	4,186,481	328,246	13	4,327,920	168,129,484
3	Mayflower Rd (Route58/Colchester)	40	0.79	344.2	4,361	4,361	585,292	672,296	1,591,884	0.47	740,876	11	8,186,684	851,007	10	8,463,270	432,826,836
4	Route 58 (Mayflower/Montello)	45	1.2	330.1	11,786	11,786	2,402,556	2,759,696	4,301,877	0.47	2,002,130	4	7,908,414	2,299,746	4	8,175,599	1,704,003,354
5	Montello St (Route58/ProjDwy)	30	0.32	367.5	52	52	2,822	3,242	18,951	0.47	8,820	12	106,721	10,131	11	110,327	2,228,600
6	Route 58 (Montello N/Montello S)	45	0.52	323.3	11,994	11,994	1,059,453	1,216,941	4,377,681	0.47	2,037,410	0	101,871	2,340,271	0	105,312	736,050,084
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	386.4	7,892	7,892	348,565	400,379	2,880,552	0.47	1,340,633	0	0	1,539,918	0	0	289,380,237
8	N Plaza Dwy (Montello/End)	10	0.09	708.3	21	21	318	365	7,580	0.47	3,528	6	21,344	4,052	5	22,065	483,219
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	382.5	7,902	7,902	53,696	61,678	2,884,342	0.47	1,342,397	0	0	1,541,945	0	0	44,125,529
10	S Plaza Dwy (Montello/End)	10	0.08	704.7	1,983	1,983	26,954	30,960	723,928	0.47	336,922	7	2,392,149	387,006	6	2,472,967	40,814,418
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	438.1	9,875	9,875	33,551	38,538	3,604,480	0.47	1,677,556	151	253,898,067	1,926,924	136	262,475,967	31,581,481
12	Gas Station Dwy (Route58/End)	10	0.05	712.2	1,464	1,464	12,436	14,285	534,418	0.47	248,723	150	37,308,417	285,695	135	38,568,875	19,030,255
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	350.4	19,366	19,366	427,680	491,254	7,068,722	0.47	3,289,844	2	4,934,766	3,778,879	1	5,101,486	322,017,792
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	381.2	2,856	2,856	116,423	133,730	1,042,305	0.47	485,098	0	0	557,207	0	0	95,370,066
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	347.0	5,036	5,036	222,439	255,505	1,838,247	0.47	855,536	300	256,660,742	982,711	270	265,331,979	165,869,246
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	327.1	19,574	19,574	399,015	458,328	7,144,526	0.47	3,325,124	1	2,327,587	3,819,403	1	2,406,224	280,422,667
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	354.2	3,998	3,998	190,158	218,425	1,459,227	0.47	679,137	0	0	780,090	0	0	144,729,773
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	322.6	3,686	3,686	156,554	179,826	1,345,521	0.47	626,217	300	187,865,079	719,304	270	194,212,067	108,519,762
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	356.0	20,561	20,561	174,635	200,595	7,504,595	0.47	3,492,703	1	2,270,257	4,011,892	1	2,346,957	133,582,548
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	410.3	20,716	20,716	668,641	768,034	7,561,448	0.47	3,519,163	0	527,874	4,042,286	0	545,709	589,404,326
21	High St (Route58/Gate)	30	0.77	365.7	1,246	1,246	162,993	187,222	454,824	0.47	211,679	39	8,329,567	243,145	35	8,610,980	128,067,510
22	Route 58 (High/Plymouth)	35	0.14	367.5	20,509	20,509	487,744	560,247	7,485,644	0.47	3,483,883	8	27,871,063	4,001,761	7	28,812,682	385,113,190
23	Plymouth St (Wall/Route58)	30	1.63	365.7	3,946	3,946	1,092,616	1,255,033	1,440,276	0.47	670,317	72	48,329,835	769,959	65	49,962,650	858,495,144
24	Plymouth St (Route58/Braddock)	20	0.13	496.9	5,296	5,296	116,953	134,338	1,933,002	0.47	899,636	7	6,522,358	1,033,366	7	6,742,715	124,874,235
25	Route 58 (Plymouth/Forest)	45	0.42	373.0	15,628	15,628	1,115,019	1,280,766	5,704,251	0.47	2,654,807	12	30,663,021	3,049,444	10	31,698,965	893,622,188
26	Route 44 (Route105/Route58)	55	4.09	311.4	19,107	19,107	13,275,093	15,248,433	6,973,967	0.47	3,245,744	23	73,191,529	3,728,223	20	75,664,292	8,883,300,060
27	Route 105 (Thompson/Route44)	35	0.61	359.3	5,036	5,036	521,877	599,454	1,838,247	0.47	855,536	18	15,185,761	982,711	16	15,698,809	402,932,669
28	Route 105 (Rt44/Plymouth)	35	0.3	351.2	8,100	8,100	412,774	474,133	2,956,356	0.47	1,375,913	27	36,736,884	1,580,442	24	37,978,033	311,469,812
29	Route 44 (Rotary/Rt105)	50	4.03	320.2	19,055	19,055	13,044,804	14,983,912	6,955,016	0.47	3,236,924	173	559,664,183	3,718,092	156	578,572,337	8,975,796,282
30	Route 28 (Leona/Rotary)	45	0.6	362.6	17,757	17,757	1,809,855	2,078,890	6,481,241	0.47	3,016,425	25	76,768,022	3,464,816	23	79,361,616	1,410,149,602
31	Route 44 (I495 Ramps/Rotary)	50	0.21	349.8	27,829	27,829	992,774	1,140,350	10,157,735	0.47	4,727,497	98	463,767,439	5,430,238	88	479,435,738	746,092,766
32	Route 18 (Rotary/I495 Ramps)	45	0.21	346.5	12,669	12,669	451,935	519,115	4,624,044	0.47	2,152,069	87	186,584,422	2,471,974	78	192,888,143	336,444,974
33	Route 28 (Rotary/Anderson)	45	0.78	337.3	12,565	12,565	1,664,855	1,912,335	4,586,142	0.47	2,134,430	18	38,099,567	2,451,712	16	39,386,754	1,206,756,125
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.4	323.3	0	0	0	0	0	0.47	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.1361742	367.5	0	0	0	0	0	0.47	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	323.3	0	0	0	0	0	0.47	0	0	0	0	0	0	0
						VMT (per year)	42,998,648	49,390,388									33,759.13
												Arterial	2,348,176,958			2,427,509,693	**Total (tons/year)**

	Weekday	Total
VMT per year	**92,389,035.43**	**92,389,035.43**

	Weekday Idle			Total Idle		
	(g/s)	(g/year)	(tons/year)	(g/s)	(g/year)	(tons/year)
Peak Period	0.9305	2,184,880,755	**2,408.38**			**2,408.38**
Off-Peak Period	0.9305	2,258,696,557	**2,489.74**			**2,489.74**
Total			**4,898.12**	Total (Including Link)		**38,657.26**

Rt 44 Carver-FEIR

No Build

Link No.	Description	Roadway Link Length Speed	Roadway Link Length (miles)	Emission Factor (g/mi) CO_2	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Annual Weekday Trips (veh/yr)	Peak Period Factor	Weekday Peak Traffic Data Period Volume (vehicles)	Peak Traffic Data Average Delay (sec)	Peak Traffic Data Adjusted Delay (veh-sec)	Weekday Off-Peak Traffic Data Period Volume (vehicles)	Off-Peak Traffic Data Average Delay (sec)	Off-Peak Traffic Data Adjusted Delay (veh-sec)	Link Emissions CO_2 (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	404.1	12,617	12,617	707,272	812,408	4,605,093	0.47	2,143,249	4	8,144,348	2,461,843	3	8,419,503	614,162,743
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	365.1	1,682	1,682	214,325	246,184	614,012	0.47	285,767	13	3,643,524	328,246	11	3,766,620	168,129,484
3	Mayflower Rd (Route58/Colchester)	40	0.79	344.2	4,309	4,309	578,325	664,292	1,572,933	0.47	732,056	9	6,771,522	840,876	8	7,000,296	427,674,136
4	Route 58 (Mayflower/Montello)	45	1.2	330.1	10,851	10,851	2,212,045	2,540,865	3,960,759	0.47	1,843,371	4	7,834,327	2,117,388	4	8,099,008	1,568,884,145
5	Montello St (Route58/ProjDwy)	30	0.32	367.5	52	52	2,822	3,242	18,951	0.47	8,820	11	95,697	10,131	10	98,930	2,228,600
6	Route 58 (Montello N/Montello S)	45	0.52	323.3	11,059	11,059	976,898	1,122,114	4,036,563	0.47	1,878,651	0	93,933	2,157,912	0	97,106	678,695,532
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	386.4	260	260	11,466	13,170	94,755	0.47	44,100	0	0	50,655	0	0	9,519,087
8	N Plaza Dwy (Montello/End)	10	0.09	708.3	21	21	318	365	7,580	0.47	3,528	4	14,641	4,052	4	15,136	483,219
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	382.5	270	270	1,835	2,107	98,545	0.47	45,864	0	11,466	52,681	0	11,853	1,507,574
10	S Plaza Dwy (Montello/End)	10	0.08	704.7	1,983	1,983	26,954	30,960	723,928	0.47	336,922	4	1,482,458	387,006	4	1,532,543	40,814,418
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	438.1	2,243	2,243	7,620	8,753	818,683	0.47	381,022	17	6,344,019	437,661	15	6,558,350	7,173,081
12	Gas Station Dwy (Route58/End)	10	0.05	712.2	1,464	1,464	12,436	14,285	534,418	0.47	248,723	23	5,720,624	285,695	21	5,913,894	19,030,255
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	350.4	12,669	12,669	279,769	321,357	4,624,044	0.47	2,152,069	0	968,431	2,471,974	0	1,001,150	210,649,709
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	381.2	1,558	1,558	63,504	72,943	568,530	0.47	264,599	0	0	303,931	0	0	52,020,036
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	347.0	4,621	4,621	204,094	234,432	1,686,639	0.47	784,976	66	51,886,924	901,663	59	53,639,914	152,189,308
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	327.1	14,590	14,590	297,409	341,619	5,325,231	0.47	2,478,408	1	1,734,885	2,846,823	1	1,793,498	209,015,303
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	354.2	3,011	3,011	143,236	164,528	1,099,158	0.47	511,557	0	0	587,600	0	0	109,017,231
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	322.6	3,219	3,219	136,709	157,031	1,174,962	0.47	546,837	31	17,170,692	628,125	28	17,750,801	94,763,736
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	356.0	16,043	16,043	136,268	156,525	5,855,858	0.47	2,725,367	0	953,878	3,130,492	0	986,105	104,234,867
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	410.3	17,186	17,186	554,687	637,141	6,272,780	0.47	2,919,406	0	437,911	3,353,375	0	452,706	488,954,466
21	High St (Route58/Gate)	30	0.77	365.7	1,090	1,090	142,619	163,819	397,971	0.47	185,219	20	3,722,904	212,752	18	3,848,681	112,059,071
22	Route 58 (High/Plymouth)	35	0.14	367.5	17,134	17,134	407,482	468,054	6,253,829	0.47	2,910,586	5	15,135,046	3,343,244	5	15,646,381	321,740,134
23	Plymouth St (Wall/Route58)	30	1.63	365.7	3,790	3,790	1,049,487	1,205,493	1,383,423	0.47	643,857	55	35,508,705	739,566	50	36,708,360	824,607,178
24	Plymouth St (Route58/Braddock)	20	0.13	496.9	4,465	4,465	98,607	113,265	1,629,786	0.47	758,516	8	5,688,872	871,270	7	5,881,070	105,286,120
25	Route 58 (Plymouth/Forest)	45	0.42	373.0	13,240	13,240	944,617	1,085,035	4,832,505	0.47	2,249,089	9	20,691,619	2,583,416	8	21,390,681	757,055,342
26	Route 44 (Route105/Route58)	55	4.09	311.4	17,341	17,341	12,048,590	13,839,611	6,329,633	0.47	2,945,866	16	47,723,022	3,383,768	15	49,335,336	8,062,560,381
27	Route 105 (Thompson/Route44)	35	0.61	359.3	5,036	5,036	521,877	599,454	1,838,247	0.47	855,536	17	14,757,993	982,711	16	15,256,589	402,932,669
28	Route 105 (Rt44/Plymouth)	35	0.3	351.2	8,100	8,100	412,774	474,133	2,956,356	0.47	1,375,913	25	34,810,605	1,580,442	23	35,986,675	311,469,812
29	Route 44 (Rotary/Rt105)	50	4.03	320.2	17,290	17,290	11,836,294	13,595,756	6,310,682	0.47	2,937,046	155	455,095,217	3,373,637	139	470,470,526	8,144,251,122
30	Route 28 (Leona/Rotary)	45	0.6	362.6	17,757	17,757	1,809,855	2,078,890	6,481,241	0.47	3,016,425	23	69,679,422	3,464,816	21	72,033,529	1,410,149,602
31	Route 44 (I495 Ramps/Rotary)	50	0.21	349.8	26,064	26,064	929,800	1,068,014	9,513,401	0.47	4,427,618	88	391,401,458	5,085,783	80	404,624,885	698,765,986
32	Route 18 (Rotary/I495 Ramps)	45	0.21	346.5	12,669	12,669	451,935	519,115	4,624,044	0.47	2,152,069	91	195,192,699	2,471,974	82	201,787,250	336,444,974
33	Route 28 (Rotary/Anderson)	45	0.78	337.3	12,565	12,565	1,664,855	1,912,335	4,586,142	0.47	2,134,430	17	35,324,809	2,451,712	15	36,518,251	1,206,756,125
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.4	323.3	0	0	0	0	0	0.47	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.1361742	367.5	0	0	0	0	0	0.47	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	323.3	0	0	0	0	0	0.47	0	0	0	0	0	0	0
						VMT (per year)	38,886,784	44,667,296									30,481.95
											Arterial		1,438,041,649			1,486,625,627	**Total (tons/year)**

	Weekday	Total
VMT per year	**83,554,079.99**	**83,554,079.99**

	Weekday Idle (g/s)	Weekday Idle (g/year)	Weekday Idle (tons/year)	Total Idle (g/s)	Total Idle (g/year)	Total Idle (tons/year)
Freeway						
Peak Period	0.9305	0	**0.00**			**0.00**
Off-Peak Period	0.9305	0	**0.00**			**0.00**
Arterial						
Peak Period	0.9305	1,338,037,797	**1,474.91**			**1,474.91**
Off-Peak Period	0.9305	1,383,243,163	**1,524.74**			**1,524.74**
Total			**2,999.65**	Total (Including Link)		**33,481.60**

Rt 44 Carver-FEIR

Existing		Weekday									Weekday						Link Emissions
		Roadway										Peak Traffic Data			Off-Peak Traffic Data		
Link No.	Description	Type	Link Length (miles)	Emission Factor (g/mi) CO_2	AADT (veh/day)	Seasonally Adjusted ADT (veh/day)	VMT Peak (veh-miles)	VMT Off-Peak (veh-miles)	Annual Weekday Trips (veh/yr)	Peak Period Factor	Period Volume (vehicles)	Average Delay (sec)	Adjusted Delay (veh-sec)	Period Volume (vehicles)	Average Delay (sec)	Adjusted Delay (veh-sec)	CO_2 (grams)
1	Route 58 (Palmer/Mayflower)	30	0.33	488.8	11,786	11,786	660,703	758,916	4,301,877	0.47	2,002,130	3	6,506,923	2,299,746	3	6,726,758	693,845,358
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	442.0	1,578	1,578	201,095	230,988	576,110	0.47	268,127	14	3,793,993	307,984	13	3,922,172	190,994,400
3	Mayflower Rd (Route58/Colchester)	40	0.79	416.9	3,998	3,998	536,518	616,271	1,459,227	0.47	679,137	10	6,791,367	780,090	9	7,020,812	480,565,728
4	Route 58 (Mayflower/Montello)	45	1.2	399.8	10,125	10,125	2,063,870	2,370,664	3,695,445	0.47	1,719,892	4	6,621,583	1,975,553	3	6,845,292	1,772,952,330
5	Montello St (Route58/ProjDwy)	30	0.32	444.8	52	52	2,822	3,242	18,951	0.47	8,820	12	101,430	10,131	10	104,856	2,697,599
6	Route 58 (Montello N/Montello S)	45	0.52	391.7	10,280	10,280	908,103	1,043,092	3,752,298	0.47	1,746,351	0	87,318	2,005,946	0	90,268	764,222,988
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	467.5	260	260	11,466	13,170	94,755	0.47	44,100	0	0	50,655	0	0	11,516,617
8	N Plaza Dwy (Montello/End)	10	0.09	859.2	21	21	318	365	7,580	0.47	3,528	4	14,818	4,052	4	15,318	586,207
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	462.8	270	270	1,835	2,107	98,545	0.47	45,864	0	11,466	52,681	0	11,853	1,824,121
10	S Plaza Dwy (Montello/End)	10	0.08	855.0	1,983	1,983	26,954	30,960	723,928	0.47	336,922	4	1,482,458	387,006	4	1,532,543	49,515,820
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	529.4	2,243	2,243	7,620	8,753	818,683	0.47	381,022	15	5,734,383	437,661	14	5,928,118	8,668,135
12	Gas Station Dwy (Route58/End)	10	0.05	863.8	1,464	1,464	12,436	14,285	534,418	0.47	248,723	20	5,086,381	285,695	18	5,258,223	23,081,786
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	424.2	11,786	11,786	260,277	298,967	4,301,877	0.47	2,002,130	0	900,959	2,299,746	0	931,397	237,229,147
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	461.4	1,454	1,454	59,270	68,081	530,628	0.47	246,959	0	0	283,669	0	0	58,760,149
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	420.3	4,309	4,309	190,335	218,628	1,572,933	0.47	732,056	19	13,616,249	840,876	17	14,076,272	171,891,680
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	396.2	13,603	13,603	277,299	318,520	4,965,162	0.47	2,310,829	1	1,617,580	2,654,333	1	1,672,230	236,063,148
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	429.0	2,804	2,804	133,358	153,181	1,023,354	0.47	476,278	0	0	547,076	0	0	122,910,947
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	391.1	3,011	3,011	127,889	146,900	1,099,158	0.47	511,557	21	10,742,707	587,600	19	11,105,648	107,474,451
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	431.3	14,953	14,953	127,007	145,887	5,457,888	0.47	2,540,148	0	1,016,059	2,917,740	0	1,050,386	117,698,794
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	496.3	15,992	15,992	516,144	592,869	5,836,907	0.47	2,716,547	0	407,482	3,120,361	0	421,249	550,448,991
21	High St (Route58/Gate)	30	0.77	442.7	1,090	1,090	142,619	163,819	397,971	0.47	185,219	17	3,167,246	212,752	15	3,274,251	135,644,827
22	Route 58 (High/Plymouth)	35	0.14	445.1	15,940	15,940	379,082	435,432	5,817,956	0.47	2,707,727	5	12,590,929	3,110,230	4	13,016,312	362,521,514
23	Plymouth St (Wall/Route58)	30	1.63	442.7	3,531	3,531	977,604	1,122,925	1,288,668	0.47	599,757	39	23,120,635	688,911	35	23,901,761	929,800,941
24	Plymouth St (Route58/Braddock)	20	0.13	601.9	4,154	4,154	91,728	105,363	1,516,080	0.47	705,597	8	5,644,772	810,483	7	5,835,480	118,624,001
25	Route 58 (Plymouth/Forest)	45	0.42	451.4	12,409	12,409	885,347	1,016,954	4,529,289	0.47	2,107,970	10	20,025,712	2,421,319	9	20,702,277	858,603,686
26	Route 44 (Route105/Route58)	55	4.09	377.4	16,199	16,199	11,254,970	12,928,020	5,912,711	0.47	2,751,827	15	40,727,032	3,160,885	13	42,102,988	9,126,920,150
27	Route 105 (Thompson/Route44)	35	0.61	435.3	4,725	4,725	489,596	562,374	1,724,541	0.47	802,616	16	13,082,642	921,925	15	13,524,637	457,943,212
28	Route 105 (Rt44/Plymouth)	35	0.3	425.5	7,580	7,580	386,314	443,740	2,766,846	0.47	1,287,714	21	26,848,830	1,479,132	19	27,755,913	353,193,382
29	Route 44 (Rotary/Rt105)	50	4.03	388.0	16,095	16,095	11,018,772	12,656,710	5,874,809	0.47	2,734,187	168	460,573,733	3,140,623	152	476,134,133	9,184,911,326
30	Route 28 (Leona/Rotary)	45	0.6	438.9	16,563	16,563	1,688,140	1,939,081	6,045,368	0.47	2,813,566	135	379,409,403	3,231,802	121	392,227,682	1,592,090,010
31	Route 44 (I495 Ramps/Rotary)	50	0.21	423.4	24,299	24,299	866,825	995,679	8,869,067	0.47	4,127,740	149	613,794,904	4,741,327	134	634,531,854	788,672,044
32	Route 18 (Rotary/I495 Ramps)	45	0.21	419.5	11,786	11,786	420,447	482,947	4,301,877	0.47	2,002,130	150	300,319,528	2,299,746	135	310,465,769	378,929,531
33	Route 28 (Rotary/Anderson)	45	0.78	408.5	11,734	11,734	1,554,782	1,785,900	4,282,926	0.47	1,993,310	150	298,996,535	2,289,615	135	309,098,079	1,364,604,357
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.4	391.7	0	0	0	0	0	0.47	0	0	0	0	0	0	0
35	Project Driveway [BDMIT Only]	30	0.1361742	444.8	0	0	0	0	0	0.47	0	0	0	0	0	0	0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	391.7	0	0	0	0	0	0.47	0	0	0	0	0	0	0
						VMT (per year)	36,281,545	41,674,789									34,452.61
												Arterial	2,262,835,056			2,339,284,531	**Total (tons/year)**

	Weekday	Total
VMT per year	**77,956,334.10**	**77,956,334.10**

	Weekday			Total		
	(g/s)	(g/year)	(tons/year)	(g/s)	(g/year)	(tons/year)
Peak Period	1.1397	2,578,909,175	**2,842.76**			**2,842.76**
Off-Peak Period	1.1397	2,666,037,157	**2,938.80**			**2,938.80**
Total			**5,781.56**	Total (Including Link)		**40,234.17**

Rt 44 Carver-FEIR

Weekday Traffic

Link No.	Roadway Description	2018 Roadway S.A.F.	2018 Roadway ADT (veh/day)	2018 Seasonal ADT (veh/day)	2025 Roadway ADT (veh/day)	2025 Seasonal ADT (veh/day)	2025 Traffic Increase (existing)	2025 Roadway ADT (veh/day)	2025 Seasonal ADT (veh/day)	2025 Traffic Increase (existing)	2025 Traffic Increase (no-build)	2025 Roadway ADT (veh/day)	2025 Seasonal ADT (veh/day)	2025 Traffic Increase (existing)	2025 Traffic Increase (no-build)
1	Route 58 (Palmer/Mayflower)	100%	11,786	11,786	12,617	12,617	7%	13,447	13,447	14%	7%	13,447	13,447	14%	7%
2	Parsonage Rd (Winnetuxet/Route58)	100%	1,578	1,578	1,682	1,682	7%	1,682	1,682	7%	0%	1,682	1,682	7%	0%
3	Mayflower Rd (Route58/Colchester)	100%	3,998	3,998	4,309	4,309	8%	4,361	4,361	9%	1%	4,361	4,361	9%	1%
4	Route 58 (Mayflower/Montello)	100%	10,125	10,125	10,851	10,851	7%	11,786	11,786	16%	9%	11,786	11,786	16%	9%
5	Montello St (Route58/ProjDwy)	100%	52	52	52	52	0%	52	52	0%	0%	208	208	300%	300%
6	Route 58 (Montello N/Montello S)	100%	10,280	10,280	11,059	11,059	8%	11,994	11,994	17%	8%	0	0	-100%	-100%
7	Montello St (Proj Drwy/North Plaza Dwy)	100%	260	260	260	260	0%	7,892	7,892	2940%	2940%	0	0	-100%	-100%
8	N Plaza Dwy (Montello/End)	100%	21	21	21	21	0%	21	21	0%	0%	0	0	-100%	-100%
9	Montello St (N Plaza Dwy/S Plaza Dwy)	100%	270	270	270	270	0%	7,902	7,902	2827%	2827%	0	0	-100%	-100%
10	S Plaza Dwy (Montello/End)	100%	1,983	1,983	1,983	1,983	0%	1,983	1,983	0%	0%	1,973	1,973	-1%	-1%
11	Montello St (S Plaza Dwy/Route 58)	100%	2,243	2,243	2,243	2,243	0%	9,875	9,875	340%	340%	1,983	1,983	-12%	-12%
12	Gas Station Dwy (Route58/End)	100%	1,464	1,464	1,464	1,464	0%	1,464	1,464	0%	0%	1,464	1,464	0%	0%
13	Route 58 (Montello S/ Rt44WBRamps)	100%	11,786	11,786	12,669	12,669	7%	19,366	19,366	64%	53%	19,366	19,366	64%	53%
14	Route 44 WB On-Ramp (Route58/Route44)	100%	1,454	1,454	1,558	1,558	7%	2,856	2,856	96%	83%	2,856	2,856	96%	83%
15	Route 44 WB Off-Ramp (Route58/Route44)	100%	4,309	4,309	4,621	4,621	7%	5,036	5,036	17%	9%	5,036	5,036	17%	9%
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	100%	13,603	13,603	14,590	14,590	7%	19,574	19,574	44%	34%	19,574	19,574	44%	34%
17	Route 44 EB On-Ramp (Route58/Route44)	100%	2,804	2,804	3,011	3,011	7%	3,998	3,998	43%	33%	3,998	3,998	43%	33%
18	Route 44 EB Off-Ramp (Route58/Route44)	100%	3,011	3,011	3,219	3,219	7%	3,686	3,686	22%	15%	3,686	3,686	22%	15%
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	100%	14,953	14,953	16,043	16,043	7%	20,561	20,561	38%	28%	20,561	20,561	38%	28%
20	Route 58 (Rt44EBOnRamps/High)	100%	15,992	15,992	17,186	17,186	7%	20,716	20,716	30%	21%	20,716	20,716	30%	21%
21	High St (Route58/Gate)	100%	1,090	1,090	1,090	1,090	0%	1,246	1,246	14%	14%	1,246	1,246	14%	14%
22	Route 58 (High/Plymouth)	100%	15,940	15,940	17,134	17,134	7%	20,509	20,509	29%	20%	20,509	20,509	29%	20%
23	Plymouth St (Wall/Route58)	100%	3,531	3,531	3,790	3,790	7%	3,946	3,946	12%	4%	3,946	3,946	12%	4%
24	Plymouth St (Route58/Braddock)	100%	4,154	4,154	4,465	4,465	8%	5,296	5,296	28%	19%	5,296	5,296	28%	19%
25	Route 58 (Plymouth/Forest)	100%	12,409	12,409	13,240	13,240	7%	15,628	15,628	26%	18%	15,628	15,628	26%	18%
26	Route 44 (Route105/Route58)	100%	16,199	16,199	17,341	17,341	7%	19,107	19,107	18%	10%	19,107	19,107	18%	10%
27	Route 105 (Thompson/Route44)	100%	4,725	4,725	5,036	5,036	7%	5,036	5,036	7%	0%	5,036	5,036	7%	0%
28	Route 105 (Rt44/Plymouth)	100%	7,580	7,580	8,100	8,100	7%	8,100	8,100	7%	0%	8,100	8,100	7%	0%
29	Route 44 (Rotary/Rt105)	100%	16,095	16,095	17,290	17,290	7%	19,055	19,055	18%	10%	19,055	19,055	18%	10%
30	Route 28 (Leona/Rotary)	100%	16,563	16,563	17,757	17,757	7%	17,757	17,757	7%	0%	17,757	17,757	7%	0%
31	Route 44 (I495 Ramps/Rotary)	100%	24,299	24,299	26,064	26,064	7%	27,829	27,829	15%	7%	27,829	27,829	15%	7%
32	Route 18 (Rotary/I495 Ramps)	100%	11,786	11,786	12,669	12,669	7%	12,669	12,669	7%	0%	12,669	12,669	7%	0%
33	Route 28 (Rotary/Anderson)	100%	11,734	11,734	12,565	12,565	7%	12,565	12,565	7%	0%	12,565	12,565	7%	0%
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	100%	0	0	0	0	#DIV/0!	0	0	#DIV/0!	#DIV/0!	12,253	12,253	#DIV/0!	#DIV/0!
35	Project Driveway [BDMIT Only]	100%	0	0	0	0	#DIV/0!	0	0	#DIV/0!	#DIV/0!	7,632	7,632	#DIV/0!	#DIV/0!
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	100%	0	0	0	0	#DIV/0!	0	0	#DIV/0!	#DIV/0!	18,224	18,224	#DIV/0!	#DIV/0!

Rt 44 Carver-FEIR
Weekday Vehicle Delay

Link No.	Description	Directions	2018 Delay By Approach NB or EB (sec)	2018 Delay By Approach SB or WB (sec)	2018 Adjusted Delay * NB or EB (sec)	2018 Adjusted Delay * SB or WB (sec)	2018 Combined Delay (sec)	2025 Delay By Approach NB or EB (sec)	2025 Delay By Approach SB or WB (sec)	2025 Adjusted Delay * NB or EB (sec)	2025 Adjusted Delay * SB or WB (sec)	2025 Combined Delay (sec)	2025 Delay By Approach NB or EB (sec)	2025 Delay By Approach SB or WB (sec)	2025 Adjusted Delay * NB or EB (sec)	2025 Adjusted Delay * SB or WB (sec)	2025 Combined Delay (sec)	2025 Delay By Approach NB or EB (sec)	2025 Delay By Approach SB or WB (sec)	2025 Adjusted Delay * NB or EB (sec)	2025 Adjusted Delay * SB or WB (sec)	2025 Combined Delay (sec)
1	Route 58 (Palmer/Mayflower)	2	0	6.5	0	6.5	3.25	0	7.6	0	7.6	3.8	0	6.8	0	6.8	3.4	0	6.8	0	6.8	3.4
2	Parsonage Rd (Winnetuxet/Route58)	2	28.3	0	28.3	0	14.15	25.5	0	25.5	0	12.75	29.3	0	29.3	0	14.65	29.3	0	29.3	0	14.65
3	Mayflower Rd (Route58/Colchester)	2	0	20	0	20	10	0	18.5	0	18.5	9.25	0	22.1	0	22.1	11.05	0	22.1	0	22.1	11.05
4	Route 58 (Mayflower/Montello)	2	7.7	0	7.7	0	3.85	8.5	0	8.5	0	4.25	7.9	0	7.9	0	3.95	7.9	0	7.9	0	3.95
5	Montello St (Route58/ProjDwy)	2	23	0	23	0	11.5	21.7	0	21.7	0	10.85	24.2	0	24.2	0	12.1	24.2	0	24.2	0	12.1
6	Route 58 (Montello N/Montello S)	2	0	0.1	0	0.1	0.05	0	0.1	0	0.1	0.05	0	0.1	0	0.1	0.05			0	0	0
7	Montello St (Proj Drwy/North Plaza Dwy)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	N Plaza Dwy (Montello/End)	2	8.4	0	8.4	0	4.2	8.3	0	8.3	0	4.15	12.1	0	12.1	0	6.05	12.1	0	12.1	0	6.05
9	Montello St (N Plaza Dwy/S Plaza Dwy)	2	0.5	0	0.5	0	0.25	0.5	0	0.5	0	0.25	0	0	0	0	0	0	0	0	0	0
10	S Plaza Dwy (Montello/End)	2	8.8	0	8.8	0	4.4	8.8	0	8.8	0	4.4	14.2	0	14.2	0	7.1	14.2	0	14.2	0	7.1
11	Montello St (S Plaza Dwy/Route 58)	2	23.7	6.4	23.7	6.4	15.05	26.9	6.4	26.9	6.4	16.65	300	2.7	300	2.7	151.35	1100.7	2.7	300	2.7	151.35
12	Gas Station Dwy (Route58/End)	2	0	40.9	0	40.9	20.45	0	46	0	46	23	0	300	0	300	150	0	0	0	0	0
13	Route 58 (Montello S/ Rt44WBRamps)	2	0.9	0	0.9	0	0.45	0.9	0	0.9	0	0.45	3	0	3	0	1.5	3	15.6	3	15.6	9.3
14	Route 44 WB On-Ramp (Route58/Route44)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Route 44 WB Off-Ramp (Route58/Route44)	1	0	18.6	0	18.6	18.6	0	66.1	0	66.1	66.1	0	961	0	300	300	0	39.6	0	39.6	39.6
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	2	1.4	0	1.4	0	0.7	1.4	0	1.4	0	0.7	1.4	0	1.4	0	0.7	16.5	10.9	16.5	10.9	13.7
17	Route 44 EB On-Ramp (Route58/Route44)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Route 44 EB Off-Ramp (Route58/Route44)	1	21	0	21	0	21	31.4	0	31.4	0	31.4	713.3	0	300	0	300	31.2	0	31.2	0	31.2
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	2	0	0.8	0	0.8	0.4	0	0.7	0	0.7	0.35	0	1.3	0	1.3	0.65	10.7	4.1	10.7	4.1	7.4
20	Route 58 (Rt44EBOnRamps/High)	2	0	0.3	0	0.3	0.15	0	0.3	0	0.3	0.15	0	0.3	0	0.3	0.15	0	0.3	0	0.3	0.15
21	High St (Route58/Gate)	2	0	34.2	0	34.2	17.1	0	40.2	0	40.2	20.1	0	78.7	0	78.7	39.35	0	78.7	0	78.7	39.35
22	Route 58 (High/Plymouth)	2	0	9.3	0	9.3	4.65	0	10.4	0	10.4	5.2	0	16	0	16	8	0	24.1	0	24.1	12.05
23	Plymouth St (Wall/Route58)	2	77.1	0	77.1	0	38.55	110.3	0	110.3	0	55.15	144.2	0	144.2	0	72.1	56.7	0	56.7	0	28.35
24	Plymouth St (Route58/Braddock)	2	0	16	0	16	8	0	15	0	15	7.5	0	14.5	0	14.5	7.25	0	11.2	0	11.2	5.6
25	Route 58 (Plymouth/Forest)	2	19	0	19	0	9.5	18.4	0	18.4	0	9.2	23.1	0	23.1	0	11.55	25.1	0	25.1	0	12.55
26	Route 44 (Route105/Route58)	2	0	29.6	0	29.6	14.8	0	32.4	0	32.4	16.2	0	45.1	0	45.1	22.55	0	43.8	0	43.8	21.9
27	Route 105 (Thompson/Route44)	2	0	32.6	0	32.6	16.3	0	34.5	0	34.5	17.25	0	35.5	0	35.5	17.75	0	36.8	0	36.8	18.4
28	Route 105 (Rt44/Plymouth)	2	41.7	0	41.7	0	20.85	50.6	0	50.6	0	25.3	53.4	0	53.4	0	26.7	55.6	0	55.6	0	27.8
29	Route 44 (Rotary/Rt105)	2	36.9	415.9	36.9	300	168.45	41.4	268.5	41.4	268.5	154.95	45.8	367.5	45.8	300	172.9	37.2	367.5	37.2	300	168.6
30	Route 28 (Leona/Rotary)	2	0	269.7	0	269.7	134.85	0	46.2	0	46.2	23.1	0	50.9	0	50.9	25.45	0	50.9	0	50.9	25.45
31	Route 44 (I495 Ramps/Rotary)	2	297.4	0	297.4	0	148.7	176.8	0	176.8	0	88.4	196.2	0	196.2	0	98.1	196.2	0	196.2	0	98.1
32	Route 18 (Rotary/I495 Ramps)	2	373.8	0	300	0	150	181.4	0	181.4	0	90.7	173.4	0	173.4	0	86.7	173.4	0	173.4	0	86.7
33	Route 28 (Rotary/Anderson)	2	365.6	0	300	0	150	33.1	0	33.1	0	16.55	35.7	0	35.7	0	17.85	35.7	0	35.7	0	17.85
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	24	12
35	Project Driveway [BDMIT Only]	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.1	0	19.1	0	9.55
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.9	0.1	14.9	0.1	7.5

PM PEAK CONDITION
DELAY BY APPROACH (seconds)

No.	Description	2018 Existing	2018 Existing EB	2018 Existing WB	2018 Existing NB	2018 Existing SB	2025 No Build	2025 No Build EB	2025 No Build WB	2025 No Build NB	2025 No Build SB	2025 Build	2025 Build EB	2025 Build WB	2025 Build NB	2025 Build SB	2025 Build-Mit	2025 Build-Mit EB	2025 Build-Mit WB	2025 Build-Mit NB	2025 Build-Mit SB
1	North Plaza Driveway & Monetello Street		8.4		0.5	0		8.3		0.5	0		12.1		0	0		12.1		0	0
2	South Plaza Driveway & Monetello Street		0	6.4	8.8			0	6.4	8.8			0	2.7	14.2			0	2.7	14.2	
3	Route 58 & Monetello Street/Gas Station Driveway		23.7	40.9	0.9	0.1		26.9	46	0.9	0.1		300	300	3	0.1		1100.7		3	0.1
4	Route 58 & Route 44 WB On-Ramp/Route 44 WB Off-Ramp			18.6	1.4	0			66.1	1.4	0			961	1.4	0			39.6	16.5	15.6
5	Route 44 EB Off-Ramp & Route 58		21		0	0		31.4		0	0		713.3		0	0		31.2		10.7	10.9
6	Route 58 & Route 44 EB On-Ramp			0	0	0.8			0	0	0.7			0	0	1.3			0.2		4.1
7	Route 58 & High Street			34.2	0	0.3			40.2	0	0.3			78.7	0	0.3			78.7	0	0.3
8	Route 58 & Plymouth Street		77.1	16	19	9.3		110.3	15	18.4	10.4		144.2	14.5	23.1	16		56.7	11.2	25.1	24.1
9	Route 58 & Monetello Street		23		0	0		21.7		0	0		24.2		0	0		24.2		0	0
10	Route 58 & Parsonage Road/Mayflower Road		28.3	20	7.7	6.5		25.5	18.5	8.5	7.6		29.3	22.1	7.9	6.8		29.3	22.1	7.9	6.8
11	Route 105 & Route 44		36.9	29.6	41.7	32.6		41.4	32.4	50.6	34.5		45.8	45.1	53.4	35.5		37.2	43.8	55.6	36.8
12	Route 44/Route 28/Route 18 Rotary	365.6	415.9	297.4	269.7	373.8	33.1	268.5	176.8	46.2	181.4	35.7	367.5	196.2	50.9	173.4	35.7	367.5	196.2	50.9	173.4
24	Route 58 & Montello Street [BDMIT ONLY]																	19.1		14.9	24

Rt 44 Carver-FEIR

Weekday Average Daily Traffic (ADT) for Mesoscale Roadway Network

	Roadway Segments	Speed Limit (mph)	2018 Existing Volume (ADT)	2025 No-Build Volume (ADT)	2025 Build Volume (ADT)	2025 Build-Mit Volume (ADT)	K Factor	S.A.F.	Unadjusted PM Peak Hour 2018 Existing	2025 No-Build	2025 Build	2025 Build-Mit
							9.6%	1.00				
1	Route 58 (Palmer/Mayflower)	30	11,786	12,617	13,447	13,447			1,135	1,215	1,295	1,295
2	Parsonage Rd (Winnetuxet/Route58)	40	1,578	1,682	1,682	1,682			152	162	162	162
3	Mayflower Rd (Route58/Colchester)	40	3,998	4,309	4,361	4,361			385	415	420	420
4	Route 58 (Mayflower/Montello)	45	10,125	10,851	11,786	11,786			975	1,045	1,135	1,135
5	Montello St (Route58/ProjDwy)	30	52	52	52	208			5	5	5	20
6	Route 58 (Montello N/Montello S)	45	10,280	11,059	11,994	0			990	1,065	1,155	0
7	Montello St (Proj Drwy/North Plaza Dwy)	30	260	260	7,892	0			25	25	760	0
8	N Plaza Dwy (Montello/End)	10	21	21	21	0			2	2	2	0
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	270	270	7,902	0			26	26	761	0
10	S Plaza Dwy (Montello/End)	10	1,983	1,983	1,983	1,973			191	191	191	190
11	Montello St (S Plaza Dwy/Route 58)	30	2,243	2,243	9,875	1,983			216	216	951	191
12	Gas Station Dwy (Route58/End)	10	1,464	1,464	1,464	1,464			141	141	141	141
13	Route 58 (Montello S/ Rt44WBRamps)	45	11,786	12,669	19,366	19,366			1,135	1,220	1,865	1,865
14	Route 44 WB On-Ramp (Route58/Route44)	40	1,454	1,558	2,856	2,856			140	150	275	275
15	Route 44 WB Off-Ramp (Route58/Route44)	30	4,309	4,621	5,036	5,036			415	445	485	485
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	13,603	14,590	19,574	19,574			1,310	1,405	1,885	1,885
17	Route 44 EB On-Ramp (Route58/Route44)	40	2,804	3,011	3,998	3,998			270	290	385	385
18	Route 44 EB Off-Ramp (Route58/Route44)	30	3,011	3,219	3,686	3,686			290	310	355	355
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	14,953	16,043	20,561	20,561			1,440	1,545	1,980	1,980
20	Route 58 (Rt44EBOnRamps/High)	35	15,992	17,186	20,716	20,716			1,540	1,655	1,995	1,995
21	High St (Route58/Gate)	30	1,090	1,090	1,246	1,246			105	105	120	120
22	Route 58 (High/Plymouth)	35	15,940	17,134	20,509	20,509			1,535	1,650	1,975	1,975
23	Plymouth St (Wall/Route58)	30	3,531	3,790	3,946	3,946			340	365	380	380
24	Plymouth St (Route58/Braddock)	20	4,154	4,465	5,296	5,296			400	430	510	510
25	Route 58 (Plymouth/Forest)	45	12,409	13,240	15,628	15,628			1,195	1,275	1,505	1,505
26	Route 44 (Route105/Route58)	55	16,199	17,341	19,107	19,107			1,560	1,670	1,840	1,840
27	Route 105 (Thompson/Route44)	35	4,725	5,036	5,036	5,036			455	485	485	485
28	Route 105 (Rt44/Plymouth)	35	7,580	8,100	8,100	8,100			730	780	780	780
29	Route 44 (Rotary/Rt105)	50	16,095	17,290	19,055	19,055			1,550	1,665	1,835	1,835
30	Route 28 (Leona/Rotary)	45	16,563	17,757	17,757	17,757			1,595	1,710	1,710	1,710
31	Route 44 (I495 Ramps/Rotary)	50	24,299	26,064	27,829	27,829			2,340	2,510	2,680	2,680
32	Route 18 (Rotary/I495 Ramps)	45	11,786	12,669	12,669	12,669			1,135	1,220	1,220	1,220
33	Route 28 (Rotary/Anderson)	45	11,734	12,565	12,565	12,565			1,130	1,210	1,210	1,210
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0	0	0	12,253			0	0	0	1,180
35	Project Driveway [BDMIT Only]	30	0	0	0	7,632			0	0	0	735
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0	0	0	18,224			0	0	0	1,755

Rt 44 Carver-FEIR

Weekday ATR Volumes

Route 58 06/06/2017					Route 58 06/07/2017					Weekday Average				
			Peak Period Data					Peak Period Data					Peak Period Data	
Begin Time	Volume	V/C Ratio	Hours	Volume	Begin Time	Volume	V/C Ratio	Hours	Volume	Begin Time	Volume	V/C Ratio	Hours	Volume
12:00 AM	31	0.02	0	0	12:00 AM	33	0.02	0	0	12:00 AM	32	0.02	0	0
1:00 AM	17	0.01	0	0	1:00 AM	18	0.01	0	0	1:00 AM	18	0.01	0	0
2:00 AM	9	0.01	0	0	2:00 AM	9	0.01	0	0	2:00 AM	9	0.01	0	0
3:00 AM	18	0.01	0	0	3:00 AM	17	0.01	0	0	3:00 AM	18	0.01	0	0
4:00 AM	72	0.05	0	0	4:00 AM	64	0.04	0	0	4:00 AM	68	0.05	0	0
5:00 AM	286	0.19	0	0	5:00 AM	320	0.22	0	0	5:00 AM	303	0.21	0	0
6:00 AM	663	0.45	0	0	6:00 AM	723	0.49	0	0	6:00 AM	693	0.47	0	0
7:00 AM	996	0.68	1	996	7:00 AM	992	0.67	1	992	7:00 AM	994	0.68	1	994
8:00 AM	838	0.57	1	838	8:00 AM	854	0.58	1	854	8:00 AM	846	0.58	1	846
9:00 AM	648	0.44	0	0	9:00 AM	683	0.46	0	0	9:00 AM	666	0.45	0	0
10:00 AM	675	0.46	0	0	10:00 AM	658	0.45	0	0	10:00 AM	667	0.45	0	0
11:00 AM	674	0.46	0	0	11:00 AM	738	0.50	0	0	11:00 AM	706	0.48	0	0
12:00 PM	693	0.47	0	0	12:00 PM	752	0.51	0	0	12:00 PM	723	0.49	0	0
1:00 PM	754	0.51	0	0	1:00 PM	780	0.53	1	780	1:00 PM	767	0.52	0	0
2:00 PM	801	0.54	1	801	2:00 PM	844	0.57	1	844	2:00 PM	823	0.56	1	823
3:00 PM	935	0.64	1	935	3:00 PM	947	0.64	1	947	3:00 PM	941	0.64	1	941
4:00 PM	1,115	0.76	1	1,115	4:00 PM	1,314	0.89	1	1,314	4:00 PM	1,215	0.83	1	1,215
5:00 PM	955	0.65	1	955	5:00 PM	1,148	0.78	1	1,148	5:00 PM	1,052	0.72	1	1,052
6:00 PM	705	0.48	0	0	6:00 PM	774	0.53	0	0	6:00 PM	740	0.50	0	0
7:00 PM	422	0.29	0	0	7:00 PM	590	0.40	0	0	7:00 PM	506	0.34	0	0
8:00 PM	307	0.21	0	0	8:00 PM	466	0.32	0	0	8:00 PM	387	0.26	0	0
9:00 PM	184	0.13	0	0	9:00 PM	259	0.18	0	0	9:00 PM	222	0.15	0	0
10:00 PM	131	0.09	0	0	10:00 PM	171	0.12	0	0	10:00 PM	151	0.10	0	0
11:00 PM	61	0.04	0	0	11:00 PM	79	0.05	0	0	11:00 PM	70	0.05	0	0
Total	**11,990**		**6**	**5,640**	**Total**	**13,233**		**7**	**6,879**	**Total**	**12,612**		**6**	**5,870**

Roadway Capacity	Crit. V/C	Critical Capacity	Roadway Capacity	Crit. V/C	Critical Capacity	Roadway Capacity	Crit. V/C	Critical Capacity
1,470	53%	779	1,470	53%	779	1470	53%	779
Peak Hour (K) Factor	**0.093**		**Peak Hour (K) Factor**	**0.099**		**Peak Hour (K) Factor**	**0.096**	
Peak Period Volume Factor	**0.470**		**Peak Period Volume Factor**	**0.520**		**Peak Period Volume Factor**	**0.465**	

Rt 44 Carver-FEIR

Emissions Factors By Link (g/mi)

Emission Factors From MOVES2014a

	Roadway Segments	2018 Existing			2025 No Build			2025 Build			2025 Build-Mit		
		NO_x	VOC	CO_2	NO_x	VOC	CO_2	NO_x	VOC	CO_2	NO_x	VOC	CO_2
1	Route 58 (Palmer/Mayflower)	0.36	0.34	488.75	0.19	0.24	404.14	0.19	0.24	404.14	0.19	0.24	404.14
2	Parsonage Rd (Winnetuxet/Route58)	0.34	0.19	442.03	0.19	0.13	365.09	0.19	0.13	365.09	0.19	0.13	365.09
3	Mayflower Rd (Route58/Colchester)	0.31	0.18	416.87	0.17	0.13	344.17	0.17	0.13	344.17	0.17	0.13	344.17
4	Route 58 (Mayflower/Montello)	0.30	0.14	399.81	0.17	0.10	330.09	0.17	0.10	330.09	0.17	0.10	330.09
5	Montello St (Route58/ProjDwy)	0.31	0.34	444.83	0.16	0.24	367.49	0.16	0.24	367.49	0.16	0.24	367.49
6	Route 58 (Montello N/Montello S)	0.29	0.22	391.67	0.16	0.16	323.34	0.16	0.16	323.34	0.16	0.16	323.34
7	Montello St (Proj Drwy/North Plaza Dwy)	0.34	0.40	467.47	0.18	0.29	386.38	0.18	0.29	386.38	0.18	0.29	386.38
8	N Plaza Dwy (Montello/End)	0.53	1.07	859.24	0.26	0.78	708.29	0.26	0.78	708.29	0.26	0.78	708.29
9	Montello St (N Plaza Dwy/S Plaza Dwy)	0.33	2.00	462.76	0.17	1.51	382.46	0.17	1.51	382.46	0.17	1.51	382.46
10	S Plaza Dwy (Montello/End)	0.52	1.18	854.99	0.26	0.86	704.74	0.26	0.86	704.74	0.26	0.86	704.74
11	Montello St (S Plaza Dwy/Route 58)	0.41	3.91	529.40	0.22	2.97	438.09	0.22	2.97	438.09	0.22	2.97	438.09
12	Gas Station Dwy (Route58/End)	0.54	1.75	863.81	0.27	1.30	712.19	0.27	1.30	712.19	0.27	1.30	712.19
13	Route 58 (Montello S/ Rt44WBRamps)	0.33	0.67	424.20	0.18	0.50	350.43	0.18	0.50	350.43	0.18	0.50	350.43
14	Route 44 WB On-Ramp (Route58/Route44)	0.37	0.41	461.40	0.20	0.30	381.25	0.20	0.30	381.25	0.20	0.30	381.25
15	Route 44 WB Off-Ramp (Route58/Route44)	0.29	0.39	420.31	0.15	0.28	347.05	0.15	0.28	347.05	0.15	0.28	347.05
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	0.30	0.71	396.20	0.16	0.53	327.08	0.16	0.53	327.08	0.16	0.53	327.08
17	Route 44 EB On-Ramp (Route58/Route44)	0.33	0.36	428.95	0.18	0.26	354.22	0.18	0.26	354.22	0.18	0.26	354.22
18	Route 44 EB Off-Ramp (Route58/Route44)	0.25	0.40	391.12	0.13	0.29	322.61	0.13	0.29	322.61	0.13	0.29	322.61
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	0.31	1.61	431.30	0.17	1.22	356.00	0.17	1.22	356.00	0.17	1.22	356.00
20	Route 58 (Rt44EBOnRamps/High)	0.39	0.50	496.34	0.21	0.37	410.26	0.21	0.37	410.26	0.21	0.37	410.26
21	High St (Route58/Gate)	0.31	0.20	442.65	0.16	0.14	365.68	0.16	0.14	365.68	0.16	0.14	365.68
22	Route 58 (High/Plymouth)	0.33	0.64	445.08	0.18	0.47	367.48	0.18	0.47	367.48	0.18	0.47	367.48
23	Plymouth St (Wall/Route58)	0.31	0.15	442.65	0.16	0.10	365.68	0.16	0.10	365.68	0.16	0.10	365.68
24	Plymouth St (Route58/Braddock)	0.42	0.73	601.88	0.21	0.53	496.93	0.21	0.53	496.93	0.21	0.53	496.93
25	Route 58 (Plymouth/Forest)	0.37	0.27	451.35	0.20	0.19	373.00	0.20	0.19	373.00	0.20	0.19	373.00
26	Route 44 (Route105/Route58)	0.29	0.09	377.41	0.16	0.06	311.44	0.16	0.06	311.44	0.16	0.06	311.44
27	Route 105 (Thompson/Route44)	0.32	0.22	435.32	0.17	0.15	359.33	0.17	0.15	359.33	0.17	0.15	359.33
28	Route 105 (Rt44/Plymouth)	0.31	0.34	425.51	0.16	0.25	351.19	0.16	0.25	351.19	0.16	0.25	351.19
29	Route 44 (Rotary/Rt105)	0.30	0.09	387.95	0.17	0.06	320.24	0.17	0.06	320.24	0.17	0.06	320.24
30	Route 28 (Leona/Rotary)	0.35	0.21	438.93	0.20	0.15	362.62	0.20	0.15	362.62	0.20	0.15	362.62
31	Route 44 (I495 Ramps/Rotary)	0.35	0.44	423.45	0.19	0.33	349.77	0.19	0.33	349.77	0.19	0.33	349.77
32	Route 18 (Rotary/I495 Ramps)	0.33	0.44	419.45	0.18	0.33	346.48	0.18	0.33	346.48	0.18	0.33	346.48
33	Route 28 (Rotary/Anderson)	0.32	0.18	408.48	0.17	0.12	337.35	0.17	0.12	337.35	0.17	0.12	337.35
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	0.29	0.22	391.67	0.16	0.16	323.34	0.16	0.16	323.34	0.16	0.16	323.34
35	Project Driveway [BDMIT Only]	0.31	0.34	444.83	0.16	0.24	367.49	0.16	0.24	367.49	0.16	0.24	367.49
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	0.29	0.22	391.67	0.16	0.16	323.34	0.16	0.16	323.34	0.16	0.16	323.34

Rt 44 Carver-FEIR

Mesoscale Roadway Data

Link No.	Description	Speed Limit (mph)	Link Length (miles)	Start Elev	Finish Elev	Grade (%)
1	Route 58 (Palmer/Mayflower)	30	0.33	86	104	1.0
2	Parsonage Rd (Winnetuxet/Route58)	40	0.75	70	104	0.9
3	Mayflower Rd (Route58/Colchester)	40	0.79	89	104	0.4
4	Route 58 (Mayflower/Montello)	45	1.20	89	104	0.2
5	Montello St (Route58/ProjDwy)	30	0.32	89	90	0.1
6	Route 58 (Montello N/Montello S)	45	0.52	87	89	0.1
7	Montello St (Proj Drwy/North Plaza Dwy)	30	0.26	82	90	0.6
8	N Plaza Dwy (Montello/End)	10	0.09	82	87	1.1
9	Montello St (N Plaza Dwy/S Plaza Dwy)	30	0.04	82	83	0.5
10	S Plaza Dwy (Montello/End)	10	0.08	83	87	0.9
11	Montello St (S Plaza Dwy/Route 58)	30	0.02	85	87	1.9
12	Gas Station Dwy (Route58/End)	10	0.05	87	90	1.1
13	Route 58 (Montello S/ Rt44WBRamps)	45	0.13	87	92	0.7
14	Route 44 WB On-Ramp (Route58/Route44)	40	0.24	92	108	1.3
15	Route 44 WB Off-Ramp (Route58/Route44)	30	0.26	100	92	-0.6
16	Route 58 (Rt44WBRamps/Rt44EBOffRamps)	45	0.12	91	92	0.2
17	Route 44 EB On-Ramp (Route58/Route44)	40	0.28	91	100	0.6
18	Route 44 EB Off-Ramp (Route58/Route44)	30	0.25	109	91	-1.4
19	Route 58 (Rt44EBOffRamp/Rt44EBOffRamp)	35	0.05	91	92	0.4
20	Route 58 (Rt44EBOnRamps/High)	35	0.19	92	109	1.7
21	High St (Route58/Gate)	30	0.77	109	109	0.0
22	Route 58 (High/Plymouth)	35	0.14	104	109	0.7
23	Plymouth St (Wall/Route58)	30	1.63	105	105	0.0
24	Plymouth St (Route58/Braddock)	20	0.13	97	105	1.2
25	Route 58 (Plymouth/Forest)	45	0.42	105	133	1.3
26	Route 44 (Route105/Route58)	55	4.09	90	103	0.1
27	Route 105 (Thompson/Route44)	35	0.61	75	90	0.5
28	Route 105 (Rt44/Plymouth)	35	0.30	86	90	0.3
29	Route 44 (Rotary/Rt105)	50	4.03	51	90	0.2
30	Route 28 (Leona/Rotary)	45	0.60	51	83	1.0
31	Route 44 (I495 Ramps/Rotary)	50	0.21	50	60	0.9
32	Route 18 (Rotary/I495 Ramps)	45	0.21	51	58	0.6
33	Route 28 (Rotary/Anderson)	45	0.78	50	67	0.4
34	Route 58 (Montello N/ProjDrwy) [BDMIT Only]	45	0.40	87	88	0.0
35	Project Driveway [BDMIT Only]	30	0.14	88	88	0.0
36	Route 58 (ProjDrwy/Montello S) [BDMIT Only]	45	0.12	88	89	0.2

Project Data

TRAFFIC DATA	
Project Name	Rt 44 Carver-FEIR
Existing Year	2018
No-Build Year	2025
Build Year	2025
Build with Mitigation Year	2025
Seasonal Adjustment Factor	1.00
K-Factor	9.6%

Idle Emission Factors

Year	NOx (g/hr)	VOC (g/hr)	CO2 (g/hr)
2018	2.29	1.51	4102.85
2025	0.93	0.95	3349.65

Energy Modeling

Date: January 7, 2019

Subject: 44 Carver Energy Model Update per Initial Review

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44 Carver Energy Model Update per Initial Review

Base model Updates per C406.1

All four baseline models have been updated with 10% improvement in HVAC system performance and additional 10% LPD reduction over ASHRAE 90.1-2013.

Proposed Model Update with Additional ECM's

Proposed model Roof insulation have been updated to R-40 form R-30.
HVAC system of office spaces have been updated to high efficiency Heat pump system for all four buildings.

PV System Covering 30% of the Roof Area

Preliminary calculations have been done for PV systems covering 30% of the roof area for all four building.

Results have been provided for energy performance of all four buildings based on above changes in both design and baseline models. On-site energy production has been updated based on 30% of roof area of all four buildings

Route 44 North Carver Building
A - ASHRAE 90.1-2013 Energy Model

1/7/2019 **Tables 1.8 PerformanceRating Method Compliance** 3:52 PM

		0 Rotation	90 Rotation	180 Rotation	270 Rotation	ASHRAE 90.1 2013	Design Case
Interior Lighting	Energy use(kWh)	1,055,410	1,055,582	1,054,471	1,055,676	1,055,285	841,839
	Demand (kW)	357.87	357.87	357.87	357.87	357.87	284.85
Exterior Lighting	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Space Heating	Energy use(kWh)	0	0	0	0	0	107,245
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	137.89
Space Heating	Energy use (Therms)	70,538	71,324	70,037	70,215	70,529	52,843
	Demad (Therm/hr)	130.00	130.00	130.00	130.00	130.00	49.00
Space Cooling	Energy use(kWh)	79,578	86,477	88,894	82,054	84,251	67,010
	Demand (kW)	102.15	136.40	135.53	102.46	119.14	87.80
Pumps	Energy use(kWh)	1,966	1,960	1,928	1,946	1,950	1,104
	Demand (kW)	0.59	0.59	0.59	0.59	0.59	3.85
Heat Rejection	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Fans- Interior	Energy use(kWh)	105,123	103,609	105,343	107,106	105,295	95,488
	Demand (kW)	52.89	52.89	52.89	52.89	52.89	52.40
Fans - Garage	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	Eenrgy use (Therms)	6,099	6,099	6,098	6,096	6,098	4,753
	Demad (Therm/hr)	2.00	2.00	2.00	2.00	2.00	0.00
Receptacle Equipment	Energy use(kWh)	1,726,065	1,726,065	1,726,065	1,726,065	1,726,065	1,726,065
	Demand (kW)	624.99	624.99	624.99	624.99	624.99	624.99
Elevator	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
TotalRegulated Energy Cost ($)							
Electricity		$445,223.00	$446,056.00	$446,507.00	$445,929.00	$445,928.75	$426,814.00
Fuel		$91,965	$92,908	$91,362	$91,574	$91,952	$69,115
Building Total		$537,188	$538,964	$537,869	$537,503	$537,881	$495,929
Total Electricity	Energy use(kWh)	2,968,154	2,973,705	2,976,714	2,972,858	2,972,858	2,845,428
Total Gas	Use(Therms)	76,637	77,423	76,135	76,312	76,627	57,595
Total Energy	Use(MBtu)	17,794	17,891	17,773	17,777	17,809	15,471

Savings						COST	**7.80%**
Savings						ENERGY	**13.1%**
	Hours Under Cooled	46	0	0	70		36
	Hours Under Heated	51	53	53	55		14
	% Process load	61.3%	61.1%	61.2%	61.3%		52.2%

PV System Size

30% Roof Area M2 X 1 X 0.15 Eff = System Size

29,550x1x0.15 = **4,432 KW**

Total Usage	Design Energy	Energy Cost	PV Generated Energy	PV Energy Cost
Electricity (kWh)	2,845,428	$426,814.00	5,733,436	$793,508
Natural Gas (Therms)	57,595	$69,115	0	0
Toal Energy (Mbtu)	**15,471**	**$495,929.00**	**19,563**	**$793,508**

Route 44 North Carver Building B - ASHRAE 90.1-2013 Energy Model

1/7/2019 **Tables 1.8 PerformanceRating Method Compliance** 3:55 PM

		0 Rotation	90 Rotation	180 Rotation	270 Rotation	ASHRAE 90.1 2013	Design Case
Interior Lighting	Energy use(kWh)	114,117	114,117	114,107	114,096	114,109	91,046
	Demand (kW)	38.82	38.82	38.82	38.82	38.82	30.90
Exterior Lighting	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Space Heating	Energy use(kWh)	0	0	0	0	0	52,237
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	38.70
Space Heating	Energy use (Therms)	10,927	10,784	10,691	10,577	10,745	6,806
	Demad (Therm/hr)	130.00	130.00	130.00	130.00	130.00	49.00
Space Cooling	Energy use(kWh)	19,968	18,007	20,260	20,431	19,667	17,298
	Demand (kW)	23.05	18.38	22.47	24.67	22.14	27.25
Pumps	Energy use(kWh)	801	682	776	764	756	160
	Demand (kW)	0.19	0.16	0.20	0.20	0.19	0.77
Heat Rejection	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Fans- Interior	Energy use(kWh)	15,698	14,833	16,380	16,327	15,810	13,622
	Demand (kW)	8.95	7.55	9.59	9.53	8.91	8.79
Fans - Garage	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	Eenrgy use (Therms)	1,327	1,326	1,326	1,325	1,326	1,182
	Demad (Therm/hr)	2.00	2.00	2.00	2.00	2.00	0.00
Receptacle Equipment	Energy use(kWh)	187,256	187,256	187,256	187,256	187,256	187,256
	Demand (kW)	67.80	67.80	67.80	67.80	67.80	67.80
Elevator	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
TotalRegulated Energy Cost ($)							
Electricity		$50,676.00	$50,234.00	$50,817.00	$50,831.00	$50,639.50	$54,419.00
Fuel		$14,705	$14,532	$14,420	$14,282	$14,485	$9,585
Building Total		$65,381	$64,766	$65,237	$65,113	$65,124	$64,004
Total Electricity	Energy use(kWh)	337,841	334,896	338,781	338,875	337,598	362,793
Total Gas	Use(Therms)	12,254	12,110	12,017	11,902	12,071	7,988
Total Energy	Use(MBtuh)	2,378	2,354	2,358	2,347	2,359	2,037

Savings						COST	**1.72%**
Savings						ENERGY	**13.7%**
	Hours Under Cooled	31	74	26	15		0
	Hours Under Heated	93	236	40	52		38
	% Process load	150.7%	152.1%	151.1%	151.3%		43.9%

PV System Size

30% Roof Area M2 X 1 X 0.15 Eff = System Size

3,205x1x0.15 = 480 KW

Total Usage	Design Energy	Energy Cost	PV Generated Energy	PV Energy Cost
Electricity (kWh)	362,793	$54,419.00	620,950	$85,938
Natural Gas (Therms)	7,988	$9,585	0	0
Toal Energy (Mbtu)	**2,037**	**$64,004.00**	**2,119**	**$85,938**

Route 44 North Carver Building C - ASHRAE 90.1-2013 Energy Model

1/7/2019 **Tables 1.8 PerformanceRating Method Compliance** 3:56 PM

		0 Rotation	90 Rotation	180 Rotation	270 Rotation	ASHRAE 90.1 2013	Design Case
Interior Lighting	Energy use(kWh)	584,096	584,152	583,909	584,009	584,042	475,227
	Demand (kW)	200.95	200.95	200.95	200.95	200.95	161.21
Exterior Lighting	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Space Heating	Energy use(kWh)	0	0	0	0	0	112,778
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	121.77
Space Heating	Energy use (Therms)	44,181	44,630	43,645	43,554	44,003	31,181
	Demad (Therm/hr)	130.00	130.00	130.00	130.00	130.00	49.00
Space Cooling	Energy use(kWh)	43,322	43,858	47,550	45,175	44,976	43,913
	Demand (kW)	59.35	78.18	73.35	59.32	67.55	64.85
Pumps	Energy use(kWh)	1,652	1,641	1,584	1,575	1,613	400
	Demand (kW)	0.46	0.46	0.46	0.46	0.46	0.88
Heat Rejection	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Fans- Interior	Energy use(kWh)	61,592	60,248	62,071	62,621	61,633	55,601
	Demand (kW)	30.69	30.69	30.69	30.69	30.69	36.91
Fans - Garage	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	Eenrgy use (Therms)	3,796	3,799	3,792	3,789	3,794	3,796
	Demad (Therm/hr)	2.00	2.00	2.00	2.00	2.00	0.00
Receptacle Equipment	Energy use(kWh)	976,886	976,886	976,886	976,886	976,886	976,886
	Demand (kW)	353.72	353.72	353.72	353.72	353.72	353.72
Elevator	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
TotalRegulated Energy Cost ($)							
Electricity		$250,132.00	$250,017.00	$250,800.00	$250,540.00	$250,372.25	$250,514.00
Fuel		$57,573	$58,115	$56,924	$56,812	$57,356	$41,972
Building Total		$307,705	$308,132	$307,724	$307,352	$307,728	$292,486
Total Electricity	Energy use(kWh)	1,667,544	1,666,783	1,671,997	1,670,263	1,669,147	1,670,096
Total Gas	Use(Therms)	47,977	48,429	47,437	47,343	47,797	34,977
Total Energy	Use(MBtuh)	10,489	10,532	10,450	10,435	10,476	9,198

Savings						COST	**4.95%**
Savings						ENERGY	**12.2%**
	Hours Under Cooled	71	0	24	114		3
	Hours Under Heated	35	37	14	17		32
	% Process load	70.5%	70.4%	70.5%	70.6%		50.1%

PV System Size

30% Roof Area M2 X 1 X 0.15 Eff = System Size

16,723x1x0.15 = 2500 KW

Total Usage	Design Energy	Energy Cost	PV Generated Ener	PV Energy Cost
Electricity (kWh)	1,670,096	$250,514.00	3,234,114	$447,602
Natural Gas (Therms	34,977	$41,972	0	0
Toal Energy (Mbtu)	**9,198**	**$292,486.00**	**11,035**	**$447,602**

Route 44 North Carver Building
WWTF - ASHRAE 90.1-2013
Energy Model

1/7/2019 **Tables 1.8 PerformanceRating Method Compliance** 3:58 PM

		0 Rotation	90 Rotation	180 Rotation	270 Rotation	ASHRAE 90.1 2013	Design Case
Interior Lighting	Energy use(kWh)	1,239	1,255	1,234	1,269	1,249	837
	Demand (kW)	0.72	0.72	0.72	0.72	0.72	0.49
Exterior Lighting	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Space Heating	Energy use(kWh)	2,173	2,192	1,747	1,757	1,967	1,938
	Demand (kW)	2.27	2.20	1.93	1.99	2.10	1.88
Space Heating	Energy use (Therms)	0	0	0	0	0	0
	Demad (Therm/hr)	130.00	130.00	130.00	130.00	130.00	49.00
Space Cooling	Energy use(kWh)	949	911	967	999	957	828
	Demand (kW)	1.93	1.85	1.88	1.85	1.88	1.65
Pumps	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Fans- Interior	Energy use(kWh)	3,014	2,500	3,094	3,045	2,913	2,071
	Demand (kW)	0.82	0.69	0.86	0.85	0.81	0.57
Fans - Garage	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	Eenrgy use (Therms)	0	0	0	0	0	0
	Demad (Therm/hr)	2.00	2.00	2.00	2.00	2.00	0.08
Receptacle Equipment	Energy use(kWh)	2,834	2,834	2,834	2,834	2,834	3,184
	Demand (kW)	1.01	1.01	1.01	1.01	1.01	1.01
Elevator	Energy use(kWh)	0	0	0	0	0	0
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Heat Pumps	Energy use(kWh)	1,575	1,717	1,797	1,737	1,707	1,574
	Demand (kW)	0.00	0.00	0.00	0.00	0.00	0.00
Service Water Heating	Energy use(kWh)	197	197	197	196	197	164
		0	0	0	0		0
Electricity		$1,797.00	$1,741.00	$1,780.00	$1,776.00	$1,773.50	$1,589.00
Fuel		$0	$0	$0	$0	$0	$0
Building Total		$1,797	$1,741	$1,780	$1,776	$1,774	$1,589
Total Electricity	Energy use(kWh)	11,981	11,606	11,870	11,838	11,824	10,596
Total Gas	Use(Therms)	0	0	0	0	0	0
Total Energy	Use(MBtuh)	41	40	41	40	40	36

Savings						COST	**10.40%**
Savings						ENERGY	**10.4%**
	Hours Under Cooled	0	0	0	0		0
	Hours Under Heated	5	5	7	6		8
	% Process load	3943.2%	4070.1%	3980.9%	3989.8%		30.0%

PV System Size
30% Roof Area M2 X 1 X 0.15 Eff = System Size
42x1x0.15 = 6.3 KW

Total Usage	Design Energy	Energy Cost	PV Generated Ene	PV Energy Cost
Electricity (kWh)	10,596	$1,589.00	8,152	$1,128
Natural Gas (Therms	0	$0	0	0
Toal Energy (Mbtu)	**36**	**$1,589.00**	**28**	**$1,128**

Stationary Source Analysis

Stationary Source Greenhouse Gas Emissions Estimate

Job number: 12681.03
Project: Route 44 Carver Development
Scenario: Proposed

Building A

ENERGY CONSUMPTION

Scenario	Space Cool (kWh)	Space Heating (kWh)	Space Heating (therm)	Hot Water (kWh)	Hot Water (therm)	Vent Fans (kWh)	Pumps & Aux. (kWh)	Misc. Equip. (kWh)	Interior Lighting (kWh)	Total Electricity (MWh)	Total Gas (MMBtu)	Total Energy (MMBtu)	EUI (kBtu/sf-yr)
BASELINE	84,251	0	70,529	0	6,098	105,295	1,950	1,726,065	1,055,285	2,972.9	7,663	17,799	16.8
DESIGN	67,010	107,245	52,843	0	4,753	95,488	1,104	1,726,065	841,839	2,845.4	5,760	15,461	14.6
END-USE SAVINGS	17,241	-107,245	17,686	0	1,345	9,807	846	0	213,446	127.4	1,903	2,338	
PERCENT SAVINGS												13.1%	

GREENHOUSE GAS EMISSIONS

Scenario	Space Cool (tons/yr)	Space Heating (tons/yr)	Space Heating (tons/yr)	Hot Water (tons/yr)	Hot Water (tons/yr)	Vent Fans (tons/yr)	Pumps & Aux. (tons/yr)	Misc. Equip. (tons/yr)	Interior Lighting (tons/yr)	Total Electricity (tons/yr)	Total Gas (tons/yr)	Total Energy (tons/yr)
BASELINE	29.9	0.0	412.6	0.0	35.7	37.4	0.7	612.8	374.6	1,055.4	448.3	1,503.6
DESIGN	23.8	38.1	309.1	0.0	27.8	33.9	0.4	612.8	298.9	1,007.8	336.9	1,344.7
END-USE SAVINGS	6.1	-38.1	103.5	0.0	7.9	3.5	0.3	0.0	75.8	47.6	111.3	158.9
PERCENT SAVINGS												10.6%

Building B

ENERGY CONSUMPTION

Scenario	Space Cool (kWh)	Space Heating (kWh)	Space Heating (therm)	Hot Water (kWh)	Hot Water (therm)	Vent Fans (kWh)	Pumps & Aux. (kWh)	Misc. Equip. (kWh)	Interior Lighting (kWh)	Total Electricity (MWh)	Total Gas (MMBtu)	Total Energy (MMBtu)	EUI (kBtu/sf-yr)
BASELINE	19,667	0	10,745	0	1,326	15,810	756	187,256	114,109	337.6	1,207	2,358	20.5
DESIGN	17,298	52,237	6,806	0	1,182	13,622	160	187,256	91,046	362.8	799	2,036	17.7
END-USE SAVINGS	2,369	-52,237	3,939	0	144	2,188	596	0	23,063	-25.2	408	322	
PERCENT SAVINGS												13.7%	

GREENHOUSE GAS EMISSIONS

Scenario	Space Cool (tons/yr)	Space Heating (tons/yr)	Space Heating (tons/yr)	Hot Water (tons/yr)	Hot Water (tons/yr)	Vent Fans (tons/yr)	Pumps & Aux. (tons/yr)	Misc. Equip. (tons/yr)	Interior Lighting (tons/yr)	Total Electricity (tons/yr)	Total Gas (tons/yr)	Total Energy (tons/yr)
BASELINE	7.0	0.0	62.9	0.0	7.8	5.6	0.3	66.5	40.5	119.8	70.6	190.5
DESIGN	6.1	18.5	39.8	0.0	6.9	4.8	0.1	66.5	32.3	128.4	46.7	175.1
END-USE SAVINGS	0.8	-18.5	23.0	0.0	0.8	0.8	0.2	0.0	8.2	-8.5	23.9	15.4
PERCENT SAVINGS												8.1%

Building C

ENERGY CONSUMPTION

Scenario	Space Cool (kWh)	Space Heating (kWh)	Space Heating (therm)	Hot Water (kWh)	Hot Water (therm)	Vent Fans (kWh)	Pumps & Aux. (kWh)	Misc. Equip. (kWh)	Interior Lighting (kWh)	Total Electricity (MWh)	Total Gas (MMBtu)	Total Energy (MMBtu)	EUI (kBtu/sf-yr)
BASELINE	44,976	0	44,003	0	3,794	61,633	1,613	976,886	584,042	1,669.1	4,780	10,471	17.5
DESIGN	43,913	112,778	31,181	0	3,796	55,601	400	976,886	475,227	1,670.1	3,498	9,192	15.3
END-USE SAVINGS	1,063	-112,778	12,822	0	-2	6,032	1,213	0	108,815	-0.9	1,282	1,279	
PERCENT SAVINGS												12.2%	

GREENHOUSE GAS EMISSIONS

Scenario	Space Cool (tons/yr)	Space Heating (tons/yr)	Space Heating (tons/yr)	Hot Water (tons/yr)	Hot Water (tons/yr)	Vent Fans (tons/yr)	Pumps & Aux. (tons/yr)	Misc. Equip. (tons/yr)	Interior Lighting (tons/yr)	Total Electricity (tons/yr)	Total Gas (tons/yr)	Total Energy (tons/yr)
BASELINE	16.0	0.0	257.4	0.0	22.2	21.9	0.6	346.8	207.3	592.5	279.6	872.2
DESIGN	15.6	40.0	182.4	0.0	22.2	19.7	0.1	346.8	168.7	591.0	204.6	795.6
END-USE SAVINGS	0.4	-40.0	75.0	0.0	0.0	2.1	0.4	0.0	38.6	1.5	75.0	76.5
PERCENT SAVINGS												8.8%

Building WWTF

ENERGY CONSUMPTION

Scenario	Space Cool (kWh)	Space Heating (kWh)	Space Heating (therm)	Hot Water (kWh)	Hot Water (therm)	Vent Fans (kWh)	Pumps & Aux. (kWh)	Misc. Equip. (kWh)	Interior Lighting (kWh)	Total Electricity (MWh)	Total Gas (MMBtu)	Total Energy (MMBtu)	EUI (kBtu/sf-yr)
BASELINE	957	1,967	0	197	0	2,913	1,707	2,834	1,249	11.8	0.0	40	26.9
DESIGN	828	1,938	0	164	0	2,071	1,574	3,184	837	10.6	0.0	36	24.1
END-USE SAVINGS	129	29	0	33	0	842	133	-350	412	1.2	0.0	4	
PERCENT SAVINGS												10.4%	

GREENHOUSE GAS EMISSIONS

Scenario	Space Cool (tons/yr)	Space Heating (tons/yr)	Space Heating (tons/yr)	Hot Water (tons/yr)	Hot Water (tons/yr)	Vent Fans (tons/yr)	Pumps & Aux. (tons/yr)	Misc. Equip. (tons/yr)	Interior Lighting (tons/yr)	Total Electricity (tons/yr)	Total Gas (tons/yr)	Total Energy (tons/yr)
BASELINE	0.3	0.7	0.0	0.1	0.0	1.0	0.6	1.0	0.4	4.2	0.0	4.2
DESIGN	0.3	0.7	0.0	0.1	0.0	0.7	0.6	1.1	0.3	3.8	0.0	3.8
END-USE SAVINGS	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-0.1	0.1	0.4	0.0	0.4
PERCENT SAVINGS												10.4%

PROJECT TOTAL

ENERGY CONSUMPTION

Scenario	Space Cool (kWh)	Space Heating (kWh)	Space Heating (therm)	Hot Water (kWh)	Hot Water (therm)	Vent Fans (kWh)	Pumps & Aux. (kWh)	Misc. Equip. (kWh)	Interior Lighting (kWh)	Total Electricity (MWh)	Total Gas (MMBtu)	Total Energy (MMBtu)
BASELINE	149,851	1,967	125,277	197	11,218	185,651	6,026	2,893,041	1,754,685	4,991	13,650	30,668
DESIGN	129,049	274,198	90,830	164	9,731	166,782	3,238	2,893,391	1,408,949	4,889	10,056	26,725
END-USE SAVINGS	20,802	-272,231	34,447	33	1,487	18,869	2,788	-350	345,736	103	3,593	3,943
PERCENT SAVINGS												12.9%

GREENHOUSE GAS EMISSIONS

Scenario	Space Cool (tons/yr)	Space Heating (tons/yr)	Space Heating (tons/yr)	Hot Water (tons/yr)	Hot Water (tons/yr)	Vent Fans (tons/yr)	Pumps & Aux. (tons/yr)	Misc. Equip. (tons/yr)	Interior Lighting (tons/yr)	Total Electricity (tons/yr)	Total Gas (tons/yr)	Total Energy (tons/yr)
BASELINE	53.2	0.7	732.9	0.1	65.6	65.9	2.1	1,027.0	622.9	1,772.0	798.5	2,570.4
DESIGN	45.8	97.3	531.4	0.1	56.9	59.2	1.1	1,027.2	500.2	1,730.9	588.3	2,319.2
END-USE SAVINGS	7.4	-96.6	201.5	0.0	8.7	6.7	1.0	-0.1	122.7	41.1	210.2	251.3
PERCENT SAVINGS												9.8%

CONVERSION TABLE

CONVERT	MULTIPLY BY
KWH TO MWH	0.001
MWH TO LBS[2]	710.0
THERMS TO MBTU	0.1
LBS TO SHORT TONS	0.0005
kBTU to KWH	0.293
MMBTU to LBS[3]	117.0

Energy Source

Natural Gas Use

Electricity Use

2 mwh to lbs of CO2 conversion factor from 2016 ISO New England Electric Generator Air Emissions Report
3 https://www.eia.gov/environment/emissions/co2_vol_mass.cfm

Solar Feasibility Analysis

Building A

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at https://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

5,733,436 kWh/Year*

System output may range from 5,502,951 to 5,942,133 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.93	341,335	47,241
February	3.79	392,953	54,385
March	4.59	500,084	69,212
April	5.28	547,133	75,723
May	5.81	606,844	83,987
June	5.94	580,066	80,281
July	6.34	624,407	86,418
August	5.95	588,120	81,396
September	5.36	526,853	72,916
October	4.09	431,111	59,666
November	2.91	313,099	43,333
December	2.48	281,431	38,950
Annual	4.62	5,733,436	$ 793,508

Location and Station Identification

Requested Location	Route 44 Carver, MA
Weather Data Source	Lat, Lon: 41.89, -70.78 0.6 mi
Latitude	41.89° N
Longitude	70.78° W

PV System Specifications *(Commercial)*

DC System Size	4432 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.138 $/kWh

Performance Metrics

Capacity Factor	14.8%

Building B

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

620,950 kWh/Year*

System output may range from 595,988 to 643,552 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.93	36,968	5,116
February	3.79	42,558	5,890
March	4.59	54,161	7,496
April	5.28	59,256	8,201
May	5.81	65,723	9,096
June	5.94	62,823	8,695
July	6.34	67,625	9,359
August	5.95	63,695	8,815
September	5.36	57,060	7,897
October	4.09	46,691	6,462
November	2.91	33,910	4,693
December	2.48	30,480	4,218
Annual	**4.62**	**620,950**	**$ 85,938**

Location and Station Identification

Requested Location	Route 44 Carver, MA
Weather Data Source	Lat, Lon: 41.89, -70.78 0.6 mi
Latitude	41.89° N
Longitude	70.78° W

PV System Specifications *(Commercial)*

DC System Size	480 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.138 $/kWh

Performance Metrics

Capacity Factor	14.8%

Building C

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

3,234,113 kWh/Year*

System output may range from 3,104,102 to 3,351,835 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.93	192,540	26,648
February	3.79	221,657	30,677
March	4.59	282,087	39,041
April	5.28	308,626	42,714
May	5.81	342,308	47,375
June	5.94	327,203	45,285
July	6.34	352,215	48,747
August	5.95	331,747	45,914
September	5.36	297,187	41,131
October	4.09	243,181	33,656
November	2.91	176,613	24,443
December	2.48	158,750	21,971
Annual	4.62	3,234,114	$ 447,602

Location and Station Identification

Requested Location	Route 44 Carver, MA
Weather Data Source	Lat, Lon: 41.89, -70.78 0.6 mi
Latitude	41.89° N
Longitude	70.78° W

PV System Specifications *(Commercial)*

DC System Size	2500 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.138 $/kWh

Performance Metrics

Capacity Factor	14.8%

WWTF

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data for nearby , and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

8,150 kWh/Year*

System output may range from 7,822 to 8,447 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Value ($)
January	2.93	485	67
February	3.79	559	77
March	4.59	711	98
April	5.28	778	108
May	5.81	863	119
June	5.94	825	114
July	6.34	888	123
August	5.95	836	116
September	5.36	749	104
October	4.09	613	85
November	2.91	445	62
December	2.48	400	55
Annual	4.62	8,152	$ 1,128

Location and Station Identification

Requested Location	Route 44 Carver, MA
Weather Data Source	Lat, Lon: 41.89, -70.78 0.6 mi
Latitude	41.89° N
Longitude	70.78° W

PV System Specifications *(Commercial)*

DC System Size	6.3 kW
Module Type	Standard
Array Type	Fixed (roof mount)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.138 $/kWh

Performance Metrics

Capacity Factor	14.8%

North Carver Development 30% Area Solar Assessment			
Building	**System Size (kW)**	**System Production (kWh)**	**GHG Reduction (Tons)**
A	4,432	5,733,436	2,035
B	480	620,950	220
C	2,500	3,234,114	1,148
WWTF	6	8,152	3
Total	**7,418**	**9,596,652**	**3,407**

APPENDIX D: Secretary's Certificate and Comment Letters on the DEIR (Annotated)

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September 14, 2018

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: North Carver Development
PROJECT MUNICIPALITY	: Carver
PROJECT WATERSHED	: Taunton River
EEA NUMBER	: 15639
PROJECT PROPONENT	: Route 44 Redevelopment, LLC
DATE NOTICED IN MONITOR	: July 25, 2018

Pursuant to the Massachusetts Environmental Policy Act (M.G. L. c. 30, ss. 61-62I) and Section 11.08 of the MEPA regulations (301 CMR 11.00), I have reviewed the Draft Environmental Impact Report (DEIR) and hereby determine that it **adequately and properly complies** with MEPA and its implementing regulations. The Proponent may prepare and submit for review a Final Environmental Impact Report (FEIR).

Project Description

As described in the DEIR, the project involves the construction of up to 1.77 million square feet (sf) of warehouse/distribution uses in three buildings, including 1.06 million sf in Building A, 115,000 sf in Building B and 600,000 sf in Building C. The project includes 1,883 parking spaces, including 259 spaces for trucks and trailers, the construction of access roads, a wastewater treatment facility (WWTF) and water, stormwater, electricity and communications infrastructure and utilities.

A conceptual plan of the project was included in the Expanded Environmental Notification Form (EENF) as a component of the North Carver Urban Renewal Plan (NCURP). A Final Record of Decision on a request for a Phase 1 Waiver for the NCURP was issued on April 12, 2017. The FROD indicated that the Department of Housing and Community Development (DHCD) could act on the NCURP prior to conclusion of MEPA review for the development project. The NCURP was approved by the Department of Housing and Community Development (DHCD) on May 8, 2017. The Carver Redevelopment Authority (CRA) is responsible for the following actions identified in the NCURP:

- Acquire 13 privately-owned parcels and portions of two other privately-owned parcels totaling 242.1 acres to assemble a suitable development area;
- Relocate three residential occupants and three commercial occupants displaced by land acquisition;
- Demolish five buildings;
- Install infrastructure, including new public roadways, reconstruction of existing roadways and intersections, and extension of the municipal water system to the site;
- Create a viable disposition parcel to convey to a selected developer; and
- Establish design controls for the redevelopment of the parcel.

According to the DEIR, the Proponent has been selected as the designated developer in the NCURP district. Acquisition of the parcels is expected to be completed in 2019; one residential property has already been acquired, its resident has been relocated and the building has been demolished.

Project Site

The NCURP applies to a 301.4-acre area in northwest Carver. The area is bordered by Route 58 (North Main Street) to the east, Route 44 to the south, the Middleborough town line and Middleborough landfill to the west, and the Plympton town line and a low-density residential neighborhood to the north. A portion of Montello Street passes through the eastern section of the planning area. The planning area is comprised of 25 parcels, of which two are publicly owned and the remainder are privately owned.

The project site occupies 283.2 acres within the NCURP district. It includes the 128-acre Whitworth property, which was historically used for sand and gravel extraction, a wood waste landfill, a wood waste processing operation and a 30-acre septage facility, which was demolished in 2013. The site also includes cranberry bogs and a former residential property. The Proponent is conducting site preparation activities, including placement of fill material pursuant to an Administrative Consent Order (ACO) issued by the Massachusetts Department of Environmental Protection's (MassDEP) in accordance with its Interim Policy for the Re-Use of Soil for Large Reclamation Projects (COMM-15-01) dated August 28, 2015.

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM) numbers 25023C0337J and 25023C0341J (both maps effective July 17, 2012), a portion of the northwest part of the site associated with a cranberry bog is within the 100-year floodplain (Zone A).

Environmental Impacts and Mitigation

Potential environmental impacts of the project include disturbance of 123 acres of land, addition of 79.1 acres of impervious area, and potential impacts to wetlands including 950 sf of Bordering Vegetated Wetlands (BVW) and 74,774 sf of Riverfront Area. The project will generate 8,398 average daily trips (adt) and add 1,883 parking spaces. It will use up to 38,000 gallons per day (gpd) of water and generate 38,000 gpd of wastewater. It will emit Greenhouse Gasses (GHG) associated with on-site energy use and transportation.

Measures to avoid, minimize and mitigate impacts include siting structures to minimize direct impacts to wetlands resource areas and providing a buffer between project activities and residences north of the site. The project will include a new wastewater treatment facility and a stormwater management system designed in accordance with the Stormwater Management Standards (SMS) of the Wetlands Protection Act Regulations (310 CMR 10.00). Traffic mitigation will include reconfiguring Montello Street and its intersection with Route 58 and prohibiting project-related traffic from the residential portion of Montello Street north of the site entrance. The building designs incorporate measures to increase energy efficiency. During the construction period, mitigation measures will include sedimentation and erosion controls, designated truck routes, measures to minimize emissions of air pollutants by construction vehicles, and noise, dust and odor controls.

Jurisdiction and Permitting

The project is subject to the preparation of a Mandatory EIR pursuant to the MEPA regulations because it requires State Agency Actions and will directly alter 50 or more acres of land (301 CMR 11.03(1)(a)(1)); create ten or more acres of impervious area (301 CMR 11.03(1)(a)(2)); generate 3,000 or more new trips on roadways providing access to a single location (301 CMR 11.03(6)(a)(6)); and construct 1,000 or more new parking spaces at a single location (301 CMR 11.06(a)(7)). In addition, the approval of a new urban renewal plan in accordance with MGL c. 121B meets the ENF threshold at 301 CMR 11.03(1)(b)(7). The NCURP was approved by DHCD on May 8, 2017. The project requires a Groundwater Discharge Permit, a Drinking Water Distribution Modification Permit and a Corrective Action Design (CAD) Permit from MassDEP. It requires Vehicular Access Permit from the Massachusetts Department of Transportation (MassDOT). The project is subject to review under the May 2010 MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol ("GHG Policy").

The project requires an Order of Conditions from the Carver Conservation Commission (or in the case of an appeal, a Superseding Order of Conditions (SOC)) from MassDEP. It will require a National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit from the United States Environmental Protection Agency (EPA).

The project is a component of the NCURP, which was developed by a municipal redevelopment authority acting in accordance with M.G.L. c. 121B. Therefore, MEPA jurisdiction for this project is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

Changes Since the Filing of the EENF

The project has undergone design development since the EENF was filed and is presented in greater detail in the DEIR. The area of the project site has increased from 242.1 acres to 283.2 acres to include areas for site access and stormwater management that were not reflected in the project area in the EENF. The building area has decreased from 1.85 million sf proposed in the EENF to 1.77 million sf. Parking spaces have decreased from 2,400 spaces to 1,883 spaces. Impervious area has decreased from 81.7 acres to 79.1 acres.

Review of the DEIR

The DEIR was generally responsive to the Scope included in the Certificate on the EENF. It described existing site conditions and provided a detailed description and plans of the project, including proposed uses and structures. It identified the project's potential impacts on wetlands, transportation, water and sewer use, drainage, GHG emissions, and historic resources. The DEIR reviewed the status of remediation activities for contaminated soil and solid waste at the site and provided an update on remediation of up-gradient contamination. It described short-term impacts anticipated during the construction period, and identified potential mitigation measures. The DEIR provided an updated list of required State Permits, Financial Assistance, or other State approvals and provided an update on the status of each of these pending actions, a Response to Comments received on the EENF and Draft Section 61 Findings.

Land Alteration

The DEIR described site conditions under existing and proposed conditions. Approximately 81.3 percent (230.1 acres) of the site has been altered due to current and historical uses, including a 127-acre sand and gravel operation, a 3-acre wood waste landfill, a 30-acre septage treatment facility, residential uses and cranberry bogs. Most project-related activities will occur in previously-disturbed areas; the project will impact 6.5 acres of the 53.1 acres that have not been previously altered. The project will avoid wetlands, cranberry bogs and undisturbed areas that are located primarily around the perimeter of the site.

The DEIR included a plan showing areas to be regraded to provide the final site elevation. Most of the site will be raised by placement of fill to a depth of up to 22.04 feet and elevated landforms will be lowered by up to 37.46 feet to establish the final site grade. Excavated soil will be reused on-site as fill material. In accordance with the ACO, the Proponent may place 732,000 cubic yards (cy) of reclaimed soils on the site and an additional 61,500 cy of processed asphalt, brick and concrete (ABC) for reuse as the subgrade material for roadways and buildings. During the review period, the Proponent provided a revised plan showing the area that may accept off-site soils which includes most of the former Whitworth parcel. The DEIR included a summary of the Fill Management Plan (FMP) approved by MassDEP. The FMP includes criteria for the nature of soil that may be accepted at the site, documentation that is necessary to characterize the material and requirements for soil sampling depending on the source of the material. Soil with anthropogenic impacts must be sampled at a rate of one sample for every 500 cy and material with no anthropogenic impacts at a rate of one sample for every 1,000 cy to be placed on-site. Soils are tested for constituents in accordance with the soil

reporting category (RCS-1) for sites with the highest potential for exposure established in the Massachusetts Contingency Plan (310 CMR 40.000).

Alternatives Analysis

The DEIR provided an alternatives analysis that compared the Preferred Alternative to three alternatives: No Build Alternative, EENF Alternative and Reduced Build Alternative. Under the No-Build Alternative, the sand and gravel quarry would continue to be filled as allowed by MassDEP, but the site would not be redeveloped. This alternative is not consistent with the redevelopment goals for the site identified in the NCURP.

The EENF Alternative was described conceptually in the EENF and was identified as the preferred alternative. It would include four buildings with a gross floor area (GFA) of 1.85 million sf. As envisioned in the NCURP, the buildings would be occupied by warehouse, office and light industrial uses. This alternative would alter 133.1 acres of land and add 90 acres of impervious area. It would include 2,400 parking spaces, generate 8,778 adt, require the use of 47,500 gpd of water and generate 47,500 gpd of wastewater. The EENF Alternative would have significant impacts on wetland resource areas, including 98,417 sf of BVW, 850 linear feet (lf) of Bank, 14,914 sf of Land Under Waterbodies and Waterways (LUWW) and 210,162 sf of Riverfront Area. The EENF Alternative would provide a smaller buffer between the residences north of the site and the project's construction activities and warehousing operations.

The Reduced Build Alternative would include a single warehouse/distribution building with a GFA of approximately one million square feet and 1,077 parking spaces. It would alter 62.2 acres of land, add 47.9 acres of impervious area and impact 950 sf of BVW and 25,928 sf of Riverfront Area. The Reduced Build Alternative would generate 8,216 adt, use 15,500 gpd of water and generate 14,200 gpd of wastewater. It would provide a larger buffer to the site's residential neighbors. According to the DEIR, this alternative is not economically feasible because it would require a similar level of infrastructure improvements, land acquisition and site preparation as the Preferred Alternative but with less commercial development, resulting in a higher cost per square foot.

Four access alternatives were reviewed in the DEIR. Access Alternative 1 would realign Montello Street so that it meets Route 58 approximately 1,000 feet north of the existing intersection. Under this alternative, Montello Street would be rerouted through a wetland area east of the site and have significant impacts to BVW. Access Alternative 2 would avoid the wetland area impacted by Alternative 1 by shifting Montello Street an additional 200 feet to the north. This alternative would facilitate safe traffic operations at the intersection of Route 58 at Montello Street, but would require the acquisition of privately-owned land and the demolition of an existing building. Access Alternative 3 would modify the existing intersection of Route 58 at Montello Street by widening the existing approaches to the intersection, adding turning lanes and changing its geometry to accommodate larger turning radii for trucks. This alternative would not provide adequate sight lines and would impact wetlands in the vicinity of the intersection.

The Preferred Alternative has been reduced in size since the EENF and reoriented to minimize impacts to residential neighbors and to avoid wetlands and undisturbed areas. It

includes measures to minimize traffic impacts by restricting site-generated traffic to the southern section of Montello Street and providing mitigation at other area intersections. The Preferred Alternative will shift the intersection of Route 58 at Montello Street 400 feet to the north to a location that will provide safe traffic operations and minimize wetland impacts. The Preferred Alternative will provide the uses and level of development proposed in the NCURP.

Traffic and Transportation

The DEIR included a Transportation Impact Assessment (TIA) generally consistent with the EEA/Massachusetts Department of Transportation (MassDOT) TIA Guidelines which were issued in March 2014. The DEIR described existing traffic volumes and conditions on area roadways, anticipated trip generation rates and levels-of-service (LOS) operations at intersections under existing and future conditions. It reviewed crash rate data and safety conditions at intersections in the project study area.

The TIA transportation study area including the following intersections:

- Montello Street at Shopping Center North Driveway;
- Montello Street at Shopping Center South Driveway;
- Route 58 at Montello Street (south intersection);
- Route 58 at Montello Street (north intersection);
- Route 58 at High Street;
- Route 58 at Plymouth Street;
- Route 58 at Parsonage Road and Mayflower Road;
- Route 44 Westbound Off-Ramp at Route 58;
- Route 44 Eastbound On-Ramp at Route 58;
- Route 44 Eastbound Off-Ramp at Route 58
- Route 44 Westbound Ramps at Route 58;
- Route 44 at Route 105 (Plympton Street); and
- Middleborough Rotary.

The project area is not served by public transportation and includes limited pedestrian and bicycle facilities. Sidewalks and crosswalks are located along the east side of Route 58 from Montello Street to High Street and on its west side between the Route 44 Westbound On-Ramp and Route 44 Eastbound Off-Ramp. They are also provided along Route 58 north of the site in the vicinity of Mayflower Road and Parsonage Road. There are no bicycle facilities in the study area.

Traffic Operations

Access to the site will be provided by two driveways off Montello Street. A gate will be constructed across Montello Street north of the northern driveway that will allow access to the site for emergency vehicles only; all other traffic to and from the site will be required to use the southern intersection of Route 58 at Montello Street. The DEIR included an analysis of traffic operations under 2018 Existing, 2025 No Build, and 2025 Build and 2025 Build with Mitigation scenarios.

The project's trip generation was determined by comparing actual trip counts from similar uses to trip rates published by the Institute of Transportation Engineers (ITE) *Trip Generation Handbook* 10th Edition for land use codes (LUC) 150 (Warehouse), 154 (High-Cube Transload and Short-Term Storage Warehouse), 155 (High-Cube Fulfillment Center Warehouse) and 156 (High-Cube Parcel Hub Warehouse). The empirical data included counts from three warehouse facilities in southeastern Massachusetts and nationwide average trip generation from Amazon distribution centers. The empirical data corresponded most closely to trip rates for LUCs 150 and 154; trip generation rates for LUCs 155 and 156 were four- to five-times higher than the actual trip counts. In order to provide a conservative estimate, trip generation was calculated using an average rate for LUCs 150 and 156. Based on these sources, the project will generate 8,398 adt, including 420 truck trips. It will generate 770 trips during the morning peak period and 735 trips during the evening peak period.

The DEIR provided a capacity analysis of the intersections in the study area under existing and future conditions. Existing conditions were based primarily on traffic counts and turning movement counts (TMC) collected in June 2017; TMC data collected at the Middleborough Rotary in 2014 was adjusted to reflect a one percent per year increase in traffic volume. Future conditions in 2025 were determined by applying a growth factor of one percent per year to the 2018 Existing conditions data. No other developments are planned in the area that would impact traffic volumes or patterns within the study period. The 2025 No Build and 2025 Build scenarios were modeled to include resurfacing and safety improvements planned for the intersection of Route 44 at Route 105 and interim operational and safety improvements at the Middleborough Rotary.

The DEIR included a capacity analysis of intersections in the study area. Operating conditions were denoted with LOS designations ranging from LOS A to LOS F that reflect the overall operations of an intersection, including traffic speed, delay and capacity. For urban intersections, LOS D reflects an acceptable level of operations. According to the analysis, most intersections will continue to operate at LOS D or better under 2025 Build conditions, indicating that project-generated traffic will not have significant impacts at these intersections. The intersection of Route 58 at Plymouth Street operates at LOS F under 2018 Existing conditions and will continue to do so under 2025 Build conditions. According to the TIA, the project will have significant impacts at the following intersections:

- Route 58 at Montello Street (south intersection);
- Route 58 at Route 44 Westbound Ramps;
- Route 58 at Route 44 Eastbound Off-Ramp;
- Route 58 at High Street;
- Route 105 at Route 44; and,
- Middleborough Rotary.

Roadway Safety

The DEIR included a review of crash rates at study area intersections and compared them to the average crash rates for MassDOT's District 5, which includes Carver. Three intersections

have crash rates that exceed the district average and are designated as Highway Safety Improvement Program (HSIP) clusters, including Route 58 at Plymouth Street, Route 44 at Route 105 and the Middleborough Rotary. MassDOT completed a Roadway Safety Audit (RSA) at the Middleborough Rotary in 2016 and the Proponent completed RSAs at the other two HSIP intersections in May 2018. Recommendations for safety improvements include:

- A new signal and construction of a flyover of Route 44 at the Middleborough Rotary;
- Signage, new signals and refreshed pavement markings and signs at the intersection of Route 58 at Plymouth Street; and,
- Signage, pavement markings and potential changes to roadway geometry at the intersection of Route 44 at Route 105.

The Proponent has not proposed safety improvements at these intersections.

Roadway Mitigation

The DEIR identified the following mitigation measures at three of the intersections that are expected to be significantly impacted by project-generated traffic. Traffic signals will include pedestrian phases and five-foot wide shoulders will be provided along Route 58 to accommodate bicyclists. As detailed below, the Proponent has proposed to phase-in mitigation measures based on project build-out and peak-hour trip generation.

Route 58 at Montello Street (south intersection)

As noted above, all vehicles traveling to and from the project site will be required to use this intersection. A driveway providing access to a shopping center joins Montello Street approximately 50 feet west of the intersection, which is unsignalized. The northbound left turn onto Route 58 from Montello Street is expected to operate at LOS F in the evening peak period under 2025 Build conditions. Proposed mitigation at this intersection includes shifting Montello Street 400 feet to the north to create a perpendicular intersection, providing separate left-turn and right-turn lanes on the Montello Street eastbound approach, adding a dedicated left-turn lane and a through lane on the Route 58 northbound approach and signalizing the intersection. The shopping center would no longer have access to Montello Street and would continue to use the unsignalized intersection. According to the TIA, the new intersection would operate at LOS A in the morning peak period and LOS B in the evening peak period.

Realignment of Montello Road to create an unsignalized intersection at Route 58 will be implemented prior to occupancy of any of the buildings. The signal will be added as a second phase of the mitigation when the project generates approximately 550 peak hour trips, which corresponds to approximately 1.3 million to 1.77 million sf of occupied space. The need for the Phase 2 mitigation will be determined through a traffic monitoring program.

Route 58 at Route 44 Westbound and Eastbound Ramps

According to the TIA, the Route 44 Westbound Ramps approach is anticipated to operate at LOS F in both morning and evening peak periods in the 2025 Build condition. Proposed

mitigation includes signalizing the intersection, maintaining the channelized right-turn lane and adding two through lanes on the Route 58 southbound approach, and adding a shared left-turn/through lane and a through lane on the Route 58 northbound approach. Under 2025 Build with Mitigation conditions, intersection operations are expected to improve to LOS B in the morning peak period and LOS C in the evening peak period.

The Route 44 Eastbound Off-Ramp approach is anticipated to operate at LOS F in the morning and evening peak hours in the 2025 Build condition. Proposed mitigation includes signalizing the Eastbound Off-Ramp and Eastbound On-Ramp intersections, extending two through lanes on the Route 58 southbound approach to the off-ramp, adding a shared left-turn/through lane and a through lane on the Route 58 southbound approach to the on-ramp, and maintaining the channelized right-turn lane and adding two through lanes on the Route 58 northbound approach to the on-ramp. Under Build 2025 with Mitigation conditions, the Route 58 at Route 44 Eastbound Off-Ramp intersection will operate at LOS B in both peak periods and the Route 58 at Route 44 Eastbound On-Ramp will operate at LOS A in both peak periods.

Mitigation at these intersections will be provided in two phases. The first phase will include signalizing both intersections without modifying the lane geometry on Route 58. This mitigation will be provided when the project generates approximately 225 peak hour trips, which corresponds to approximately 500,000 sf to 1.3 million sf of occupied development. Phase 2 will include modifying the lane geometry on Route 58 to provide four lanes as described above. This mitigation will be provided when the project generates 550 peak hour trips at approximately 1.3 million to 1.77 million sf of occupied buildings. The Proponent has committed to funding police control of the intersection if traffic operations are impacted by project-generated traffic before these mitigation measures are implemented.

Transportation Demand Management

The DEIR included a list of Transportation Demand Management (TDM) measures to be implemented by the project to reduce single-occupancy vehicle (SOV) trips to and from the site. The TDM measures include:

- Designating an on-site Transportation Coordinator to promote alternative means of transportation to the site;
- Installing infrastructure to support electric vehicle charging stations in the future;
- Providing a cafeteria, mail drop boxes and ATM machines for employee use;
- Promoting carpooling and ride-matching assistance programs offered by Bay State Commute;
- Designating preferential parking spaces for low emissions vehicles;
- Implementing a guaranteed ride home program for employees; and,
- Using direct deposit for employee paychecks.

Traffic Monitoring Program

In addition to the traffic monitoring to be conducted to determine the need for roadway mitigation for Phase 2, the Proponent will conduct a Traffic Monitoring Program annually for

five years beginning six months after full occupancy. The annual reports will be provided to MassDOT and MassDEP. The monitoring program will include:

- Automatic traffic recorder (ATR) counts on Montello Street east of Route 58 for a continuous 24-hour period on a typical weekday and Saturday; and,
- TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM at the following intersections:
  - Route 58 at Montello Street;
  - Route 58 at Route 44 Westbound Ramps; and
  - Route 58 at Route 44 Eastbound Off-Ramps and On-Ramps.

Parking

The project will provide 1,883 parking spaces, including 1,624 spaces for employees and 259 truck/trailer spaces. According to the DEIR, the number of spaces is based on the number of trips the project will generate and the anticipated number of employees rather than the ITE *Parking Generation* manual, which provides parking rates for only LUC 150 (Warehousing). As noted earlier, the ITE trip generation rates for LUC 150 and for the recommended parking supply (758 spaces) is too low.

Climate Change

The DEIR reviewed climate change projections for the Taunton River basin, identified potential impacts of higher temperatures and precipitation levels and described resiliency measures that are incorporated into the project design. It provided an analysis of the project's stationary- and mobile-source GHG emissions.

Adaptation and Resiliency

The DEIR reviewed how climate change could affect the site due to higher temperatures and extreme weather conditions. It included data from the *Massachusetts Climate Change Projections - Statewide and for Major Drainage Basins* report prepared by the Northeast Climate Service Center, which is available on the Climate Change Clearinghouse for the Commonwealth website (www.resilientma.org). Future weather conditions are expected to include more annual precipitation, higher annual temperatures and increases in the number of days with extreme heat (over 90 degrees F and 100 degrees F).

The project will reduce heat gain by using a low-albedo roofing system, such as solar photovoltaic (PV) panels or white roofing material. Drought-resistant plants are incorporated into the landscaping. The Proponent will evaluate the need for backup generators and fuel supplies.

Greenhouse Gas (GHG) Emissions

The DEIR included a GHG analysis based on the MEPA Greenhouse Gas Policy and Protocol ("the Policy"). The Policy requires projects to quantify carbon dioxide (CO_2) emissions

and identify measures to avoid, minimize or mitigate such emissions. The analysis quantified the direct and indirect CO_2 emissions associated with the project's energy use (stationary sources) and transportation-related emissions (mobile sources). The DEIR outlined and committed to mitigation measures to reduce GHG emissions.

The stationary source GHG analysis evaluated CO_2 emissions for two alternatives as required by the Policy, a Base Case and the Design Case. The Base Case was designed to meet the minimum energy requirements of the 9th Edition of the Massachusetts Building Code, which references the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2013. The Design Case included additional energy-efficiency measures proposed in the Preferred Alternative.

The GHG analysis used eQuest modeling software to quantify emissions from the project's stationary sources. The DEIR provided separate model results for each of the proposed buildings and WWTF. The project's overall stationary source CO_2 emissions were estimated at 2,972.9 tons per year (tpy) in the Base Case. The mitigation measures included in the Design Case will reduce GHG emissions to 2,615.7 tpy, a reduction of 357.2 tpy (12 percent). The estimates of GHG emissions were calculated using the CO_2 emission factors of 710 pounds per megawatt-hour for grid electricity published by the Independent System Operator-New England (ISO-NE) in the *2016 ISO New England Electric Generator Air Emissions Report* and 117 pounds per million British Thermal Units (MMBTU) established by the Energy Information Administration. As noted by the Department of Energy Resources (DOER), it is not clear whether the Base Case was modelled with all energy-efficiency measures required in the Building Code. The FEIR must clarify the Base Case assumptions used in the analysis.

According to the DEIR, energy efficiency measures proposed as part of the project include, but are not limited to:

- Energy efficient windows and building envelope with wall insulation, roof insulation and window U-values meeting Building Code requirements;
- Low window to wall ratios ranging from 11.4 percent to 15.4 percent in the buildings and 19.6 percent in the WWTF;
- High-efficiency Heating, Ventilation, and Air Conditioning (HVAC) meeting Building Code requirements;
- High efficiency boilers (94 percent efficiency) and service hot water heaters (97 percent efficiency) exceeding Building Code requirements;
- Water source heat pumps in Building A;
- Reduced lighting power density (LPD) in the buildings and the WWTF;
- Encouraging the use of Energy STAR appliances and equipment;
- Building commissioning and energy tracking and monitoring systems;
- Low-flow and water-efficient plumbing; and
- Green Tenant guidelines to inform tenants on how to conserve energy.

The DEIR included an evaluation of the feasibility of installing rooftop solar PV Combined Heat and Power (CHP) systems and wind turbines to meet the project's energy needs. Solar PV systems of three sizes were considered: a 28,173-kiloWatt (kW) system covering all of

the usable roof area (approximately 90 percent of the total roof area); a 4,057-kW system, covering approximately 15 percent of the roof area, that would meet all of the project's electricity needs; and a 1,014-kW system using approximately 3 percent of the roof area that would meet 25 percent of the projects electricity needs. According to the DEIR, each system would achieve significant energy cost savings and reduce GHG emissions, but the feasibility of constructing one of the options will not be known until the Solar Massachusetts Renewable Target (SMART) is finalized and its financial incentives made available. The Proponent has committed to constructing solar-ready roofs on all buildings. Neither CHP nor wind turbines are feasible options because the project does not have a sufficiently high hot water load throughout the year to make CHP feasible and the site has low wind speeds that would not effectively generate electricity.

The DEIR analyzed the project's mobile-source CO_2 emissions using the EPA's MOVES2014a emissions model and data from the traffic study. The MOVES2014 model calculates emissions factors for vehicles expressed in units of mass per distance travelled. Total emissions of vehicles are estimated by applying Vehicle Miles Travelled (VMT) data, emissions from idling vehicles, vehicle emissions standards and vehicle age distribution. Under the 2025 Build conditions, estimated project-related emissions would be 5,176 tpy of CO_2. The DEIR estimated that the implementation of roadway mitigation and TDM measures would reduce mobile-source emissions by 1,259 tpy to 3,916 tpy, a reduction of approximately 25 percent.

Air Quality

The EENF included a mesoscale analysis of the impact to regional air quality from air emissions from vehicle trips generated by the project. The method used was similar to mobile-source GHG analysis described above and included calculations of vehicle emissions in the 2018 Existing, 2025 No Build and 2025 Build conditions. The mesoscale analysis was used to determine whether and to what extent the project will increase precursors to the development of ozone, including volatile organic compounds (VOCs) and nitrogen oxides (NO_x). It analyzed the mobile source emissions generated by the project with respect to consistency with the National Ambient Air Quality Standards (NAAQS), as applicable, in the project area. According to the DEIR, project-related emissions are 6.1 kilograms per day (kg/day) of VOC and 5.4 kg/day of NO_x. Implementation of the proposed roadway improvements and TDM measures will reduce VOC emissions to 4.1 kg/day and NOx emissions to 4.5 kg/day in the 2025 Build scenario.

Wetlands and Stormwater

The DEIR included a map showing wetland resource areas on the project site, including BVW, Bank, Land Under Water Bodies and Waterways (LUWW), Riverfront Area, Bordering Land Subject to Flooding (BLSF) and Isolated Land Subject to Flooding (ILSF). The resource areas are generally located around the edges of the site. The Carver Conservation Commission issued an Order of Resource Area Delineation (ORAD) on April 11, 2018 that confirmed the wetland boundaries. Construction of the southern driveway and realignment of Montello Street will impact 950 sf of BVW and 74,774 sf of Riverfront Area, including 19,123 sf of the Inner Riparian Zone. The DEIR did not provide detailed plans of the areas of wetland impacts or describe the nature of the impacts to each resource area. The Proponent has committed to

preparing a Wetland Mitigation Plan that will provide details of any BVW replication areas required.

The project will increase impervious area by 79.1 acres. The DEIR described the hydrological characteristics of the site's drainage areas under existing and proposed conditions. Impacts to water quality and changes to existing drainage patterns will be mitigated through installation of a new stormwater management system, which will include Best Management Practices (BMP) such as oil/grit separators, deep-sump hooded catch basins, sediment forebays, water quality swales and infiltration basins. Low Impact Development (LID) techniques such as bioretention areas, tree box filters and the use of roof runoff for irrigation will be incorporated into the project design. The DEIR reviewed how the stormwater management system will comply with the SMS, by removing 80 percent of the Total Suspended Solids (TSS) in runoff prior to discharge and maintenance of pre-development peak discharge flow rates and volumes. Because the site is considered a land use with higher pollutant load (LUHPPL) and will discharge stormwater to an Interim Wellhead Protection Area (IWPA) near Montello Street, the BMPs will be designed to treat the first 1-inch runoff volume and remove 44 percent of TSS prior to infiltration.

Water Supply and Wastewater

The project is expected to use an average of 23,000 gpd of drinking water with a maximum day demand of 38,000 gpd. Water service to the site will be provided by the North Carver Water District (NCWD) through a connection to a 12-inch water main near the intersection of Montello Street and Route 58. The NCWD has a maximum permitted withdrawal capacity of 100,000 gpd and currently provides an average of 45,000 gpd of water to its customers. According to the DEIR, the NCWD until recently provided an additional 30,000 gpd to a commercial use that no longer buys water. The NCWD is anticipated to have adequate capacity to meet the project's water demand.

Eight-inch diameter domestic and fire protection water supply lines will be looped through the site with connections to an elevated 125,000-gallon domestic water storage tank and a 550,000-gallon fire protection storage tank. The fire protection and domestic water distribution and storage loops will be separated to prevent cross-contamination. The domestic water storage tank has been sized to hold approximately 103,000 gallons of water, which will have a turnover rate of three days in accordance with MassDEP's guidelines for maintaining drinking water quality. The project will implement water conservation measures such as low-flow plumbing, drought-resistant landscaping, reuse of rainwater for irrigation and high-efficiency drip-type irrigation and sensors for soil water content.

The site is not served by any wastewater collection, treatment or disposal facilities. The project will generate approximately 38,000 gpd of wastewater based on Title V flow generation rates; no industrial wastewater will be generated by the project. A WWTF will be designed and constructed to accommodate a maximum day flow of 38,000 gpd and an average daily flow rate of 23,000 gpd and to achieve expected effluent limits established in accordance with MassDEP's Groundwater Discharge Permit Program regulations (314 CMR 5.00). The Proponent is evaluating three treatment process technologies for the WWTF, including a Membrane

Bioreactor (MBR), and Moving Bed Bioreactor (MBBR) and a Submerged Active Growth Bioreactor (SAGR). In addition to the central treatment process, the WWTF will include the process building, settling tanks and process tanks. Sludge will be stored in a precast concrete holding tank until it is transported off-site for processing.

As required by MassDEP's Wastewater Discharge Permitting process, the Proponent is preparing a hydrogeological report to support design and sizing of the treatment and effluent disposal facilities. Based on the results of the report, treated wastewater effluent will be discharged to groundwater using conventional leaching trenches, high-density polyethylene (HDPE) chambers or precast concrete diffusers. The Proponent will be required to monitor effluent and groundwater quality, establish repair and replacement escrow accounts for the WWTF and provide monthly compliance reporting to MassDEP.

Solid Waste

The DEIR described corrective actions being undertaken by the Proponent to remediate the woodwaste landfill on the site in accordance with MassDEP's Solid Waste Management (310 CMR 19.00) and Site Assignment (310 CMR 16.00) regulations. The Proponent will excavate and remove the landfill material and mix it with reclamation soil brought to the site to stabilize the site as a final corrective action. MassDEP is reviewing a Corrective Action Design (CAD) permit application. Once the approved CAD corrective actions have been completed, the Proponent will request that the Carver Board of Health and MassDEP rescind the Site Assignment for the woodwaste landfill.

Construction Period

The DEIR reviewed measures to mitigate construction-period impacts to air quality, noise levels, traffic and water quality. The project will control fugitive dust by using wet suppression, covering trucks carrying soil and minimizing debris stored on site. Noise levels will be controlled by minimizing vehicle idling, using mufflers on construction equipment, scheduling noisy construction activities during periods of high ambient noise levels and complying with MassDEP and Town of Carver noise regulations. Construction vehicles will be required to comply with state and federal emissions standards. A construction-period Storm Water Pollution Prevention Plan (SWPPP) will be developed to identify locations where sedimentation and erosion controls are necessary and to identify measures to maintain these controls throughout the construction period. All truck traffic to the site will be required to access the site from Montello Street south of the existing driveway. The draft s. 61 Findings should list all construction period mitigation commitments.

<u>Conclusion</u>

The DEIR was generally responsive to the Scope issued in the EENF Certificate. It provided a more detailed description of the project and its impacts and identified mitigation measures. As described below, the FEIR must provide additional analysis to support the proposed roadway mitigation, additional documentation of the baseline energy model and

analysis of GHG mitigation measures, a more detailed assessment of wetlands impacts and mitigation and additional detail regarding the proposed wastewater system.

SCOPE

General

The FEIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this Scope. The FEIR should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent feasible. The FEIR should identify proposed mitigation measures and clearly describe how these measures will minimize impacts to the environment and the neighborhood.

Project Description and Permitting

C.1 The FEIR should describe the project and identify any changes to the project since the filing of the DEIR. It should include updated site plans, if applicable, for existing and post-development conditions at a legible scale. Conceptual plans should be provided at a legible scale and clearly identify buildings, impervious areas, driveways and internal circulation roads, stormwater and utility infrastructure and any off-site roadway mitigation.

C.2

C.3 The FEIR should identify and describe State, federal and local permitting and review requirements associated with the project including requests for Financial Assistance and Land Transfers and provide an update on the status of each of these pending actions. It should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.

C.4

Land Alteration

C.5 The FEIR should provide a detailed description of proposed regrading of the site, including excavation and the use of fill material from on-site and off-site sources. It should include an updated plan showing areas to be filled pursuant to the ACO. The FEIR should clarify the total amount of fill material to be brought to the site and whether that volume may be reduced by the reuse of fill material generated on-site. It should show the locations where fill has been placed for regrading purposes and the depth of fill. The FEIR should include plans showing the proposed site elevation in relation to exiting wetland features.

C.6

C.7

C.8

C.9

Traffic and Transportation

C.10 The FEIR should include additional details regarding the method used to calculate trip generation. It should respond to comments submitted by the Old Colony Planning Commission (OCPC) regarding monitoring traffic operations at the intersection of Route 58 at Parsonage Road and Mayflower Road. As requested by the Southeastern Regional Planning and Economic Development District (SRPEDD), the FEIR should review options for signal timing and other

C.11

C.12

C.12 CONT... adjustments at the proposed intersection of Route 58 at Montello Street if necessary to address traffic operational deficiencies and conflicts caused by long queue lengths.

C.13 The FEIR should expand upon the discussion of mitigation presented in the DEIR. It should clarify whether the phased mitigation measures will be triggered by deterioration of LOS or satisfaction of the traffic signal warrant analysis.

C.14 The FEIR should include commitments to implement safety measures identified in the RSAs for the intersections of Route 58 at Plymouth Street, Route 44 at Route 105 and the Middleborough Rotary.

C.15 The TIA documented that project-generated traffic will impact the intersections of Route 58 at High Street, Route 58 at Plymouth Street and the Middleborough Rotary but did not propose any mitigation measures. The FEIR should identify improvements to be implemented by the Proponent to ensure that the intersections operate at the 2025 No Build levels or provide justification why such mitigation is unnecessary or infeasible.

C.16 As recommended by the Greater Attleboro-Taunton Regional Transit Authority (GATRA), the site driveways and internal circulation roadways should be designed to accommodate busses and shelters.

C.17 I encourage the Proponent to consider land banking parking spaces until they are necessary. The FEIR should review opportunities for land banking, shared spaces or other means of minimizing the number of parking spaces and impervious area.

C.18 The FEIR should provide greater detail, including plans, of the bicycle and pedestrian facilities proposed to be constructed along Route 58.

C.19 The Proponent should provide sidewalks on both sides of Route 58 between the proposed intersection of Route 58 at Montello Street and the shopping center, a crosswalk across Route 58 and bicycle accommodations.

C.20 All roadways should be designed in accordance with MassDOT's Complete Streets guidance.

C.21 The DEIR notes that the Proponent expects that the proposed TDM measures will achieve a 5 percent reduction in vehicle trips. The FEIR should describe how the Proponent will monitor employee trips and, if necessary add or modify the TDM plan to achieve this goal.

C.22 As requested by MassDOT, the Transportation Monitoring Program should be revised to include 24-hour ATR counts at the site driveway on a typical weekday and Saturday, a travel survey of employees and patrons of the site and TMCs and operations analyses for the weekday morning, weekday evening and Saturday peak periods at mitigated intersections.

Greenhouse Gas Emissions

C.23 The FEIR should provide the analysis and information requested in DOER's comment letter.

C.24 It should confirm that the Base Case design incorporates all applicable requirements of the Building Code.

C.25 If necessary, the FEIR should provide a revised analysis of stationary-source GHG emissions under the Base Case and Design Case that includes additional mitigation measures such as increased roof insulation with R values of R-40 to R-50.

According to DOER, the project could offset GHG emissions entirely by incorporating heat pumps for space and water heating and installing a solar PV system on 30 percent of the roof area.

C.26 The FEIR should review the feasibility of incorporating heat pumps into the project design, including financial incentives available through Alternative Energy Credits and savings that could result from eliminating the need for gas infrastructure. The project has expansive roof areas which offer a unique opportunity for significant renewable energy generation. One of the

proposed warehouses is almost twice the size of the Boston Convention and Exhibition Center (BCEC) and another one is approximately the same size. Given the size of the roof and the opportunity to significantly offset GHG emissions, further investigation of rooftop solar feasibility is warranted. The FEIR should provide an updated analysis of solar PV feasibility and
C.27 provide a schematic roof plan showing potential space for solar PV systems in coordination with skylights and other rooftop systems. I strongly encourage the Proponent to make a commitment
C.28 to install solar on a minimum of 30 percent of the total roof area.

C.29 The FEIR should include a commitment to provide a self-certification to the MEPA Office at the completion of the project. It should be signed by an appropriate professional (e.g. engineer, architect, transportation planner, general contractor) indicating that all of the GHG mitigation measures, or equivalent measures that are designed to collectively achieve identified reductions in stationary source GHG emission and transportation-related measures, have been incorporated into the project.

Wetlands

C.30 The FEIR should provide a detailed description of the project's impacts on wetland resource areas, including all temporary and permanent impacts. It should provide plans showing
C.31 proposed structures, regrading and construction activities in Riverfront Area and BVW, and describe measures that will be undertaken to minimize impacts. The FEIR should provide a
C.32 detailed description, including plans, of BVW replication areas and Riverfront Area restoration.

Water and Wastewater

The DEIR reviewed potential wastewater processing system designs but did not identify a
c.33 preferred alternative. The FEIR should provide the results of the hydrologic study and describe the design of the proposed WWTF and effluent disposal area. It should review how the
C.34 wastewater facilities will comply with water quality standards. It should include commitments
C.35 for ongoing monitoring and the establishment of escrow accounts for maintenance and replacement.

Mitigation and Draft Section 61 Findings

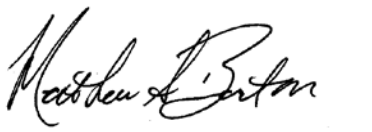
C.36 The FEIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each permit to be issued by State Agencies. The FEIR should contain clear commitments to implement these mitigation measures,
C.37 estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and a schedule for implementation. The FEIR should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing, either tying
C.38 mitigation commitments to overall project square footage/phase or environmental impact thresholds, to ensure that measures are in place to mitigate the anticipated impact associated with each development phase.

Responses to Comments

C.39 The FEIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the FEIR should
C.40 include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the Scope of the FEIR beyond what has been expressly identified in this certificate.

Circulation

C.41 The Proponent should circulate the FEIR to those parties who commented on the EENF and/or DEIR, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations. Several commenters
C.42 submitted comments on the EENF electronically without providing a mailing address. The Proponent should distribute the FEIR to these commenters via email. Per 301 CMR 11.16(5), the Proponent may circulate copies of the EIR to commenters in CD-ROM format or by directing commenters to a project website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. The FEIR submitted to the MEPA office should include a digital copy of the complete document. A copy of the FEIR should be made available for public review at
C.43 the Carver, Plympton, and Middleborough Public Libraries.



September 14, 2018
Date

Matthew A. Beaton

Comments received:

08/22/2018	Old Colony Planning Council (OCPC)
08/23/2018	Massachusetts Department of Transportation (MassDOT)
08/23/2018	Southeastern Regional Planning and Economic Development District (SRPEDD)
08/24/2018	Massachusetts Department of Environmental Protection (MassDEP) – Southeast Regional Office (SERO)
08/24/2018	Greater Attleboro-Taunton Regional Transit Authority (GATRA)
08/27/2018	Department of Energy Resources (DOER)
09/08/2018	Robert Belbin

MAB/AJS/ajs

Old Colony Planning Council

Frank P. Staffier
President

70 School Street
Brockton, MA 02301-4097

Pasquale Ciaramella
Executive Director

Telephone: (508) 583-1833
Fax: (508) 559-8768
Email: information@ocpcrpa.org
Website: www.ocpcrpa.org

August 22, 2018

Secretary Matthew Beaton
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
[Alex Strysky], EEA No. 15639
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: EEA #15639 - North Carver Development, Carver, MA

Dear Secretary Beaton:

Old Colony Planning Council (OCPC) has reviewed the Draft Environmental Impact Report (DEIR) submitted for the North Carver Development (EEA #15639) in Carver, MA. The Project is located in the northwest corner of the Town of Carver adjacent to the municipal boundaries of the Towns of Plympton and Middleborough. The Project involves the construction of approximately 1.77 million square feet of new warehouse/ distribution facilities with ancillary office uses, provides approximately 1,883 parking spaces, and provides paved access roads. The Project is estimated to generate approximately 8,398 weekday trips, approximately 770 new trips during the weekday morning peak hours and 735 new trips during the weekday evening peak hours. To support the Project, new utility infrastructure, a new sewage treatment facility and a new stormwater management system will be constructed. The Project Site will be accessed from a re-configured intersection of Montello Street and Route 58 and a new configuration for Montello Street.

Level of Service (LOS)

Intersection capacity analyses were conducted at all intersections in the identified study area. Analyses were conducted for the 2018 Existing, 2025 No-Build, and 2025 Build conditions (without any mitigation).

According to the analysis included in the DEIR, the intersection of Route 58 at Parsonage Road/ Mayflower Road in Plympton, operates at an acceptable LOS under 2018 Existing conditions (LOS A in the AM Peak/ LOS B in the PM Peak) and is expected to continue to operate at an acceptable LOS (LOS A in the AM Peak/ LOS B in the PM Peak) with the addition of the Project's trips in 2025. Nevertheless, Old Colony Planning Council continues to be concerned about the potential impacts to this intersection, especially in the event that the trip distribution from/ to the Project site should shift more towards the north.

Monitoring Program

The DEIR provides that the Proponent will complete an annual Transportation Monitoring Plan (TMP) to begin six months after full occupancy of the Project and extend for a period of five years, and will provide the data collected as part of the TMP to MassDOT and MassDEP.

The TMP will include ATR counts for a 24-hour period on a typical weekday and Saturday at the following location:

- Montello Street east of Route 58.

In addition, TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at the following locations:

- Route 58 at Montello Street;
- Route 58 at Route 44 Westbound ramps; and
- Route 58 at Route 44 Eastbound off-ramp and on-ramp.

1.1 Though analyzed in the DEIR, OCPC notes that the signalized intersection of Route 58 at Parsonage Road/ Mayflower Road in Plympton is not included in the proposed Transportation Monitoring Plan (TMP). Given the proximity of the project site to this intersection, combined with the concern for the potential transportation impacts of the Project, it is requested that this intersection be added to the Transportation Monitoring Program. Inclusion of this intersection will allow for an assessment of the resultant transportation impacts and for the determination of potential deficiencies.

Mitigation

As noted in the DEIR, mitigation is proposed at three intersections, Route 58 with Montello Street (relocating the Site access), the Route 44 Westbound ramps, and Route 44 Eastbound ramps. The measures address existing deficiencies as well as Project related impacts and incorporate pedestrian and bicycle accommodations where appropriate. The mitigation will be implemented in phases based on occupancy and trip generation.

1.2 As mentioned earlier, the intersection of Route 58 at Parsonage Road/ Mayflower Road in Plympton is not included in the proposed Transportation Monitoring Plan (TMP). As such, the Project's actual impact on this intersection along with the potential need for mitigation cannot be determined as the project is built out. As such, it is requested that this location be added to the Transportation Monitoring Program in order to adequately gauge the resultant transportation affects and that the Project provide necessary mitigation measures to address deficiencies should they arise from the Project.

Old Colony Planning Council thanks you for the opportunity to comment on this project to ensure that it accomplishes its objectives with minimal impacts and look forward to reviewing all future filings. Should you have any questions, please contact me at your convenience.

Sincerely,

Pasquale Ciaramella
Executive Director

cc: John Traynor, Jr., Chairperson, Plympton Board of Selectmen
Christine Joy, Vice-Chairperson, Plympton Board of Selectmen & OCPC Delegate
Elizabeth Dennehy, Plympton Town Administrator
Scott Ripley, Plympton Highway Superintendent
Mary-Joe Perry, Director, MassDOT District 5
J. Lionel Lucien, P.E., Manager, MassDOT Public/Private Development Unit
Derek Krevat, MPO Liaison, MassDOT OTP

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

August 23, 2018

Matthew Beaton, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Carver: North Carver Development - DEIR
(EEA #15639)

ATTN: MEPA Unit
Alex Strysky

Dear Secretary Beaton:

On behalf of the Massachusetts Department of Transportation, I am submitting comments regarding the proposed North Carver Development project in Carver, as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please contact J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit, at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

Ten Park Plaza, Suite 4150, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

cc: Jonathan Gulliver, Administrator, Highway Division
Patricia Leavenworth, P.E., Chief Engineer, Highway Division
Neil Boudreau, Assistant Administrator of Traffic and Safety Engineering
Mary-Joe Perry, District 5 Highway Director
Southeastern Regional Planning & Economic Development District
Old Colony Planning Council
Greater Attleboro Taunton Regional Transit Authority
Department of Planning and Community Development, Town of Carver
Planning Board, Town of Plympton
Diane Hanson, Director, MassRIDES
PPDU Files

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

TO: David J. Mohler, Executive Director
Office of Transportation Planning

FROM: J. Lionel Lucien, P.E, Manager
Public/Private Development Unit

DATE: August 23, 2018

RE: Carver: North Carver Development – DEIR
(EEA #15639)

The Public/Private Development Unit (PPDU) has reviewed the Draft Environmental Impact Report (DEIR) for the North Carver Development in Carver. The project site consists of 282.3 acres of abandoned and/or underutilized land making up the western portion of the North Carver Urban Renewal Plan (NCURP), bounded by the Carver town line to the north and west, Route 44 to the south, and portions of North Main Street and Montello Street to the east. The Proponent seeks to develop warehouse/distribution facilities with ancillary office uses comprising approximately 1.77 million square feet.

The NCURP was the subject of an Expanded Environmental Notification Form (EENF) found to be in compliance with MEPA regulations in March 2017. The NCURP is proposed to be redeveloped in two phases. This project is part of the implementation of the North Carver Urban Renewal Plan (NCURP). The NCURP is proposed to redevelop the property in two phases. The first phase, which is the subject of this DEIR, involves the redevelopment of the western portion of the NCURP. The second phase, which will focus on retail and commercial development on the eastern edge of the NCURP, is considered outside the scope of this DEIR.

Based on the information presented in the DEIR, the project would generate 8,398 new trips on a typical weekday, with 770 new trips during the weekday morning peak hour and 735 new trips during the weekday evening peak hour. The project site will accommodate 1,883 parking spaces.

The project requires a Vehicular Access Permit from MassDOT, as most traffic will access the site via Route 44, a state-controlled highway, and Route 58, a state-controlled highway south of Montello Street. The project exceeds the Massachusetts Environmental Policy Act (MEPA) threshold for trip generation (3,000 new trips) and parking (1,000 new spaces), and is therefore categorically included for preparation of an Environmental Impact Report (EIR).

The DEIR includes a Traffic Impact Assessment (TIA) that is in general conformance with the current MassDOT/EOEEA *Transportation Impact Assessment Guidelines*. The FEIR should address the comments raised in this letter.

Ten Park Plaza, Suite 4150, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

Study Area

The study area includes the following intersections and connecting roadway segments:

- Montello Street at Shopping Center Driveway (north);
- Montello Street at Shopping Center Driveway (south);
- Route 58 (North Main Street) at Montello Street (south);
- Route 58 (North Main Street) at Route 44 Westbound Ramps;
- Route 58 (North Main Street) at Route 44 Eastbound Off-Ramp;
- Route 58 (North Main Street) at Route 44 Eastbound On-Ramp;
- Route 58 (North Main Street) at High Street;
- Route 58 (North Main Street) at Plymouth Street;
- Route 58 (North Main Street) at Montello Street (north);
- Route 58 (North Main Street) at Parsonage Road/Mayflower Road;
- Route 44 at Route 105 (Plympton Street); and
- The Middleborough Rotary.

The study area is considered to be acceptable and adequate in capturing the impact of the project on area roadways.

Trip Generation

The TIA uses trip generation rates from the Institute of Transportation Engineers (ITE)'s *Trip Generation Manual* (10th Edition). As presented in the DEIR, trip generation was calculated based on ITE trip rates for Land Use Code (LUC) 150 –Warehousing, LUC 154 – High-Cube Transload and Short-Term Storage Warehouse, LUC 155 – High-Cube Fulfillment Center Warehouse, and LUC 156 – High-Cube Parcel Hub Warehouse. Empirical data from four facilities and facility types fitting the characteristics of the project were also referenced: the MS Walker Distribution facility in Boston and Milton, the Stop & Shop Distribution facility in Boston and Milton, the Campanelli Industrial Park in Middleborough, and data specific to Amazon Fulfillment Centers. In comparing the ITE trip generation and empirical data, it was decided to use rates for LUC 150 and LUC 156 to derive the trip generation rates. This provides a conservative analysis, as LUC 156 contains a trip generation rate higher than any of the empirical data references, while acknowledging the intended usage of the project site for warehousing. Accordingly, the site is expected to generate 7,978 daily weekday trips, with 734 trips occurring during the weekday morning peak hour and 699 trips occurring during the weekday evening peak hour. The FEIR should provide the square footage figures used for LUC 150 and LUC 156 to derive the trip generation rates, as MassDOT cannot replicate the trip generation methodology without this information.

2.1

The project is expected to generate significant daily truck traffic. An estimate of five percent of total daily trips was used to provide an estimate for daily truck trip generation, with the assumption that trucks would arrive and depart evenly over a 12-hour operating day. This results in 420 daily weekday truck trips, with 36 trips occurring during the weekday morning peak hour and 36 trips occurring during the weekday evening peak hour.

2.2 The FEIR should update the trip generation methodology if the development profile becomes more clarified.

Safety

The TIA includes a summary of crash rates derived from MassDOT for the continuous five-year period of 2011 through 2015. The crash rates at three of the study area intersections (Route 58 at Plymouth Street, Route 58 at Mayflower Road/Parsonage Road, and the Middleborough Rotary) exceed the MassDOT District 5 average.

Three study area intersections (Route 58 at Plymouth Street, Route 44 at Route 105, and the Middleborough Rotary) are listed as Highway Safety Improvement Program (HSIP) crash clusters for 2013-2015. A Road Safety Audit (RSA) was previously completed at the Middleborough Rotary in February 2016, the results of which can still be considered valid. The

2.3 Proponent carried out RSA's at the Route 58 at Plymouth Street and Route 44 at Route 105 intersections in May 2018. The Proponent must commit to specific safety and operational improvements at each of these intersections and detail these measures in the FEIR.

Traffic Operations

Capacity analyses were conducted for the weekday morning and weekday evening peak periods for the existing, future 2025 No-Build, future 2025 Build, and future 2025 Mitigated Build conditions. The capacity analysis found most of the study area intersections operating at acceptable conditions in 2025, with level of service (LOS) at D or better. The following intersections were found to be operating at LOS E or F:

Route 58 (North Main Street) at Montello Street (south)

The Montello Street eastbound approach is anticipated to process the majority of the project's exiting traffic in the weekday morning and weekday evening peak hours, with northbound Route 58 left-turn movements operating at LOS E in the 2025 Build condition. The Proponent seeks to shift this intersection approximately 400 feet to the north and create a new signalized intersection. This realignment would create a perpendicular intersection, limiting the interaction between project-related trips and Silo Marketplace Shopping Center traffic. The existing unsignalized intersection would remain to provide access to the shopping center. Montello Street is proposed to be gated just north of its intersection with the northern Site Driveway to restrict project-related traffic on the residential portion of the street. The new intersection satisfies traffic signal and left-turn lane warrant analyses.

The lane geometry of the mitigated intersection would include separate left-turn and right-turn lanes on the Montello Street eastbound approach, separate left-turn and through lanes on the Route 58 northbound approach, and a shared through/right-turn lane on the Route 58 southbound approach.

The mitigated intersection is anticipated to operate at LOS A in the weekday morning peak hour and LOS B in the weekday evening peak hour in the 2025 Mitigated Build condition.

The Proponent intends to implement this improvement in phases. The intersection will be relocated prior to any site occupancy. A sensitivity analysis determined approximately 550 peak hour trips would be needed for signalization to be needed, which corresponds to approximately 1.3 million square feet of the 1.77 million square foot development program. It is unclear whether this figure is based on satisfaction of the traffic signal warrant analysis or deterioration of the intersection LOS to LOS E or F.

2. 4

The Proponent will implement signalization of the intersection based on the results of the traffic monitoring program, in combination with capacity analyses and a signal warrant evaluation. The Proponent has also committed to coordinating and funding police control during peak periods if traffic operations are unacceptable prior to the mitigation implementation. The Proponent should define whether this would occur in the period prior to the traffic signal being erected or if unacceptable conditions can be triggered without the need for signalization of the intersection.

2.5

Route 58 (North Main Street) at Route 44 Westbound Ramps

The westbound Route 44 Westbound Ramps approach is anticipated to operate at LOS F in the weekday morning and weekday evening peak hours in the 2025 Build condition. The Proponent seeks to signalize this intersection and modify the lane geometry on Route 58. The Route 58 southbound approach would include two through lanes and maintain the channelized right-turn lane. The Route 58 northbound approach would include a shared left-turn/through lane and a through lane. The lane geometry would be consistent with the proposed modifications to the intersections to the north and south of this location. The new intersection satisfies a traffic signal warrant analysis.

The mitigated intersection is anticipated to operate at LOS B in the weekday morning peak hour and LOS C in the weekday evening peak hour in the 2025 Mitigated Build condition.

The Proponent also intends to implement this improvement in phases. A sensitivity analysis determined approximately 325 peak hour trips would be needed for signalization to be needed, which corresponds to approximately 500,000 square feet of the 1.77 million square foot development program. Five-hundred fifty peak period trips would be needed for modification of the lane geometry on Route 58 to a four-lane cross section in the vicinity of the ramps, which corresponds to approximately 1.3 million square feet of the 1.77 million square foot development program. It is unclear whether these figures are based on satisfaction of the traffic signal warrant analysis or deterioration of the intersection LOS to LOS E or F.

2. 4 cont...

The Proponent will implement these improvements based on the results of the traffic monitoring program, in combination with capacity analyses and a signal warrant evaluation. The Proponent has also committed to coordinating and funding police control during peak periods if traffic operations are unacceptable prior to the mitigation implementation. The Proponent should define whether this would occur in the period prior to the traffic signal being erected or if unacceptable conditions can be triggered without the need for signalization of the intersection.

2.5 cont...

Route 58 (North Main Street) at Route 44 Eastbound Ramps

The eastbound Route 44 Eastbound Off-Ramp approach is anticipated to operate at LOS F in the weekday morning and weekday evening peak hours in the 2025 Build condition. The Proponent seeks to signalize this intersection and modify the lane geometry on Route 58. The Route 58 southbound approach would include two through lanes and maintain the channelized right-turn lane. The two southbound lanes of Route 58 would be carried south to meet the existing two lane southbound section. The new intersection satisfies a traffic signal warrant analysis.

The mitigated intersections are anticipated to operate at LOS B (Route 58/Route 44 Eastbound Off-Ramp) and LOS A (Route 58/Route 44 Eastbound On-Ramp) in both the weekday morning and weekday evening peak hours in the 2025 Mitigated Build condition.

The Proponent intends to phase implementation of this improvement. A sensitivity analysis determined approximately 325 peak hour trips would be needed for signalization to be needed, which corresponds to approximately 500,000 square feet of the 1.77 million square foot development program. Five-hundred fifty peak period trips would be needed for modification of the lane geometry on Route 58 to a four-lane cross section in the vicinity of the ramps, which corresponds to approximately 1.3 million square feet of the 1.77 million square foot development program. It is unclear whether these figures are based on satisfaction of the traffic signal warrant analysis or deterioration of the intersection LOS to LOS E or F.

2.4 cont...

The Proponent will implement these improvements based on the results of the traffic monitoring program, in combination with capacity analyses and a signal warrant evaluation. The Proponent has also committed to coordinating and funding police control during peak periods if traffic operations are unacceptable prior to the mitigation implementation. The Proponent should define whether this would occur in the period prior to the traffic signal being erected or if unacceptable conditions can be triggered without the need for signalization of the intersection.

2.5 cont...

Route 58 (North Main Street) at High Street

The westbound High Street approach is anticipated to operate at LOS F in the weekday morning and weekday evening peak hours in the 2025 Build condition. The Proponent indicates it will only add five to ten vehicles to this approach; however, the capacity analysis indicates much more significant impacts between the 2025 No-Build and Build conditions. The FEIR should explore operational and safety improvements at this intersection and provide mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Appropriate justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.

2.6

Route 58 (North Main Street) at Plymouth Street

This intersection is anticipated to operate at LOS F in the weekday morning and weekday evening peak hours in the 2025 No-Build and Build condition. Traffic volume projections show a significant number of project-generated trips expected to use this intersection. The FEIR should

2.7 explore operational and safety improvements at this intersection and provide mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.

Route 44 at Route 105 (Plympton Street)

2.8 This intersection is anticipated to deteriorate from an LOS D to LOS E in the weekday morning peak hour between the 2025 No-Build and Build conditions. The Proponent does not provide any justification for not exploring operational improvements at this intersection in the TIA. An RSA was conducted at this intersection in May 2018; the FEIR should explore operational and safety improvements explored in the RSA and, if necessary, provide additional mitigation measures to restore weekday morning peak hour operations at this intersection to the No-Build condition. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.

Middleborough Rotary

This rotary is anticipated to operate at LOS F in the weekday morning and weekday evening peak hours in the 2025 No-Build and Build conditions. MassDOT plans to implement interim improvements at the rotary to address existing operational and safety deficiencies. These improvements are incorporated into the 2025 Build analysis. MassDOT is also currently in the

2.9 preliminary design phase for future improvement plans for the rotary to address long-term operational and safety deficiencies. The FEIR should explore means to implement some of the long-term recommendations including in these improvement plans. Justification must be provided if the Proponent determines they cannot reasonably implement mitigation improvements at this location.

Conceptual Plans

2.10 Any proposed mitigation within the state highway layout and all internal site circulation must be consistent with a Complete Streets design approach that provides adequate and safe accommodation for all roadway users, including pedestrians, bicyclists, and public transit riders. Guidance on Complete Streets design is included in the MassDOT *Project Development and Design Guide*. Where these criteria cannot be met, the proponent should provide justification, and should work with the MassDOT Highway Division to obtain a design waiver.

Parking

The project will include provision for 1,883 parking spaces, which includes 1,624 employee spaces and 259 truck/trailer spaces. The TIA references the parking demand estimate in ITE's *Parking Generation* (4th edition) for LUC 150 – Warehousing (the only parking demand rate available among the four LUC's used to derive trip generation) is 758 parking spaces. The Proponent cites that the parking generation rate is not comparable to the trip generation rate used for this project and should not be considered reflective of the characteristics of the project. The

1,883 parking space figure is based on the project's anticipated trip generation and employee density.

2.11 The Proponent is encouraged to continue to investigate reducing parking or land banking of parking spaces until and unless needed, based on monitoring conducted at a future date.

Multimodal Access

The TIA documents a sidewalk along the east side of Route 58 between Montello Street and High Street, with crosswalks across the Route 44 westbound off-ramp and Route 44 eastbound on-ramp. There is also a sidewalk on the west side of Route 58 between the Route 44 westbound on-ramp and Route 44 eastbound off-ramp. There are no bicycle facilities or transit services in the vicinity of the project site.

2.12 The Proponent is expected to provide sidewalks along both sides of Route 58 along the 400 feet between the shopping center driveway and the new Route 58/Montello Street (south) intersection. The Proponent is also expected to provide a crosswalk across Route 58 to connect to the existing curb cut at the northern limit of the existing sidewalk along the east side of the roadway, as well as bicycle infrastructure which is more effective than the five-foot wide shoulders along Route 58 proposed as mitigation in the DEIR. The FEIR should provide justification should these improvements not found to be feasible.

2.13 MassDOT's EENF response letter requested that the Proponent coordinate with the Greater Attleboro Taunton Regional Transit Authority (GATRA) to investigate the possibility of future service to the site. This coordination is not documented in the DEIR. The FEIR should detail this coordination and explore alternative means should GATRA be unable to provide services to the site.

Transportation Demand Management Program

The Proponent has identified the following TDM measures with the goal of reducing single-occupancy vehicle trips by employees and patrons of the project:

- Provision of an on-site Transportation Management Coordinator to facilitate and assist with the various TDM measures;
- Installation of conduit in support of future electric vehicle charging stations where appropriate in parking areas;
- Provision of an on-site ATM, cafeteria, and mail drop boxes for employees and customers;
- Surveying and evaluation of employee transportation needs;
- Support of a carpool and ride-matching coordination program through the promotion of Bay State Commute and other MassRIDES initiatives;
- Designation of preferential low-emission vehicle only spaces within general and employee parking areas;
- Provision of a guaranteed ride home for employees; and

- Use of direct deposit for employee paychecks.

2.14 The Proponent should work toward identifying the details of these measures as well as developing additional programs. The Proponent should also consult with MassRIDES, the
2.15 Commonwealth's Travel Options provider, to help implement the TDM program.

Transportation Monitoring Program

The Proponent has committed to traffic monitoring following initial site occupancy, in accordance with the proposed phasing of the mitigation program. The Proponent is also required
2.16 to conduct an annual traffic monitoring program for a period of five years, beginning six months after occupancy of the Full-Build project. At a minimum, the monitoring program should include:

- Simultaneous automatic traffic recorder (ATR) counts at the site driveway for a continuous 24-hour period on a typical weekday and Saturday;
- Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator); and
- Weekday AM, weekday PM and Saturday peak hour turning movement counts (TMCs) and operations analysis at "mitigated" intersections.

The Proponent has indicated the monitoring program will also include collection of ATR counts on Montello Street east of the Route 58/Montello Street (south).

The goals of the monitoring program will be to evaluate the assumptions made in the Draft Environmental Impact Report and the adequacy of the mitigation measures, as well as to determine the effectiveness of the TDM program. The results of each iteration of the monitoring
2.17 program should be summarized in a technical memorandum provided to MassDOT PPDU and the District 5 Office.

Section 61 Finding

The FEIR should include a revised Draft Section 61 Finding, outlining the mitigation
2.18 measures the Proponent has committed to implementing in conjunction with this project, including any additional mitigation resulting from the RSAs. The revised Draft Section 61 Finding will be the basis for MassDOT to issue a final Section 61 Finding for the project.

The FEIR should provide an update of the local permitting processes for the proposed
2.19 project, particularly with respect to any transportation issues being discussed. We strongly encourage the Proponent to consult with MassDOT before any transportation issues are
2.20 discussed in local meetings or hearings.

The Proponent should continue consultation with appropriate MassDOT units, including
2.21 PPDU and the District 5 Office, to discuss preparation of the FEIR. If you have any questions regarding these comments, please contact me at (857) 368-8862 or Michael Clark at (857) 368-8867.

Southeastern Regional Planning & Economic Development District
88 Broadway ◆ Taunton, MA 02780-2557

August 23, 2018

Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: EEA #15639 North Carver Development, Carver, Massachusetts

Dear Secretary Beaton:

SRPEDD has reviewed the proposed DEIR for the North Carver Development located on the northwest portion of Carver, Massachusetts. The proposed development includes a new warehouse, office and/or light manufacturing buildings and new pavement for parking circulation. As stated in the DEIR, the preferred site access alternative would relocate Montello Street further north creating a new intersection at Route 58 to realign the intersection to improve the sight distance and accommodate truck turns. The addition of exclusive turn lanes will also be added at the intersection. It is estimated that the development will generate 8,398 new daily trips which includes 420 daily truck trips. It is estimated that 770 trips will be generated during the weekday AM peak hour and 735 trips during the weekday PM peak hour.

Based on the review of the DEIR report dated July 16, 2018, SRPEDD offers the following comments for your consideration:

1. SRPEDD agrees that traffic monitoring recommended in the DEIR should be conducted periodically and as additional tenants occupy the development in order to determine whether a signal may be required in the future. The DEIR does not provide capacity analysis and/or a traffic signal timing plan. Based on our internal analysis during the AM peak period, the only option that would allow the proponent to obtain a LOS A would have to include a permitted left-turn phase. A protected left-turn phase will yield a worse LOS C, however, a protected left-turn phase is ideal to provide for safe movements if a signal becomes warranted.

3.1

2. SRPEDD is concerned by the close proximity of the relocated Montello Street intersection to the Silo Marketplace and gas station driveways, in reagards to the queues extending beyond these driveway causing conflicts at this location.

3.2

3. SRPEDD would like to inquire if there is a possibility of leaving access open from the Silo Marketplace to the relocated Montello Street, rather than discontinuing the access. This would give customers at the Silo Marketplace the option to exit and enter at the Silo Marketplace access or at the proposed Montello Street. This would assist drivers in exiting in the event that Route 58 experiences queues. In the event that a signal is installed at the relocated Montello Street, this

3.3

will also provide customers the option of exiting at the signal rather than a stop control.

Thank you for the opportunity to comment on this proposal. SRPEDD staff is available to answer any questions or address any concerns raised by these comments.

Respectfully,

William Napolitano

William Napolitano
Environmental Program Director

WN:ldo

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

August 24, 2018

Mathew A. Beaton,
Secretary of Environment and Energy
Executive Office of Environmental Affairs
ATTN: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: DEIR Review. EOEEA # 15639.
CARVER. North Carver Development

Dear Secretary Beaton,

The Southeast Regional Office of the Department of Environmental Protection (MassDEP) has reviewed the Draft Environmental Impact Report (DEIR) for the North Carver Development Project to be located at , Carver, Massachusetts (EOEEA # 15639). The Project Proponent provides the following information for the Project:

The Project is located on approximately 282.3 acres in the northwest corner of the Town of Carver adjacent to the municipal boundaries of the Towns of Plympton and Middleborough. The Project involves the construction of approximately 1.77 million square feet of new warehouse/distribution facilities with ancillary office uses, approximately 1,883 parking spaces, and paved access roads. To support the program, new utility infrastructure, a new sewage treatment facility and a new stormwater management system will be constructed. The Project Site will be accessed from a re-configured intersection of Montello Street and Route 58 and a new configuration for Montello Street. Facility construction is expected to begin in 2020.

The NCURP proposes redevelopment in two phases. The first phase focuses on the redevelopment of the primarily abandoned and/or underutilized area in the western portion of the NCURP, and is the subject of this DEIR. This 283.2-acre portion of the NCURP is bounded by the Carver Town Line to the north and west; Route 44 to the South; and portions of North Main Street and Montello Street to the east (Figure 1.1).[1] It will be developed by Route 44 Redevelopment, LLC, which the CRA deemed the "designated developer) for phase 1 activities. The second phase of NCURP development, which will focus on retail and commercial redevelopment on the eastern edge of the NCURP, will be undertaken by others and is outside the scope of this DEIR.

Bureau of Water Resources

Wetlands and Waterways: The Proponent has identified two areas of wetland resource areas that would be directly impacted by the proposed development. An area of approximately 950 square
4.1 feet of bordering vegetated wetland is proposed for permanent alteration. A wetland mitigation area of at least 1:1 wetland replication area is proposed in order to comply with the wetland replication standards set forth under 310 CMR 10.55. This information should be provided with any Notice of Intent application.

A second wetland resource area impacted by road development would be approximately 1.7 acres of Riverfront Area. In accordance with the General Performance Standards set forth under 310 CMR 10.58, an alternatives analysis must be provided with any Notice of Intent application.

The applicant should also provide all drainage calculations and supporting information detailing all stormwater management drainage structures. The best management practices should be done in accordance with the Department's Stormwater Standards.

Water Management Act According to the DEIR, North Carver Water District (NCWD) is expected to supply a maximum of 0.038 MGD of water to this Project. NCWD is approved to produce less than 0.1 MGD of water and it has been reporting withdrawals close to or under 0.05 MGD in the past 5 years. The Project Proponent has demonstrated in the DEIR that supplying water to this Project will not cause NCWD to be over its approved capacity. The Proponent also mentioned in the DEIR that water conservation measures include the low flow plumbing fixtures, outdoor water use restrictions and drought resistant plants will be incorporated in the Project site.
4.2 MassDEP encourages the Project Proponent to continue exploring and implementing conservation efforts that incorporate Best Management Practices (BMPs) at the Project site. In addition, be aware that should withdrawals exceed 100,000 gallons of water or more for any period of three consecutive months, NCWD must obtain a permit prior to exceeding that permitting threshold.

Drinking Water Program (DWP): The Proponent has adequately addressed the DWP's comments on the ENF. The Proponent has correctly identified the need for a backflow prevention device on the 500,000 gallon fire suppression water tank. The Proponent should coordinate closely with the
4.3 North Carver Water District (NCWD) when the tank is to be filled to ensure that a sufficient amount of water is available to supply its existing customers. The possibility of activating the
4.4 interconnection with the Town of Middleboro should be explored when the fire suppression water tank is filled. The same care should be used when filling the 125,000 gallon tank that will become a part of the NCWD. When NCWD proposes to add the tank to its water supply system through a BRP WS 33 permit application, MassDEP will likely change the NCWD compliance sampling plan requirements.

Bureau of Waste Site Cleanup Comments

DEIR #15639 – There are a few 21E sites nearby, two of them are at the site. They are all permanently closed except for one off site that has a Temporary Solution. Additional work is required before the Permanent Solution can be achieved.

Since the Proponents last submittal as an ENF, the Bureau of Waste Site Cleanup (BWSC) searched its databases for disposal sites and release notifications that have occurred at or might impact the proposed Project area. A disposal site is a location where there has been a release to the environment of oil and/or hazardous material that is regulated under M.G.L. c. 21E, and the Massachusetts Contingency Plan [MCP – 310 CMR 40.0000].

There are no listed MCP disposal sites located at or in the vicinity of the site that would appear to impact the proposed Project area. Four sites are worth noting however. Two Release Tracking Numbers (RTN) are located at the site: RTN 4-19098 was closed under a Permanent Solution with No Conditions on September 26, 2016. RTN 4-24189 was closed under a Downgradient Property Status on January 27, 2015. That RTN is associated with off-site impacts from Ravenbrook Farms Demolition Landfill located approximately 1,600 feet south. Ravenbrook Farms (RTN 4-951) was closed under a Permanent Solution with No Conditions on October 31, 2012. Finally, RTN 4-911 is associated with Simeone Asphalt Plant located approximately 600 feet south of the proposed Project area. The Simeone RTN was closed under a Temporary Solution on June 29, 2006. Continued response actions and reporting are required at the site prior to permanent closure under the MCP.

Interested parties may view a map showing the location of BWSC disposal sites using the MassGIS data viewer (Oliver) at: http://maps.massgis.state.ma.us/map_ol/oliver.php Under "Available Data Layers" select "Regulated Areas", and then "DEP Tier Classified 21E Sites". MCP reports and the compliance status of specific disposal sites may be viewed using the BWSC Waste Sites/Reportable Release Lookup at: https://eeaonline.eea.state.ma.us/portal#!/search/wastesite

4.5 *The Project Proponent is advised that if oil and/or hazardous material are identified during the implementation of this Project, notification pursuant to the Massachusetts Contingency Plan (310 CMR 40.0000) must be made to MassDEP, if necessary. A Licensed Site Professional (LSP) should be retained to determine if notification is required and, if need be, to render appropriate opinions. The LSP may evaluate whether risk reduction measures are necessary if contamination is present. The BWSC may be contacted for guidance if questions arise regarding cleanup.*

Bureau of Air and Waste Comments

Solid Waste: As a result of its review of the Draft Environmental Impact Report for the North Carver Development and Urban Renewal Plan, EEA No. 15630 (Project), the Massachusetts Department of Environmental Protection (MassDEP) Solid Waste Management Section (Solid Waste) has determined that the Proponent has adequately addressed its comments previously provided in the Project's Environmental Notification Form.

Please contact Mark Dakers at (508) 946-2847 or mark.dakers@mass.gov if you should have any additional questions pertaining to solid waste management during implementation of the Project.

Air Quality. The Proponent has adequately addressed the Program's requirements as specified in 310 CMR 7.09 (Dust, Odor, Construction, and Demolition) and 310 CMR 7.10 (Noise) and those related to construction and excessive idling.

GHG Comments:

Mesoscale and Microscale Analyses

The DEIR included an analysis and supporting documentation in response to the Secretary's Scope with regard to Project-related air quality and GHG emissions impacts. The mesoscale analysis was used to determine whether and to what extent the proposed Project will increase precursors to the development of ozone (volatile organic compounds (VOCs) and nitrogen oxides (NOx,)) in the Project area. These data were used to determine consistency with the

Massachusetts State Implementation Plan (SIP), the Clean Air Act (CAA), and the National Ambient Air Quality Standards (NAAQS), as applicable.

The mesoscale analysis evaluated VOC and NOx emissions within the Project study area under the following scenarios: a 2018 Existing Condition; a 2025 No-Build Condition, and a 2025 Build Condition. Project related emissions are estimated at 6.1 kg/day VOCs and 5.4 kg/day NOx. The DEIR indicated that the proposed traffic mitigation measures (i.e., new intersection that realigns Montello Street with Route 58 and the signalization of the intersections of Route 58 with the Route 44 Eastbound and Westbound Ramps) and implementation of the Transportation Demand Management (TDM) program will result in a lower Project-related VMT, reducing VOC emissions by 1.9 kg/day (to 4.1 kg/day) and reduction NOx emissions by 0.9 kg/day (to 4.5 kg/day). This analysis assumed a 2% reduction in VMT (0.1 kg/day of both VOC, and NOx, respectively) attributable solely to the TDM program, with the difference attributable to intersection improvements.

MassDEP is generally satisfied with the analysis conducted in the DEIR with regard to Project compliance with the CAA, NAAQS and SIP. However, the FEIR should clarify the application of
4.6 a 5% trip reduction credit for the TDM program (as noted at page 5-35) and a 2% reduction in VMT for the TDM program (as noted at page 6-7). While individual trips and VMT are not necessarily congruent, the FEIR should provide supporting data to justify application of these reduction credits attributable to the TDM program, particularly in light of the rural location and nature (warehousing) of the proposed development. A 5% overall trip reduction credit for the TDM program appears overly aggressive for the Project type. The proposed TDM and traffic monitoring programs should include an assessment of mode share and application of the TDM program elements to verify the assumptions made in the DEIR (or modified for the FEIR) and propose actions to be undertaken by the Proponent should the mode share goals not be reached.

GHG emissions

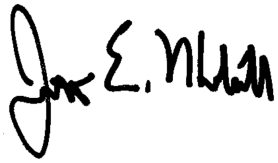
The mobile source GHG analysis presented in the DEIR evaluated Project-related emissions in the 2018 Existing Condition; the 2025 future No-Build Condition, the 2025 Build Condition and the 2025 Build with Mitigation Condition. Project related emissions without the implementation of mitigation measures are estimated at 5,176 tons per year (tpy). Data presented in the DEIR includes an assumption of a 2% reduction in VMT associated with the implementation of the proposed TDM program (a reduction of 104 tpy of CO2) and an additional reduction of 1,155 tpy of CO2 due to the proposed roadway improvements (primarily through reductions in delay and idling). Overall these mitigation commitments are Projected to reduce Project-related mobile source GHG emissions by 24%. MassDEP acknowledges the challenges associated with implementing a robust TDM program when access to public transportation and bicycle/pedestrian infrastructure is limited. However, additional means to reduce Project-related stationary and
4.7 mobile source emissions are available on-site and should be considered. The DEIR noted the potential feasibility of on-site solar using the roof space on the warehouses, but only committed to making the roofs solar ready. We strongly encourage the Proponent to commit to the placement of solar on each roof within the Project area, as these large rooftops have proven viable locations for such systems and will assist the Commonwealth in meeting its GHG reduction goals outlined in the Global Warming Solutions Act. Additionally, the warehouse space will generate significant
4.8 truck traffic. Depending upon the end user and their needs (i.e. a distribution center, use of refrigerated trucks), the Proponent should consider implementation of EPA SmartWay-verified idling reduction technologies on-site (https://www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-technologies-irts-trucks-and-school-buses). Finally, the Proponent should post

4.9 permanent signage regarding Massachusetts Idling Regulations (310 CMR 7.11) limiting idling to five minutes or less on-site.

Other Comments/Guidance

MassDEP staff is available to provide additional guidance to the Proponent upon request. If you have any questions regarding this comment letter please do not hesitate to contact George Zoto at (508) 946-2820.

Very truly yours,



Jonathan E. Hobill,
Regional Engineer,
Bureau of Water Resources

JH/GZ

Cc: DEP/SERO

ATTN: Millie Garcia-Serrano, Regional Director
David Johnston, Deputy Regional Director, BWR
Maria Pinaud, Deputy Regional Director, BAW
Gerard Martin, Deputy Regional Director, BWSC
Jennifer Viveiros, Deputy Regional Director, ADMIN
Mark Dakers, Chief, Solid Waste, BAW
Doug Coppi, Solid Waste, BAW
Duane LeVangie, Chief, Water Management Act, BWR/Boston
Shi Chen, Water Management Act, BWR/Boston
Rick Rondeau, Chief, Drinking Water Program, BWR
Tom Cushing, Chief, Air Quality, BAW
Holly Johnson, Regulatory & Permit Ombudsman/Commissioner's Office
Allen Hemberger, Site Management, BWSC

Bcc: Michael Woollam, North Carver Water District (carver.planning@carverma.org)

GREATER ATTLEBORO–TAUNTON REGIONAL TRANSIT AUTHORITY

BY EMAIL

August 24, 2018

Secretary Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
MEPA Analyst: Alex Strysky, EEA #15639
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: EEA # 15639 – North Carver Development - Draft Environmental Impact Report

Dear Secretary Beaton:

The Town of Carver is a member of the Greater Attleboro Taunton Regional Transit Authority (GATRA). GATRA provides demand response and medical transportation bus service along the Route 44 corridor in conjunction with the local Council on Aging.

The proposed development would appear to have some impact for service requests from GATRA for public transportation services and we would be willing to examine our options and mutually explore our interests in that regard with the project developer.

GATRA is asking for the proponent to work with GATRA to establish a transit friendly environment on the development site. On-site roadways should be developed in order for
5.1 demand response vehicles to enter the site and circulate in an efficient manner. If shelters are constructed, the facility should meet all appropriate ADA guidelines and path of travel for
5.2 individuals with disabilities to access the bus service.

GATRA would be willing to meet with the developer to ensure a transit friendly development is constructed and easily accessed by GATRA vehicles if warranted.

Sincerely,

Francis J. Gay
Administrator

cc: Stephanie Kruel, VHB Senior Environmental Planner
Paul Mission, SRPEDD
Ron Morgan

rkm

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENERGY RESOURCES
100 CAMBRIDGE ST., SUITE 1020
BOSTON, MA 02114
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Facsimile: 617-727-0030

Charles D. Baker
Governor

Karyn E. Polito
Lt. Governor

Matthew A. Beaton
Secretary

Judith F. Judson
Commissioner

27 August 2018

Matthew Beaton, Secretary
Executive Office of Energy & Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02114
Attn: MEPA Unit

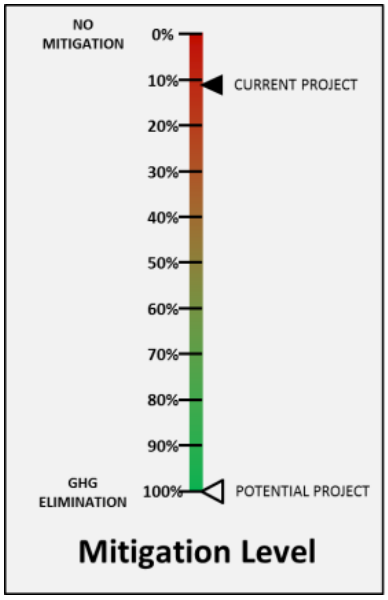
RE: North Carver Development, North Carver, Massachusetts, EEA #15639

Cc: Maggie McCarey, Director of Efficiency Programs, Department of Energy Resources
Judith Judson, Commissioner, Department of Energy Resources

Dear Secretary Beaton:

We've reviewed the Draft Environmental Impact Report (DEIR) for the above project. The proposed project consists of approximately 1.8M sf of warehouse space. About 5% of the warehouse floor area will be office.

In summary:



- The project can readily **eliminate emissions** (100% reduction in GHG) from the project. Current emission reduction is reported at 12%. This can be done with the addition of heat pump heating and PV on about 30% of the roof area.

- The project does not appear to be incorporating C406.1 of the Code in the base case building. If incorporated, we estimate that the planned level of mitigation (currently about 12%) would be cut in half. To compensate, the project should consider R-30 or R-40 roofs.

- Heat pump heating would be eligible for up to about

$100,000 per year worth of Alternative Energy Credits. Heat pump heating could also be used for cooling, and planned cooling systems could be eliminated from the project.

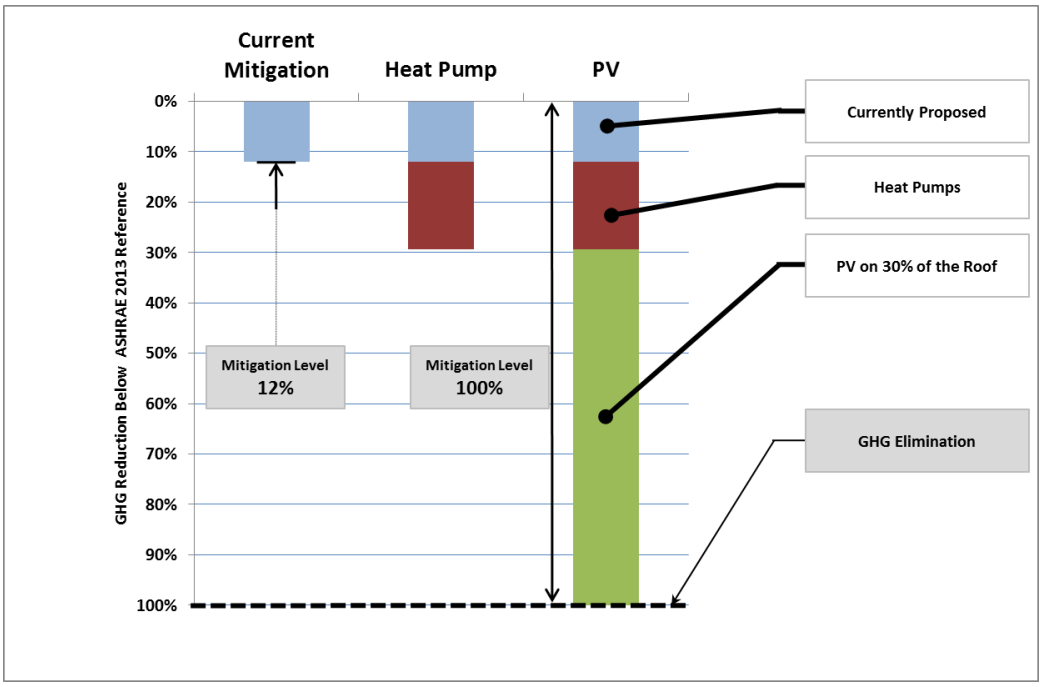
- The project would also be positioned to **eliminate all gas** service from the warehouse buildings, by swapping to electric-based water heating such as heat pump water heaters.

Pathway to Emissions Elimination

The currently-planned GHG reduction is 12%. Emissions can be eliminated, as illustrated below:

- Incorporation of heat pump (or VRF) for space heating would more than double GHG mitigation, improving reduction to 29%.

- Addition of solar PV on about 30% of the roof area would eliminate the balance of all emissions.



Heat Pumps and Alternative Energy Credits

Currently planned heating and cooling systems can be replaced with heat pump (or VRF) systems, replacing two systems with one. Space heating with heat pumps would improve emission reduction by a factor of more than two. Heat pumps also provide efficient space cooling.

Space heating with eligible heat pumps would qualify for Alternative Energy Credits (AECs)[1]. The value of these credits would be approximately $112,000 per year.

Utilization of heat pumps (or VRF) for space heating positions the development to largely eliminate gas infrastructure. The warehouses (with offices), for example, have small service water loads; such loads would be readily met with heat pump water heaters, electric on demand heaters, or electric storage heaters.

Items to Confirm

It appears that C406.1 is not fully implemented in the base case scenario. The submission should be checked to confirm that 10% HVAC and 10% lighting power density reduction are included in the Base Case.

Also, review Table G3.1.1-1 for window to wall ratios to be used in base case.

Once implemented fully, compensating mitigation will have to be provided. We recommend R40 and R50 roofs be investigated.

Recommendations for Future Submissions

Our recommendations for future submissions are as follows:

6.1 1. Confirm that C406.1 measures are a part of the baseline; provide additional measures to compensate if they are not. Increased roof assembly (R-40 or R-50) is recommended.

6.2 2. Investigate heat pumps for space heating (which can also double for cooling).

6.3 3. Evaluate value of Alternative Energy Credits (AECs).

6.4 4. Evaluate value of gas elimination.

6.5 5. Incorporate solar PV on at least 30% of the roofs. Develop scale roof plan showing PV areas. Show coordination strategy with skylights and other rooftop features.

Sincerely,

Paul F. Ormond, P.E.
Energy Efficiency Engineer
Massachusetts Department of Energy Resources

[1] https://www.mass.gov/service-details/alternative-portfolio-standard-rulemaking

26 Gate St
Carver MA 02330

To: The Executive Office of Energy and Environmental Affairs
MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02114
RE: Carver URP North Carver Development
DEIR #15639

My Name is Robert Belbin, A Redevelopment Authority Member. I live in North Carver and less than a mile from the development. I write this a member and resident, not as the RDA Board. I have some concerns related to the Filing of the DEIR for MEPA and the information related to the Project submitted to the State by Rt44 Development. We were told a draft was submitted to the Town at our last meeting. We were supposed to receive that Draft DEIR document. I did not! Then I found a Facebook message from a concerned citizen that the form (200+ pages and 900 attachments) was submitted to the State and the public Comment period was extended. I called the Contact person with MEPA and was told an electronic copy is not available. I then called our Town Planner and he submitted the documents electronically to me. This process concerns me as a member and a resident of lack of being informed of the projects documents submitted by the Developer and my and others ability to know what is going on with the process. **I request the Process be extended in order for the RDA to go over the Developers intentions.**

Before I get to the MEPA application I have questions:

7.1 1. Who provided the electronic copy to the Town?

7.2 2. What paper was the MEPA comment period posted in?

Now to the MEPA application:

Having only a few days to read and skim over it I have some initial concerns.

1.1: I do not see any "green business park" as was presented to Town meeting on this application as to the proposed businesses, since the end users have not been vetted by the Town. No type of green Businesses are proposed or green energy businesses presented.

There is no proof of the development is sustainable for the future.

Minimizing adverse impacts? Over 3000 vehicular traffic in an area that has poor entry and exit to Rt 58.

7.3 Protecting the Aquafer that we use as drinking water is a major concern of mine. Environmental discharge to the land, ground water and air around the development is of great concern. We residents need to be protected from dangerous/hazardous discharge. The building of the water tank storage and its maintenance is important to insure it is built and maintained.

7.4 There is no proof of any Tax base increase to the town, without having an occupant. We were told at a hearing that the developer had an end user, but there was a Non-disclosure agreement, so they could not say anything. Yet the residents have told me it was Amazon. Then it was disclosed in Executive Session. Yet the Developer now states there is no End user. So the truthfulness is an issue.

7.5 I could not read and go through all the report and documents please start the process over so the RDA can go over all the documents

Thank you Robert Belbin
26 Gate St
Carver MA 02330
5085747067
housecallbob@comcast.net