



A.D. MAKEPEACE

Inspired by nature.

July 15, 2009

Secretary Ian A. Bowles
Attn: MEPA Office
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Via: Hand Delivery

Reference: Notice of Project Change
Request for Amended Phase A Waiver
EOEA No. 13940 - ADM Tihonet Mixed Use Development
Wareham, Carver and Plymouth, Massachusetts

Dear Secretary Bowles:

On behalf of ADM Development Services LLC, I respectfully submit this Notice of Project Change (NPC) requesting an Amended Phase A Waiver for the ADM Tihonet Mixed Use Development in Wareham, Carver, and Plymouth, Massachusetts. This NPC is submitted in accordance with the Special Review Procedure (SRP) issued as part of the Secretary's Certificate dated January 29, 2007.

This NPC outlines proposed changes to the Phase A1 and A2 program previously presented in the EENF and approved through a Final Record of Decision issued on October 15, 2008. The NPC also includes a Phase A3 program as part of the Request for Amended Waiver.

Phases A1, A2 and A3 are located entirely within the town of Wareham. In addition to the pre-filing public informational meeting that is required under the SRP (held on June 25, 2009 at the Carver Town Hall), I personally met with the Wareham Board of Selectmen on June 30, 2009, to present information about the building program and the process during a meeting that was broadcast on local access cable TV.

The waiver effects three changes to the plan we proposed in our original filing, all to reflect market conditions. First, it reduces the size of the building included in Phase A1 and adjusts the ratio of office to manufacturing space, in response to feedback from potential tenants. The adjustment to Phase A2 moves the building to a more suitable location that will allow the tenant,

Southcoast Hospital Group, to expand in the future. And finally, we are requesting approval for five acres of new cranberry bog, in light of favorable cranberry pricing and strong consumer demand.

As you know, the Tihonet Mixed Use Development plans have evolved to include significant renewable energy components, and this proposal further espouses “smart growth” principles by emphasizing development in proximity to existing highway systems. We had already detailed plans for low-impact site design and wastewater disposal initiatives that respond to local concerns about nitrogen runoff.

The NPC document compares the Phase A program described in the EENF with the revised Phase A program, including a description and analysis of the three sub-phases of the revised Phase A program along with alternatives at a level of detail generally consistent with an Environmental Impact Report. Please note that the development of the sub-phases of the revised Phase A may not be undertaken in the chronological order of Phase A1 first, A2 second, and A3 third. The sub-phases should be considered geographical, rather than sequential.

I look forward to continuing to work with you to make the Tihonet Mixed Use Development a true showcase of environmentally and socially responsible growth.

Should you have any questions, please do not hesitate to contact me at (508) 295-1000.

Sincerely,



Michael P. Hogan
President/CEO

cc: Circulation List (via Certified Mail)

Notice of Project Change
Request for Amended Phase A Waiver

ADM Tihonet Mixed Use Development

Wareham, Carver and Plymouth, Massachusetts

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***Submitted in compliance with the Massachusetts
Environmental Policy Act***

July 15, 2009

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SOURCES

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APPENDIX D – GREENHOUSE GAS EMISSION EVALUATION INFORMATION

APPENDIX E – PHASE A1 CONSERVATION AND MANAGEMENT PERMIT

Section 1.0
Notice of Project Change Form

MEPA Analyst:

Phone: 617-626-

NPC

Notice of Project Change

The information requested on this form must be completed to begin MEPA Review of a NPC in accordance with the provisions of the Massachusetts Environmental Policy Act and its implementing regulations (see 301 CMR 11.10(1)).

Project Name: ADM Tihonet Mixed Use Development		EOEA #: 13940	
Street: Tihonet Road, Wareham			
Municipality: Wareham/Carver/Plymouth		Watershed: Buzzard's Bay	
Universal Transverse Mercator Coordinates:		Latitude: 41°47'52" N Longitude: 70°43'29" W	
Status of project construction: 0 %complete			
Proponent: ADM Development Services LLC			
Street: 158 Tihonet Road			
Municipality: Wareham		State: MA	Zip Code:02571
Name of Contact Person From Whom Copies of this NPC May Be Obtained: Stacy Minihane			
Firm/Agency: Beals and Thomas, Inc.		Street: 32 Court Street	
Municipality: Plymouth		State: MA	Zip Code: 02360
Phone: 508-746-3288	Fax: 508-746-6407	E-mail: sminihane@btiweb.com	

In 25 words or less, what is the project change? The project change involves . . .
 The building program associated with the Phase A development in Wareham as presented in the Expanded Environmental Notification Form (EENF) dated July 11, 2008 has been changed. As currently proposed, Phase A1 has been reduced in size, while Phase A2 has been relocated and increased in size. An additional Phase (Phase A3) has been proposed.

Date of ENF filing or publication in the Environmental Monitor: EENF filed: July 11, 2008; noticed in Monitor: July 23, 2008

Was an EIR required? Yes No; if yes,
 was a Draft EIR filed? Yes (Date:) No
 was a Final EIR filed? Yes (Date:) No
 was a Single EIR filed? Yes (Date:) No

Have other NPCs been filed? Yes (Date(s):) No

If this is a NPC solely for lapse of time (see 301 CMR 11.10(2)) proceed directly to "ATTACHMENTS & SIGNATURES" on page 4.

PERMITS / FINANCIAL ASSISTANCE / LAND TRANSFER

List or describe all new or modified state permits, financial assistance, or land transfers not previously reviewed:

DEP Sewer Extension/Connection Permit
MassHighway - Traffic Signal Permit

Are you requesting a finding that this project change is insignificant? (see 301 CMR 11.10(6))
Yes No; if yes, attach justification.

Are you requesting that a Scope in a previously issued Certificate be rescinded?
Yes No; if yes, attach the Certificate

Are you requesting a change to a Scope in a previously issued Certificate? Yes No; if yes, attach Certificate and describe the change you are requesting:

Request for Amended Phase A Waiver. The Phase A Waiver was granted through a Final Record of Decision dated October 15, 2008.

Does the project change involve any new or modified:

1. conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97? Yes No

2. release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction? Yes No

3. impacts on Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities? Yes No

4. impact on any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

Yes No; if yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? Yes No

5. impact upon an Area of Critical Environmental Concern? Yes No
If you answered 'Yes' to any of these 5 questions, explain below:

The newly proposed Phase A3 bog creation is located within NHESP mapped habitat.

PROJECT CHANGE DESCRIPTION (attach additional pages as necessary). The project change description should include:

- (a) a brief description of the project as most recently reviewed
- (b) a description of material changes to the project as previously reviewed,
- (c) the significance of the proposed changes, with specific reference to the factors listed 301 CMR 11.10(6), and
- (d) measures that the project is taking to avoid damage to the environment or to minimize and mitigate unavoidable environmental impacts. If the change will involve modification of any previously issued Section 61 Finding, include a proposed modification of the Section 61 Finding (or it will be required in a Supplemental EIR).

(a) PROJECT DESCRIPTION AS PREVIOUSLY REVIEWED (EENF Filing)

The Special Review Procedure (SRP) issued by the Secretary on January 29, 2007 identified the

Phase A program as a 150,000 sf office, laboratory, and manufacturing space, with associated infrastructure on 14 acres of land in Wareham in the 50-acre Tihonet Technology Park site. Subsequent to the issuance of the SRP and as part of the Expanded ENF (EENF) filing, the Proponent modified and advanced the Phase A program into two (2) separate and distinct phases in Wareham referred to in the EENF as Phase A1 and A2. A description of each Phase as previously reviewed in the EENF follows.

Prior Phase A1 Introduction

Phase A1, located within the Tihonet Technology Park (TTP), included the development of a 115,200± sf two-story mixed use building (likely to be constructed in phases) including office (25%) and light manufacturing (75%) space, an associated cul-de-sac access roadway, parking, stormwater management facilities, and on-site wastewater facilities. The total proposed impervious area associated with Phase A1 was approximately 8.3 acres. The development was proposed to encompass 18.4± acres within the overall 60± acre wooded TTP site. The TTP site is located west of Farm-to-Market Road, east of active cranberry bogs, south of a power line easement, and north of an irrigation canal (Refer to Figures 3.1.1 and 3.1.2 dated July 11, 2008 in the EENF, Phase A1 Locus Map and Phase A1 Topographic Map). The development was proposed to be sited in the southeastern quadrant of the TTP site.

When completed, the Phase A1 development was proposed to include 28,800± sf of office space, 86,400± sf of light manufacturing space, and 407 parking spaces (25% of which were anticipated to be constructed with pervious pavement), or a similar facility, as dictated by market conditions. The building was to be constructed with twelve discreet sections and was likely to be phased. Each section was to consist of a two-story 4,800 sf footprint (120-feet by 40-feet). Phase A1 was to be serviced by an on-site Title 5 sewage disposal system with enhanced nitrogen removal and municipal water services provided by the Wareham Fire District. All water/wastewater infrastructure was to be constructed and owned by the Proponent. The Wareham Fire District was to also provide water supply for the remainder of TTP, when developed. In the future, wastewater service for the remainder of TTP would likely be provided by a private on-site wastewater treatment and disposal facility permitted under the DEP Groundwater Discharge Permit program. Refer to the attached Figure 3.1.3 dated July 11, 2008, Phase A1 Conceptual Site Plan, which depicts the conceptual site plan for the previously proposed Phase A1 development.

Prior Phase A1 Permits and Approvals Summary

The anticipated permits necessary to facilitate the construction associated with Phase A1 included:

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)

- *State* → State Highway Access Permit (MassHighway)
→ Conservation and Management Permit (NHESP)

- *Town of Wareham* → Preliminary and Definitive Subdivision Approval (Wareham Planning Board)

- Site Plan Review-Special Permit (Wareham Planning Board)
- Water Main Extension Approval (Wareham Fire District Water Department & Wareham Municipal Maintenance Department (road cut))
- Title 5 Sewage Disposal Permit (Wareham Board of Health)
- Building Permit (Wareham Building Department)

Prior Phase A2 Introduction

The Phase A2 portion of the project previously reviewed in the EENF was located in Wareham off Lou Avenue, with frontage on Garage Street, and was proposed to consist of the development of a 40,000± sf medical office building with 170 parking spaces (25% of which were anticipated to be constructed of pervious pavement) and other site amenities (including stormwater facilities). The building had a footprint of approximately 17,000 sf and was proposed to be 2 ½ stories in height (the total structure footprint was anticipated to be 20,500 sf due to a proposed portico). The existing topography allowed the building's lower level (basement) to be placed on-grade with walk-out access on the northerly side. The development was sited on 6± acres and included both wooded and previously developed areas (Refer to Figures 3.6.1 and 3.6.2 dated July 11, 2008 in the EENF, Phase A2 Locus Map and Phase A2 Topographic Map, respectively). Note that the Phase A2 development was not discussed in the SRP, as it was proposed in the EENF in response to a specific market opportunity that had been identified by the Proponent subsequent to the issuance of the SRP.

The Phase A2 project was to be serviced by a municipal sewer and water service provided by the Wareham Fire District. Lou Avenue, a public way, was proposed to be improved and realigned in order to accommodate the Phase A2 development. Refer to the attached Figure 3.6.3 dated July 11, 2008, Phase A2 Conceptual Site Plan, which depicts the previously proposed Phase A2 development plan.

Prior Phase A2 Permits and Approvals Summary

The permits necessary for the construction associated with Phase A2 included:

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)
- *State* → State Highway Access Permit (MassHighway)
- *Town of Wareham* → Order of Conditions (Wareham Conservation Commission)
 - Preliminary and Definitive Subdivision Approval (Wareham Planning Board)
 - Site Plan Review-Special Permit (Wareham Planning Board)
 - New Service Connection (Wareham Fire District)
 - Road Cut Approval (Wareham Municipal Maintenance Department)
 - Sewer connection (Wareham Sewer Department)
 - Building Permit (Wareham Building Department)

Prior Phase A Summary **MEPA Review Thresholds**

The Phase A development program presented in the EENF was proposed as two independent projects (Phase A1 and Phase A2) that could be assimilated into future development plans while minimizing environmental impacts. Numerous alternatives were considered during the design process, focusing on limiting impacts to wetlands, rare species habitat, wastewater and other environmental constraints. Overall, impacts from the Phase A development were limited to the extent practicable by respecting the natural resources of the initial development area and utilizing the available infrastructure to support this phase. Through careful planning and design, the number of MEPA ENF review thresholds that would have been exceeded through the development of Phase A was minimized. Specifically, the thresholds previously exceeded consisted of:

Prior Phase A1 Thresholds Exceeded

1) The creation of five or more acres of impervious area (301 CMR 11.03(1)(b)(2)); and 2) the construction of 300 or more new parking spaces (301 CMR 11.03(6)(b)(15)). The Phase A1 project was anticipated to result in the creation of approximately 8.3-acres of impervious area, and the creation of 407 parking spaces.

Prior Phase A2 Thresholds Exceeded

The generation of 1,000 or more new ADT on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location” (301 CMR 11.03(6)(b)(14)).

Prior Combined Phase A1 and Phase A2 Thresholds Exceeded and Required Permits

1) The creation of ten or more acres of impervious area (301 CMR 11.03(1)(a)(2)); 2) Generation of 2,000 or more new adt on roadways providing access to a single location (301 CMR 11.03(6)(b)(13)); 3) Generation of 1,000 or more new adt on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location (301 CMR 11.03(6)(b)(14)).

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)
- *State* → State Highway Access Permit (Massachusetts Highway Department)
→ Conservation and Management Permit (NHESP)
- *Town of Wareham* → Preliminary and Definitive Subdivision Approval (Wareham Planning Board)
→ Site Plan Review-Special Permit (Wareham Planning Board)
→ Water Main Extension Approval (Wareham Fire District Water Department)
→ New Service Connection (Wareham Fire District)
→ Street Opening Permit (Wareham Municipal Maintenance Department)
→ Title 5 Sewage Disposal Permit (Wareham Board of Health)

- Order of Conditions (Wareham Conservation Commission)
- Building Permit (Wareham Building Department)
- Demolition Permit (Wareham Building Department)

Prior Phase A Project Severability

The SRP requires a demonstration that *“implementation of the proposed phase will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases.”*

The Phase A1 development incorporated a ±115,200 sf building that was severable from potential future development of adjacent land under the ownership of the Proponent (including from Phase A2, as discussed further in this NPC section). The proposed Phase A1 development included a single cul-de-sac roadway to access the proposed development (and potentially future phases of Tihonet Technology Park), was self-sufficient and did not rely on the construction of infrastructure or utilities associated with a future phase of development. Water supply and wastewater systems to be provided to support the Phase A1 development did not require additional stages of development to operate effectively.

The Phase A2 development consisted of a building and associated infrastructure that was severable from potential future development of adjacent land (including from Phase A1) owned by the Proponent. The Phase A2 development would result in the realignment and eventual continuation of Lou Avenue to accommodate future development. It was self-sufficient and did not rely on the construction of infrastructure or utilities associated with a future phase of development. Water supply and wastewater systems to be provided to support the Phase A2 development did not require additional stages of project development to operate effectively.

Due to their de minimis land areas relative to the overall ±6,100 Tihonet Mixed Use Development (TMUD) Parcel (0.003% of the total Parcel for Phase A1 and 0.001% of the total Parcel for Phase A2), implementation of Phase A1 and/or A2 did not preclude opportunities to avoid, minimize or mitigate environmental impacts related to future phases.

Prior Phase A Project Impacts

Table 1 identifies the combined impacts associated with Phase A as contained in the previously reviewed EENF along with a distribution of the impacts by sub-Phase A1 and A2.

Table 1 Distribution of Previously Reviewed Phase A Impacts

Summary of Project Size and Environmental Impacts	EENF Phase A1	EENF Phase A2	Total EENF Phase A (EENF Phase A1 & A2)
LAND			
Total site acreage	18.4±	6±	24.4±
Acres of land altered	15.1±	4.9±	20±
Acres of impervious area	8.3 ±	3±	11.3±
Square feet of bordering vegetated wetlands alteration	0	0	0
Square feet of other wetland alteration	0	0	0
Acres of non-water dependent use of tidelands or waterways	0	0	0
STRUCTURES			
Gross square footage	115,200±	40,000±	155,200±
Number of housing units	0	0	0
Maximum height (in feet)	42'±	42'±	42'±
TRANSPORTATION			
Vehicle trips per day	828±	1,422±	2,250±
Parking spaces	407±	170±	577±
WATER/WASTEWATER			
Gallons/day (GPD) of water use	4,000±	3,500±	7,500±
GPD water withdrawal	4,350±	3,850 ± (Avg/day)	8,200±
GPD wastewater generation/ treatment	8,000±	7,000±	15,000±
Length of water/sewer mains (in miles)	0.2±	0.1±	0.3±

The Secretary issued the Phase One Waiver decision, dated October 15, 2008, determining that no further MEPA review of Phases A1 and A2 was required.

(b) DESCRIPTION OF PROPOSED CHANGES

As part of this NPC, three (3) separate and distinct development phases (Phase A1, A2 and A3) are proposed to be established as part of Phase A (instead of the 2 phases originally reviewed), each of which can stand alone as a separate project that will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases. A brief description of the three proposed Phase A projects is provided below. A full, detailed description of each of the proposed sub-phases is provided in the accompanying narrative document. The Notice of Project Change proposes the following changes in Phase A.

Proposed Phase A1 - The proposed Phase A1 building area in the TTP would be reduced from 115,200± sf to 80,000± sf along with a modification in the apportioned use of the building to 10% (8,000± sf) office and 90% (72,000± sf) light industrial use. This will result in a commensurate decrease in the number of vehicle trips per day generated, the parking required, the impervious area, as well as water consumption and sewage flow. The full buildout to 115,200 sf building area for this parcel of the Tihonet Technology Park will be reviewed in a future MEPA filing. A detailed accounting of the change in impacts for the proposed Phase A1 is provided in Table 2 below.

Table 2 Comparison of Previously Reviewed to Revised Phase A1 Impacts

Summary of Project Size and Environmental Impacts	Previously Reviewed Impacts (EENF Phase A1)	NPC Revised Impacts (Proposed Phase A1)
Total site acreage	18.4±	16.4±
Acres of land altered	15.1±	15.7±
Acres of impervious area	8.3 ±	7.3±
Square feet of bordering vegetated wetlands alteration	0	0
Square feet of other wetland alteration	0	0
Acres of non-water dependent use of tidelands or waterways	0	0
Gross square footage	115,200±	80,000±
Number of housing units	0	0
Maximum height (in feet)	42'±	42'±
Vehicle trips per day	828±	450±
Parking spaces	407±	256±
Gallons/day (GPD) of water use	4,000±	2,748±
GPD water withdrawal	4,350±	3,023±
GPD wastewater generation/ treatment	8,000±	5,496±
Length of water/sewer mains (in miles)	0.2±/NA	0.3±/NA

Proposed Phase A2 – The proposed revisions to the Phase A2 program are intended to accommodate the needs of a particular end user that the Proponent has identified for the Phase A2 site. The location of Phase A2 remains off Route 28 at Lou Avenue, as reviewed in the EENF. However, the proposed development has been relocated ±0.2 miles to the north side of Rose Brook,

in an area called “Rosebrook Business Center” and will require the further extension of Lou Avenue. This extension of Lou Avenue is now proposed to connect to Tihonet Road. The proposed Medical Office Building has been increased in size from 40,000± sf to 65,850± sf. Also, a 5,000± sf “Gatehouse” at the entrance to the site is proposed. The Gatehouse will be unoccupied at this time, but may be used for storage and office space in the future. Such change in use would be part of a subsequent phase of the Project, and therefore subject to a separate filing. The proposed parking for the Medical Office Building has been increased from 170 spaces to 279 spaces. Public water will continue to be supplied by the Wareham Fire District through a proposed looped waterline extension. A sewer connection to the Wareham Wastewater Treatment Plant is proposed via a new pump station and force main from Phase A2 directed and connected to existing sewer infrastructure in the Wareham Industrial Park. The type of Medical Office Building proposed has also been revised as the program and medical services have become more defined. Specifically, in the previously reviewed EENF a full service medical facility including radiology, laboratory and diagnostic testing was proposed. As currently proposed, the Phase A2 building is a non-procedural facility providing only general medical offices for internal, bariatric and specialty medicine with limited radiological and laboratory services. Diagnostic testing and full service medical procedures will not be performed on-site but will be provided at other locations. This results in a reduction in the proposed water use and a commensurate reduction in anticipated sewage flow to be generated. A detailed accounting of the change in impacts for the proposed Phase A2 is provided in Table 3 below.

Table 3 Comparison of Previously Reviewed to Revised Phase A2 Impacts

Summary of Project Size and Environmental Impacts	Previously Reviewed Impacts (EENF Phase A2)	Revised Impacts (Proposed Phase A2)
Total site acreage	6.0±	13.3±
Acres of land altered ¹	4.9±	15.9± ²
Acres of impervious area	3.0±	6.6±
Square feet of bordering vegetated wetlands alteration	0	1,680±
Square feet of other wetland alteration	0	Bank 210 lf± RFA 36,810± BLSF 28,200±
Acres of non-water dependent use of tidelands or waterways	0	0
Gross square footage	40,000±	70,850±
Number of housing units	0	0
Maximum height (in feet)	42'±	42'±
Vehicle trips per day	1,422±	2,478±
Parking spaces	170±	279±

¹ The acres of land altered is greater than the site area due to off-site grading associated with the subdivision roadway, stormwater facilities, and proposed development area outside of Phase A2 that will be located in an easement.

² Excludes impacts associated with water and sewer line installation outside of the Phase A2 area.

Summary of Project Size and Environmental Impacts	Previously Reviewed Impacts (EENF Phase A2)	Revised Impacts (Proposed Phase A2)
Gallons/day (GPD) of water use	3,500±	2,470±
GPD water withdrawal	3,850±	2,720±
GPD wastewater generation/ treatment	7,000±	4,940±
Length of water/sewer mains (in miles)	0.1/0.1±	0.7/0.4± ³

Proposed Phase A3 - Phase A3 includes the construction of a 4.9± acre cranberry bog from upland area as part of the Proponent's on-going cranberry production operation at existing bogs adjacent to the Phase A3 site. The proposed bog is located in Wareham between Tihonet Road and Charlotte Furnace Road adjacent to other existing bogs owned and operated by the Proponent.

Table 4 Comparison of Previously Reviewed to Revised Phase A3 Impacts

Summary of Project Size and Environmental Impacts	Previously Reviewed Impacts (Not incl. in EENF)	Revised Impacts (Proposed Phase A3)
Total site acreage	NA	9.0±*
Acres of land altered	NA	9.0±*
Acres of impervious area	NA	0
Square feet of bordering vegetated wetlands alteration	NA	0
Square feet of other wetland alteration	NA	0
Acres of non-water dependent use of tidelands or waterways	NA	0
Gross square footage	NA	0
Number of housing units	NA	0
Maximum height (in feet)	NA	NA
Vehicle trips per day	NA	0 ⁴
Parking spaces	NA	0
Gallons/day (GPD) of water use ⁵	NA	±26,780
GPD water withdrawal	NA	±26,780
GPD wastewater generation/ treatment	NA	0
Length of water/sewer mains (in miles)	NA	0

* In addition to the 4.9± acre, approximately 4 acres of land will be disturbed as part of the associated clearing and grading.

³ Total length of sewer main excludes 0.2 miles of main to be sleeved inside existing abandoned main.

⁴ Sand and gravel will not be sold or removed from the Parcel. Therefore, traffic will be limited to that associated with cranberry bog production and will be internal to the Parcel.

⁵ Water use is approximate, based on current farming practices, and the withdrawal is included in existing DEP Water Management Act permits.

NA = Not Applicable as Phase A3 was not previously proposed in the Expanded ENF.

Proposed Phase A Cumulative Analysis Table 5 below provides a combined summary of the previously reviewed impacts for Phase A contained in the EENF in comparison to the impacts associated with the revised Phase A proposed as part of this Notice of Project Change.

Table 5 Proposed Total Phase A Project Impacts (Includes Phase A1, A2 and A3)

Summary of Project Size and Environmental Impacts	Previously Reviewed (EENF Phase A)	Net Change	Total Revised Phase A (Rev. Phase A1/ A2/A3)
Total site acreage	24.4±	+14.3±	38.7±
Acres of land altered ⁶	20.0±	+20.6±	40.6±
Acres of impervious area	11.3±	+2.6±	13.9±
Square feet of bordering vegetated wetlands alteration	0	+1,682±	1,682±
Square feet of other wetland alteration	0	Bank+210 LF± RFA +36,810± BLSF+28,200±	Bank 210 LF± RFA 36,810± BLSF 28,200±
Acres of non-water dependent use of tidelands or waterways	0	0	0
Gross square footage	155,200±	-4,350	150,850
Number of housing units	0	0	0
Maximum height (in feet)	42'	0	42'
Vehicle trips per day	2,250±	678	2,928
Parking spaces	577	-42	535
Gallons/day (GPD) of water use	7,500±	- 2,282±	31,998± ⁷
GPD water withdrawal	8,200± (Avg/day)	-2,457±	32,523±
GPD wastewater generation/ treatment	15,000±	-4,564±	10,436±
Length of water/sewer mains (in miles)	0.1/0±	+0.8/+0.3±	0.9/0.4±

⁶ The acres of land altered is greater than the site area due to off-site grading associated with the subdivision roadways, stormwater facilities, and proposed development area outside of Phase A1 and Phase A2.

⁷ Phase A3 water withdrawal is included in existing DEP Water Management Act permits.

(c) THE SIGNIFICANCE OF THE PROPOSED CHANGES

As described below, the proposed changes with specific reference to the factors listed 301 CMR 11.10(6), will not significantly change the Phase A project and do not warrant additional MEPA review beyond this Notice of Project Change/Request for Amended Waiver.

301 CMR 11.10(6)(a) Expansion of the project: Although the Phase A portion of the overall ADM Tihonet Mixed Use Development Project has increased in area due to the previously described changes to Phase A2 and the addition of A3, the overall Project (including Phases A, B and C) remains consistent with that presented in the July 11, 2008 Expanded Environmental Notification Form.

301 CMR 11.10(6)(b) Generation of further impacts: Although the Phase A portion of the overall ADM Tihonet Mixed Use Development Project has increased in area due to the previously described changes to Phase A2 and the addition of A3, the overall Project (including Phases A, B and C) remains consistent with that presented in the July 11, 2008 Expanded Environmental Notification Form. Although new impacts are associated with the revised Phase A (including wetlands and priority rare species habitat), the increase in impacts associated with Phase A has been minimized and a number of the impact categories have been reduced. The decrease in the proposed building program square footage and proposed uses has resulted in a reduction in the estimated water and sewer use, and the number of parking spaces proposed. The increases in site area, land, wetlands altered, and priority habitat impacted are attributable to the proposed bog construction and the proposed connector roadway, which will mitigate the increase in traffic impacts.

301 CMR 11.10(6)(c) Change in expected date for commencement: A Special Review Procedure was established for the Project in part due to the extended timeline of the Project. Therefore, the expected commencement date for the Project and/or construction, completion date, or schedule of work has not changed.

301 CMR 11.10(6)(d) Change of project site: Although the Phase A2 site has been relocated to an adjacent site and a new Phase A3 site has been added, environmental impacts remain de minimis in relation to the overall Project, and the proposed Phase A will not preclude options to avoid, minimize or mitigate future environmental impacts. Refer to the accompanying narrative for additional information.

301 CMR 11.10(6)(e) New application for a permit, new request for financial assistance or a land transfer: The new Phase A3 project will require the permits noted within this NPC. A permit for a traffic signal from Mass Highway will be an additional permit required for the proposed Phase A2 in conjunction with the proposed extension of Lou Avenue and the connector road between Route 28 and Tihonet Road. Similarly, a sewer connection/extension permit for Phase A2 will now also be required. Such connection is already provided for and capacity allocation made to such developments in this zoning area referred to as the BDOD. A development agreement between the town of Wareham and signed by the Board of Selectmen/Sewer Commissioners and A.D. Makepeace Company, the land owner, exists and is in force. Although previously required for work within the 100-foot buffer zone, Phase A2 will now also require an Order of Conditions for work within resource areas. Additionally, a

Water Quality Certification will be required for work within wetlands, although it is anticipated that the Order of Conditions will serve as the Water Quality Certification as proposed impacts to vegetated wetland total less than 5,000 sf.

301 CMR 11.10(6)(f) Prevention or delay in realization of benefits: The proposed changes to Phase A will not result in the prevention or delay of net benefits to environmental quality and resources or public health.

301 CMR 11.10(6)(g) Lapse of time: A lapse of time has not occurred.

(d) MEASURES TO AVOID DAMAGE TO THE ENVIRONMENT OR TO MINIMIZE AND MITIGATE UNAVOIDABLE ENVIRONMENTAL IMPACTS

Refer to the accompanying narrative in Section 2 with regard to measures that the project is taking to avoid damage to the environment or to minimize and mitigate unavoidable environmental impacts. The proposed modifications to the Phase A program avoid, minimize, and mitigate unavoidable environmental impacts to the maximum extent practicable.

ATTACHMENTS & SIGNATURES

Attachments:

1. Secretary's most recent Certificate on this project
2. Plan showing most recent previously-reviewed proposed build condition
3. Plan showing currently proposed build condition
4. Original U.S.G.S. map or good quality color copy (8-1/2 x 11 inches or larger) indicating the project location and boundaries
5. List of all agencies and persons to whom the proponent circulated the NPC, in accordance with 301 CMR 11.10(7)

Signatures:

		8/13/09	
Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing NPC (if different from above)

Michael Hogan, President/CEO	George G. Preble, Principal
Name (print or type)	Name (print or type)

ADM Development Services LLC	Beals and Thomas, Inc.
Firm/Agency	Firm/Agency

158 Tihonet Road	32 Court Street
Street	Street

Wareham, MA 02571	Plymouth, MA 02360
Municipality/State/Zip	Municipality/State/Zip

508-742-3100	508-746-3288
Phone	Phone

Section 2.0
Phase A Description

2.0 PHASE A DESCRIPTION

Background

As set forth in the Special Review Procedure (SRP) Certificate issued January 29, 2007, the SRP establishes a process for phased review of the Tihonet Mixed Use Development Project (the “Project”). The SRP provides for full evaluation and review of the ADM Project and ensures that the cumulative impacts are documented in a timely manner, while allowing for more detailed analysis of individual components of the project in documents to be prepared for each proposed phase. The first filing pursuant to the SRP was the *Expanded Environmental Notification Form, Request for Single Review Document for Phase A1 and A2, Request to Amend the Special Review Procedure* for the ADM Tihonet Mixed Use Development, dated July 11, 2008 (“EENF”). Subsequently, the Secretary issued a Certificate relating to the Expanded Environmental Notification Form (the “EENF Certificate”) dated September 12, 2008; and a Final Record of Decision regarding Phase A (the “Phase A FROD”) dated October 15, 2008.

The SRP identified a Phase A program consisting of a 150,000± sf office, laboratory, and manufacturing space, with associated infrastructure on 14 acres of land located in the northwestern quadrant in the 50-acre Tihonet Technology Park (TTP) site in Wareham, Massachusetts.

Subsequent to the issuance of the SRP, the Proponent modified and advanced the Phase A program to include two separate sub-phases (Phase A1 and Phase A2), as described in the EENF. EENF-Phase A1 included a 115,200± sf building with associated infrastructure located on 18.4 acres of land in the southeastern quadrant of the TTP. The area comprising the TTP site was increased from the SRP to include 60 acres of land. EENF-Phase A2 was added to include a 40,000± sf building located on Lou Avenue.

As presented herein, the proposed Phase A program detailed in this Request for an Amended Phase A Waiver does not constitute a significant change from the development approved in the original Phase One Waiver. (Refer to the NPC form for additional detail.) The attached Phase Location Index exhibits (USGS and aerial), Figures 1 (rev1) and 2 (rev1), respectively, depict the location of the three sub-phases in relation to one another, as well as in relation to Phases B and C of the overall Project. As applicable, exhibits from the EENF have been updated to reflect the change in Phase A program. In order to facilitate a review of this NPC in the context of the EENF, many of the updated exhibits retain the Figure Numbers from the EENF followed by the notation “(rev1)”. Where a Figure Number does not correspond to the original EENF figure (i.e. the updated figure has been assigned a new Figure Number), the notation (rev1) is not included.

Current Proposal

As part of this NPC, the Phase A1 development has been reduced in size to an 80,000± sf building program. In addition, Phase A2 has been revised and relocated to consist of the development of a 65,850± sf Medical Office Building located on an extension of Lou Avenue north of Rose Brook. Also proposed as part of Phase A2 is the reconstruction, realignment and

extension of Lou Avenue to connect with the existing Tihonet Road, and the construction of a 5,000± sf unoccupied gatehouse proximate to Route 28. In addition, the NPC proposes a Phase A3 program consisting of the construction of a 4.9± acre cranberry bog adjacent to existing bogs owned by the Proponent. Taken together, the Phase A1, Phase A2, and Phase A3 programs comprise the revised Phase A Project described in this NPC. The Phase A Project is located in Wareham, Massachusetts. The Proponent anticipates applying for public funding to assist with the construction of infrastructure associated with Phase A.

The revised Phase A1 program is discussed in Sections 2.1 through 2.5. The Phase A1 sections of this NPC include a discussion of the surrounding Tihonet Technology Park (TTP) site. The Phase A2 program is discussed in Section 2.6 through 2.10. The Phase A3 program is discussed in Sections 2.11 through 2.15. A cumulative analysis of the entire Phase A Project is included in Section 2.16.

Subsequent to the submission of the EENF and prior to submission of this NPC document, the Proponent has met with the following entities:

- Wareham Board of Selectmen
- Wareham Fire District
- Wareham Planning Board
- Wareham Conservation Commission
- Wareham Community and Economic Development Authority Director
- Chief Plant Operator, Sewer Department
- Massachusetts Natural Heritage & Endangered Species Program
- Massachusetts Highway Department
- Southeastern Regional Planning and Economic Development District
- The Greater Attleboro Taunton Regional Transit Authority

As required by the SRP, the Proponent conducted a pre-filing public informational meeting on June 25, 2009 at the Carver Town Hall to present information relating to this Notice of Project Change filing. This meeting also served as the fifth quarterly update meeting. Notice of the meeting was provided on June 11, 2009 in the *New Bedford Standard Times* and the *Wareham Courier*, on June 12, 2009 in the *Carver Reporter*, and on June 13, 2009 in the *Old Colony Memorial*. The notice was also posted in the Wareham, Carver and Plymouth Town Halls, and entities who have participated in the Project to date were also notified by letter dated June 12, 2009. Additionally, notice of the meeting and this NPC filing was posted on the ADM website (www.admakepeace.com) established by the Proponent in accordance with the SRP.

2.1 Phase A1 Introduction

Phase A1, located within the TTP, includes the development of an 80,000± sf two-story mixed use building (likely to be constructed in phases) including office and light manufacturing space, an associated cul-de-sac subdivision access roadway (unchanged

from the EENF filing), parking, stormwater management facilities, and wastewater facilities. Refer to Figure 3.1.3 (rev1), Phase A1 Conceptual Site Plan. The total proposed impervious area associated with Phase A1 is approximately 7.3± acres. The development will encompass 16.4± acres within the overall 60± acre predominantly wooded, TTP site, located west of Farm-to-Market Road, east of active cranberry bogs, south of a power line easement, and north of an irrigation canal (Refer to Figures 3.1.1 and 3.1.2, Phase A1 Locus Map and Phase A1 Topographic Map, in the EENF). Presently, the Proponent anticipates that the development will be sited in the southeastern quadrant of the TTP site.

When completed, the Phase A1 program will include 8,000± sf of office space, 72,000± sf of light manufacturing space, and 226 parking spaces. An additional 30 parking spaces are considered as potential future parking spaces for a total of 256 spaces (25% of which are anticipated to be constructed with pervious pavement). The building will be constructed with eight discreet sections and will likely be built in phases. Each section will consist of a two-story, 4,800± sf footprint (120-feet by 40-feet). As part of Phase A1, 80,000± sf of the building and associated appurtenances will be constructed. The remaining 35,200± sf (3,520± sf office and 31,680± sf of light manufacturing) of the 115,200± sf development previously proposed in the EENF may be developed at a later date and would be included as part of a future phase within the overall TTP development (i.e. not part of Phase A). This future building phase would, however, be connected to the building proposed under Phase A1, resulting in an overall 115,200± sf building, and would be located on the same lot. Refer to Figure 3.1.3 (rev1), Phase A1 Conceptual Site Plan, which depicts the initial development constituting Phase A1, the land area altered associated with Phase A1, as well as the future phase to be undertaken as part of Phase B.

Phase A1 will be serviced by a proposed on-site Title 5 sewage disposal system with enhanced nitrogen removal. This system has been relocated from the cul-de-sac to the eastern edge of the development area. Municipal water services will be provided by the Wareham Fire District. All water/wastewater infrastructure will be constructed by the Proponent. The Wareham Fire District will also provide water supply for the remainder of the TTP, when developed. In the future, wastewater service for the remainder of the TTP will likely be provided by a private on-site wastewater treatment and disposal facility permitted under the DEP Groundwater Discharge Permit program. Refer to Section 2.3 for additional information regarding proposed conditions.

2.1.1 Phase A1 MEPA Review Thresholds

The Phase A1 development program has been advanced as an independent project that can be assimilated into future development plans while avoiding and minimizing environmental impacts. Numerous alternatives were considered during the design process, focusing on limiting impacts to wetlands, rare species habitat, wastewater and other environmental constraints. Overall, impacts from the Phase A1 development have been limited to the extent practicable by

respecting the natural resources of the initial development area and utilizing the available infrastructure to support this phase. The proposed Phase A1 program does not exceed any review thresholds for a mandatory EIR. In addition, through careful planning and design, the number of MEPA ENF review thresholds that will be exceeded through the development of Phase A1 has been minimized. The only ENF threshold exceeded consists of the creation of five or more acres of impervious area (301 CMR 11.03(1)(b)(2)). The Phase A1 project will result in the creation of approximately 7.3 acres of impervious area. No additional MEPA thresholds have been exceeded for Phase A1 as a result of the changes proposed in this NPC, and a threshold that was previously exceeded (construction of more than 300 parking spaces) is no longer exceeded.

2.1.2 Phase A1 Project Severability

The SRP requires a demonstration that *“implementation of the proposed phase will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases.”*

The Phase A1 development is comprised of an 80,000± sf building that is severable from potential future development of adjacent land under the ownership of the Proponent (including from Phase A2 and A3, as discussed further in this NPC). The proposed Phase A1 development will be serviced by a single cul-de-sac roadway to access the proposed development (and potentially future phases of the Tihonet Technology Park), is self-sufficient and does not rely on the construction of infrastructure or utilities associated with a future phase of development. Water supply and wastewater systems to be provided to support the Phase A1 development do not require additional stages of development to operate effectively. Similarly, due to its de minimis land area relative to the overall 6,100± acre Parcel associated with the ADM TMUD, implementation of Phase A1 will not preclude opportunities to avoid, minimize or mitigate environmental impacts related to future phases.

2.1.3 Phase A1 Permits and Approvals Summary

Applications for permits necessary to facilitate the construction associated with Phase A1 will be/have been submitted to appropriate agencies. Permits anticipated at this time remain the same as reported in the EENF:

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)
- *State* → State Highway Access Permit (MassHighway)
→ Conservation and Management Permit (NHESP)-received

- *Town of Wareham*→ Preliminary and Definitive Subdivision Approval (Wareham Planning Board)
 - Site Plan Review-Special Permit (Wareham Planning Board)
 - New Service Connection (Wareham Fire District)
 - Water Main Extension Approval (Wareham Fire District Water Department)
 - Street Opening Permit (Wareham Municipal Maintenance Department)
 - Title 5 Sewage Disposal Permit (Wareham Board of Health)
 - Building Permit (Wareham Building Department)

2.2 Phase A1 Existing Conditions

2.2.1 Phase A1 General Site Description

The TTP site is comprised of approximately 60 acres of undeveloped land located off Farm-to-Market Road (Refer to Figures 3.1.1 and 3.1.2, Phase A1 Locus Map and Phase A1 Topographic Map, respectively, in the EENF). The site lies between Farm-to-Market Road and active cranberry bogs (to its east and west) and between a power line easement and sand track road (to its north and south). A 4.9± acre cleared area southeast of the center of the TTP site that was formerly used for septage sludge disposal, has been regraded and is presently utilized to provide parking for community-focused events sponsored by the A.D. Makepeace Company and the Cape Cod Cranberry Growers Association. A sand track agricultural road oriented southeast/northwest bisects the TTP site.

The Phase A1 development parcel comprises approximately 16.4 acres (previously 18.4 acres) in the southeast quadrant of the TTP site. Specifically, Phase A1 includes the building development lot (excluding those portions that will be developed during a later phase) and subdivision roadway, which was reviewed as part of the prior Phase One Waiver. With the exception of the aforementioned cleared area (totaling 4.9± acres), the Phase A1 parcel is wooded. Note, however, that clearing pursuant to an NHESP Conservation and Management Permit will be undertaken in the near future. The proposed building lot (excluding the future phase) is approximately 12.5± acres in area while the proposed subdivision roadway layout consists of 3.9± acres.

2.2.2 Phase A1 Topography, Geology & Soils

Topography

The topography of the 60± acre TTP site ranges in elevation from ±50 above sea level to 73± feet above sea level. The highest point lies east of cranberry bogs and south of the sand track road bisecting the TTP site in a northwest/southeast

direction. From this high point, the site slopes down to a plateau that extends north and south at elevation 71± feet. A second high point is associated with a hill in the southwestern portion of the TTP site. This hill slopes up from Mosquito Pond to an elevation of 64± feet. The portion of the TTP site east of these high points generally slopes down to the southeast, although a shallow valley oriented generally north/south extends from the sand track road forming the southern extent of the TTP site into its approximate center.

The topography for the 16.4± acre Phase A1 area located in the southeastern portion of the TTP site is gently sloping, with a maximum elevation of approximately 60 feet, and low elevations of approximately 50 feet along the southern perimeter.

Geology

The surficial geology of the Phase A1 parcel is comprised of sand and gravel in the northern two-thirds of the area, with a large sand deposit present in the southern third of the site. The majority of the remaining ±60-acre TTP site also consists of sand and gravel, although the same large sand deposit extends into the TTP site from the south, and forms a band along its southern perimeter. Floodplain alluvium lies off-site to the west of the TTP site. Figure 3.2.2.1 in the EENF, Phase A1 Surficial Geology Map, depicts the Surficial Geology of the TTP site and Phase A1 parcel.

Soils

The 1969 Plymouth County Soil Survey indicates that soil types within the TTP site consist of:

- Carver Coarse Sand (CaA) – 0 to 3% slopes
- Carver Coarse Sand (CaB) – 3 to 8% slopes
- Carver Coarse Sand (CaC) – 8 to 15% slopes

Specifically, CaA soils begin in the central portion of the TTP site and extend east. CaB soils are present in the western portion of the TTP site, and CaC soils are located in the southern and northeast sections of the TTP site. Refer to Figure 3.2.2.2 in the EENF, Phase A1 1969 Soils Map. Carver Soils are typically very deep and excessively drained. These soils typically have a low water holding capacity which, unless irrigated, makes them poorly suited for intensive agricultural production or for woodland productivity. These soils are not known to have limitations for commercial or residential development; however, are associated with aquifer recharge areas.

The Draft Updated Plymouth County Soil Survey Information (Draft Updated Soil Survey) modifies the boundaries of each individual soil type.¹ The new codes in the Draft Updated Soil Survey are listed below, following the corresponding 1969 codes:

- CaA – 252A (Carver Coarse Sand – 0 to 3% slopes)
- CaB – 252B (Carver Coarse Sand – 3 to 8% slopes)
- CaC – 252C (Carver Coarse Sand – 8 to 15% slopes)

The Draft Updated Soil Survey confirms that the majority of the TTP site is comprised of Carver soils; and also notes the presence of Udisamments (702) and Udipsamments (665) where the historic septage sludge disposal area is located, which occurs within the Phase A1 parcel (Refer to Figure 3.2.2.3 in the EENF, Phase A1 2003 Draft Updated Plymouth County Soil Survey Information).

Soils designated as Udisamments are characterized by moderately sloped to steep areas where the original soil has been replaced with gravel or sandy fill materials. Udisamments are generally suitable for development, but are not suitable for lawns, gardens or landscaping unless topsoil is added.

Soils designated as Udipsamments are nearly level, excessively drained excavated soils. They are often associated with developed areas, adjacent to cranberry beds and/or near roads. Vegetation associated with this soil type is minimal.

2.2.3 Phase A1 Zoning & Land Use

The TTP site is located in the town of Wareham, within a portion of the Residence 60 (R-60) zoning district that is also overlain by the Business Development Overlay District (BDOD). Pursuant to the Wareham Zoning By-laws, *“the R-60 district is intended to permit residential development at low densities in areas not served by public water or sewer systems.”* However, the BDOD *“is intended to create office/R&D development opportunities in a campus-like environment using the existing agricultural uses and natural landscapes as amenities for the businesses located in the office parks.”*

As previously described, the majority of the TTP site is wooded, although unimproved agricultural access roads and a cleared area presently used as parking are also present within the overall ±60-acre site. The TTP site is not used for active cranberry farming. Based upon the most recent Prime Farmland List (1969), no soils within the TTP site are categorized as “prime.” Note that approximately 10.4 acres has or will be cleared by the Proponent in accordance with a Conservation and Management Permit received from NHESP.

¹ Draft Updated Plymouth County Soil Survey Information provided by the USDA – NRCS on May 4, 2007

The TTP site is not accessible to the public, as it consists of private land. The majority of the TTP is currently classified under the Chapter 61A agricultural program (Refer to Figure 3.2.3.1 in the EENF, Phase A1 Chapter 61 Lands).

2.2.4 Phase A1 Wetlands, Surface Water & Hydrology

No wetlands are present within the TTP site. However, wetland resource areas proximate to the TTP site have been reviewed and delineated in the field. The majority of these off-site wetland resource areas have not been formally reviewed by the town of Wareham Conservation Commission. The 100-foot buffer zone to Bordering Vegetated Wetlands and Bank associated with off-site cranberry bogs and Mosquito Pond wetlands west of the TTP site, and an irrigation canal south of the TTP site, extends onto the TTP site. Similarly, the 200-foot Riverfront Area associated with the irrigation canal flowing north/south through the bogs west of the site extends onto the TTP site. Although man-made irrigation canals do not include an associated 200-foot Riverfront Area, based upon a review of historic maps (“A Survey of the Town of Wareham” dated 1830; the 1889 USGS map; and the 1939 USGS map) this waterway existed as a natural perennial stream prior to canalization for cranberry bog operations. Therefore, the canal is considered to have an associated 200-foot Riverfront Area.

The TTP site and Phase A1 parcel do not contain any areas of standing water. The TTP site and Phase A1 parcel are proximate to agricultural irrigation canals used in association with cranberry cultivation; however, these canals are also located off-site. Surface water in these locations is controlled by various structures, such as flashboards to support cranberry cultivation and harvesting.

Under existing conditions, the ±60-acre TTP site includes two surface water drainage areas, which both eventually flow to the Wankinco River (Refer to Figure 3.2.4.1 in the EENF, Phase A1 Watershed & Hydrology Map). The western portion is tributary to Mosquito Pond. The irrigation canal located south of the TTP site connects Mosquito Pond to Tihonet Pond and the Wankinco River. Surface runoff from the remaining portion of the TTP site (including the Phase A1 parcel) drains to the perennial stream downstream of Mosquito Pond.

2.2.5 Phase A1 Rare Species & Wildlife Habitat

According to the 2008 Edition of the “*Massachusetts Natural Heritage Atlas*” prepared by NHESP, the TTP site is not presently mapped as Estimated Habitat (EH) or Priority Habitat (PH). The nearest mapped habitat is located approximately 900 feet to the southeast of the TTP site (EH 17/PH 404). A second mapped area is located approximately 1,200 feet to the west of the TTP site (EH 712/PH 1165). Correspondence dated August 30, 2006 from NHESP indicates that the habitat to the southeast of the TTP site has been mapped based

on the presence of water-willow stem borer (*Papaipema sulphurata*) and the habitat located west of the TTP site has been mapped based on the presence of Eastern box turtle. The Eastern box turtle is listed as a species of special concern in Massachusetts and the water-willow stem borer is listed as a threatened species. Both species are protected under the Massachusetts Endangered Species Act (MESA). No rare or endangered plant or animal species were observed by project consultant ENSR during the preparation of the previously reviewed EENF within the Phase A1 parcel.

The TTP site is comprised of ±60 acres of upland forest, pine barrens and open areas (Refer to Figure 3.2.5.2 in the EENF, Cover Types). Based on field observations and the work performed as part of the EENF, ENSR determined that the western portion of the TTP site is comprised of approximately 31 acres of upland forest dominated by white pine (*Pinus strobus*) and scarlet oak (*Quercus coccinea*) in the overstory and black huckleberry (*Gaylussacia baccata*) in the understory. The eastern portion of the TTP site contains approximately 22 acres of pine barrens habitat as depicted on Figure 3.2.5.2 in the EENF, Cover Types. The majority of the 16.4-acre Phase A1 parcel is comprised of approximately equal areas of upland forest and pine barrens habitat, with the remainder being upland open areas that contain either unimproved roads or are used as storage and staging yards for cranberry bog activities.

The MassGIS pine barrens classifications were reviewed and a code system was developed that ranks the various sub-categories relative to pine barrens habitats. Mark Mello, Lepidopterist and Director of Research at the Lloyd Center for Environmental Studies in Dartmouth, Massachusetts, has refined these categories describing the pine barrens vegetation characteristics by canopy closure and species composition. These refined categories (the “Mello Code”) were utilized and amended to create the following value categories to calculate rare species habitat and associated impacts as described below. Mello Codes were used as a measure of succession within pitch pine-scrub oak communities (“pine barrens”). The Mello Codes can be compared to successional stages of pine barrens with Codes 1 and 2 representing early successional scrub oak habitat, Codes 3 and 4 being pitch pine-scrub oak woodland, and Code 5 being pitch pine woodlands. The various rare species which are known to inhabit pine barrens require different pine barren successional communities throughout their life cycle for survival. Therefore, the “best” Mello Code habitats are specific to each species. Pine barrens habitat found at the eastern edge of the TTP site and within the Phase A1 parcel has been identified as being comprised of Mello Code 4 and 5 as shown on Figure 3.2.5.2 in the EENF, Cover Types.

The Pine Barrens Zanclognatha moth (*Zanclognatha martha*) utilizes the type of pitch pine woodlands found within the eastern portion of this area. Although no Eastern box turtles have been observed within Phase A1 or the TTP, box turtle habitat is present as shown on Figure 3.2.5.3 in the EENF, Box Turtle Habitat Functions. Pine barrens and uplands forests, both present in this area, provide habitat for foraging, migration, and aestivation of the box turtles.

2.2.6 Phase A1 Cultural Resources

An intensive (locational) archaeological survey (950 CMR 70) was completed for the preparation of the previously reviewed EENF for areas identified as having high and moderate archaeological sensitivity within the 60± acre TTP site. Archival research indicated that the potential for the TTP site to contain Native American cultural resources was high based upon favorable environmental conditions.

The goal of the intensive (locational) archaeological survey was to locate and identify any significant archaeological deposits that may be present within the TTP site. The archaeological survey was undertaken in accordance with the National Historic Preservation Act of 1966 as amended,² the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation*,³ the Advisory Council on Historic Preservation's handbook *Treatment of Archaeological Properties*,⁴ Massachusetts General Laws, Chapter 9, Sections 26–27c as amended by Chapter 254 of the Acts of 1988 and accompanying regulations,⁵ and the MHC's handbook *Public Planning and Environmental Review: Archeology and Historic Preservation*.⁶

The intensive survey was conducted under state archaeological permit number 2892, issued by the MHC/state archaeologist on September 6, 2006, and included archival research, a walkover survey, and subsurface testing to locate and identify any potentially significant archaeological resources that may be affected by project construction.

In general, archival research indicated that the TTP site had a strong potential to contain pre-contact Native American archaeological sites given the reported presence of four sites adjacent to and within 2 miles of the TTP site, as well as dozens of sites located within southeastern Massachusetts in similar environmental contexts. Numerous known archaeological sites occupied in the pre-contact period from about 10,000 to 400 years ago are located in proximity to

² 36 CFR 800

³ 48 FR 44716, September 29, 1983

⁴ 1980

⁵ 950 CMR 71.00

⁶ 1985

the TTP site. Most of these known sites are situated on low knolls and terraces of sandy glacial outwash deposits that border marshes along the Weweantic, Wankinco, Agawam and Wareham rivers, adjacent tributary streams and wooded wetlands, and cranberry bogs. Previous cultural resource management surveys in close proximity to the TTP site identified pre-contact Native American archaeological sites that appear to be remains of small, temporary camps containing low-density deposits of cultural material. Based on this available information, it was expected that the TTP site could contain a small to moderate-sized temporary camp or activity area associated with pre-contact period Native American settlement. Additionally, a majority of the TTP site contains well-drained soils with a high potential to contain pre-contact Native American archaeological sites.

Subsurface testing with 117, 50-x-50-centimeter test pits documented natural A and subsoil horizons over the majority of the tested portions of the TTP site. No cultural material was recovered from any of the test pits. Based upon the results of the intensive (locational) archaeological survey, it has been determined that no significant archaeological resources are present within the TTP site including the Phase A1 parcel.

A report of the findings of the intensive survey was submitted to the Massachusetts Historic Commission (MHC) for review and comment on May 14, 2007. On June 4, 2007, the MHC issued correspondence concurring with the findings that no significant archaeological resources would be impacted by the Phase A1 development.

2.2.7 Phase A1 Stormwater Management

Since the TTP site is undeveloped under existing conditions, there is no stormwater management infrastructure present on-site. The ± 4.9 -acre cleared area and unimproved sand track access roads do not have associated drainage structures. Therefore, stormwater runoff flows overland, and, under existing conditions, the $60\pm$ acre TTP site is divided into two drainage areas, which both eventually flow to the Wankinco River (Refer to Figure 3.2.4.1 in the EENF, Phase A1 Watershed & Hydrology Map). The western portion is tributary to Mosquito Pond. An irrigation canal located south of the TTP site connects Mosquito Pond to Tihonet Pond and the Wankinco River. Surface runoff from the remaining portion of the TTP site drains to the perennial stream downstream of Mosquito Pond.

2.2.8 Phase A1 Transportation

Phase A1 is located within the TTP site and has access from Farm-to-Market Road in Wareham, Massachusetts. The study area assessed as part of the Phase A1 analysis is described in detail in Section 2.16.8. The elements of the

transportation system serving Phase A1 described in Section 2.16.8 include: physical characteristics; operating conditions; existing traffic volumes; vehicle travel speeds; pedestrian and bicycle facilities; and motor vehicle crash data for the study area roadways and intersections.

2.2.9 Phase A1 Groundwater

The TTP site is located within the service area of the Wareham Fire District (WFD), the municipal water supply authority for the town of Wareham. WFD withdraws water from the Plymouth-Carver Aquifer through a network of eight wells (one well, Maple Springs #5 is inactive). The Plymouth-Carver Aquifer is the second largest aquifer in Massachusetts, underlying approximately 200 square miles and containing more than 500 billion gallons of fresh water. The towns of Plymouth, Carver, Wareham, Bourne, Plympton, Middleborough, and Kingston all depend on the Plymouth-Carver Aquifer as a principal source of water. The nearest municipal well is approximately 2 miles from the TTP site.

2.2.10 Phase A1 Water Supply

The WFD has a total permitted withdrawal of 1.87 million gallons per day (MGD). The average withdrawal rate as reported in the WFD 2006 Annual Statistical Report is 1.65 MGD. Based upon the 2003 Draft Water Supply and Distribution System Management Plan prepared by SEA, there is sufficient capacity in the storage facilities to meet Wareham's current system-wide peak hourly demands and provide fire flow protection.

Adequate public water supply is available for the Phase A1 project via connection to the WFD. There is an existing 12-inch water main along Tihonet Road and Farm-to-Market Road that services the Proponent's headquarters and two single-family subdivisions located off Farm-to-Market Road.

2.2.11 Phase A1 Wastewater Infrastructure

Currently, no municipal or private wastewater infrastructure exists to accommodate wastewater generated by Phase A1. The few developed properties in this area utilize on-site Title 5 sewage disposal systems. Two residential subdivisions developed by A.D. Makepeace Company proximate to the Phase A1 area are serviced by Title 5 sewage disposal systems with de-nitrifying components.

2.2.12 Phase A1 Utility Infrastructure

Electric service will be provided to the TTP site and the Phase A1 parcel by a recently constructed underground primary distribution system located along the western edge of Farm-to-Market Road outside of the right of way, and fronting the TTP site. NSTAR is the electric utility provider for the Phase A1 parcel. Cable television and telecommunications infrastructure was upgraded along with

the primary electrical system, and these services are available to the Phase A1 parcel through local providers. Gas service is not available to the Phase A1 parcel.

2.2.13 Phase A1 Documented Environmental Conditions

A portion (approximately 4.9 acres) of the overall 60± acre TTP site was used historically as a septage sludge disposal area. This area is located in the southeast quadrant of the TTP, where the Phase A1 development is proposed. A Phase I Investigation and Tier Classification was completed for the site in 1998, and the site was assigned a DEP Release Tracking Number (RTN) of 4-13693.

A Phase II investigation and Method 3 Risk Characterization were subsequently conducted at the site. The Phase II investigation concluded that the extent of contamination of soil and groundwater was limited to the area of former sludge disposal. The Method 3 Risk Characterization assumed no future limitations on the use of the site, and concluded that a condition of No Significant Risk exists for human health concerns, public welfare, safety and potential environmental receptors. The findings supported a Class B-1 Response Action Outcome (RAO), and a RAO Statement was submitted to the DEP in June 2001.

2.3 Phase A1 Proposed Conditions

2.3.1 Phase A1 Summary

The proposed Phase A1 parcel constitutes a 16.4± acre portion of an area identified as the TTP site (60± acres). The proposed lot on which the building is to be constructed is approximately 12.5± acres in area. The construction of a 1,330 lf long subdivision roadway is proposed to provide access to the lot. The roadway layout consists of an additional 3.9± acres. As previously described, this initial phase will consist of the development of a 80,000± square-foot, two-story building (likely to be constructed in phases) accommodating office and light manufacturing space, an associated access road, parking, loading docks, landscape amenities, a Title 5 sewage disposal facility and stormwater management facilities. The location for this initial development is the southeast quadrant of the TTP site, as identified on Figures 3.1.1 and 3.1.2 in the EENF, Phase A1 Locus Map and Phase A1 Topographic Map.

The Phase A1 development will consist of 8,000± sf of office space, 72,000± sf of light manufacturing space, and 226 parking spaces (25% of which are anticipated to be constructed with pervious pavement). An additional 30 spaces are provided as potential future parking spaces for a total of 256 spaces. The development will be served by an on-site Title 5 sewage disposal system with enhanced nitrogen removal, and by municipal water and fire protection services to be provided by the Wareham Fire District. All water and fire protection infrastructure will be privately installed by the Proponent. Electric, telephone and cable services will

be provided via new underground cable, installed by the Proponent in 2006 to serve other users on Farm-to-Market and Federal Roads. Access to the Phase A1 development will be from a new subdivision roadway (approved in the prior Phase One Waiver) that is 1,330± lf in length and will consist of a 80± foot right-of-way. The boulevard roadway includes two 18-foot wide travel lanes with a 10-foot wide landscaped median strip.

2.3.2 Phase A1 Topography, Geology & Soils

Existing topography will be maintained to the maximum extent practicable in order to minimize earthwork activities. Similarly, the existing soils will remain; although topsoil will be added in landscaped areas. The geology of the site will not be affected by the proposed Phase A1 development.

2.3.3 Phase A1 Zoning & Land Use

The proposed commercial use is allowed within the BDOD. Local permits such as Site Plan Review and building permits will be obtained prior to construction.

It is anticipated that the active bogs proximate to the TTP site will continue to be utilized by the Proponent for cranberry cultivation purposes upon completion of the Phase A1 development.

The Phase A1 parcel is presently held in private ownership with no designated public open space or recreational uses. Therefore, no recreation or open space will be impacted by the Phase A1 development.

2.3.4 Phase A1 Wetlands, Surface Water & Hydrology

No direct impact to wetlands is anticipated as part of the Phase A1 development. Work will also occur outside of the 100-foot buffer zone to Bank associated with the off-site irrigation canal.

The entire Phase A1 site currently drains to the irrigation canal parallel to the southern boundary of the TTP site. The Proponent has initiated the site planning process for the proposed development with a focus on low impact development (LID) techniques. In addition, the Phase A1 development will be designed in accordance with the DEP Stormwater Management Standards, which provides standards regarding proposed conditions hydrology, groundwater recharge and water quality.

The Proponent is seeking to reduce the impact on the natural site hydrology by introducing recharge to groundwater. Any increase in runoff resulting from the development will be minimized using best management practices such as vegetated swales, rain gardens, basins, and infiltration of roof runoff. There will be no increase in peak runoff rates to adjacent land or water bodies.

Any future development (initiated as part of Phase B – see EENF for a description of Phase B) on the remaining TTP site will undergo a similar site planning and design process that minimizes the impact to the site’s natural hydrology.

2.3.5 Phase A1 Rare Species & Wildlife Habitat

Potential project impacts were calculated by identifying the habitat vegetation communities within the TTP site and the Phase A1 parcel that consist of upland open areas, upland forested areas, and pine barrens. In order to analyze the pitch pine communities located within the TTP site, available information was obtained from MassGIS. The habitats identified within the TTP site through field surveys were then compared with the habitat requirements of listed species to determine if the existing habitats provide rare species habitat. Impacts to rare species habitat were then calculated according to the habitat specific to the target species.

Potential rare species habitat impacts within the Phase A1 parcel are limited to upland forested areas and pine barrens, which may provide habitat for the Eastern box turtle (Refer to Figure 3.2.5.3 in the EENF, Box Turtle Habitat Functions). The TTP site contains ±53 acres of forested uplands that could be used by Eastern box turtle throughout the year for foraging, migration, and aestivation. Potential nesting habitat exists along the utility corridor to the north of Phase A1 and the overall TTP site, as well as in limited areas to the west and south along the edges of unimproved roads and disturbed areas associated with the cranberry bogs. Extensive areas of water bodies and cranberry bogs located between the TTP site and the western and southeastern mapped Priority Habitat represent a potential obstacle to the movement patterns of eastern box turtles. The Proponent has received a Conservation and Management Permit dated June 23, 2009 from NHESP for work associated with Phase A1 (attached as Appendix E).

2.3.6 Phase A1 Cultural Resources

An intensive (locational) archaeological survey of the Phase A1 parcel did not identify any cultural resources. A report of the findings of the intensive survey was submitted to the Massachusetts Historic Commission (MHC) for review and comment on May 14, 2007. On June 4, 2007, the MHC issued correspondence concurring with the findings that no significant archaeological resources would be impacted by the Phase A1 development.

2.3.7 Phase A1 Stormwater Management

Site specific stormwater management practices will be determined during the local site plan and subdivision approval process required by the town of Wareham. The stormwater management system will be designed to be consistent with the 2008 DEP Stormwater Management Standards, as revised, and will incorporate low-impact development (LID) design techniques to effectively

manage stormwater while reducing direct impacts to the land. Given the proximity to agricultural uses and wetlands, the Proponent will incorporate a method of stormwater management to effectively control and convey stormwater runoff, with consideration for water quality and quantity.

The stormwater management system for the Phase A1 development will result in pollutant removal, maintenance of existing groundwater recharge, and mitigation of potential changes in hydrology characteristics of stormwater exiting the Phase A1 parcel. Specifically, the following LID principles (as outlined in the Massachusetts Low Impact Development Toolkit) will be considered in the site design:

- ***Work with the Landscape*** - The development envelope will be maintained outside of sensitive areas, including wetlands, to the maximum extent practicable. Existing topography will be maintained (i.e. grading will be minimized) wherever possible in order to retain existing flow paths to the maximum extent practicable. Similarly, tree clearing will also be minimized to the maximum extent practicable.
- ***Focus on Prevention*** - The proposed parking areas will be minimized while accommodating zoning requirements. Similarly, the access roadways will be maintained at a minimum width, while respecting zoning requirements and the need for an emergency access roadway has been eliminated due to the boulevard style of the main access. Additionally, the amount of stormwater runoff typically associated with comparable developments will be decreased through the use of pervious materials (25% of the parking area will be constructed of pervious pavement).
- ***Micromanage Stormwater*** - The site design will strive to collect and infiltrate runoff close to its source, resulting in the management of small volumes of water, rather than the large volumes associated with a singular basin associated with typical large scale projects. Clean rooftop runoff will be directly recharged to groundwater using subsurface infiltration systems adjacent to the building. Additionally, a “treatment train” utilizing multiple techniques (potentially including vegetated swales, rain gardens, and bio-retention basins) will maximize filtration and recharge.
- ***Keep it Simple*** - Phase A1 will incorporate non-structural techniques that will include vegetated swales, rain gardens, bio-retention basins, street sweeping, and infiltration of roof runoff into vegetated areas, among others.

- ***Practice Multi-Tasking*** - The Phase A1 design will include stormwater management components that provide filtration, treatment, and infiltration. Additionally, certain components of the system, such as proposed stormwater basins, may be planted with native vegetation to enhance wildlife habitat. Swales may also be used for snow storage as necessary.
- ***Maintain and Sustain*** - A Long-Term Operation and Maintenance Plan will be developed in compliance with the 2008 DEP Stormwater Management Standards to ensure that stormwater facilities are maintained so that they function as designed.

As previously mentioned, the specific design of the stormwater management system will be based upon site conditions, including soil characteristics, drainage area, available area, and aesthetics. However, the system will include infiltration components, such as bioretention areas and infiltration basins, to address the recharge requirements of the 2008 DEP Stormwater Management Standards. See the current Phase A1 site plan (Figure 3.1.3 (rev1), Phase A1 Conceptual Site Plan).

In accordance with the 2008 DEP Stormwater Management Policy and the EPA National Pollutant Discharge Elimination System (NPDES) General Permit Program for Stormwater Discharges from Construction Sites, Phase A1 requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) by the site contractor and owner, since it will result in the disturbance of greater than one acre of land. The SWPPP will include a description of Phase A1 and of the sedimentation and erosion controls to be used on-site, as well as a description of inspection and maintenance procedures. The SWPPP will designate the erosion and sedimentation controls during construction, and will, at a minimum, incorporate measures such as straw bales, silt fencing, check dams/catch basin protection, and stabilization of construction access ways and slopes. Preventative measures to avoid spills while refueling construction equipment and proper disposal of construction generated wastes will also be incorporated into the SWPPP.

2.3.8 Phase A1 Transportation

The Phase A1 development program will consist of an 80,000 square foot (sf) building encompassing 8,000 sf of general office space and 72,000 sf of light manufacturing space. Phase A1 is expected to generate approximately 450 new vehicle trips on an average weekday, with 78 new vehicle trips expected during the weekday morning peak hour and 69 new vehicle trips expected during the weekday evening peak hour. Phase A1 will not result in a significant impact on the transportation infrastructure over existing or anticipated future conditions without Phase A1 (the “No-Build” condition). Section 2.8.11 presents a detailed

assessment of the impacts of Phase A1 on the transportation system.

2.3.9 Phase A1 Groundwater

Water for the proposed Phase A1 project will be provided by the WFD from supply that is both adequate and available through the District’s existing groundwater sources. The WFD withdraws groundwater from the Plymouth-Carver Aquifer, an extensive and highly productive aquifer. The WFD system operates in compliance with a current Water Management Act permit issued by the DEP.

2.3.10 Phase A1 Water Supply

The Proponent has confirmed that there is adequate capacity in the existing distribution system to service Phase A1 for a typical user. Hydraulic modeling of Phase A1 will be conducted by WFD’s consultant as part of the site plan approval process to validate this assumption, or to identify specific and limited infrastructure improvements if required. A preliminary estimate of the water use demands (average day, maximum day, and peak day) of the Phase A1 development is provided in Table 2.3.10.

Table 2.3.10. Phase A1 – Estimated Wastewater Flows and Water Demands

TITLE 5 WASTE WATER FLOW (gpd)	AVERAGE DAY WATER DEMAND		MAXIMUM DAY WATER DEMAND		PEAK DAY WATER DEMAND	
	Flow (gpd)	Flow (gpm)	Flow (gpd)	Flow (gpm)	Max (gpd)	Min (gpd)
5,496	3,023	2.1	9,069	6.3	18,138	12,092

Notes: Title 5 flows based on 326 employees @ 15gpd/employee (no cafeteria) plus 8,000 sf of office @ 75gpd/1,000 sf.

Average Day Water Demand = Title 5 flows/2 +10% Unaccounted

Maximum Day Water Demand = 3x Average day

Peak Day Water Demand Max. = 6x Average demand assuming green lawns

Peak Day Water Demand Min. = 4x Average demand assuming LID, no irrigation use

To accommodate the Phase A1 project, a new water main will be extended into the Phase A1 parcel within the proposed roadway 500± feet from the existing 12” water main located in the Farm-to-Market Road right-of-way. The new main, as well as new service connections, necessary appurtenances, and provisions for fire protection, will be designed and constructed to WFD Standards. A preliminary layout of the proposed new water main is depicted in Figure 3.3.10.1 in the EENF, Phase A1 Conceptual Water Supply Layout.

An alternative to connecting to the existing WFD municipal water supply infrastructure would be to construct a private well on-site to meet the demands of

the development. This alternative was not investigated further, however, because the area surrounding the Phase A1 parcel may be developed in the future (Phase B) and it would be impracticable to maintain an undeveloped protective radius (Zone I) around a new well while preserving the development potential of Phase B. In addition, locating a water supply on-site would be a constraint considering the on-site wastewater disposal strategy presented in Section 2.3.11.

Extension of the municipal water system will be conducted under the provisions of a Distribution System Modification permit anticipated to be issued by the DEP to the WFD. In addition, approvals will need to be obtained from the WFD (water main extension and new service connection) as well as from the Wareham Municipal Maintenance Department (road opening approval). No other water supply-related permits are anticipated for Phase A1.

2.3.11 Phase A1 Wastewater Treatment/Disposal

To facilitate planning for wastewater treatment and disposal for Phase A1, a site screening investigation was performed within the TTP site in September 2006. The investigation included the excavation of five test pits, the performance of several percolation tests, soils classification, and review of environmental receptors. The results of the site screening investigation indicated that the site soils within the TTP site in general, including the Phase A1 parcel are well drained and highly permeable, with percolation rates of less than 2 minutes/inch. Groundwater depths within the TTP site range from approximately 15 feet below the ground surface to more than 30 feet below the ground surface, based on regional groundwater and topographic mapping. The engineering evaluation of the field results concluded that the 60± acre TTP site could readily assimilate a treated effluent disposal volume of at least 40,000 gallons per day, and that an effluent disposal field for a Title 5 system to accommodate the Phase A1 development could be readily sited. Accordingly, the sewage generated by the proposed Phase A1 development can be accommodated at the site.

Projected Phase A1 wastewater flows are 5,496 gpd. These projected flows are based on Title 5 estimated flows of 326 employees at 15 gpd/employee (no cafeteria) for the light manufacturing space associated with Phase A1, plus 8,000 sf of office space at 75 gpd/1,000 sf. Note that, whereas the Title 5 system was proposed within the roadway cul-de-sac during the EENF, the system is currently proposed on the lot associated with the Phase A1 development.

Based on the findings of the site screening investigation, and with consideration that the estimated wastewater flows from Phase A1 will be 5,496 gallons per day, a Title 5 on-site sewage disposal system with enhanced nitrogen removal capabilities is proposed for the Phase A1 project. The locations of the test pits are depicted by Figure 3.3.11.1 in the EENF, Phase A1 Conceptual Wastewater

Treatment & Disposal Layout, while Figure 3.1.3 (rev1) depicts the current proposed location for the system (relocated from cul-de-sac). The sewage disposal system will be constructed in phases.

Prior to the final design and construction of the proposed Title 5 sewage disposal system, a field investigation will be conducted to provide the final design information for the proposed system. Note that the Title 5 sewage disposal system will be built in phases with the first two phases constructed for the 80,000 sf building proposed as Phase A1.

An alternative to an on-site sewage disposal system for the Phase A1 project is the design and construction of a larger treatment and disposal facility to service the entire 60± acre TTP site. This alternative is not recommended due to the lack of certainty associated with the timing of future development of the remainder of the TTP site, and the prohibitively high initial cost and extended schedule required to design, permit, and construct such a system for the limited flows associated with the Phase A1 development. Flows under 10,000 gpd are allowed by the Title 5 regulations with local approval only.

No state permits will be required for the Phase A1 wastewater treatment. Approval for the proposed Title 5 sewage disposal system for Phase A1 will be sought from the town of Wareham Board of Health. As future projects within the TTP site are advanced that exceed total projected wastewater flows of 10,000 gpd, a comprehensive Groundwater Discharge Permit application will be submitted to DEP. The application will address effluent quality and project-wide groundwater impacts, and will incorporate the impacts of the Phase A1 Title 5 system as appropriate. The permit is expected to contain discharge limitations, mitigation provisions, and monitoring requirements to holistically address groundwater impacts due to the proposed development.

2.3.12 Phase A1 Utility Infrastructure

Service connections for electricity, telecommunications and other related utilities will be extended to the Phase A1 parcel from the existing underground utility network located along the west shoulder of Farm-to-Market Road in the vicinity of the proposed development outside of the public right-of-way.

2.3.13 Phase A1 Greenhouse Gas Analysis

Greenhouse gas (GHG) emissions, specifically carbon dioxide (CO₂) emissions, associated with proposed Phase A1 of the Tihonet Mixed Used Development were evaluated and quantified in general accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*.

Phase A is being proposed as three distinct developments areas. One of these areas, Phase A1, consists of an 80,000 square foot (sf) mixed-use building located within the planned Tihonet Technology Park (TTP) area. The planned Phase A1 building will be located on an approximately 16.4 acre parcel in the southeastern quadrant of the TTP area. The current conceptual design for the Phase A1 building includes 10 percent office space (approximately 8,000 sf) and 90 percent light manufacturing (72,000 sf).

A pre-filing meeting for the EENF submittal was held at the MEPA offices on June 2, 2008 to discuss the proposed approach for performing the GHG evaluation for Phase A. During the meeting, it was recognized that Phase A1 is in the conceptual phase of design; and therefore, assumptions would be required to perform the GHG evaluation. Based on the conceptual nature of the final building design for Phase A1 and the relatively small percentage (i.e., de minimus) of the total development that Phase A represents, as well as the minimal design information available at this stage of planning, a simplified GHG emission evaluation was proposed for Phase A1.

The proposed Phase A1 GHG emission evaluation approach was designed to quantify baseline emissions for a Phase A1 “code-complaint” building and associated transportation-related emissions and then to quantify GHG reductions for mitigation measures that would be generally applicable to Phase A1 even if the current conceptual design was modified.

A GHG emission baseline for Phase A1 was established for both direct and indirect sources of emissions. The methodology for establishing the baseline for Phase A1 included assessing emissions from the following elements: (1) direct and indirect source emissions associated with energy consumption for a Massachusetts code-compliant building with a similar footprint and usage to the proposed Phase A1 building, and (2) transportation-related indirect emissions for Phase A1 based on forecasted trip generation rates.

The baseline Phase A1 building energy consumption was estimated using eQUEST (i.e., Quick Energy Simulation Tool version 3.63) energy modeling software. The eQUEST energy model provides estimates for electrical and natural gas consumption for a building based on the parameters selected within the model. Estimated electrical consumption (i.e., kilowatt-hours) was converted to an annual CO₂ emission rate using data provided in the 2005 New England Marginal Emission Rate Analysis dated July 2007 and prepared by ISO New England, Inc.⁷

⁷ CO₂ marginal emission rate data for Massachusetts was provided in Table 5.9 of the above-referenced July 2007 report.

It is anticipated that energy for the operation of boilers (e.g., space heaters) for the Phase A1 building would likely be supplied by fuel oil, as natural gas is not currently available within Phase A1. The eQUEST energy modeling software does not have an option for fuel oil; therefore, natural gas was selected as a surrogate and fuel oil emissions were estimated using U.S. Environmental Protection Agency (USEPA) emission factors.⁸ In addition, direct source emissions were estimated for a diesel-fueled emergency generator sized for the baseline energy load for the proposed Phase A1 building and assumed to operate for 26 hours per year (i.e., 0.5 hours per week). USEPA-approved emission factors were used to estimate emissions from the emergency generator.⁹

The baseline transportation-related GHG emissions were evaluated using information provided in the Phase A1 traffic study performed in accordance with state standards for the preparation of Traffic Impact Assessments (TIAs). The traffic study estimated 2,130,960 total annual vehicle-miles traveled (VMT) associated with the planned Phase A1 development, assuming Institute of Transportation Engineers (ITE) land use codes (LUCs) 140 and 710. Transportation-related emissions were estimated using the USEPA Mobile 6.2 average fleet mix emission factor of 550.4 grams of CO₂ per mile traveled.

Baseline GHG emissions for Phase A1, including emissions from both direct and indirect sources, are summarized in Table 2.3.13.1. Supporting calculations and eQUEST model outputs are provided in Appendix D.

Table 2.3.13.1. Phase A1 Baseline GHG Emissions

GHG Emission Source	Tons CO₂ Per Year
Building-Related Emissions (Direct and Indirect Sources)	3,481
Transportation-Related Emissions (Indirect Sources)	1,293
Total Estimated Emissions for Baseline Project:	4,774

⁸ The source of the fuel oil carbon dioxide emission factor was the USEPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, AP 42, Fifth Edition, Volume I Chapter 1.3: Fuel Oil Combustion.

⁹ The source of the diesel-fired emergency generator carbon dioxide emission factor was the USEPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, AP 42, Fifth Edition, Volume I Chapter 3.3: Gasoline and Diesel Industrial Engines.

2.4 Phase A1 Alternatives Analysis

The proposed location for the 16.4± acre Phase A1 development is the southeastern quadrant of the 60± acre TTP site. Since the proposed development program would be consistent with each alternative location; water, wastewater, traffic, and greenhouse gas impacts would remain consistent (refer to individual subsections within Section 2.3 for alternatives specific to these topics). For example, differences among the potential Phase A1 development parcels include proximity to wetlands and rare species habitat, as well as the length of new road and utility infrastructure required to serve the development.

2.4.1 Phase A1 – Alternative 1 (Northeastern Quadrant)

The Alternative 1 location (northeastern quadrant of the Tihonet Technology Park) does not contain any areas jurisdictional under the Massachusetts Wetlands Protection Act or Wareham Wetlands Protection Bylaw.

Approximately 90% of the northeastern quadrant contains pine barrens habitat comprised of Mello Code 4. The remainder of the quadrant is comprised of upland – forested areas. Extensive areas of water bodies and cranberry bogs located between the TTP site and the western and southeastern mapped Priority Habitat represent a potential obstacle to the movement patterns of eastern box turtles. It is unlikely that there would be significant movement within a turtle population between the TTP site and the mapped Priority Habitat areas approximately 1,200 feet to the west. As the pine barrens within the TTP site are not located contiguous to large tracts of undisturbed pine barrens habitats, it is unlikely that the TTP site provides valuable habitat for rare pine barrens species, including the Pine Barrens Zanclognatha. Therefore, it is unlikely that development within this area will result in the take of a rare species.

Alternative 1 would likely require similar roadway length and utility infrastructure to be constructed/installed as for the Anticipated Alternative.

2.4.2 Phase A1 – Alternative 2 (Southwestern Quadrant)

The Alternative 2 location (southwestern quadrant) contains the 100-foot buffer zone associated with an off-site irrigation canal and Mosquito Pond. If development were to occur at this location, work within the buffer zone would be avoided to the maximum extent practicable.

The southwest quadrant does not contain pine barrens habitat as it is comprised entirely of upland – forested habitat. Extensive areas of water bodies and cranberry bogs located between the TTP site and the western and southeastern mapped Priority Habitat represent a potential obstacle to the movement patterns of eastern box turtles. It is unlikely that there would be significant movement within a turtle population between the TTP site and the mapped Priority Habitat areas approximately 1,200 feet to the west. As the pine barrens within the TTP

site are not located contiguous to large tracts of undisturbed pine barrens habitats, it is unlikely that the TTP site provides valuable habitat for rare pine barrens species, including the Pine Barrens Zanclognatha. Therefore, it is unlikely that development within this area will result in the take of a rare species.

Roadway and utility infrastructure lengths associated with Alternative 2 would be greater than for the Anticipated Alternative.

2.4.3 Phase A1 – Alternative 3 (Northwestern Quadrant)

The Alternative 3 location (northwestern quadrant) was formerly the Anticipated Alternative, as noted in the SRP. However, due to market conditions, the southeastern quadrant has been amended to represent the Anticipated Development area.

Alternative 3 contains the 100-foot buffer zone associated with cranberry bogs and an isolated wetland to the west, although it is likely that any development could be maintained outside of these buffer zones. The Alternative 3 location also contains Riverfront Area associated with a perennial stream flowing through the off-site cranberry bogs. If development were to occur here, work within Riverfront Area would be avoided to the maximum extent practicable.

The northwest quadrant does not contain pine barrens habitat as it is comprised entirely of upland – forested habitat. Extensive areas of water bodies and cranberry bogs located between the TTP site and the western and southeastern mapped Priority Habitat represent a potential obstacle to the movement patterns of eastern box turtles. It is unlikely that there would be significant movement within a turtle population between the TTP site and the mapped Priority Habitat areas approximately 1,200 feet to the west. As the pine barrens within the TTP site are not located continuous to large tracts of undisturbed pine barrens habitats, it is unlikely that the TTP site provides valuable habitat for rare pine barrens species, including the Pine Barrens Zanclognatha. Therefore, it is unlikely that development within this area will result in the take of a rare species.

Roadway and utility infrastructure lengths necessary to access a development within the Alternative 3 area would be greater than required for the southeastern quadrant (Anticipated Alternative).

Note that the above-described alternative locations are identified as future sites within the Phase B Conceptual Plan, and may therefore be developed in the future. However, the southeastern quadrant of the Tihonet Technology Park has been chosen as the Anticipated Alternative for Phase A1 due to market considerations, proximity to infrastructure in Farm-to-Market Road, and avoidance of anticipated environmental impacts. The anticipated Phase A1 development location will result in shorter roadway length and

utility infrastructure requirements than Alternatives 2 and 3. Furthermore, it will not impact any state or local jurisdictional wetland resource areas or buffer zones. It is unlikely that the Phase A1 proposed development will result in the take or any rare species as described in Section 2.3.5.

2.5 Phase A1 Avoidance, Minimization & Mitigation of Impacts

The Phase A1 program has been developed in order to avoid and minimize potential impacts to environmentally sensitive resources. The Phase A1 program has been developed to minimize the State permits required and exceedance of MEPA thresholds to the extent feasible. No thresholds are exceeded for a mandatory EIR. The Proponent has completed an impact matrix (Refer to Table 2.5.1) detailing the relationship of the Phase A1 development to the MEPA ENF thresholds, based upon the conceptual site plan (Figure 3.1.3 (rev1)). The project has been designed to avoid impact to wetland resources, and utilizes a disturbed portion of the TTP site.

Table 2.5.1. Phase A1 Development Impact Matrix

MEPA REVIEW CATEGORY	PHASE A1 EXCEEDS ENF REVIEW THRESHOLD?	COMMENTS
Cultural/Historical Resources	NO	No Impacts
ACECs	Not Applicable	
Land Resources	YES	(301 CMR 11.03(1)(b)2 – creation of five or more acres of impervious area)
Rare Species	NO ¹⁰	The Proponent has received a Conservation and Management Permit
Wetlands, Waterways & Tidelands	NO	
Water Supply	NO	
Wastewater	NO	
Transportation	NO	
Energy/Air/Solid Waste/Hazardous Waste	NO	

2.5.1 Phase A1 Wetlands, Surface Water & Hydrology

As previously noted, no wetlands alteration will occur as a result of the Phase A1 development. If the Phase A1 development is undertaken in the anticipated location, all work will be maintained outside of areas subject to jurisdiction pursuant to the Massachusetts Wetlands Protection Act and town of Wareham Wetlands Protection Bylaw. However, if another quadrant is utilized that contains buffer zone or Riverfront Area, work within these areas will be avoided and minimized, and will also meet the 2008 DEP Stormwater Management Standards as described in Section 2.3.7. An alternatives analysis would also be

¹⁰ The Proponent has applied for and received a Conservation and Management Permit despite the fact that Phase A1 is located outside of mapped habitat and no species have been observed to date.

undertaken for work within Riverfront Area.

The stormwater management system will be designed to avoid any adverse surface water and hydrological impacts caused by the proposed development. Given the proximity to agricultural uses and wetlands, the Proponent will implement a stormwater management system to effectively control and convey stormwater runoff, with consideration for water quality and quantity. Specifically, Phase A1 will include the following measures to avoid impacts:

Protection of Surface Waters: Runoff from all proposed impervious surfaces within Phase A1 will be treated using LID management practices approved by the DEP Stormwater Management Standards. These practices will be designed to capture and remove pollutants from water quality volume as required by the Standards.

Protection of Groundwater: Only clean, rooftop runoff will be recharged directly into the ground via infiltration chambers. All best management practices will be designed with a minimum 2-foot offset between the bottom surface of the treatment system and the groundwater surface.

Prevention of Erosion and Sedimentation: Erosion and sediment controls will be installed prior to commencement of construction activity and maintained until the disturbed land surfaces have been stabilized. Erosion control barriers consisting of silt fencing backed by staked straw bales will be installed to prevent sedimentation within wetland areas and downstream waters. Since Phase A1 involves the disturbance of greater than 1 acre, a Stormwater Pollution Prevention Plan (SWPPP), which includes a complete list of protection measures and an inspection and maintenance schedule, will be prepared in accordance with EPA's National Pollutant Discharge Elimination System (NPDES) General Permit Program for Stormwater Discharges from Construction Sites. The SWPPP will be certified by the site contractor and owner. The SWPPP will include a description of Phase A1 and of the controls to be used on-site, as well as a description of inspection and maintenance procedures. The SWPPP will designate the erosion and sedimentation controls during construction, and will, at minimum, incorporate measures such as straw bales, silt fencing, check dams/catch basin protection, and stabilization of construction access ways and slopes. Preventative measures to avoid spills while refueling of construction equipment and proper disposal of construction-generated wastes will also be incorporated into the SWPPP.

Control Peak Runoff Rates: The stormwater management system will be designed to control post-development peak discharge rates for the 2-, 10-, and 100-year, 24-hour storms so as to maintain existing conditions/pre-development peak discharge rates.

As previously discussed, the specific design of the stormwater management system will be based upon site conditions, including soil characteristics, drainage area size, available area, and aesthetics. Currently, the Proponent is investigating opportunities to incorporate low-impact development (LID) design techniques in order to effectively manage stormwater while reducing direct impacts to the land. The use of low-impact design will result in pollutant removal, maintenance of existing groundwater recharge, and mitigation of potential changes in hydrology leaving the site.

Additionally, grading and tree clearing will be minimized in order to retain existing flow paths and land cover to the maximum extent practicable.

The size of proposed parking areas and the access road will be minimized while accommodating zoning requirements.

The stormwater management system will collect and dispose of runoff close to its source, resulting in the management of small volumes of water, rather than the large volumes associated with typical subdivisions. Additionally, a “treatment train” utilizing multiple best management practices techniques will maximize filtration, treatment and recharge. This will allow the Proponent to avoid installing an expansive pipe system to convey stormwater runoff. Phase A1 will rely upon LID techniques that may include vegetated swales, rain gardens, vegetated basins, pervious pavement, street sweeping, and infiltration of roof runoff into vegetated areas, among others. Native vegetation will also be planted within certain stormwater facilities (basins and swales, for example) to enhance wildlife habitat.

2.5.2 Phase A1 Rare Species & Wildlife Habitat

Inspections of the TTP site did not identify any rare species of plants or animals. Rare species habitat impacts within the Phase A1 development footprint are limited to upland forested areas that may provide habitat for the Eastern box turtle. The TTP site does contain undisturbed forested uplands and pine barrens that could be used by Eastern Box Turtles throughout the year for foraging, migration, and aestivation. Potential nesting habitat exists along the utility corridor to the north of the TTP site, as well as in limited areas to the west and south along the edges of unimproved roads and disturbed areas associated with the cranberry bogs. As previously indicated, extensive areas of water bodies and cranberry bogs located between the TTP site and the western and southeastern mapped Priority Habitat represent a potential obstacle to the movement patterns of Eastern Box Turtles. Furthermore, the Proponent has received a Conservation and Management Permit from NHESP for work associated with this Phase.

2.5.3 Phase A1 Cultural Resources

An intensive (locational) archaeological survey of Phase A1 did not identify any cultural resources. Therefore, consideration of avoidance, minimization, and mitigation of impacts is not applicable.

2.5.4 Phase A1 Transportation

The impacts to the transportation system associated with Phase A1 are expected to be insignificant; however, a comprehensive transportation mitigation program has been developed that is designed to accommodate the additional traffic expected to be generated by Phase A1 and planned future development in the area independent of Phase A1. The Phase A1 transportation mitigation program is described in detail in Section 2.16.8.

2.5.5 Phase A1 Groundwater

The proposed water supply system represents an extension to an existing municipal water system operated by the Wareham Fire District (WFD). The existing municipal system withdraws groundwater from the Plymouth-Carver Aquifer, an extensive and highly productive aquifer, under the provisions of a current Water Management Act permit.

The proposed Phase A1 water supply system will be designed to minimize impacts to existing water resources in the basin, while supplying a safe, reliable source of potable water. The WFD distribution system is located in close proximity to the Phase A1 parcel and the system has adequate capacity to meet the projected demands and fire flow requirements of the Phase A1 development. Groundwater quality impacts from the proposed on-site Title 5 sewage disposal system will be avoided/minimized by the addition of an advanced nitrogen removal component and the proposed increased separation from groundwater. Treated effluent will be returned as groundwater recharge within the same basin to minimize groundwater withdrawal impacts. Protection of sensitive environmental resources will be accomplished by responsive consideration of the Title 5 system siting and construction. In addition, the withdrawal required to support Phase A1 is de minimis in relation to the overall size and capacity of the aquifer. Therefore, Phase A1 will have no significant impact on groundwater.

2.5.6 Phase A1 Water Supply

The impacts associated with the Phase A1 water system will be minimal, as the new main will be installed within proposed roadways. As previously discussed, water for the proposed Phase A1 development will be provided by the WFD supply that is both adequate and available through the WFD existing sources.

Water conservation will be promoted through metered services, water-efficient landscaping, minimizing developed (landscaped) areas, and installing low-flow

plumbing fixtures. The development will be constructed following low impact development principles and current State Plumbing Code for low flow fixtures.

2.5.7 Phase A1 Wastewater Treatment/Disposal

The proposed on-site sewage disposal system will be designed and constructed in accordance with State and local requirements and the findings of the site screening investigation, and will include an advanced nitrogen removal component. The impacts of this system are expected to be negligible.

The Phase A1 wastewater system will be designed to minimize impacts to existing groundwater and environmental resources in the basin. The addition of nitrogen removal technology to the sewage disposal system will minimize nutrient impacts to groundwater while maintaining beneficial recharge. Therefore, the Phase A1 wastewater system will have no significant impact on the environment.

2.5.8 Phase A1 Utility Infrastructure

The impacts associated with extending electric, telecommunications and other related utilities to Phase A1 will be minimal, as the new service connections will be installed within the footprint of existing and proposed roadways and utility easements. Therefore, the Phase A1 utility infrastructure system will have no significant impact on the environment.

2.5.9 Phase A1 Greenhouse Gas Analysis

In accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*, GHG emission avoidance, minimization and mitigation measures are anticipated to be incorporated into all phases of the Tihonet Mixed Use Development. Phase A1 is in the initial phase of design; therefore, numerous assumptions were required to perform the GHG evaluation. Based on the conceptual nature of the final building design, proposed GHG mitigation measures were selected for Phase A1 based on their ability to meet the needs of the current conceptual design, while maintaining flexibility for changes in the design.

The methodology for estimating GHG emissions for the proposed Phase A1 project was consistent with that used to evaluate Phase A1 baseline emissions (described in Section 2.3.13), and included assessing the following elements: (1) direct and indirect source emissions associated with energy consumption for the proposed Phase A1 building, and (2) indirect transportation-related emissions for Phase A1 based on forecasted trip generation rates.

Some of the mitigation measures selected for the proposed Phase A1 project: (1) are not accounted for in conventional energy/transportation modeling, and/or (2) are difficult to quantify as they may be highly variable or subjective. In general, a

conservative approach (i.e., to underestimate reductions) was taken when estimating GHG emission reductions associated with such mitigation measures.

The proposed GHG mitigation measures were chosen for Phase A1 to align with the objectives of the Tihonet Mixed Used Development. Those objectives include establishing a mixed-use village community incorporating the principles of smart-growth, open space preservation, low-impact development, traditional village design, pedestrian orientation, and the preservation of environmental resources.

The proposed mitigation measures for Phase A1 can generally be included in one of the following categories: (1) Siting & Site Design, (2) Building Design & Operation, and (3) Transportation. Additional details are provided in the following sections.

SITING & SITE DESIGN

The proposed GHG mitigation measures for Phase A1 siting and site design focused on the preservation of open space, conservation of resources, and support for alternative forms of transportation.

Siting and site design-related mitigation measures anticipated to be incorporated into the final Phase A1 project design are listed in Table 2.5.9.1.

Table 2.5.9.1. Phase A1 Proposed Siting & Site Design Mitigation Measures

Siting & Site Design Mitigation Measures	Selected for Phase A1
Provide permanent protection for open space on the project site	√
Conserve and restore natural areas on-site	√
Design project to support alternative transportation to site including transit, walking, and bicycling	√
Use low impact development for stormwater design	√
Design water efficient landscaping	√

In general, the mitigation measures identified above are not accounted for in the energy consumption modeling methodology used for this analysis; however, it is anticipated that these measures will have a beneficial impact on GHG emissions associated with Phase A1 (i.e., will reduce GHG emissions).

BUILDING DESIGN & OPERATION

Where appropriate, the proposed building design and operation mitigation measures selected for Phase A1 focused on incorporating low-impact and energy efficient design features. Examples of these measures include adding additional insulation and climate controls to reduce the energy requirements of the Phase A1 building. In addition, the Project Proponent has engaged a Leadership in Energy

and Environmental Design (LEED)-certified architect to assist in developing an energy efficient design for Phase A1. As noted previously, the Phase A1 building design is still in the conceptual phase; therefore, mitigation measures were ultimately selected based on their ability to meet the needs of the current conceptual design, while maintaining flexibility for changes in the design.

Building design and operation-related mitigation measures anticipated to be incorporated into the final Phase A1 project design are listed in Table 2.5.9.2.

Table 2.5.9.2. Phase A1 Proposed Building Design & Operation Mitigation Measures

Building Design & Operation Mitigation Measures	Selected for Phase A1
Use high-albedo roofing materials	√
Install high-efficiency HVAC systems	√
Eliminate or reduce use of refrigerants in HVAC systems	√
Maximize interior daylighting through floor plates, increased building perimeter and use of skylights, celestories, and light wells	√
Incorporate window glazing to balance and optimize daylighting, heat loss, and solar heat gain performance	√
Incorporate super insulation to minimize heat loss	√
Incorporate motion sensors and lighting and climate control	√
Use efficient, directed exterior lighting	√
Use water conserving fixtures that exceed building code requirements	√
Re-use gray water and/or collect and re-use rainwater	√
Provide for storage and collection of recyclables (including paper, corrugated cardboard, glass, plastic, and metals) in building design	√
Use building materials with recycled content	√
Use building materials that are extracted and/or manufactured within the region	√
Use wood that is certified in accordance with the Forestry Stewardship Council's Principles and Criteria	√
Use low-VOC adhesives, sealants, paints, carpets, and wood	√
Conduct 3 rd party building commissioning to ensure energy performance	√
Provide construction and design guidelines to facilitate sustainable design for build-out by tenants	√
Purchase Energy Star-rated appliances that are the lowest energy rating	√

The eQUEST modeling software and general assumptions were used to estimate reductions in GHG emissions for several of the mitigation measures identified above. In some instances, reductions in GHG emissions for the selected mitigation measures were subjective and; therefore, were not directly quantifiable.

TRANSPORTATION

The proposed transportation mitigation measures selected for Phase A1 focused on: (1) the incorporation of transit-oriented development; (2) traffic signal improvements designed to improve the flow of traffic and accommodate pedestrians and bicyclists; (3) street and building lighting to create a pedestrian and bicycle friendly environment; and, (4) the implementation of a Transportation Demand Management (TDM) program, inclusive of the designation of car/vanpool spaces, etc. Public transportation services within the area are currently provided by the Greater Attleboro–Taunton Regional Transit Authority (GATRA). GATRA provides public bus service by way of the Onset-Wareham Link (OWL) service routes.

Transportation-related mitigation measures anticipated to be incorporated into the final Phase A1 project design are listed in Table 2.5.9.3.

Table 2.5.9.3. Phase A1 Proposed Transportation Mitigation Measures

Transportation Mitigation Measures	Selected for Phase A1
Locate new buildings in or near areas designated for transit-oriented development (TOD) and, where possible, incorporate TOD principles in employee and customer activity patterns	√
Develop or support multi-use paths to and through site	√
Size parking capacity to meet, but not exceed, local parking requirements and, where possible, seek reductions in parking supply through special permits or waivers	√
Provide bicycle storage and showers/changing rooms	√
Roadway improvements to improve traffic flow	√
Traffic signalization and coordination to improve traffic flow and support pedestrian and bicycle safety	√
Make on- and off-site improvements to reduce VMT including sidewalks, paths, traffic signals, lighting and landscaping.	√
Provide no-idling truck zones at loading/off-loading and queuing areas.	√

It is anticipated that the Proponent, as the property owner, will have limited ability to implement transportation-related mitigation measures directly associated with future tenants and employees in the early stages of the project. As such, to generally represent the potential for mitigation measures based on the availability of public transportation and proposed site improvements, a maximum of 4.7% reduction in VMT was assumed for this analysis¹¹.

¹¹ According to information obtained by the U.S. Census Bureau (as reported at: <http://www.employmentspot.com/employment-articles/saving-time-and-money-on-public-transportation/>), an average of 4.7% of individuals in the United States commute to work using public transportation.

Note that additional mitigation measures were considered for Phase A1, but were not included generally due to the small scope and size of Phase A1 relative to the Project as a whole. It is anticipated, however, that it will be possible to incorporate some of these mitigation measures into subsequent phases of the Tihonet Mixed Used Development. Examples of such measures may include incorporating on-site renewable energy sources and purchasing renewable energy (i.e., “green power”).

PHASE A1 PROPOSED PROJECT GHG EMISSIONS REDUCTION

GHG emissions for Phase A1 with proposed mitigation measures are included in the GHG emission evaluation summary provided in Table 2.5.9.4.

Table 2.5.9.4. Phase A1 Proposed Project GHG Emission Evaluation Summary

GHG Emission Source	Baseline Project [Tons CO ₂ Per Year]	Proposed Project [Tons CO ₂ Per Year]	Estimated Percent Reduction
Building-Related Emissions (Direct and Indirect Sources)	3,481	2,981	14%
Transportation-Related Emissions (Indirect Sources)	1,293	1,232 to 1,293	0% to 4.7%
Total Estimated Emissions:	4,774	4,213 to 4,274	10% to 12%

A comparison of these results to the estimated baseline emissions identified in the table above and detailed in Section 2.3.13, indicates that implementation of the proposed mitigation measures may result in an estimated overall project reduction in GHG emissions of about 10% to 12%. Supporting calculations and eQUEST model outputs are provided in Appendix D.

PHASE A1 PROPOSED PROJECT WITH ADDITIONAL MITIGATION MEASURES GHG EMISSIONS REDUCTION

In accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*, estimated reductions associated with mitigation measure(s) not selected for Phase A1 have been quantified. For example, the Proponent considered purchasing electricity generated by “green power” sources (e.g., wind-generated electricity) for Phase A1. NSTAR, the local electric utility, offers its commercial customers the option to purchase renewable energy to meet 50% or 100% of their electricity needs. GHG emissions for the proposed Phase A1 project with additional mitigation measures, specifically purchasing green power, are included in the GHG emission evaluation summary provided in Table 2.5.9.5.

Table 2.5.9.5. Phase A1 Proposed Project with Additional Mitigation Measures GHG Emission Evaluation Summary

GHG Emission Source	Baseline Project [Tons CO ₂ Per Year]	Proposed Project With Additional Mitigation Measures [Tons CO ₂ Per Year]	Estimated Percent Reduction
Building-Related Emissions (Direct and Indirect Sources)	3,481	2,725	22%
Transportation-Related Emissions (Indirect Sources)	1,293	1,232 to 1,293	0% to 4.7%
Total Estimated Emissions:	4,774	3,957 to 4,018	16% to 17%

A comparison of these results to the estimated baseline emissions identified in the table above and detailed in Section 2.3.13, indicates that implementation of the additional mitigation measure may result in an estimated overall project reduction in GHG emissions of about 16% to 17%. However, due to the relatively small scope of Phase A1 compared to the entire Tihonet Mixed Use Development project, as well as the financial burden that implementation of this measure would place on the tenants of the building; this mitigation measure was not selected for Phase A1. This mitigation measure will be considered for implementation during subsequent phases of the project.

Supporting calculations and eQUEST model outputs are provided in Appendix D.

2.6 Phase A2 Introduction

The Phase A2 project, located at an extension of Lou Avenue, consists of the development of a 65,850± sf Medical Office Building with 279 parking spaces (25% of which are anticipated to be constructed of pervious pavement) and other site amenities (including stormwater management facilities). The building will be 3 stories in height with a footprint of approximately 22,000± sf. It shall provide for general medical offices that service internal, bariatric and specialty medicine, including limited radiological and laboratory services. The structure includes multiple points of access and egress, common lobby space, and elevator and stairwell service. In addition, a 5,000± sf (2,500 sf footprint) unoccupied “Gatehouse” is proposed at the entrance to Lou Avenue at its intersection with Route 28. The Phase A2 development will be located on a 13.3± acre site that includes both wooded and previously developed areas off Lou Avenue in Wareham (Refer to Figures 3.6.1 (rev1) and 3.6.2 (rev1), Phase A2 Locus Map and Phase A2 Topographic Map, respectively).

Consistent with an agreement with the town of Wareham, sewer service for the Phase A2 project will be provided by a connection, via a pumping station and force main, to the Wareham Water Pollution Control Facility. Phase A2 also includes the improvement, realignment and extension of Lou Avenue to Tihonet Road (a total of 4,770± lf) in order to accommodate the new Phase A2 location and development program. This road extension is included in the amended Phase A2 waiver request. Because a portion of Lou Avenue is a public roadway, this work will be coordinated with the town of Wareham. In addition the extension of the roadway will require approval by the Wareham Planning Board under the Subdivision Control Law. (Refer to Section 2.8 for additional information regarding the proposed conditions.) Figure 3.6.3 (rev1), Phase A2 Conceptual Site Plan depicts the proposed Phase A2 development.

2.6.1 Phase A2 MEPA Review Thresholds

The Phase A2 project has been developed as an independent project that can be assimilated into and support future development plans while minimizing environmental impacts. Overall impacts from the Phase A2 project have been limited to the extent practicable by respecting the natural resources of the development site and utilizing the available infrastructure and previously developed land to support this phase. The proposed Phase A2 program does not exceed any review thresholds for a mandatory EIR. In addition, through careful planning and design, exceedance of MEPA ENF review thresholds has been minimized. Specifically, the following thresholds will be exceeded with the proposed development of Phase A2: 1) the creation of five or more acres of impervious area (301 CMR 11.03(1)(b)(2)); 2) generation of 1,000 or more new ADT on roadways providing access to a single location and construction of 150 or more new parking spaces at a single location” (301 CMR 11.03(6)(b)14).

2.6.2 Phase A2 Project Severability

The SRP requires a demonstration that “*implementation of the proposed phase will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases.*” The Phase A2 development consists of 70,850 sf of buildings (65,850± sf Medical Office Building and 5,000± sf gatehouse) and associated infrastructure that is severable from potential future development of adjacent land (including from Phase A1 and Phase A3) owned by the Proponent. The proposed Phase A2 development will also include the realignment as well as the extension of Lou Avenue to accommodate the development. Phase A2 is self-sufficient and does not rely on the construction of infrastructure or utilities associated with a future phase of development. Water supply and wastewater systems to be provided to support the Phase A2 development do not require additional stages of development to operate effectively. Similarly, due to the minimis land area of Phase A2 relative to the overall Project site, implementation of this phase of development will not preclude opportunities to avoid, minimize or mitigate environmental impacts related to future phases.

2.6.3 Phase A2 Permits and Approvals Summary

Those permits necessary for the construction associated with Phase A2 will be submitted for review and approval with appropriate officials once the MEPA review of Phase A2 has been completed. Permits anticipated at this time include:

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)

- *State*
 - State Highway Access Permit (MassHighway)
 - Traffic Signal Permit (MassHighway)
 - Conservation and Management Permit
 - Sewer Extension Permit (DEP)
 - Sewer Connection Permit (DEP)

- *Town of Wareham*
 - Abbreviated Notice of Resource Area Delineation (Wareham Conservation Commission)
 - Order of Conditions (Wareham Conservation Commission)
 - Preliminary and Definitive Subdivision Approval (Wareham Planning Board)
 - Site Plan Review-Special Permit (Wareham Planning Board)
 - New Service Connection (Wareham Fire District)
 - Sewer Connection (Wareham Sewer Department)
 - Building Permit (Wareham Building Department)

- Water Main Extension Approval (Wareham Fire District Water Department)
- Street Opening Permit (Wareham Municipal Maintenance Department)

2.7 Phase A2 Existing Conditions

2.7.1 Phase A2 General Site Description

The Phase A2 development area is comprised of approximately 13.3 acres of wooded and previously altered land off Lou Avenue, north of Rose Brook (Refer to Figures 3.6.1 (rev1) and 3.6.2 (rev1), Phase A2 Locus Map and Phase A2 Topographic Map). Phase A2 has been relocated from the development proposed in the EENF. Specifically, the Phase A2 area includes the lot for the Medical Office Building, as well as the proposed Gatehouse lot, and a roadway extending Lou Avenue to the A2 development and then connecting to Tihonet Road. Existing cranberry bogs are located to the east, north and west of the Phase A2 development site while Rose Brook is located proximate to the southerly limits of the Medical Office Building development site.

2.7.2 Phase A2 Topography, Geology & Soils

The topography of the Phase A2 area ranges in elevation from ± 25 to ± 40 feet above sea level (Refer to Figure 3.6.2 (rev1), Phase A2 Topographic Map).

Based upon MassGIS information, the surficial geology of that portion of the Phase A2 parcel proposed for the Medical Office Building consists of Large Sand Deposits. The roadway area proposed for the extension of Lou Avenue varies with location from Till or Bedrock to Floodplain Alluvium as well as Large Sand Deposits. (Refer to Figure 3.7.2.1 (rev1), Phase A2 Surficial Geology Map).

Based upon the official 1969 soil survey map for Plymouth County (Refer to Figure 3.7.2.2), soils within the Phase A2 parcel consist of Carver Coarse Sand with 3-8% slopes in the area proposed for the Medical Office Building and the extension of Lou Avenue on the northerly side of Rose Brook. Gloucester loamy sands with 3-8% and 8-15% slopes are located within the area of the extension of Lou Avenue, south of Rose Brook back to Route 28. Sanded Muck (Sb) soils are present within the bog system that Lou Avenue extension is proposed to cross via an existing causeway.

The Carver soils are typically very deep and excessively drained. These soils typically have a low water holding capacity which, unless irrigated, makes them poorly suited for intensive agricultural production or for woodland productivity. These soils are not known to have limitations for commercial or residential development; however, are associated with aquifer recharge areas.

The Gloucester series includes soils that are characteristically very deep and nearly level, as well as somewhat excessively drained. They are generally formed in sandy glacial till or boulder outwash.

Sanded Muck (Sb) soils consist of Muck, Peat and very poorly drained mineral soils that have been developed for cranberry production.

The 2003 Draft Updated Plymouth County Soil Survey information was obtained for the Phase A2 parcel (Refer to Figure 3.7.2.3 (rev1)). The following soils are noted within the Phase A2 area:

- Carver coarse sand with 3-8% slopes and 8-15% slopes
- Deerfield loamy sand with 3-8% slopes
- Windsor loamy sand with 8-15% slopes
- Birchwood loamy sand, with 3-8% slopes, very stony
- Carver Urban Land Complex, undulating
- Udipsamments, wet substratum, nearly level
- Stockpiles

Specifically, Deerfield loamy sand and Windsor loamy sand comprise the majority of the Medical Office Building Site, while Carver urban land complex is located within the Gatehouse lot, and the remaining listed soils are present along various sections of the proposed roadway. Both Deerfield and Windsor soils are very deep and moderately to excessively well drained. Birchwood soils are also very deep, and moderately well drained, and are present on ground moraines and drumlins, in the gently sloping areas and on the toes of slopes. Stockpile soils consist of organic and topsoils. Udipsamments represent areas where the upper soil materials have been disturbed; they are moderately well drained, gravelly and sandy soil areas located within floodplain alluvium.¹²

2.7.3 Phase A2 Zoning & Land Use

The Phase A2 parcel is located in the town of Wareham and is situated within the Residence 60 (R-60) zoning district and is also overlain by the Business Development Overlay District (BDOD). Pursuant to the Wareham Zoning By-laws, *“the R-60 district is intended to permit residential development at low densities in areas not served by public water or sewer systems.”* However, the BDOD *“is intended to create office/R&D development opportunities in a campus-like environment using the existing agricultural uses and natural landscapes as amenities for the businesses located in the office parks.”*

¹² Soil series descriptions from nesoil.com viewed June 20, 2008.

As previously described, the Phase A2 parcel includes both wooded and previously developed areas. The Medical Office Building site lies proximate to agricultural uses, and the proposed roadway utilizes some existing agricultural access roads in order to minimize environmental impacts. Based upon the most recent prime farmland list (1969), no soils within the parcel are categorized as “prime.”

The Phase A2 parcel is not accessible to the public, as it consists of private land. The parcel proposed for the Medical Office Building as well as a portion of the subdivision roadway extension are part of the Chapter 61A agricultural program. Lands to the north of this parcel include active cranberry bogs, owned and operated by the Proponent. (Refer to Figure 3.7.3.1, Phase A2 Chapter 61 Lands).

2.7.4 Phase A2 Wetlands, Surface Water & Hydrology

Wetland resource areas within and proximate to the Phase A2 parcel have been delineated in the field and located by instrument survey, but have not been confirmed by the Wareham Conservation Commission. Wetlands within the Phase A2 development area include Bordering Vegetated Wetland, Bank and Land Under Water Bodies and Waterways associated with an intermittent stream (ditch) and Rose Brook, as well as Bordering Land Subject to Flooding and Riverfront Area associated with Rose Brook. Bordering Vegetated Wetland, Bank and Land Under Water Bodies and Waterways have an associated 100-foot buffer zone (pursuant to the Massachusetts Wetlands Protection Act and town of Wareham Wetlands Protection Bylaw). Additionally, the 100-foot buffer zone to the Bank of the irrigation canals associated with the off-site cranberry bogs as well as with a proximate Isolated Vegetated Wetland also extends into the Phase A2 parcel.

There are no permanent surface waters within the Phase A2 parcel except for Rose Brook. A ditch that crosses the roadway portion of the parcel exhibits intermittent flows in a southeasterly direction. Surface water associated with the off-site cranberry bogs is controlled by various structures, such as flashboards.

Under existing conditions, the 13.3± acre Phase A2 parcel is located entirely within the Rose Brook sub-basin and is tributary to the surrounding bog systems (Refer to Figure 3.7.4.1, Phase A2 Hydrology Map).

An Abbreviated Notice of Resource Area Delineation (ANRAD) will be filed with the Wareham Conservation Commission to confirm the wetland delineation.

2.7.5 Phase A2 Rare Species & Wildlife Habitat

The Phase A2 parcel is not presently mapped as Estimated Habitat (EH) or Priority Habitat (PH) according to the 2008 Edition of the “*Massachusetts*

Natural Heritage Atlas prepared by NHESP (Refer to Figure 3.7.5.1 (rev1) NHESP Mapping). The nearest mapped habitat is located approximately 3,000 feet to the south of the Phase A2 parcel. Rare species within this mapped area are associated with the coastal waters of the Weweantic River. A second mapped area is located approximately 3,000 feet to the northeast of the Phase A2 parcel. This second area is mapped for the water willow stem borer. No water willow plants were observed in or around the Phase A2 parcel. The Phase A2 parcel is comprised of approximately 13.3 acres of upland forest and open areas (Refer to Figure 3.7.5.2 (rev1), Phase A2 Cover Types). Although MassGIS has identified pine barrens proximate to the Phase A2 parcel, field observations have confirmed that no pine barrens exist in this area. The Phase A2 area may provide Eastern box turtle habitat.

2.7.6 Phase A2 Cultural Resources

Portions of the previously reviewed Phase A2 parcel located on Lou Avenue were surveyed in 2005 under State Archaeological Permit Number 2798, as the northern extent of the Phase A2 parcel overlaps with the Hotel Lot parcel identified in the EENF exhibit for the archaeological survey. The majority of the 11-acre Hotel Lot parcel (Refer to Figure 2.5.1 in the EENF for area locations) has been previously developed by historic residential, commercial and agricultural use. The intensive survey was conducted under state archaeological permit number 2798, issued by the MHC/state archaeologist on October 5, 2005 and included archival research, a walkover survey, and subsurface testing to locate and identify any potentially significant archaeological resources that may be affected by project construction. The archaeological survey was undertaken in accordance with the National Historic Preservation Act of 1966 as amended¹³; the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation*¹⁴; the Advisory Council on Historic Preservation's handbook *Treatment of Archaeological Properties*¹⁵; Massachusetts General Laws, Chapter 9, Sections 26–27c as amended by Chapter 254 of the Acts of 1988¹⁶; and the MHC's handbook *Public Planning and Environmental Review: Archeology and Historic Preservation*¹⁷.

The proposed Medical Office Building and attendant parking is situated on upland areas that were not included the original survey. The Project Proponent recognizes the potential for archaeological sites within this area and has retained PAL to conduct an intensive (locational) archaeological survey. A report of the findings of the intensive survey that incorporates part of the Phase A2

¹³ 36 CFR 800

¹⁴ 48 FR 44716, September 29, 1983

¹⁵ 1980

¹⁶ 950 CMR 71.00

¹⁷ 1985

development was submitted to the MHC for review and comment on February 13, 2007. On February 21, 2007, the MHC issued correspondence concurring with the findings that no significant archaeological resources would be impacted. An intensive (locational) archaeological survey is currently being conducted for the remainder of the Phase A2 area under Permit Number 3125 issued on June 18, 2009. The results of the survey will be incorporated into a technical report that will be forwarded to the MHC for review and comment.

2.7.7 Phase A2 Stormwater Management

The Phase A2 parcel is largely undeveloped; accordingly, under existing conditions there is no existing stormwater management infrastructure. The Phase A2 area is located within the Rose Brook sub-basin. Therefore, stormwater runoff flows overland to the surrounding bogs and Rose Brook (Refer to Figure 3.7.4.1, Phase A2 Hydrology Map).

2.7.8 Phase A2 Transportation

The Phase A2 parcel is located off the proposed Route 28-Tihonet Road connector, a connector roadway that will link Route 28 and Tihonet Road by way of an extension of Lou Avenue. The study area assessed as part of the Phase A2 analysis is described in detail in Section 2.16.8. The elements of the transportation system serving Phase A2 described in Section 2.16.8 include physical characteristics; operating conditions; existing traffic volumes; vehicle travel speeds; pedestrian and bicycle facilities; and motor vehicle crash data for the study area roadways and intersections.

2.7.9 Phase A2 Groundwater

The Phase A2 parcel is located within the service area of the Wareham Fire District (WFD), the municipal water supply authority for the town of Wareham. WFD withdraws water from the Plymouth-Carver Aquifer through a network of eight wells (one well, Maple Springs #5 is inactive). The Plymouth-Carver Aquifer is the second largest aquifer in Massachusetts, underlying approximately 200 square miles and containing more than 500 billion gallons of fresh water. The towns of Plymouth, Carver, Wareham, Bourne, Plympton, Middleborough, and Kingston all depend on the Plymouth-Carver Aquifer as their principal source of water. The nearest municipal well is approximately 3 miles from the Phase A2 parcel.

2.7.10 Phase A2 Water Supply

The WFD has a total permitted withdrawal of 1.87 MGD. The average withdrawal rate as reported in the WFD 2006 Annual Statistical Report is 1.65 MGD. Based upon the 2003 Draft Water Supply and Distribution System Management Plan prepared by SEA, there is sufficient capacity in the storage

facilities to meet current system-wide peak hourly demands and provide fire flow protection.

Adequate public water supply is available for Phase A2 via connection to the WFD. There is an existing 8-inch water main located within the Route 28 right-of-way which extends within Lou Avenue and Garage Street. The current and former residential and commercial users in the previously reviewed Phase A2 parcel are serviced from this 8-inch water main. In addition, there is a 16" water main that is located within the Route 28 right-of-way in the vicinity of the Phase A2 parcel. Further, there is an existing 12-inch water main along Tihonet Road and Farm-to-Market Road that services the Proponent's headquarters and two single-family subdivisions located off Farm-to-Market Road.

2.7.11 Phase A2 Wastewater Infrastructure

The residential properties in the vicinity of the Phase A2 site are serviced by on-site Title 5 sewage disposal systems. The town of Wareham maintains a small (2-inch) force main which provides municipal sewer service to several of the commercial properties along Route 28 in the vicinity of the Phase A2 site; however, the capacity of this force main may be limited. An abandoned 6-inch force main, formerly maintained by the Town, runs from the pump station at the Wareham Industrial Park west of Interstate 195, under the highway onto the Parcel north of the Garage Street area, south under Lou Avenue and along Route 28; ultimately connecting with the Town's gravity sewer system near the railroad crossing on Main Street. This force main was reportedly abandoned a number of years ago due to chronic operational problems, and is not currently available for use.

2.7.12 Phase A2 Utility Infrastructure

Adequate electric service is available to Phase A2 by way of existing overhead electrical distribution located proximate to the Phase A2 parcel. NSTAR is the electric utility for the Phase A2 parcel. NSTAR maintains primary electrical distribution lines along Route 28, and single phase service along Lou Avenue and Garage Street. Cable television, telecommunications and other commercial utility infrastructure is also located along Route 28, with service to the Lou Avenue and Garage Street customers.

2.7.13 Phase A2 Documented Environmental Conditions

Based on DEP records, there are no documented releases at the Phase A2 parcel.

2.8 Phase A2 Proposed Conditions

2.8.1 Phase A2 Summary

The Phase A2 development is ±13.3 acres in area and includes a proposed extension of the existing Lou Avenue, north of Rose Brook and the previously

proposed Phase A2 site. This phase will consist of the development of a 65,850 sf, three story building accommodating medical office space on a 6.7 acre lot. The proposed development also includes the improvement, realignment and extension of Lou Avenue to Tihonet Road (approximately 4,770 lf from the intersection of the existing Lou Avenue at Route 28 to Tihonet Road). Approximately 279 parking spaces, (an increase of 109 spaces), will also be provided. Approximately 25% of the total spaces are anticipated to be constructed of pervious pavement. A two story “Gatehouse”, approximately 5,000 sf in total area, is also proposed at the intersection of Lou Avenue and Route 28. Presently, the Gatehouse as proposed will serve as an unoccupied storage building that will also provide signage for the development. This Gatehouse may be occupied with an office facility in the future, however that occupation would be part of a future phase of the Project, and would thus be subject to a separate MEPA filing. Phase A2 will be served by municipal sewer and water. Figure 3.6.3 (rev1) depicts the Phase A2 Conceptual Site Plan including the extension of Lou Avenue and the “Gatehouse” location. Pursuant to a municipal agreement, the town of Wareham is required to provide sewer capacity for the Phase A2 development.

2.8.2 Phase A2 Topography, Geology & Soils

Existing topography will be maintained to the maximum extent practicable in order to minimize earthwork activities. Similarly, the existing soils will remain; although topsoil will be added in landscaped areas. The geology of the parcel will not be affected by the proposed Phase A2 development.

2.8.3 Phase A2 Zoning & Land Use

The proposed Medical Office Building use is allowed within the BDOD district. Local approvals such as Site Plan Review, Orders of Conditions, and local building permits will be obtained prior to construction.

It is anticipated that the active bogs proximate to the parcel will continue to be utilized for cranberry cultivation purposes upon completion of the Phase A2 development.

The parcel is presently held in private ownership with no designated public open space or recreational uses. Therefore, no recreation or open space will be impacted by the Phase A2 development.

2.8.4 Phase A2 Wetlands, Surface Water & Hydrology

Impacts to wetlands associated with the Phase A2 development include crossing an intermittent stream (ditch) and associated Bordering Vegetated Wetland and Bank. Given the manmade nature of the intermittent stream and small impact area ($\pm 1,682$ sf), the crossing is proposed to consist of fill. The Lou Avenue

extension will utilize an existing cranberry bog causeway as well as an existing, culverted crossing of Rose Brook in order to minimize impacts. Portions of the remaining work (parking, stormwater facilities, and roadway) are located within the 200-foot Riverfront Area associated with Rose Brook, as well as within the 100-foot Buffer Zone to Isolated and Bordering Vegetated Wetlands and Bank associated with bog irrigation canals.

The Phase A2 development will be designed in accordance with the 2008 Massachusetts Department of Environmental Protection Stormwater Management Standards, which provides requirements with regard to proposed conditions hydrology, groundwater recharge, and water quality. The conceptual site plan incorporates Low Impact Development (LID) techniques such as vegetated swales, rain gardens and pervious pavement. An infiltration basin and subsurface infiltration chambers are proposed to mitigate any increase in runoff resulting from development of the parcel. There will not be an increase in peak runoff rates to adjacent wetlands.

2.8.5 Phase A2 Rare Species & Wildlife Habitat

The Phase A2 parcel is not located within mapped Estimated or Priority Habitat. (Refer to Figure 3.7.5.1 (rev1), NHESP Mapping). The Proponent is coordinating with NHESP and will submit a Conservation and Management Permit application for the proposed work.

2.8.6 Phase A2 Cultural Resources

Portions of the area in the vicinity of the previously reviewed Phase A2 project area located off Lou Avenue were surveyed in 2005 under State Archaeological Permit Number 2798. The survey focused on small isolated pockets of undisturbed upland areas located within a generally disturbed area. The results indicated that no archaeological resources were located in the portion of the Phase A2 project area surveyed. The proposed Medical Office Building and attendant parking as well as the Lou Avenue Extension are situated on upland areas that were not included in the original survey. The Project Proponent recognizes the potential for archaeological sites within this area and has retained PAL to conduct an intensive (locational) archaeological survey. The proponent will continue to coordinate with the Massachusetts Historical Commission.

2.8.7 Phase A2 Stormwater Management

Preliminary design and layout of the stormwater management system has been completed. Detailed design and analyses will be performed in accordance with the 2008 Massachusetts DEP Stormwater Management Standards during the local site plan approval process required by the town of Wareham.

The stormwater management system has been designed to effectively mitigate stormwater runoff from new impervious areas while reducing direct impacts to the land. Given the proximity to agricultural uses and wetlands, the Proponent has incorporated several stormwater treatment trains to effectively control and convey stormwater runoff, while promoting water quality treatment and groundwater recharge.

Runoff from the proposed Medical Office Building and the adjacent parking area will be collected in catch basins and swales and conveyed to a sediment forebay, rain garden, infiltration basin, and subsurface infiltration chambers. The catch basins, forebay, and swale will be sized to provide pretreatment for the water quality volume prior to discharging to the infiltration systems (rain garden, infiltration basin, and infiltration chambers). A portion of the parking lot (comprising 25% of the total parking area) consists of pervious pavement. Pervious pavement sections typically include a filter course to provide water quality treatment and a reservoir course to facilitate groundwater recharge.

Stormwater runoff generated by the Lou Avenue roadway extension (Tihonet Road Connector) will be collected in roadside swales and conveyed to drainage basins located at several points along the roadway. This treatment train will mitigate the increase in peak runoff rates and volumes associated with the proposed impervious area, while providing water quality treatment and groundwater recharge.

Using this design approach in the Phase A2 design process will result in pollutant removal, maintenance of existing groundwater recharge, and avoidance of potential changes in hydrology characteristics of stormwater leaving the site. Although the detailed stormwater design will be developed as site plans are finalized, areas to accommodate detention basins and other stormwater management facilities have been reserved to accommodate stormwater from the Phase A2 site.

In accordance with the 2008 DEP Stormwater Management Policy and the EPA National Pollutant Discharge Elimination System (NPDES) General Permit Program for Stormwater Discharges from Construction Sites, Phase A2 requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) by the site contractor and owner, since it will result in the disturbance of greater than one acre of land. The SWPPP will include a description of Phase A2 and of the sedimentation and erosion controls to be used on-site, as well as a description of inspection and maintenance procedures. The SWPPP will designate the erosion and sedimentation controls during construction, and will, at minimum, incorporate measures such as straw bales, silt fencing, check dams/catch basin protection, and stabilization of construction access ways and

slopes. Preventative measures to avoid spills while refueling construction equipment and proper disposal of construction generated wastes will also be incorporated into the SWPPP.

2.8.8 Phase A2 Transportation

The refined Phase A2 development will entail the construction of 65,850 sf of medical office space and is expected to generate approximately 2,478 new vehicle trips on an average weekday, with 163 new vehicle trips expected during the weekday morning peak hour and 214 new vehicle trips expected during the weekday evening peak hour. Phase A2 also proposes the construction of a 5,000± sf (2,500± sf footprint) Gatehouse. Since the Gatehouse is to be unoccupied during this phase, it will not yield an increase in traffic generation. Phase A2 will not result in a significant impact on the transportation infrastructure over existing or anticipated future conditions without Phase A2 (the “No-Build” condition). The roadway proposed to connect Lou Avenue to Tihonet Road as part of Phase A2 will improve traffic circulation and distribution by diverting traffic to a signalized intersection. Section 2.16.11 presents a detailed assessment of the impacts of Phase A2 on the transportation system.

2.8.9 Phase A2 Groundwater

Water for the proposed Phase A2 project will be provided by the WFD from supply that is both adequate and available through the District’s existing groundwater sources. The WFD withdraws groundwater from the Plymouth-Carver Aquifer, an extensive and highly productive aquifer. The WFD system operates in compliance with a current Water Management Act permit.

2.8.10 Phase A2 Water Supply

The Proponent understands that there is adequate capacity in the existing distribution system to service Phase A2. Hydraulic modeling of Phase A2 will be conducted by WFD’s consultant as part of the site plan approval process to validate this assumption, or to identify specific and limited infrastructure improvements if required. A preliminary estimate of the water use demands (average day, maximum day, and peak day) of the Phase A2 development is provided in Table 2.8.10.1.

Table 2.8.10.1 Phase A2 Estimated Water Use

TITLE 5 WASTE WATER (GPD)	WASTE FLOW	AVERAGE DAY WATER DEMAND		MAXIMUM DAY WATER DEMAND		PEAK DAY WATER DEMAND	
		Flow (gpd)	Flow (gpm)	Flow (gpd)	Flow (gpm)	Max (gpd)	Min (gpd)
4,939		2,716	1.89	8,148	5.67	16,296	10,864

Notes: Title 5 wastewater flows based on general office use of 75 gpd/1000 sf
 Average Day Water Demand = Title 5 flows/2 +10% Unaccounted
 Maximum Day Water Demand = 3x Average day
 Peak Day Water Demand Max. = 6x Average demand assuming green lawns
 Peak Day Water Demand Min. = 4x Average demand assuming LID, no irrigation use

To accommodate the Phase A2 project, it is anticipated that a new 12” water main connection will be extended into the parcel from the existing 16” water main located within the Route 28 right-of-way. The new main will be extended and looped within the Lou Avenue Extension right of way to the the Mosquito Dam Road right of way to ultimately tie into the existing 12” water main located in Tihonet Road. A small portion of the proposed water line will be constructed in an existing sand track area between the Lou Avenue Extension and Mosquito Dam Road. The new main, necessary appurtenances, and provisions for fire protection, will be designed and constructed to WFD Standards. A preliminary layout of the proposed new water main is depicted in Figure 3.8.10.1 (rev1), Phase A2 Conceptual Water Supply Layout.

Construction of a new water main will be subject to approval by the WFD as well as from the Wareham Municipal Maintenance Department (road opening approval). No other water supply-related permits are anticipated for Phase A2.

2.8.11 Phase A2 Wastewater Treatment/Disposal

Wastewater flows from the Phase A2 project are estimated to be approximately 4,939 gpd (a reduction from the 7,000 gpd previously reviewed in the EENF. This reduction in flow was due to the change in type of the medical facility proposed. Previously, the sewage flow was calculated based on 250 Gallons per Day/Doctor for offices w/diagnostic and treatment facilities and services. The currently proposed office building is to be used as general medical offices for internal, bariatric and specialty medicine with limited radiological and laboratory services. Accordingly, the sewage flow is now calculated based on 75 Gallons per Day/1000 sf of office space (refer to Table 2.8.10.1 in the previous section). Consistent with an agreement between the town of Wareham and the Proponent, the town of Wareham is required to provide sewer capacity for Phase A2. The Proponent has undertaken a technical review using publically available documents to determine the most effective alternatives to utilize the Town’s

wastewater system to accommodate the Phase A2 project. The Proponent proposes to construct a pumping station to pump sewage via a new force main. A portion of this force main will be sleeved within the existing abandoned 6" force main parallel to and beneath Interstate 195.

Existing municipal collection system infrastructure will be used to convey wastewater flows to the Town's Water Pollution Control Facility. Connection to the Wareham Sewage Treatment Plant is the preferred alternative for Phase A2. In the event that the Town is unable to accommodate the Phase A2 project, a Title 5 sewage disposal system with enhanced nitrogen removal capabilities will be constructed on-site. Prior to the final design and construction of a potential Title 5 sewage disposal system, a field investigation would be conducted to provide the detailed subsurface information required for final design. In the event that the Phase A2 project must initially utilize an on-site sewage disposal system, but the Town's collection system is modified or rehabilitated in the future, after the Title 5 sewage disposal system is installed, and conditional upon Town approval, the Proponent will consider abandoning the on-site sewage disposal system constructed for Phase A2 and connecting to the municipal sewer system.

2.8.12 Phase A2 Utility Infrastructure

Service connections for electricity, telecommunications and other related commercial utilities will be extended to the Phase A2 parcel from the existing commercial utility network located along Route 28 and the existing Lou Avenue.

2.8.13 Phase A2 Greenhouse Gas Analysis

GHG emissions, specifically CO₂ emissions, associated with Phase A of the Tihonet Mixed Used Development were evaluated and quantified in general accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*.

Phase A is being proposed as three distinct developments areas. One of these areas, Phase A2, consists of a 65,850 square foot (sf) Medical Office Building (located off the proposed Route 28-Tihonet Road connector, a roadway that will link Route 28 and Tihonet Road by way of an extension of Lou Avenue, in the town of Wareham) and an unoccupied gatehouse building which will be located proximate to Route 28.

As discussed in Section 2.3.13, a pre-filing meeting for the EENF was held at the MEPA offices on June 2, 2008 to discuss the proposed approaches for performing the GHG evaluation for Phase A. Based on the relatively small percentage (i.e., de minimus) of the total development that Phase A represents, and more specifically the Phase A2 buildings, as well as the minimal information available at this stage of planning, a simplified GHG emission evaluation was proposed for Phase A2.

The proposed Phase A2 GHG emission evaluation approach was designed to quantify baseline emissions for Phase A2 “code-complaint” buildings and associated transportation-related emissions and then to quantify GHG reductions for mitigation measures that would be generally applicable to Phase A2 even if the current conceptual design was modified.

A GHG emission baseline for Phase A2 was established for both direct and indirect sources of emissions. The methodology for establishing the baseline for Phase A2 included assessing emissions from the following elements: (1) direct and indirect source emissions associated with energy consumption for Massachusetts code-compliant buildings with a similar footprint and usage to the Phase A2 buildings, and (2) transportation-related indirect emissions for Phase A2 based on the forecasted trip generation rates.

The baseline Phase A2 building energy usage was estimated using eQUEST energy modeling software. The eQUEST energy model provides estimates for electrical and natural gas consumption for a building based on the parameters selected within the model. Estimated electrical consumption (i.e., kilowatt-hours) was converted to an annual CO₂ emission rate using data provided in the 2005 New England Marginal Emission Rate Analysis dated July 2007 and prepared by ISO New England, Inc.¹⁸

For the baseline condition, it was assumed that energy for space heating for the Phase A2 Medical Office Building would likely be supplied by packaged rooftop HVAC units. It was assumed that energy for the nominal heating of the unoccupied Phase A2 gatehouse building would likely be supplied by fuel oil. As previously noted, the eQUEST energy modeling software does not have an option for fuel oil; therefore, natural gas was selected as a surrogate and fuel oil emissions were estimated using USEPA emission factors.¹⁹ In addition, direct source emissions were estimated for a 300 kW diesel-fueled emergency generator for the proposed Phase A2 Medical Office Building, assumed to operate for 26 hours per year (i.e., 0.5 hours per week). USEPA-approved emission factors were used to estimate emissions from the emergency generator.²⁰

¹⁸ CO₂ marginal emission rate data for Massachusetts was provided in Table 5.9 of the above-referenced July 2007 report.

¹⁹ The source of the fuel oil carbon dioxide emission factor was the USEPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, AP 42, Fifth Edition, Volume I Chapter 1.3: Fuel Oil Combustion.

²⁰ The source of the diesel-fired emergency generator carbon dioxide emission factor was the USEPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, AP 42, Fifth Edition, Volume I Chapter 3.3: Gasoline and Diesel Industrial Engines.

The baseline transportation-related GHG emissions were evaluated using information provided in the Phase A2 traffic study performed in accordance with state standards for the preparation of TIAs. The traffic study estimated 11,657,100 total annual VMT associated with the planned Phase A2 development, assuming ITE LUC 720. Transportation-related emissions were estimated using the USEPA Mobile 6.2 average fleet mix emission factor of 550.4 grams of CO₂ per mile traveled.

Baseline GHG emissions for Phase A2, including emissions from direct and indirect sources, are summarized in Table 2.8.13.1. Supporting calculations and eQUEST model outputs are provided in Appendix D.

Table 2.8.13.1. Phase A2 Baseline GHG Emissions

GHG Emission Source	Tons CO ₂ Per Year
Building-Related Emissions (Direct and Indirect Sources)	1,045
Transportation-Related Emissions (Indirect Sources)	7,072
Total Estimated Baseline Emissions:	8,117

2.9 Phase A2 Alternatives Analysis

The Phase A2 development previously proposed within the EENF can be considered an alternative to the presently proposed Phase A2 development. The current Phase A2 has been advanced in response to current market conditions.

The relocation of the Medical Office Building to the proposed location north of Rose Brook is the result of an expanded healthcare program proposed by the prospective Tenant, a leading healthcare provider. The revised program was developed at a higher level of detail following the submission of the original EENF by the Proponent. The structure will function as a non-procedural facility and without provisions for “urgent care”.

The Tenant’s need for broader medical and support services requires a larger structure with more workable site conditions for parking, support services and building access. These provisions meet the Tenant’s goals for growth, efficiency, modernization, and enhanced patient experience. In order to accommodate these needs, the structure increased in size from 40,000 sf (two and a half story) to 65,850 sf (three story). The original medical building described in the EENF was located at the intersection of Lou Avenue and Garage Street. Physical site constraints and local zoning regulations limited

options for design, planning, growth and internal layout. As a result, the Lou Avenue site was deemed unsuitable and not capable of supporting the Tenant’s expanded program and functional requirements. In order for the Proponent to meet the needs of the Tenant, which will provide additional, needed healthcare services to an underserved region, by contract, the Phase A2 development was relocated to the Rosebrook Business Center in the existing Business Development Overlay District (BDOD).

The Phase A2 site is located in the BDOD with specially adopted zoning that are favorable for this type of development. The Medical Office Building site has the benefit of a sewer disposal agreement with the town of Wareham and will be serviced by town water, gas, electric and telecom. The gentle topography allows for a campus master plan layout in a natural setting that promotes pedestrian links and unique architectural design. It provides for better site mobility for visiting patients, support services and building access, in addition to access for emergency vehicles. Additionally, it enhances the overall patient experience by providing for ample on-site parking, minimal slopes, new public transportation stops and easy directional wayfinding.

2.10 Phase A2 Avoidance, Minimization & Mitigation of Impacts

The overall design of the initial Phase A2 development has considered potential impacts to environmentally sensitive resources. The Phase A2 project elements have been designed to minimize the State permits required or MEPA thresholds exceeded to the extent feasible. The Phase A2 program does not exceed any thresholds for a mandatory EIR. Table 2.10.1 details the relationship of the Phase A2 development impacts to the ENF MEPA thresholds, based upon the conceptual site plan presented as Figure 3.6.3 (rev1).

Table 2.10.1. Phase A2 Development Impact Matrix

MEPA REVIEW CATEGORY	PHASE A2 EXCEEDS ENF REVIEW THRESHOLD?	COMMENTS
Cultural/Historical Resources	NO	Additional archaeological survey required for portions of Phase A2 that were not surveyed as part of the Hotel Lot
ACECs	Not Applicable	
Land Resources	YES	Creation of five or more acres of impervious area
Rare Species	NO	No mapped rare species habitat is located within Phase A2. However, a Conservation and Management Permit will be sought.
Wetlands, Waterways and Tidelands	YES	New/Expansion of fill (roadway) in regulatory floodway; alteration of > ½ acre of other wetlands
Water Supply	NO	
Wastewater	NO	
Transportation	YES	ENF threshold (>2,000 new ADT and requires both a State Highway Access

MEPA REVIEW CATEGORY	PHASE A2 EXCEEDS ENF REVIEW THRESHOLD?	COMMENTS
		Permit and Traffic Signal Permit).
Energy/Air/Solid Waste/Hazardous Waste	NO	

2.10.1 Phase A2 Wetlands, Surface Water & Hydrology

Impacts to wetlands have been minimized by utilizing an existing causeway between two cranberry bogs, as well as an existing crossing of Rose Brook to access the Medical Office Building site. Additionally, the majority of work has been maintained outside the 200-foot Riverfront Area. In accordance with the Massachusetts Wetlands Protection Act and Town of Wareham Wetlands Protection Bylaw, mitigation will be provided at a ratio of 1:1 or greater for unavoidable alterations to wetland resource areas. Approximately 1,682 sf of bordering vegetated wetland area alteration is proposed and is less than the 5,000 sf allowed as a non-limited project. Furthermore, the proposed work will meet the requirements of the 2008 DEP Stormwater Standards as described in Section 2.8.7.

The preliminary design and layout of the stormwater management system for the proposed Phase A2 development (including the proposed roadway) avoids adverse surface water and hydrological impacts caused by the proposed development. Detailed design and analyses will be performed in accordance with the 2008 Massachusetts DEP Stormwater Management Standards during the local site plan approval process required by the town of Wareham.

Given the proximity to agricultural uses and wetlands, the Proponent has incorporated several stormwater treatment trains to effectively control and convey stormwater runoff, while promoting water quality treatment and groundwater recharge. Specifically, Phase A2 will include the following measures to mitigate impacts:

Protection of Surface Waters: Runoff from all proposed impervious surfaces within Phase A2 will be treated using best management practices consistent with the 2008 DEP Stormwater Management Standards. At a minimum, these measures will be designed to capture and remove pollutants from water quality volume prior to discharge to adjacent surface waters. In addition, an Emergency Response Plan will be developed and will include measures that allow for shutdown and containment of the drainage system in the event of an emergency spill.

Protection of Groundwater: Only clean, rooftop runoff will be recharged directly into the ground via infiltration chambers. Runoff from other impervious areas will be pretreated in accordance with the Stormwater Management Standards prior to infiltrating. All best management practices will be designed with a minimum 2-foot offset between the bottom surface of the practice and the groundwater surface.

Prevention of Erosion and Sedimentation: Erosion and sediment controls will be installed prior to commencement of construction activity and maintained until the disturbed land surfaces have been stabilized. Erosion control barriers consisting of silt fencing backed by staked straw bales will be installed to prevent sedimentation within wetland areas and downstream waters. Since Phase A2 involves the disturbance of greater than 1 acre, a Stormwater Pollution Prevention Plan (SWPPP), which includes a complete list of protection measures and an inspection and maintenance schedule, will be prepared in accordance with EPA's National Pollutant Discharge Elimination System (NPDES) General Permit Program for Stormwater Discharges from Construction Sites. The SWPPP will be certified by the site contractor and owner. The SWPPP will include a description of Phase A2 and of the controls to be used on-site, as well as a description of inspection and maintenance procedures. The SWPPP will designate the erosion and sedimentation controls during construction, and will, at minimum, incorporate measures such as straw bales, silt fencing, check dams/catch basin protection, and stabilization of construction access ways and slopes. Preventative measures to avoid spills while refueling of construction equipment and proper disposal of construction-generated wastes will also be incorporated into the SWPPP.

Control Peak Runoff Rates: The stormwater management system will be designed to control post-development peak discharge rates for the 2-, 10-, and 100-year, 24-hour storms so as to maintain existing conditions/pre-development peak discharge rates.

As previously mentioned, the specific design of the stormwater management system will be based upon site conditions, including soil characteristics, drainage area size, available area, and aesthetics. Native vegetation will be planted within the BMPs to enhance wildlife habitat. Grading and tree clearing will be minimized in order to retain existing flow paths and land cover to the maximum extent practicable. Additionally, the size of proposed parking areas and access roads will be minimized while accommodating zoning requirements.

2.10.2 Phase A2 Rare Species & Wildlife Habitat

The Phase A2 parcel is not located within mapped habitat. Impacts to potential habitat will be minimized through the re-use of existing agricultural access roads for the access roadway, as well as by minimizing the amount of earth moving and

tree clearing activities to the extent practicable. Given that the Phase A2 area generally represents an upland island surrounded by cranberry bogs, and because pine barrens habitat is not present, it is likely that the only listed species for which suitable habitat is present is the Eastern Box Turtle. The Proponent will coordinate with NHESP regarding the proposed Phase A2 development, and will apply for a Conservation and Management Permit.

2.10.3 Phase A2 Cultural Resources

The proposed Medical Office Building, attendant parking and Lou Avenue Extension are proposed to be constructed on upland areas that were not included in the original survey discussed previously. The Project Proponent recognizes the potential for archaeological sites within this area and has retained PAL to conduct an intensive (locational) archaeological survey. The proponent will continue to coordinate with the Massachusetts Historical Commission.

2.10.4 Phase A2 Transportation

The impacts to the transportation system associated with Phase A2 are expected to be limited and confined to a distinct portion of the Route 28 corridor. A comprehensive transportation mitigation program has been developed that is designed to accommodate the additional traffic expected to be generated by Phase A2 and planned future development in the area independent of Phase A2. The Phase A2 transportation mitigation program is described in detail in Section 2.16.8.

2.10.5 Phase A2 Groundwater

The proposed water supply system represents an extension to an existing municipal water system operated by the WFD. The existing municipal system withdraws groundwater from the Plymouth-Carver Aquifer, an extensive and highly productive aquifer, under the provisions of a current Water Management Act permit.

The proposed Phase A2 water supply system will be designed to minimize impacts to existing water resources in the basin, while supplying a safe, reliable source of potable water. The WFD distribution system is located in close proximity to the Phase A2 parcel and the system has adequate capacity to meet the projected demands and fire flow requirements of the development. Groundwater quality impacts will be avoided and minimized through connection to the municipal sewer system. In addition, the withdrawal required to support Phase A2 is minimal given the overall size of the aquifer. Therefore, Phase A2 will have no significant impact on groundwater.

2.10.6 Phase A2 Water Supply

The land impacts associated with the Phase A2 water system will be insignificant, as the majority of the new water main and connections will be installed within proposed roadways or other previously cleared areas. As previously discussed, potable water as well as water for fire protection for the proposed Phase A2 development will be provided by the WFD supply that is both adequate and available through the District's existing sources. In addition, the proposed looping of the water system from Route 28 to Tihonet Road via Mosquito Dam Road should have a positive impact on the water distribution system.

Water conservation will be promoted through metered services, water-efficient landscaping, minimizing developed areas, and installing low-flow plumbing fixtures.

2.10.7 Phase A2 Wastewater Treatment/Disposal

Connection and discharge to the Wareham Water Pollution Control Facility (WWPCF) is the preferred alternative for Phase A2 sewage disposal. Specifically, a sewer line will be installed along existing unimproved agricultural roads within ADM's property to convey wastewater to the Thatcher Lane pump station. Portions of the sewer line, including the crossing beneath Interstate 195, will be sleeved through an existing pipe. In the event that the Town is unable to accommodate the Phase A2 project, a Title 5 sewage disposal system with enhanced nitrogen removal capabilities will be constructed on-site. Prior to the final design and construction of a potential Title 5 sewage disposal system, a field investigation would be conducted to provide the detailed subsurface information required for final design. In the event that the Phase A2 project must initially utilize an on-site sewage disposal system, but the Town's collection system is modified or rehabilitated in the future, after the Title 5 sewage disposal system is installed, and conditional upon Town approval, the Proponent will consider abandoning the on-site sewage disposal system constructed for Phase A2 and connecting to the municipal sewer system.

All new sewer infrastructure will be constructed in accordance with state and local regulations, which will ensure that potential issues such as inflow and infiltration are addressed. The town of Wareham's Water Pollution Control Facility was recently upgraded to comply with DEP regulations and policies, and provides a high level of treatment for nitrogen and other components of wastewater. Therefore, the Phase A2 wastewater system will have no significant impact on the environment.

2.10.8 Phase A2 Utility Infrastructure

Aside from the temporary construction impacts, the impacts associated with extending electric, telecommunications and other related commercial utilities to

Phase A2 will be insignificant, as the new service connections will be installed within the footprint of existing and proposed roadways and utility easements. Therefore, the Phase A2 utility infrastructure system will have no significant impact on the environment.

2.10.9 Phase A2 Greenhouse Gas Analysis

In accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*, GHG emission avoidance, minimization and mitigation measures are anticipated to be incorporated into all phases of the Tihonet Mixed Use Development. Phase A2 is in the initial phase of design; therefore, assumptions were required to perform the GHG evaluation. Based on the conceptual nature of the final building designs, proposed GHG mitigation measures were selected for Phase A2 based on their ability to meet the needs of the current conceptual designs, while maintaining flexibility for changes in the designs.

The methodology for estimating GHG emissions for the proposed Phase A2 project was consistent with that used to evaluate Phase A2 baseline emissions (described in Section 2.8.13), and included assessing the following elements: (1) direct and indirect source emissions associated with energy consumption for the proposed Phase A2 buildings, and (2) indirect transportation-related emissions for Phase A2 based on forecasted trip generation rates.

Note that some of the mitigation measures selected for the Phase A2 project: (1) are not accounted for in conventional energy/transportation modeling, and/or (2) are difficult to quantify as they may be highly variable or subjective. In general, a conservative approach (i.e., to underestimate reductions) was taken when estimating GHG emission reductions associated with such mitigation measures.

The GHG mitigation measures proposed for Phase A2 were selected to align with the objectives of the Tihonet Mixed Used Development. Those objectives include establishing a mixed-use village community incorporating the principles of smart-growth, open space preservation, low-impact development, traditional village design, pedestrian orientation, and the preservation of environmental resources.

The mitigation measures proposed for Phase A2 can generally be included in one of the following categories: (1) Siting & Site Design, (2) Building Design & Operation, and (3) Transportation. Additional details are provided in the following sections.

SITING & SITE DESIGN

The proposed GHG mitigation measures for Phase A2 siting and site design focused on the preservation of open space, conservation of resources, and the foundation for alternative forms of transportation.

Siting and site design-related mitigation measures anticipated to be incorporated into the final Phase A2 project design are listed in Table 2.10.9.1.

Table 2.10.9.1. Phase A2 Proposed Siting & Site Design Mitigation Measures

Siting & Site Design Mitigation Measures	Selected for Phase A2
Provide permanent protection for open space on the project site	√
Conserve and restore natural areas on-site	√
Design project to support alternative transportation to site including transit, walking, and bicycling	√
Design water efficient landscaping	√
Minimize energy use through building orientation	√

In general, the mitigation measures identified above are not accounted for in the energy consumption modeling methodology used for this analysis; however, it is anticipated that these measures will have a beneficial impact on GHG emissions associated with Phase A2 (i.e., will reduce GHG emissions).

BUILDING DESIGN & OPERATION

Where appropriate, the proposed building design and operation mitigation measures for the Phase A2 Medical Office Building focused on incorporating low-impact and energy efficient design features. Examples of these measures include adding additional insulation and climate controls to reduce the energy requirements of the Medical Office Building, as well as making use of low GHG-emitting fuels available in this area (e.g., natural gas²¹ instead of fuel oil) for the operation of space heating and domestic hot water units in both the Medical Office Building and the gatehouse building.

In addition, the Project Proponent has engaged a Leadership in Energy and Environmental Design (LEED)-certified architect to assist in developing an energy efficient design for Phase A2. As noted previously, the Phase A2 building designs are still in the conceptual phase; therefore, mitigation measures were ultimately selected based on their ability to meet the needs of the current conceptual designs, while maintaining flexibility for changes in the designs.

Building design and operation-related mitigation measures anticipated to be incorporated into the final Phase A2 project design are listed in Table 2.10.9.2.

²¹ The source of the natural gas carbon dioxide emission factor was the USEPA Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, AP 42, Fifth Edition, Volume I Chapter 1.4: Natural Gas Combustion.

Table 2.10.9.2. Phase A2 Proposed Building Design & Operation Mitigation Measures

Building Design & Operation Mitigation Measures	Selected for Phase A2
Use high-albedo roofing materials	√
Install high-efficiency HVAC systems	√
Eliminate or reduce use of refrigerants in HVAC systems	√
Use lower GHG-emitting fuels, when available (e.g., natural gas)	√
Maximize interior daylighting through floor plates, increased building perimeter and use of skylights, celestories, and light wells	√
Incorporate window glazing to balance and optimize daylighting, heat loss, and solar heat gain performance	√
Incorporate super insulation to minimize heat loss	√
Incorporate motion sensors and lighting and climate control	√
Use efficient, directed exterior lighting	√
Use water conserving fixtures that exceed building code requirements	√
Re-use gray water and/or collect and re-use rainwater	√
Provide for storage and collection of recyclables (including paper, corrugated cardboard, glass, plastic, and metals) in building design	√
Use building materials with recycled content	√
Use building materials that are extracted and/or manufactured within the region	√
Use wood that is certified in accordance with the Forestry Stewardship Council's Principles and Criteria	√
Use low-VOC adhesives, sealants, paints, carpets, and wood	√
Conduct 3 rd party building commissioning to ensure energy performance	√
Provide construction and design guidelines to facilitate sustainable design for build-out by tenants	√
Purchase Energy Star-rated appliances that are the lowest energy rating	√

The eQUEST modeling software and general assumptions were used to estimate reductions in GHG emissions for several of the mitigation measures identified above for the Phase A2 Medical Office Building. In some instances, reductions in GHG emissions for the selected mitigation measures were subjective and; therefore, were not directly quantifiable.

TRANSPORTATION

The proposed transportation mitigation measures selected for Phase A2 focused on: (1) the incorporation of transit-oriented development; (2) traffic signal installation/improvements designed to improve the flow of traffic and accommodate pedestrians and bicyclists; (3) street and building lighting to create a pedestrian and bicycle friendly environment; and, (4) the implementation of a Transportation Demand Management (TDM) program, inclusive of the designation of car/vanpool spaces, etc. Public transportation services within the

area are currently provided by the Greater Attleboro–Taunton Regional Transit Authority (GATRA). GATRA provides public bus service by way of the Onset-Wareham Link (OWL) service routes.

Transportation-related mitigation measures anticipated to be incorporated into the final Phase A2 project design are listed in Table 2.10.9.3.

Table 2.10.9.3. Phase A2 Proposed Transportation Mitigation Measures

Transportation Mitigation Measures	Selected for Phase A2
Locate new buildings in or near areas designated for transit-oriented development (TOD) and, where possible, incorporate TOD principles in employee and customer activity patterns	√
Develop or support multi-use paths to and through site	√
Provide bicycle storage and showers/changing rooms	√
Roadway improvements to improve traffic flow	√
Traffic signalization and coordination to improve traffic flow and support pedestrian and bicycle safety	√
Make on- and off-site improvements to reduce VMT including sidewalks, paths, traffic signals, lighting and landscaping.	√
Provide no-idling truck zones at loading/off-loading and queuing areas.	√

It is anticipated that the Proponent, as the property owner, will have limited ability to implement transportation-related mitigation measures directly associated with future tenants and employees in the early stages of the project. As such, to generally represent the potential for mitigation measures based on the availability of public transportation and proposed site improvements, a maximum of 4.7% reduction in VMT was assumed for this analysis²².

Note that additional mitigation measures were considered for Phase A2, but were not included generally due to the scope and size of Phase A2 relative to the Project as a whole. It is anticipated, however, that it will be possible to incorporate some of these mitigation measures into subsequent phases of the Tihonet Mixed Used Development. Examples of such measures may include incorporating on-site renewable energy sources and purchasing renewable energy (i.e., “green power”).

²² According to information obtained by the U.S. Census Bureau (as reported at: <http://www.employmentspot.com/employment-articles/saving-time-and-money-on-public-transportation/>), an average of 4.7% of individuals in the United States commute to work using public transportation.

PHASE A2 PROPOSED PROJECT GHG EMISSIONS REDUCTION

GHG emissions for Phase A2 with proposed mitigation measures are included in the GHG emission evaluation summary provided in Table 2.10.9.4.

Table 2.10.9.4. Phase A2 Proposed Project GHG Emission Evaluation Summary

GHG Emission Source	Baseline Project [Tons CO ₂ Per Year]	Proposed Project [Tons CO ₂ Per Year]	Estimated Percent Reduction
Building-Related Emissions (Direct and Indirect Sources)	1,045	894	14%
Transportation-Related Emissions (Indirect Sources)	7,072	6,740 to 7,072	0% to 4.7%
Total Estimated Emissions:	8,117	7,634 to 7,966	2% to 6%

A comparison of these results to the estimated baseline emissions provided in the table above and detailed in Section 2.8.13, indicates that implementation of the proposed mitigation measures may result in an estimated overall project reduction in GHG emissions of about 2% to 6%. Supporting calculations and eQUEST model outputs are provided in Appendix D.

PHASE A2 PROPOSED PROJECT WITH ADDITIONAL MITIGATION MEASURES GHG EMISSIONS REDUCTION

In accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol*, we have also quantified estimated reductions associated with mitigation measure(s) not selected for Phase A2. For example, the Proponent considered purchasing electricity generated by “green power” sources (e.g. wind-generated electricity) for Phase A2. NSTAR, the local electric utility, offers its commercial customers the option to purchase renewable energy to meet 50% or 100% of their electricity needs. GHG emissions for the proposed Phase A2 project with additional mitigation measures, specifically purchasing green power, are included in the GHG emission evaluation summary provided in Table 2.10.9.5.

Table 2.10.9.5. Phase A2 Proposed Project with Additional Mitigation Measures GHG Emission Evaluation Summary

GHG Emission Source	Baseline Project [Tons CO ₂ Per Year]	Preferred Project with Additional Mitigation Measures [Tons CO ₂ Per Year]	Estimated Percent Reduction
Building-Related Emissions (Direct and Indirect Sources)	1,045	460	56%
Transportation-Related Emissions (Indirect Sources)	7,072	6,740 to 7,072	0% to 4.7%
Total Estimated Emissions:	8,117	7,200 to 7,532	7% to 11%

A comparison of these results to the estimated baseline emissions identified in the table above and detailed in Section 2.8.13, indicates that implementation of the additional mitigation measures may result in an estimated overall project reduction in GHG emissions of about 7% to 11%. However, due to the relatively small scope of Phase A2 compared to the entire Tihonet Mixed Use Development project, as well as, the financial burden that implementation of this measure would place on the tenants of the buildings; this mitigation measure was not selected for Phase A2. This mitigation measure will be considered for implementation during subsequent phases of the project.

Supporting calculations and eQUEST model outputs are provided in Appendix D.

2.11 Phase A3 Introduction

Phase A3 is a new phase that has been added since the filing of the original EENF. Phase A3 includes the construction of a new 4.9± acres of bog as part of the Proponent’s on-going cranberry production operation at adjacent bogs. The site work and grading associated with the bog construction will require the total alteration of 9± acres of upland. The bog is located within the TMUD project site in the town of Wareham between Tihonet Road and Charlotte Furnace Road adjacent to other existing bogs owned and operated by the Proponent. Refer to Figure 2.11.1, Phase A3 Conceptual Site Plan in conjunction with this section.

2.11.1 Phase A3 MEPA Review Thresholds

The Phase A3 project has been developed as an independent project that can be assimilated into future development plans while minimizing environmental impacts. Overall impacts from the Phase A3 development have been limited to the extent practicable by respecting the natural resources of the development site

and utilizing the available infrastructure and previously disturbed land to support this phase. Through careful planning, only one MEPA ENF review threshold (greater than 2 acres of disturbance to priority habitat for rare species) will be exceeded through the development of Phase A3.

2.11.2 Phase A3 Project Severability

The SRP requires a demonstration that “*implementation of the proposed phase will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases.*” The Phase A3 project is an atypical “development” as it consists of the construction of an additional, small cranberry bog adjacent to existing operational cranberry bogs, with no associated roadway improvements, no traffic or parking impacts; and no water or sewage facilities required to support this development. Similarly, due to the de minimis land area of Phase A3 relative to the overall Project, implementation of this phase of development will not preclude opportunities to avoid, minimize or mitigate environmental impacts related to future phases.

2.11.3 Phase A3 Permits and Approvals Summary

Those permits necessary for the construction associated with Phase A3 will be submitted for review and approval with appropriate officials once the MEPA review of Phase A3 has been completed. Permits anticipated at this time include:

- State → Conservation and Management Permit (NHESP)
- *Town of Wareham* → Request for Determination of Applicability (Wareham Conservation Commission)

2.12 Phase A3 Existing Conditions

2.12.1 Phase A3 General Site Description

The Phase A3 parcel is comprised of approximately 9± acres of undeveloped land immediately adjacent to nearly 15 acres of existing cranberry bogs located between Charlotte Furnace Road and Tihonet Road in Wareham. Portions of the Phase A3 area are disturbed (i.e. non-wooded).

2.12.2 Phase A3 Topography, Geology & Soils

The topography of the Phase A3 parcel ranges in elevation from ±88 to ±114 feet above sea level.

Based upon MassGIS information, the surficial geology of the parcel consists of sand and gravel.

Based upon the official 1969 soil survey map for Plymouth County soils within the Phase A3 parcel consist of Carver Coarse Sand (CaB) – 3 to 8% slopes.

Carver Soils are typically very deep and excessively drained. These soils typically have a low water holding capacity which, unless irrigated, makes them poorly suited for intensive agricultural production or for woodland productivity. These soils are not known to have limitations for commercial or residential development; however, are associated with aquifer recharge areas. The new code contained in the Draft Updated Soil Survey for the site is 700 (udipsamments, wet substratum, nearly level) although 259A (Carver loamy coarse sand) is also present proximate to the Phase A3 area.

2.12.3 Phase A3 Zoning & Land Use

The Phase A3 parcel is partially wooded with cleared land also present and is located immediately adjacent to existing cranberry bogs of the Proponent to the west. The site is zoned Residential 60 (R-60, with agriculture as an allowed use) and also lies within the BDOD overlay district.

The Phase A3 parcel is not accessible to the public, as it consists of private land. It is included as part of the Chapter 61A agricultural program.

2.12.4 Phase A3 Wetlands, Surface Water & Hydrology

There are no wetland resource areas within the proposed Phase A3 parcel, although the 100-foot buffer zone associated with adjacent active cranberry bogs and irrigation canals/ponds extends into the Phase A3 area. In addition, there are no permanent surface waters within the Phase A3 parcel, although irrigation canals/ponds are present proximate to A3. Surface water consisting of this pond and the irrigation canals within the adjacent bogs is controlled by various structures, to support cranberry cultivation and harvesting. A Request for Determination of Applicability will be filed with the Wareham Conservation Commission for the proposed work.

Surface runoff within the Phase A3 parcel currently flows in a southerly direction, following the existing topography.

2.12.5 Phase A3 Rare Species & Wildlife Habitat

The Phase A3 parcel is presently mapped as both Estimated and Priority Habitats according to the 2008 Edition of the “*Massachusetts Natural Heritage Atlas*” prepared by NHESP. The area contains open and wooded upland areas, and is proximate to pine barrens habitat. According to information obtained from NHESP, the area has been mapped for Eastern box turtle.

2.12.6 Phase A3 Cultural Resources

There are no recorded archaeological sites within the limits of Phase A3. However, the proposed cranberry bog is located in an area of low to moderate archaeological sensitivity, based on the reconnaissance archaeological survey

conducted by PAL, and may be subject to an intensive (locational) archaeological survey, pending review of the NPC by the MHC.

2.12.7 Phase A3 Stormwater Management

The Phase A3 parcel is undeveloped with the exception of several bog roads crossing the site; accordingly, under existing conditions there is no existing stormwater management infrastructure. Therefore, stormwater runoff flows overland as previously described.

2.12.8 Phase A3 Transportation

The Phase A3 project does not entail activities that would result in regular and sustained traffic generation, with such activities primarily limited to the initial construction period with subsequent routine maintenance and harvesting activities thereafter. Additionally, excavated materials (including sand and gravel) will not be sold or removed off-site. As such, the Phase A3 project will result in a negligible impact on the transportation system. The closest public roadway to the Phase A3 site consists of Charlotte Furnace Road (refer to Section 2.16.8 for additional information regarding this roadway).

2.12.9 Phase A3 Groundwater

The Phase A3 site overlies the Plymouth-Carver Aquifer, which is the second largest aquifer in Massachusetts, underlying approximately 200 square miles and containing more than 500 billion gallons of fresh water.

2.12.10 Phase A3 Water Supply

Potable water supply services are not available in the vicinity of Phase A3. Non-potable water supply (for bog water level management) is available from the existing surface water supply network.

2.12.11 Phase A3 Wastewater Infrastructure

No public sewerage system is available in this area of Wareham.

2.12.12 Phase A3 Utility Infrastructure

Cranberry farming does not require utility services.

2.12.13 Phase A3 Documented Environmental Conditions

Based on DEP records, there are no documented releases at the Phase A3 parcel.

2.13 Phase A3 Proposed Conditions

2.13.1 Phase A3 Summary

Phase A3 includes the construction of a new 4.9± acre bog from upland area as part of the Proponent's on-going cranberry production operation. The bog is

located in the town of Wareham between Tihonet Road and Charlotte Furnace Road adjacent to other existing bogs of the Proponent.

2.13.2 Phase A3 Topography, Geology & Soils

The existing soils excavated for the construction of the bog will remain on site. The geology of the parcel will not be affected by the proposed Phase A3 development.

2.13.3 Phase A3 Zoning & Land Use

The construction of cranberry bogs is consistent with the R-60 zoning. The parcel is presently held in private ownership with no designated public open space or recreational uses. Therefore, no recreation or open space will be impacted by the Phase A3 development. It is anticipated that the active bogs proximate to the parcel will continue to be utilized for cranberry cultivation purposes upon completion of the Phase A3 development.

2.13.4 Phase A3 Wetlands, Surface Water & Hydrology

No impact to wetlands is anticipated as part of the Phase A3 development. A Request for Determination of Applicability will be filed with the Wareham Conservation Commission; however, as the bog will be within the 100-foot buffer zone associated with the existing bogs.

2.13.5 Phase A3 Rare Species & Wildlife Habitat

The Phase A3 parcel is located within mapped Estimated and Priority Habitat. The Proponent will coordinate with NHESP with regard to a Conservation and Management Permit for the Phase A3 work.

2.13.6 Phase A3 Cultural Resources

The Project Proponent recognizes the potential for archaeological sites within this area and will retain PAL to conduct an intensive (locational) archaeological survey, if needed. The proponent will continue to coordinate with the Massachusetts Historical Commission.

2.13.7 Phase A3 Stormwater Management

The Phase A3 project will consist of the construction of a cranberry bog within an area serviced by existing unpaved agricultural access roads. Only a minimal increase in stormwater runoff will result from the permeable gravel access roadways. Accordingly, formal stormwater management is not proposed.

2.13.8 Phase A3 Transportation

The Phase A3 project does not entail activities that would result in regular and sustained traffic generation on off-site roadways, with such activities primarily

limited to the initial construction period with subsequent routine maintenance activities thereafter.

2.13.9 Phase A3 Groundwater

There will be no wastewater flows generated from Phase A3 as no building or bathroom facilities are required for the proposed bog use. In addition there will be minimum stormwater runoff from the permeable surfaces. Therefore, there will no impact on groundwater quality.

2.13.10 Phase A3 Water Supply

Potable water for the proposed Phase A3 project will not be required and is not proposed. Therefore there will be no impact on water supplies. This bog will be incorporated into a larger system of bogs. Irrigation and bog management water supply is available from the existing permitted water supply system for the bogs adjacent to the proposed site.

2.13.11 Phase A3 Wastewater Treatment/Disposal

There will be no wastewater flows generated from Phase A3. No building or bathroom facilities are required and therefore there will no impact on groundwater or on municipal treatment system capacity.

2.13.12 Phase A3 Utility Infrastructure

No utilities are required as propane will be utilized to power the water pump.

2.13.13 Phase A3 Greenhouse Gas Analysis

Quantifying GHG emissions, specifically CO₂ emissions, associated with Phase A3 of the Tihonet Mixed Used Development is not applicable. Truck traffic is anticipated to be internal and the facility is not anticipated to be open to the public. Equipment will be stored on site and utilized for agricultural purposes only. We understand that any GHG emissions associated with the construction of Phase A3 is not required to be included in this analysis.

2.14 Phase A3 Alternatives Analysis

A formal alternatives analysis has not been undertaken given the nature of the Phase A3 development, which is an agricultural use consistent with the adjacent uses, in a relatively remote location with no requirement for water or sewer, with no traffic generation or parking required, and no impervious surfaces proposed. Phase A3 has been advanced in response to the Proponent's need to create additional bogs to assist and support the continued profitable operation of the cranberry business. The proposed Phase A3 site is unique in terms of the required location adjacent to existing bogs; therefore alternate locations were not considered.

2.15 Phase A3 Avoidance, Minimization & Mitigation of Impacts

The overall design of the Phase A3 development has considered the potential impacts to environmentally sensitive resources and the surrounding area. The Phase A3 project elements have been designed to limit the State permits required and/or MEPA thresholds exceeded to the extent feasible. The Proponent has completed an impact matrix (refer to Table 2.15.1) detailing the relationship of the Phase A3 development to the MEPA thresholds, based upon the conceptual site plan. As a result of this effort, only one MEPA ENF threshold has been exceeded, and only one state permit will be required.

Table 2.15.1. Phase A3 Development Impact Matrix

MEPA REVIEW CATEGORY	PHASE A3 EXCEEDS ENF REVIEW THRESHOLD?	COMMENTS
Cultural/Historical Resources	NO	Additional archaeological survey required
ACECs	Not Applicable	
Land Resources	NO	
Rare Species	YES	Greater than 2 acres impact to priority habitat
Wetlands, Waterways and Tidelands	NO	
Water Supply	NO	
Wastewater	NO	
Transportation	NO	
Energy/Air/Solid Waste/Hazardous Waste	NO	

2.15.1 Phase A3 Wetlands, Surface Water & Hydrology

No wetland or surface water resources are present on the site. Therefore, any impacts have been avoided. A Request for Determination of Applicability will be filed with the Wareham Conservation Commission for work in proximity to the existing cranberry bogs.

2.15.2 Phase A3 Rare Species & Wildlife Habitat

The area of proposed work includes both forested and disturbed land proximate to existing cranberry bogs and pine barrens habitat. The Proponent will coordinate with NHESP with regard to the proposed work and will submit an application for a Conservation and Management Permit.

2.15.3 Phase A3 Cultural Resources

The Project Proponent recognizes the potential for archaeological sites within this area and will retain PAL to conduct an intensive (locational) archaeological survey, if needed. The proponent will continue to coordinate with the Massachusetts Historical Commission.

2.15.4 Phase A3 Transportation

The Phase A3 project does not entail activities that would result in regular and sustained off-site traffic generation, with such activities primarily limited to the initial construction period and then routine operation and maintenance activities thereafter. Therefore, permanent impact on the transportation system has been avoided.

2.15.5 Phase A3 Groundwater

No impervious surfaces or sewage disposal systems are proposed as part of the Phase A3 development. All impacts to groundwater associated with pavement runoff and sewage disposal have been avoided. This bog will be constructed in upland, above the groundwater table. Although the new bog will require water for irrigation, frost control and wet harvest, there will be no perceptible impact to the aquifer.

2.15.6 Phase A3 Water Supply

No connection to the municipal water supply is required or proposed for Phase A3. The existing water supply for the existing bogs will be utilized. Therefore, there will be no impact to the municipal water supply system.

2.15.7 Phase A3 Wastewater Treatment/Disposal

No sewage flow is proposed as part of the Phase A3 development. Therefore, all impacts associated with sewage disposal have been avoided.

2.15.8 Phase A3 Utility Infrastructure

No new utility infrastructure is required.

2.15.9 Phase A3 Greenhouse Gas Analysis

As previously stated in Section 2.13.13, quantifying GHG emissions and GHG emissions mitigation, specifically CO₂ emissions, associated with Phase A3 of the TMUD is not applicable.

2.16 Phase A Cumulative Analysis

2.16.1 Introduction

Because the Proponent is requesting that this filing represent the single review document relating to Phase A, this Section provides a cumulative analysis of the sub-phases, Phase A1, A2 and A3, “the Phase A Project”, such that the total impacts associated with Phase A have been analyzed, in the event that all three (3) sub-phases are constructed at the same time. Note however that it is not anticipated that the individual sub-phases will be constructed simultaneously. As previously discussed, the sub-phases are not reliant upon each other.

The combined building program for Phase A1, A2 and Phase A3 as revised by this NPC is comprised of 150,850± sf of new structures, which is less than the 155,200 sf previously reviewed in the EENF. As proposed, the building program includes light manufacturing (72,000± sf), office (8,000± sf), medical office (65,850± sf) space, and an unoccupied gatehouse structure (5,000± sf). The construction of a 4.9± acre cranberry bog is also proposed.

Approximately 535 parking spaces are proposed to service the new development. Twenty-five percent (134) will be constructed with pervious pavement. Pervious parking is proposed in both Phase A1 and Phase A2.

The total Phase A Project will result in the creation of approximately 6,100 lf of new subdivision roadway, including the improvement, realignment and extension of the existing Lou Avenue with a proposed connection to the existing Tihonet Road.

One Title 5 sewage disposal system is proposed as part of the Phase A program; specifically for Phase A1. Phase A2 is proposed to be served by municipal sewer service.

The Proponent will seek state and federal funding to assist with transportation improvements and utility needs associated with the Phase A Project, as well as for renewable energy projects to support the overall TMUD Project.

2.16.2 Combined Phase A MEPA Review Thresholds

The Phase A Project has been developed as an independent project that can be assimilated into future development plans while minimizing environmental impacts. Impacts from the Phase A Project have been limited to the extent practicable by respecting the natural resources of the initial Phase A1, Phase A2 and Phase A3 development areas and utilizing the available infrastructure to support this phase. Specifically, the following thresholds will be exceeded (also refer to Table 2.16.2.1):

- 1) *Creation of ten or more acres of impervious area* (301 CMR 11.03(1)(a)(2));
- 2) *Direct alteration of 25 or more acres of land* (301 CMR 11.03(1)(b)(1));
- 3) *Greater than two acres of disturbance of designated priority habitat* (301 CMR 11.03(2)(b)(2));
- 4) *New fill or structure or Expansion of existing fill or structure...in a regulatory floodway* (301 CMR 11.03(3)(b)(1)(e));
- 5) *Alteration of one half or more acres of any other wetlands* (301 CMR 11.03(3)(b)(1)(f)); and
- 6) *Generation of 2,000 or more new ADT on roadways providing access to a single location* (301 CMR 11.03(6)(b)(13)).

Table 2.16.2.1. Phase A Project Impact Matrix

MEPA REVIEW CATEGORY	PHASE A PROJECT EXCEEDS REVIEW THRESHOLD?		COMMENTS
	ENF	EIR	
Cultural/Historical Resources	No	No	Additional archaeological survey required for portions of Phase A2 and A3 that were not surveyed previously
ACECs	Not Applicable	Not applicable	
Land Resources	Yes	Yes	See above for specific thresholds
Rare Species	Yes	Not applicable	See above for specific thresholds
Wetlands, Waterways and Tidelands	Yes	No	See above for specific thresholds
Water Supply	No	No	
Wastewater	No	No	
Transportation	Yes	No	See above for specific thresholds
Energy/Air/Solid Waste/Hazardous Waste	No	No	

2.16.3 Combined Phase A Project Severability

The SRP requires a demonstration that “*implementation of the proposed phase will not preclude options to avoid, minimize or mitigate environmental impacts associated with future phases.*” The Phase A Project incorporates a total of 150,850 sf of building space that is severable from potential future development of adjacent land under the ownership of the Proponent. The proposed Phase A Project does not rely on the construction of infrastructure or utilities associated with a future phase of development. Water supply and wastewater systems to be provided to support the Phase A Project do not require additional stages of development to operate effectively. Similarly, due to its small size relative to the overall Project, implementation of this phase of development will not preclude opportunities for future mitigation, and will not prevent future phases from avoiding and minimizing environmental impacts prior to mitigation.

2.16.4 Combined Phase A Permits and Approvals Summary

Those permit applications necessary for the construction associated with Phase A will be submitted for review and approval with appropriate officials prior to commencement. Permits anticipated at this time include:

- *Federal* → NPDES Stormwater Permit for Construction Activities (Environmental Protection Agency)
- *State* → State Highway Access Permit (Massachusetts Highway Department)
→ Traffic Signal Permit (Massachusetts Highway Department)
→ Conservation and Management Permit (NHESP)
→ Sewer Extension Permit (DEP)

→ Sewer Connection Permit (DEP)

- *Town of Wareham*→ Preliminary and Definitive Subdivision Approval (Wareham Planning Board)
 - Site Plan Review-Special Permit (Wareham Planning Board)
 - Water Main Extension Approval (Wareham Fire District Water Department)
 - New Service Connection (Wareham Fire District)
 - Street Opening Permit (Wareham Municipal Maintenance Department)
 - Title 5 Sewage Disposal Permit (Wareham Board of Health)
 - Sewer Connection (Wareham Sewer Department)
 - Abbreviated Notice of Resource Area Delineation (Wareham Conservation Commission)
 - Request for Determination of Applicability (Wareham Conservation Commission)
 - Order of Conditions (Wareham Conservation Commission)
 - Building Permit (Wareham Building Department)
 - Demolition Permit (Wareham Building Department)

2.16.5 Wetlands

Proposed impacts to wetlands are limited to the Phase A2 development, and are detailed in Section 2.8.4. Phase A1 has been maintained outside of the 100-foot buffer zone to wetlands, while Phase A3 is located within the 100-foot buffer zone associated with man-made agricultural wetlands (bogs, irrigation canals, and ponds). Unavoidable wetland impacts will be mitigated as previously discussed.

2.16.6 Rare Species

The Proponent has received a Conservation and Management Permit for Phase A1, and will file subsequent Conservation and Management Permit applications with NHESP for the Phase A2 and Phase A3 projects in order to ensure that appropriate mitigation is provided for any potential take of a rare species.

2.16.7 Cultural Resources

An intensive (locational) archaeological survey did not identify any cultural resources within Phase A1 or portions of Phase A2. Phase A2 is in part situated on undisturbed upland areas that were not included the original survey. Phase A3 is also located in areas of moderate to high archaeological sensitivity. The Project Proponent recognizes the potential for archaeological sites within these areas and

has retained PAL to conduct intensive (locational) archaeological surveys. The proponent will continue to coordinate with the Massachusetts Historical Commission.

2.16.8 Transportation

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Traffic Impact and Access Study (TIAS) in order to determine the traffic impacts associated with the construction of the first phase of the proposed ADM Tihonet Mixed-Use Development (the “Project”) to be located within the Towns of Wareham, Carver, and Plymouth, Massachusetts. This study specifically reviews the cumulative impacts associated with refined Phases A1 and A2 of the Project. Phase A3 of the Project does not entail uses that would result in regular, sustained traffic of a level that would cause a material impact on the transportation infrastructure. Phase A1 consists of the development of an 80,000 sf building that will encompass 8,000 sf of general office space and 72,000 sf of light manufacturing space to be located within the TTP and off Technology Park Drive. Phase A2 will consist of the development of a 65,850 sf Medical Office Building that will be located off the proposed Route 28-Tihonet Road connector, a proposed connector roadway that will link Route 28 and Tihonet Road by way of an extension of Lou Avenue. This study provides an overall context of both Phases A1 and A2 and their associated cumulative impacts on the transportation infrastructure as they relate to the full build-out of the Project. Figure 3.11.8.1 depicts the location of the Phase A1 and A2 areas in relation to the existing roadway network and the overall Project site. Rail facilities, sensitive receptors such as schools and parks, along with roadway jurisdiction are shown on Figure 3.11.8.2.

STUDY METHODOLOGY

This study was prepared in consultation with the Towns of Wareham, Carver, and Plymouth, the Southeastern Regional Planning & Economic Development District (SRPEDD), and the Massachusetts Highway Department (MassHighway); was performed in accordance with state standards for the preparation of Traffic Impact Assessments (TIAs); and was conducted in three distinct stages. The first stage involved an assessment of existing traffic conditions in the study area (defined below) and included an inventory of roadway geometrics, observations of traffic flow, and collection of daily and peak-period traffic counts. The second and third stages of the study projected and analyzed future traffic conditions, and presented and evaluated mitigation measures, respectively.

EXISTING CONDITIONS

A comprehensive field inventory of traffic conditions on the study area roadways was conducted in August 2006, March 2007, and June 2008. The field investigation consisted of an inventory of existing roadway geometrics, traffic

volumes, and operating characteristics, as well as posted speed limits and land use information within the study area.

The study area for Phase A was selected to contain the major roadways providing access to both the Phase A1 and A2 areas, including Route 28 in Wareham, Tihonet Road in Wareham and Carver, Cranberry Road in Carver, and Farm-to-Market Road in Wareham, as well as the nine major intersections located along these roadways through which project-related traffic will travel which are listed below and are depicted on Figure 3.11.8.3:

1. Cranberry Road at Tihonet Road (Carver)
2. Cranberry Road at Federal Road (Carver)
3. Wareham Street at Hammond Street (Carver)
4. Route 28 (Cranberry Highway) at the I-195 westbound ramps (Wareham)
5. Route 28 at the I-195 eastbound ramps (Wareham)
6. Route 28 at Lou Avenue (Wareham)
7. Route 28 at Tremont Road (Wareham)
8. Route 28 at Tihonet Road (Wareham)
9. Tihonet Road at Farm-to-Market Road (Wareham)

The following describes the study area roadways and intersections.

ROADWAY GEOMETRY

Route 28 – Cranberry Highway (Wareham)

Route 28 (Cranberry Highway) is a two-lane secondary arterial roadway under state jurisdiction that traverses the study area in a general east-west direction and provides access to I-195 to the west of the Project. Within the study area, Route 28 provides two 10- to 21-foot wide travel lanes separated by a double-yellow centerline or a raised median (in the vicinity of the I-195 ramps), with 2- to 9.5-foot wide marked shoulders provided intermittently along both sides of the roadway, and additional turning lanes provided at major intersections. Sidewalks are provided along the north side of Route 28 in the vicinity of the I-195 ramps. Illumination is provided by way of street lights mounted on wood poles. Land use along Route 28 consists of residential and commercial properties, and areas of open and wooded space.

Tihonet Road (Wareham)

Tihonet Road is a two-lane local roadway under Town jurisdiction that traverses the study area in a general north south direction between Route 28 and Cranberry Road. Within the study area and south of Farm-to-Market Road, Tihonet Road provides two 10- to 12-foot wide travel lanes separated by a double-yellow centerline with no marked shoulders provided. South of Cranberry Road, Tihonet Road is a gravel roadway approximately 15-foot wide and accommodates two-

way travel with no marked centerline or edge lines provided. Sidewalks are not provided along Tihonet Road within the study area. Illumination is provided intermittently by way of street lights mounted on wood poles. Land use along Tihonet Road consists of residential, agricultural and commercial properties, the Myles Standish State Forest, and areas of open and wooded space.

Cranberry Road (Carver)

Cranberry Road is a two-lane collector roadway under Town jurisdiction that traverses the study area in a general east west direction between Tremont Street and the Myles Standish State Forest. Within the study area, Cranberry Road provides two 10- to 11-foot wide travel lanes separated by a double-yellow centerline, with 1- to 1.5-foot wide marked shoulders provided along both sides of the roadway. Sidewalks are not provided along Cranberry Road within the study area. Illumination is provided by way of street lights mounted on wood poles. Land use along Cranberry Road consists of residential, agricultural and commercial properties, the Myles Standish State Forest, and areas of open and wooded space.

Farm-to-Market Road (Wareham)

Farm-to-Market Road is a two-lane local roadway under Town jurisdiction that traverses the study area in a general north south direction between Tihonet Road and the Carver Town Line, where Farm-to-Market Road becomes Hammond Street. Within the study area, Farm-to-Market Road provides two 10- to 11-foot wide travel lanes separated by a double-yellow centerline, with 1- to 2-foot wide marked shoulders provided along both sides of the roadway. Sidewalks are not provided along Farm-to-Market Road within the study area. Illumination is provided intermittently by way of street lights mounted on wood poles. Land use along Farm to-Market Road consists of residential, agricultural and commercial properties, areas of open and wooded space and a landfill.

INTERSECTION GEOMETRY

Cranberry Road at Tihonet Road (Carver)

Tihonet Road intersects Cranberry Road from the south to form this three legged, T-type, unsignalized intersection under STOP-sign control. The Cranberry Road east and westbound approaches consist of a 10-foot wide general purpose travel lane with a 1-foot wide marked shoulder provided. The directions of travel along Cranberry Road are separated by a double-yellow centerline. The Tihonet Road south leg of the intersection consists of a 15-foot wide gravel roadway that accommodates two way travel with no marked centerline or edgelines provided, and vehicles approaching Cranberry Road under STOP control. Sidewalks and illumination are not provided at the intersection. Land use in the vicinity of the intersection consists of residential and agricultural properties, the Myles Standish State Forest, and areas of open and wooded space.

Cranberry Road at Federal Road (Carver)

Federal Road intersects Cranberry Road from the south to form this three legged, T-type, unsignalized intersection under STOP-sign control. The Cranberry Road east and westbound approaches consist of a 10-foot wide general purpose travel lane with a 1.5-foot wide marked shoulder provided. The directions of travel along Cranberry Road are separated by a double-yellow centerline. The Federal Road northbound approach consists of a 10-foot wide general purpose travel lane with a 1-foot wide marked shoulder provided and vehicles approaching Cranberry Road under STOP-sign control. The directions of travel along Federal Road are separated by a double-yellow centerline. Sidewalks are not provided at the intersection. Illumination is provided by way of street lights mounted on wood poles. Land use in the vicinity of the intersection consists of residential and agricultural properties, and areas of open and wooded space.

Wareham Street at Hammond Street (Carver)

Hammond Street and a private driveway intersect Wareham Street from the east and west, respectively, to form this four legged, unsignalized intersection under STOP control. The Wareham Street north and southbound approaches consist of a 10-foot wide general purpose travel lane with a 1-foot wide marked shoulder provided. The directions of travel along Wareham Street are separated by a double-yellow centerline. The Hammond Street east leg of the intersection consists of a 15-foot wide gravel roadway that accommodates two way travel with no marked centerline or edgelines provided, and vehicles approaching Wareham Street operating under STOP control when conflicting traffic is present, although a STOP-sign is not currently provided. The private driveway west leg of the intersection consists of a paved drive that serves Slocum-Gibbs Ocean Spray and accommodates two-way travel with no marked centerline or edgelines provided, and vehicles approaching Wareham Street under STOP control, although a STOP-sign is not currently provided. Sidewalks and illumination are not provided at the intersection. Land use in the vicinity of the intersection consists of commercial and agricultural properties, and areas of open and wooded space.

Route 28 (Cranberry Highway) at the I-195 Eastbound Ramps (Wareham)

The I-195 eastbound ramps intersect Route 28 from the northeast and southwest to form this four legged intersection under traffic signal control. The Route 28 eastbound approach consists of a 12-foot wide left-turn lane and two 12-foot wide through travel lanes, with a 9-foot wide marked shoulder provided. The Route 28 westbound approach consists of two 12-foot wide through travel lanes, with a 2- to 11-foot wide marked shoulder provided. Right turns from the Route 28 westbound approach to the I-195 eastbound on-ramp exit Route 28 prior to the intersection by way of a channelized right-turn slip-ramp. The directions of travel along Route 28 are separated by a raised median. The I-195 eastbound off-ramp

consists of a single lane ramp approaching Route 28 which divides into two 12-foot wide left-turn lanes and an 18-foot wide right-turn lane, separated by a raised island, with 2 to 4-foot wide marked shoulders provided along both sides of the ramp. Sidewalks are provided along the north side of Route 28 with the interchange area. Illumination is provided by way of street lights mounted on wood poles. Land uses in the vicinity of the intersection consist of areas of open and wooded space. The traffic signal operates in a three phase, coordinated, fully actuated mode, with an advance phase provided for the Route 28 eastbound approach. The traffic signal is interconnected and coordinated with the traffic control signals at the intersections of Route 28 at the I-195 westbound ramps and Route 28 at the Kendrick Street and the Wareham Crossing retail plaza driveway.

Route 28 at the I-195 Westbound Ramps (Wareham)

The I-195 westbound ramps intersect Route 28 from the northeast and southwest to form this four legged intersection under traffic signal control. The Route 28 eastbound approach consists of two 12-foot wide through travel lanes, with a 3.5- to 10-foot wide marked shoulder provided. Right turns from the Route 28 eastbound approach to the I-195 westbound on-ramp exit Route 28 prior to the intersection by way of a channelized right-turn slip-ramp. The Route 28 westbound approach consists of a 12-foot wide left-turn lane and two 12-foot wide through travel lanes, with a 10-foot wide marked shoulder provided. The directions of travel along Route 28 are separated by a raised median. The I-195 westbound off-ramp consists of a single lane ramp approaching Route 28 which divides into a 12-foot wide left-turn lane and two 12-foot wide right-turn lanes, separated by a raised island, with 3- to 10-foot wide marked shoulders provided along both sides of the ramp. Sidewalks are provided along the north side of Route 28 within the interchange area. Illumination is not provided at the intersection. Land uses in the vicinity of the intersection consist of areas of open and wooded space. The traffic signal operates in a three phase, coordinated, fully actuated mode, with an advance phase provided for the Route 28 westbound approach. The traffic signal is interconnected and coordinated with the traffic control signals at the intersections of Route 28 at the I-195 eastbound ramps and Route 28 at Kendrick Street and the Wareham Crossing retail plaza driveway.

Route 28 at Lou Avenue (Wareham)

Lou Avenue intersects Route 28 from the northeast to form this three-legged, T-type unsignalized intersection under STOP control. The Route 28 southeastbound approach consists of a 12-foot wide left-turn lane and two 12-foot wide through travel lanes, with a 2-foot wide marked shoulder provided. The Route 28 northwestbound approach consists of a 23-foot wide general purpose travel lane, with a 4-foot wide marked shoulder provided. The directions of travel along Route 28 are separated by a raised median at and to the northwest of the intersection, and by a double-yellow centerline to the southeast. Lou Avenue

consists of a 23.5-foot wide paved roadway with no marked centerline or edgelines provided and vehicles approaching Route 28 under STOP control when conflicting traffic is present, although a STOP-sign is not currently provided. A sidewalk is provided along the north (east) side of Route 28 west (north) of Lou Avenue. Illumination is not provided at the intersection. Land uses in the vicinity of the intersection consist of residential properties and areas of open and wooded space.

Route 28 at Tremont Road (Wareham)

Tremont Road intersects Route 28 from the southeast to form this three legged, Y-type, intersection under traffic signal control. The Route 28 southeastbound approach consists of two 10.5- to 13-foot wide through travel lanes with no marked shoulder provided. Right turns from the Route 28 southeastbound approach to Tremont Road exit prior to the intersection by way of a channelized right-turn slip ramp. The Route 28 northwestbound approach consists of a 9-foot wide left turn/through travel lane and a 10-foot wide through travel lane, with no marked shoulder provided. The directions of travel along Route 28 are separated by a double-yellow centerline. The Tremont Road northwestbound approach consists of a 13-foot wide general purpose travel lane with no marked shoulder provided approaching Route 28 that widens to a 23-foot wide travel lane at the intersection. The directions of travel along Tremont Road are separated by a raised island at the intersection and by way of a double-yellow centerline approaching the intersection. Sidewalks are not provided at the intersection. Land use in the vicinity of the intersection consists of residential and commercial properties. The traffic signal functions in a two phase fully-actuated mode, with pedestrian indications and phasing not provided as a part of the traffic signal system.

Route 28 at Tihonet Road (Wareham)

Tihonet Road intersects Route 28 from the north and south to form this four legged, unsignalized intersection under STOP-sign control. The Route 28 east and westbound approaches consist of a 13- to 23.5-foot wide general purpose travel lane with no marked shoulder provided along the south side and a 7-foot wide marked shoulder provided along the north side. The directions of travel along Route 28 are separated by a double-yellow centerline. The Tihonet Road north and southbound approaches consist of an 11- to 12-foot wide general purpose travel lane with no marked shoulder provided and vehicles approaching Route 28 under STOP-sign control. The directions of travel along Tihonet Road are separated by a double-yellow centerline north of the intersection and by a single yellow centerline to the south. Sidewalks are not provided at the intersection. Illumination is provided by way of street lights mounted on wood poles. Land use in the vicinity of the intersection consists of residential and commercial properties and areas of open and wooded space.

Tihonet Road at Farm-to-Market Road (Wareham)

Farm-to-Market Road intersects Tihonet Road from the north to form this three legged, T-type, unsignalized intersection under STOP control. The Tihonet Road northbound approach consists of a 10-foot wide general purpose travel lane with a 1-foot wide marked shoulder provided. The Tihonet Road westbound approach consists of an 11.5-foot wide general purpose travel lane with no marked shoulder provided and vehicles approaching Tihonet Road northbound and Farm-to-Market Road operating under STOP control when conflicting traffic is present, although a STOP-sign is not currently provided. The directions of travel along Tihonet Road are separated by a double-yellow centerline. The Farm-to-Market Road southbound approach consists of an 11-foot wide general purpose travel lane with a 2-foot wide marked shoulder provided. The directions of travel along Farm-to-Market Road are separated by a double-yellow centerline. Sidewalks and illumination are not provided at the intersection. Land use in the vicinity of the intersection consists of agricultural and commercial properties, and areas of open and wooded space.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs), and vehicle classification counts were completed in August 2006 and June and November 2008. The ATR counts were conducted on Route 28, west of Tihonet Road, and on Farm-to-Market Road, north of Tihonet Road, in order to record weekday daily traffic conditions in the vicinity of the project site over an extended period. Weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period manual TMCs were performed at the nine study area intersections. The 2008 TMCs were performed at the intersection of Route 28 at Lou Avenue.

A review of the 2008 traffic volume data indicates that traffic volumes along the Route 28 corridor were generally lower than the traffic volume data collected in 2006 at the Route 28/I-195 interchange. As such, the 2008 turning movements entering and exiting Lou Avenue at its intersection with Route 28 were incorporated into the traffic volume data; however, the previously collected (2006) higher traffic volumes along Route 28 were used in place of the lower 2008 traffic volumes.

The 2006 traffic counts were adjusted to 2007 conditions by applying a background growth rate of 2.0 percent per year, which is consistent with the historic traffic growth rates documented for the Towns of Wareham, Carver and Plymouth. It should be noted that the traffic counts that form the basis of this assessment were completed prior to the opening of the Wareham Crossing retail

center and the implementation of the associated roadway and intersection improvements along Route 28.

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, historic traffic count data were reviewed for the nearest MassHighway permanent count stations to the Project.²³ Based on a review of this data, it was determined that traffic volumes for the months of June and August are approximately 10.0 and 15.3 percent above average-month conditions. In order to provide a conservative (above-average) analysis scenario, the June and August traffic volumes were not adjusted downward to average-month conditions. The 2007 existing weekday morning and evening peak-hour traffic volumes are depicted on Figures 3.11.8.4 and 3.11.8.5, respectively, and summarized in Table 3.11.8.1.

Table 3.11.8.1. 2007 Existing Traffic Volumes

Location	AWT ^a	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		VPH ^b	K Factor ^c	Directional Distribution ^d	VPH	K Factor	Directional Distribution
Route 28, west of Tihonet	10,020	598	6.0	57.7% WB	773	7.7	53.2% EB
Farm-to-Market Road, north of Tihonet Road	1,090	78	7.2	55.1% NB	85	7.8	54.1% SB

^aAverage weekday traffic in vehicles per day.

^bVehicles per hour.

^cPercent of daily traffic occurring during the peak hour.

^dPercent traveling in peak direction.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound.

As can be seen in Table 3.11.8.1, Route 28, west of Tihonet Road, was found to accommodate approximately 10,020 vehicles on an average weekday, with approximately 598 vehicles per hour (vph) during the weekday morning peak hour and 773 vph during the weekday evening peak hour.

Farm-to-Market Road, north of Tihonet Road, was found to accommodate approximately 1,090 vehicles on an average weekday, with approximately 78 vph during the weekday morning peak hour and 85 vph during the weekday evening peak hour.

²³ MassHighway Traffic Volumes for the Commonwealth of Massachusetts; Permanent Count Station 7 located on Route I-195, west of North Street, in Mattapoisett; Permanent Count Station 617 located on Route 140, north of the New Bedford City Line, in Freetown; and Permanent Count Station 707 located on Route 28, north of the Bourne Bridge, in Bourne; 2004.

A review of the peak-period traffic counts indicates that the weekday morning peak hour generally occurs between 7:15 and 8:15 AM, with the weekday evening peak hour generally occurring between 4:30 and 5:30 PM.

PEDESTRIAN AND BICYCLE FACILITIES

An inventory of pedestrian and bicycle facilities within the study area was undertaken in conjunction with this assessment. The inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities within the study area. Currently, sidewalks are provided along the north side of Route 28 in the vicinity of the I-195 ramps and along the west side of the Tihonet Road bridge over Route 25. Sidewalks are not currently provided along the remaining study roadways.

At present, there are no formal bicycle facilities located within the study area. A potential future off-road bicycle path is under development parallel to the Bay Colony Railroad right-of-way that bisects the town of Wareham. This potential future bicycle path would be located to the south of the project site.

The existing and proposed bicycle and pedestrian facilities identified within the study area are depicted on Figure 3.11.8.6.

PUBLIC TRANSPORTATION

Public transportation services within the study area are currently provided by the Greater Attleboro – Taunton Regional Transit Authority (GATRA). GATRA provides public bus service within the study area by way of the Onset-Wareham Link (OWL) service routes. The Cranberry Plaza to West Wareham Link (Link 4) makes regularly scheduled stops along Route 28 within the study area. Link 4 operates Monday through Friday from 7:55 AM to 6:30 PM, and on Saturday from 8:50 AM to 5:30 PM. In addition to designated stops, a passenger may board an OWL bus anywhere along the bus route by hailing the driver as the bus approaches. The OWL bus routes are depicted on Figure 3.2.8.7, with schedule and fare information included in Appendix B.

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on Farm-to-Market Road in the vicinity of Tihonet Road using a pneumatic speed measuring device (ATR) and on Route 28 in the vicinity of Lou Avenue using a calibrated pulse radar gun. Table 3.11.8.2 summarizes the vehicle travel speed measurements.

Table 3.11.8.2. Vehicle Travel Speed Measurements

	Farm-to-Market Road		Route 28	
	Northbound	Southbound	Eastbound	Westbound
Mean Travel Speed (mph)	41	43	35	39
85 th Percentile Speed (mph)	49	49	39	42
Posted Speed Limit (mph)	35	35	45	45

mph = miles per hour

As can be seen in Table 3.11.8.2, the mean (average) vehicle travel speed along Farm-to-Market Road in the vicinity of Tihonet Road was found to be approximately 42 miles per hour (mph). The average measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 49 mph, or 14 mph above the posted speed limit of 35 mph. The 85th percentile vehicle travel speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

The mean vehicle travel speed along Route 28 in the vicinity of Lou Avenue was found to be approximately 37 mph, with the average measured 85th percentile vehicle travel speed found to be approximately 41 mph, or 4 mph below the posted speed limit of 45 mph.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassHighway Safety Management/Traffic Operations Unit for the most recent three-year period available (2004 through 2006) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, and day of occurrence, and presented in Table 3.11.8.3 (following page).

Table 3.11.8.3. Motor Vehicle Crash Data Summary^a

	Cranberry Road/Tihonet Road	Cranberry Road/Federal Road	Wareham Street/Hammond Street	Location Interstate 195/Route 28 Interchange ^d	Route 28/Lou Avenue	Route 28/Tremont Road	Route 28/ Tihonet Road	Tihonet Road/Farm- to-Market Road
<i>Year:</i>								
2004	0	0	0	9	0	2	2	0
2005	0	0	1	18	1	2	1	0
<u>2006</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>25</u>	<u>1</u>	<u>4</u>	<u>5</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0
<i>Average</i>								
Rate ^b	0.00	0.00	0.33	17.33	0.67	2.67	2.67	0.00
Significant? ^c	No	No	No	--	No	No	Yes	No
<i>Type:</i>								
Angle	0	0	0	15	0	5	3	0
Rear-End	0	0	0	16	1	2	3	0
Head-On	0	0	0	1	0	0	1	0
Fixed Object	0	0	0	7	1	1	1	0
Sideswipe	0	0	0	4	0	0	0	0
<u>Other/Unknown</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>9</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0
<i>Severity:</i>								
Property Damage Only	0	0	1	37	2	6	6	0
Personal Injury	0	0	0	15	0	2	2	0
<u>Fatal</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0

Table 3.11.8.3. Motor Vehicle Crash Data Summary^a

	Cranberry Road/Tihonet Road	Cranberry Road/Federal Road	Wareham Street/Hammond Street	Location Interstate 195/Route 28 Interchange ^d	Route 28/Lou Avenue	Route 28/Tremont Road	Route 28/ Tihonet Road	Tihonet Road/Farm- to-Market Road
<i>Conditions:</i>								
Clear	0	0	0	32	1	6	5	0
Cloudy	0	0	1	10	0	1	1	0
Rain	0	0	0	4	1	1	2	0
Snow/Ice	0	0	0	5	0	0	0	0
<u>Other/Unknown</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0
<i>Lighting:</i>								
Daylight	0	0	0	41	1	6	7	0
Dawn/Dusk	0	0	1	2	0	0	0	0
Dark (Road Lit)	0	0	0	2	0	2	1	0
Dark (Road Unlit)	0	0	0	7	1	0	0	0
<u>Other/Unknown</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0
<i>Day of Week:</i>								
Monday through Friday	0	0	1	42	1	6	8	0
Saturday	0	0	0	7	1	1	0	0
<u>Sunday</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>
Total	0	0	1	52	2	8	8	0

^aSource: MassHighway Safety Management/Traffic Operations Unit records, 2004 through 2006.

^bCrash rate per million vehicles entering the intersection.

^cThe intersection crash rate is significant if it is found to exceed 0.59 crashes per million vehicles entering the intersection for unsignalized intersections and 0.84 crashes per million vehicles entering the intersection for signalized intersections as defined by MassHighway for the MassHighway District in which the project is located (District 5).

^dThe crash data did not differentiate between the individual ramp intersections that form the interchange area.

As can be seen in Table 3.11.8.3, with the exception of Route 28 at the I-195 ramps, the study area intersections averaged approximately three or fewer reported motor vehicle crashes per year over the three-year review period. The Route 28/I-195 interchange was found to have experienced a total of 52 motor vehicle collisions over the three year review period. The majority of the crashes occurring within the interchange area involved property damage only (37 out of 52); occurred on a weekday (42 out of 52); during daylight (41 out of 52) under clear weather conditions (32 out of 52); and involved angle or rear-end type collisions (31 out of 52). It is important to note that the crash data provided did not differentiate between the two individual intersections that make up this interchange. Accordingly, a meaningful motor vehicle crash rate calculation could not be performed for the interchange. In addition, it should be noted that the I-195/Route 28 interchange was recently improved in conjunction with the Wareham Crossing project which should result in a reduction in the frequency of occurrence of motor vehicle collisions within the interchange area.

With the exception of the intersection of Route 28 at Tihonet Road, all of the study intersections were found to have a motor vehicle crash rate below the MassHighway average for unsignalized or signalized intersections, as appropriate, for the MassHighway District in which the Project is located (District 5). The intersection of Route 28 at Tihonet Road was found to have a motor vehicle crash rate above the MassHighway District 5 average for unsignalized intersections. In and of itself, this does not necessarily indicate that a specific safety deficiency exists at this location. However, the data does suggest that a more detailed assessment of the cause of the motor vehicle collisions occurring at this location should be undertaken in order to determine if a specific safety deficiency exists. The detailed motor vehicle crash records have been requested from the town of Wareham Police Department in order to complete this assessment. A series of focused improvements have been developed for this intersection that are designed to reduce the frequency of occurrence of motor vehicle crashes at the intersection. These improvements are detailed in the Recommendations section of this assessment. No fatal motor vehicle crashes were reported at the study area intersections over the three-year review period. The detailed MassHighway Crash Rate Worksheets are provided in Appendix B.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2012, which reflects a five-year planning horizon from the current year (2007) consistent with state traffic study guidelines. Independent of Phase A of the Project, traffic volumes on the roadway network in the year 2012 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Superimposing the anticipated traffic volumes associated with Phase A upon the

2012 No-Build traffic networks reflects the 2012 Build conditions with Phase A of the Project.

Future Traffic Growth

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

MassHighway, SRPEDD and the Planning Departments of the Towns of Wareham, Carver, and Plymouth were contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. Based on these discussions, the following projects were identified:

- *Wareham Crossing, Wareham, Massachusetts.* This project is currently constructed and partially occupied and consists of 750,000 sf retail development located off Route 28, west of the I-195 interchange, in Wareham, Massachusetts. At the time of the traffic counts that form the basis for this study, Wareham Crossing was under construction, and therefore traffic volumes generated by this project were not accounted for in the traffic counts. Traffic volumes expected to be generated by this project were obtained from the traffic study conducted for the development²⁴ and from trip generation statistics published by the Institute of Transportation Engineers (ITE)²⁵ for a similar land use as that proposed, and assigned onto the study roadway

²⁴ *Final Environmental Impact Report*, Wareham Crossing, Wareham, Massachusetts; Edwards & Kelcey; January 2006.

²⁵ *Ibid* 1.

network based on the trip distribution pattern presented in the aforementioned traffic study.

- *Copper Lantern Lane Residential Development, Carver, Massachusetts.* This project consists of the construction of a 47-unit residential condominium community to be located off Wareham Street in Carver, Massachusetts. At the time of the completion of the traffic counts that form the basis of this study, approximately 10 of the condominium units had been constructed and occupied. Traffic volumes associated with the remaining build-out of this project within the study area are expected to be relatively minor and were assumed to be accounted for in the general background traffic growth rate.
- *Residences at Samson's Pond, Carver, Massachusetts.* This project consists of the construction of a 20-unit residential condominium community to be located off Wareham Street in Carver, Massachusetts. At the time of the completion of the traffic counts that form the basis of this study, approximately 6 of the condominium units had been constructed and occupied. Traffic volumes associated with the remaining build-out of this project within the study area are expected to be relatively minor and were assumed to be accounted for in the general background traffic growth rate.
- *Decase Cranberries Facility, Carver, Massachusetts.* This project consists of the construction of 4,000 sf of office space to be located off Wareham Street in Carver, Massachusetts. Traffic volumes associated with this project within the study area are expected to be relatively minor and were assumed to be accounted for in the general background traffic growth rate.

No other projects were identified at this time that would impact future traffic volumes within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

A review of traffic counts compiled by MassHighway for the Towns of Wareham, Carver and Plymouth not conducted on the regional highway system was undertaken in order to determine traffic growth trends for the study area. Based on a review of this data, it was determined that traffic volumes within these Towns have fluctuated over the past several years, ranging from increases of approximately 9.1 percent to decreases of approximately 10.6 percent. The average traffic growth rate was found to be approximately 0.5 percent per year. In order to account for future traffic growth and presently unforeseen development within the study area, a 2.0 percent per year compounded annual background traffic growth rate was used.

Roadway Improvement Projects

MassHighway and the Towns of Wareham, Carver, and Plymouth were contacted in order to determine if there were any planned roadway improvement projects expected to be completed within the study area. Based on these discussions, the following roadway improvement project was identified:

Route 28 at the I-195 Ramps

In conjunction with the Wareham Crossing project, improvements have been recently completed at the intersections of Route 28 at the I-195 east and westbound ramps. These improvements entailed the installation of a fully-actuated, coordinated traffic signal system at the Route 28/I-195 ramp intersections (two locations), as well as associated geometric improvements including: the reconstruction of the Route 28 approaches to the I-195 ramps to accommodate a left-turn lane and two through travel lanes approaching each intersection; widening the I-195 on- and off-ramps to accommodate two lanes approaching and departing Route 28; provision of two left-turn lanes on the I-195 eastbound off-ramp to Route 28; and the realignment and reconstruction of the I-195 on- and off-ramp approaches to accommodate the lane use and geometric modifications to Route 28 and the ramp roadways.

No-Build Traffic Volumes

The 2012 and 2017 No-Build peak-hour traffic-volume networks were developed by applying the 2.0 percent per year compounded annual background traffic growth rate to the 2007 Existing peak-hour traffic volumes and then superimposing the peak-hour traffic volumes expected to be generated by the previously identified specific development by others. The resulting 2012 No Build weekday morning and evening peak-hour traffic volume networks are shown on Figures 3.11.8.8 and 3.11.8.9, respectively.

Project Generated Traffic – Phase A

Phase A design year (2012 Build) traffic volumes for the study area roadways were determined by estimating traffic volumes associated with Phases A1 and A2 and assigning these volumes on the study roadways. The following sections describe the procedures used to develop the Phase A Build condition traffic volume networks.

Phase A of the Project will encompass two components: Phase A1 will consist of the development of an 80,000 sf building incorporating 8,000 sf of office space and 72,000 sf of light manufacturing space; Phase A2 will consist of the development of a 65,850 sf Medical Office Building. In order to develop the traffic characteristics for Phase A1 of the Project, trip generation statistics published by the ITE for similar land uses as those proposed were used. ITE Land Use Code (LUC) 140, Manufacturing, with the independent variable of

1,000 sf of gross floor area equal to 72.0 (72,000 sf), and ITE LUC 710, General Office Building, with the independent variable of 1,000 sf of gross floor area equal to 8.0 (8,000 sf), were used to develop the anticipated traffic characteristics associated with Phase A1 of the Project. ITE LUC 720, Medical-Dental Office Building, with the independent variable of 1,000 sf of gross floor area equal to 65.850 (65,850 sf) was used to develop the anticipated traffic characteristics associated with Phase A2 of the Project. Table 3.11.8.4 summarizes the traffic characteristics of Phases A1 and A2 of the Project, and those of the cumulative total of the Phase A Project.

Table 3.11.8.4. ADM Tihonet Mixed Use Development Phase A Trip-Generation Summary^a

Time Period/Direction	Phase A1			Phase A2	Phase A Total
	Office Component (8,000 sf) ^a	Light Manufacturing Component (72,000 sf) ^b	Phase A1 Total	Medical Office Building (65,850 sf) ^c	
Average Weekday Daily	192	258	450	2,478	2,928
Weekday Morning Peak Hour:					
Entering	22	41	63	129	192
Exiting	<u>3</u>	<u>12</u>	<u>15</u>	<u>34</u>	<u>49</u>
Total	25	53	78	163	241
Weekday Evening Peak Hour:					
Entering	4	15	19	58	77
Exiting	<u>22</u>	<u>28</u>	<u>50</u>	<u>156</u>	<u>206</u>
Total	26	43	69	214	283

^aBased on ITE LUC 710 – General Office Building.

^bBased on ITE LUC 140 – Manufacturing.

^cBased on ITE LUC 720 – Medical-Dental Office Building.

As can be seen in Table 3.11.8.4, Phase A1 of the Project is expected to generate approximately 450 vehicle trips (225 entering and 225 exiting) on an average weekday, with 78 vehicle trips (63 entering and 15 exiting) during the weekday morning peak hour and 69 vehicle trips (19 entering and 50 exiting) during the weekday evening peak hour. Phase A2 of the Project is expected to generate approximately 2,478 vehicle trips (1,239 entering and 1,239 exiting) on an average weekday, with 163 vehicle trips (129 entering and 34 exiting) during the weekday morning peak hour and 214 vehicle trips (58 entering and 156 exiting) during the weekday evening peak hour. In total, Phase A of the Project is expected to generate approximately 2,928 vehicle trips (1,464 entering and 1,464 exiting) on an average weekday, with 241 vehicle trips (192 entering and 49 exiting) during the weekday morning peak hour and 283 vehicle trips (77 entering and 206 exiting) during the weekday evening peak hour.

Trip Distribution and Assignment

The directional distribution of generated trips to and from Phase A of the Project was determined based on a review of journey-to-work data obtained from the 2000 U.S. Census for persons employed within the town of Wareham and adjusted based on existing travel patterns at the study area intersections. The trip distribution for Phase A of the Project is summarized in Table 3.11.8.5 and graphically depicted on Figure 3.11.8.10. The additional traffic expected to be generated by Phase A of the Project was assigned on the study area roadway network as shown on Figures 3.11.8.11 and 3.11.8.12 for the weekday morning and evening peak hours, respectively.

Table 3.11.8.5. Phase A Trip-Distribution Summary

Roadway	Direction	Commercial Component
		To/From Site (Percent)
Route 25	East	14
I-495	West	16
I-195	South	25
Route 28	East	9
Route 28	West	3
Main Street	East	6
Main Street	West	5
Route 58	North	5
County Road	South	3
Tremont Street	North	13
Charge Pond Road	North	1
Total		100

Future Traffic Volumes – Phase A Build Condition

The 2012 Phase A Build condition networks consist of the 2012 No-Build traffic volumes with the anticipated Phase A generated traffic added to them. The 2012 Phase A Build weekday morning and evening peak-hour traffic-volume networks are graphically depicted on Figures 3.11.8.13 and 3.11.8.14, respectively.

A summary of peak-hour projected traffic-volume increases external to the Phase A study area is shown in Table 3.11.8.6. These volumes are based on the expected increases from Phase A of the Project.

Table 3.11.8.6. Peak Hour Traffic-Volume Increases

Location/Peak Hour	2006 Existing	2012 No-Build	2012 Phase A Build	Traffic- Volume Increase No-Build vs. Build	Percent Increase No-Build vs. Build
<i>Route 28, east of Tihonet Road:</i>					
Weekday Morning	578	713	737	24	3.4
Weekday Evening	729	1,027	1,056	29	2.8
<i>Route 28, west of I-195:</i>					
Weekday Morning	1,229	1,888	1,931	43	2.3
Weekday Evening	1,555	3,308	3,366	58	1.8
<i>Tremont Road, south of Route 28:</i>					
Weekday Morning	876	1,019	1,019	0	0.0
Weekday Evening	1,055	1,294	1,294	0	0.0
<i>Tihonet Road, south of Route 28:</i>					
Weekday Morning	94	104	131	27	26.0
Weekday Evening	93	104	135	31	29.8
<i>Cranberry Road, east of Tihonet Road:</i>					
Weekday Morning	88	99	99	0	0.0
Weekday Evening	119	134	134	0	0.0
<i>Cranberry Road, west of Federal Road:</i>					
Weekday Morning	101	115	129	14	12.2
Weekday Evening	129	145	158	13	9.0
<i>Wareham Street, north of Hammond Street:</i>					
Weekday Morning	112	143	143	0	0.0
Weekday Evening	143	212	212	0	0.0

As shown in Table 3.11.8.6, peak-hour traffic-volume increases associated with Phase A of the Project outside of the immediate study area relative to 2012 No-Build conditions were shown to range from 0.0 to 29.8 percent, with vehicle increases ranging from 0 to 58 vehicles.

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

Methodology

Levels of Service

A primary result of capacity analyses is the assignment of level-of-service to traffic facilities under various traffic-flow conditions.²⁶ The concept of level-of-service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level-of-service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- LOS A represents a condition with little or no control delay to minor street traffic.
- LOS B represents a condition with short control delays to minor street traffic.
- LOS C represents a condition with average control delays to minor street traffic.

²⁶ The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000.

- LOS D represents a condition with long control delays to minor street traffic.
- LOS E represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- LOS F represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2000 *Highway Capacity Manual*.²⁷ Level-of-service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the affects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2000 Highway Capacity Manual. Table 3.11.8.7 summarizes the relationship between level-of-service and average control delay.

Table 3.11.8.7. Level-of-Service Criteria for Unsignalized Intersections^a

Level-of-Service	Average Control Delay (Seconds Per Vehicle)
A	≤ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

^aSource: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 17-2.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- LOS A describes operations with very low control delay; most vehicles do not stop at all.
- LOS B describes operations with relatively low control delay. However, more vehicles stop than LOS A.

²⁷ *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000

- LOS C describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- LOS E describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- LOS F describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections are calculated using the operational analysis methodology of the 2000 *Highway Capacity Manual*. This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. Level-of-service designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. Table 3.11.8.8 summarizes the relationship between level-of-service and control delay. The tabulated control delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 3.11.8.8. Level-of-Service Criteria for Signalized Intersections^a

Level-of-Service	Control (Signal) Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

^aSource: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 16-2.

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection’s ability to process vehicles under various traffic control and volume scenarios and lane use

arrangements. The vehicle queue analysis was performed using the Synchro intersection capacity analysis software which is based upon the methodology and procedures presented in the 2000 *Highway Capacity Manual*. The Synchro vehicle queue analysis methodology is a simulation-based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro reports both the 50th (average) and 95th percentile vehicle queues. For unsignalized intersections, Synchro reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of sixty minutes during the peak one hour of the day (during the remaining fifty seven minutes, the vehicle queue length will be less than the 95th percentile queue length).

Analysis Results

Level-of-service and vehicle queue analyses were conducted for 2006 Existing, 2012 No-Build, and 2012 Phase A Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized for unsignalized and signalized intersections in Tables 3.11.8.9 and 3.11.8.10 (subsequent pages), respectively. The detailed analysis results are presented in Appendix B. Please note that the existing conditions traffic operations analysis completed at the intersections of Route 28 at the I-195 east and westbound ramps (two locations) reflect the intersection geometry and traffic control devices (STOP and YIELD signs) that were in place prior to the reconstruction and signalization of the ramp intersections as a part of the Wareham Crossing project.

Table 3.11.8.9. Unsignalized Intersection Level-of-Service and Vehicle Queue Summary

Unsignalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
<i>Cranberry Road at Tihonet Road</i>												
<i>Weekday Morning Peak Hour:</i>												
Cranberry Road EB TH/RT	51	0.0	A	0	56	0.0	A	0	56	0.0	A	0
Cranberry Road WB LT/TH	39	0.0	A	0	43	0.0	A	0	43	0.0	A	0
Tihonet Road NB LT/RT	0	0.0	A	0	0	0.0	A	0	0	0.0	A	0
<i>Weekday Evening Peak Hour:</i>												
Cranberry Road EB TH/RT	56	0.0	A	0	62	0.0	A	0	62	0.0	A	0
Cranberry Road WB LT/TH	66	0.0	A	0	73	0.0	A	0	73	0.0	A	0
Tihonet Road NB LT/RT	1	9.2	A	0	1	9.3	A	0	1	9.3	A	0
<i>Cranberry Road at Federal Road</i>												
<i>Weekday Morning Peak Hour:</i>												
Cranberry Road EB TH/RT	49	0.0	A	0	54	0.0	A	0	66	0.0	A	0
Cranberry Road WB LT/TH	39	1.4	A	0	43	1.4	A	0	43	1.4	A	0
Federal Road NB LT/RT	36	9.3	A	0	39	9.4	A	1	44	9.5	A	1
<i>Weekday Evening Peak Hour:</i>												
Cranberry Road EB TH/RT	68	0.0	A	0	75	0.0	A	0	79	0.0	A	0
Cranberry Road WB LT/TH	67	2.6	A	0	74	2.6	A	0	74	2.6	A	0
Federal Road NB LT/RT	27	9.4	A	0	30	9.6	A	0	39	9.7	A	1
<i>Wareham Street at Hammond Street</i>												
<i>Weekday Morning Peak Hour:</i>												
Private Driveway EB LT/TH/RT	2	10.7	B	0	2	11.0	B	0	2	11.0	B	0
Hammond Street WB LT/TH/RT	2	10.7	B	0	2	11.0	B	0	2	11.0	B	0
Wareham Street NB LT/TH/RT	71	0.2	A	0	86	0.2	A	0	86	0.2	A	0
Wareham Street SB LT/TH/RT	45	0.0	A	0	59	0.0	A	0	59	0.0	A	0
<i>Weekday Evening Peak Hour:</i>												
Private Driveway EB LT/TH/RT	1	9.8	A	0	1	10.4	B	0	1	10.4	B	0
Hammond Street WB LT/TH/RT	1	8.7	A	0	1	8.9	A	0	1	8.9	A	0
Wareham Street NB LT/TH/RT	64	0.0	A	0	101	0.0	A	0	101	0.0	A	0
Wareham Street SB LT/TH/RT	81	0.0	A	0	110	0.0	A	0	110	0.0	A	0

See notes at end of table.

Table 3.11.8.9 (Continued) Unsignalized Intersection Level-of-Service and Vehicle Queue Summary

Unsignalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Route 28 at Lou Avenue												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB LT	1	9.7	A	0	1	10.7	B	0	139	13.5	B	1
Route 28 SEB TH	705	0.0	A	0	824	0.0	A	0	826	0.0	A	0
Route 28 NWB TH/RT	847	0.0	A	0	989	0.0	A	0	1,017	0.0	A	0
Lou Avenue SWB LT/RT	4	26.3	D	0	4	39.0	E	1	47	>50.0	F	3
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB LT	4	10.4	B	0	4	13.5	B	0	59	15.3	C	1
Route 28 SEB TH	971	0.0	A	0	1,258	0.0	A	0	1,259	0.0	A	0
Route 28 NWB TH/RT	827	0.0	A	0	1,042	0.0	A	0	1,057	0.0	A	0
Lou Avenue SWB LT/RT	16	46.0	E	1	16	>50.0	F	2	201	>50.0	F	21
Route 28 at the I-195 Westbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB TH/RT	546	0.0	A	0								
Route 28 NWB LT	152	9.7	A	1								
Route 28 NWB TH	581	0.0	A	0								
I-195 westbound ramps SWB LT	130	>50.0	F	10								
I-195 westbound ramps SWB RT	126	12.1	B	1								
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB TH/RT	945	0.0	A	0								
Route 28 NWB LT	207	13.1	B	2								
Route 28 NWB TH	546	0.0	A	0								
I-195 westbound ramps SWB LT	201	>50.0	F	22								
I-195 westbound ramps SWB RT	96	11.7	B	1								

See notes at end of table.

Table 3.11.8.9. (Continued) Unsignalized Intersection Level-of-Service and Vehicle Queue Summary

Unsignalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Route 28 at the I-195 Eastbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB LT	98	11.4	B	1								
Route 28 SEB TH	465	0.0	A	0								
Route 28 NWB TH/RT	847	0.0	A	0								
I-195 eastbound ramps NEB LT	208	>50.0	F	19								
I-195 eastbound ramps NEB RT	240	14.0	B	3	See Signalized Intersection Analysis (Table 3.11.8.10)				See Signalized Intersection Analysis (Table 3.11.8.10)			
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB LT	104	11.2	B	1								
Route 28 SEB TH	795	0.0	A	0								
Route 28 NWB TH/RT	824	0.0	A	0								
I-195 eastbound ramps NEB LT	103	>50.0	F	6								
I-195 eastbound ramps NEB RT	180	14.1	B	2								
Route 28 at Tihonet Road												
<i>Weekday Morning Peak Hour:</i>												
Route 28 EB LT	15	8.4	A	0	17	8.6	A	0	19	8.7	A	0
Route 28 EB TH/RT	238	0.0	A	0	292	0.0	A	0	299	0.0	A	0
Route 28 WB LT/TH/RT	340	0.5	A	0	410	0.5	A	0	430	0.5	A	0
Tihonet Road NB LT/TH/RT	57	17.6	C	1	63	23.3	C	1	84	30.5	D	2
Tihonet Road SB LT/TH/RT	42	14.9	B	1	46	18.3	C	1	49	19.9	C	1
<i>Weekday Evening Peak Hour:</i>												
Route 28 EB LT	12	8.3	A	0	13	8.7	A	0	14	8.7	A	0
Route 28 EB TH/RT	399	0.0	A	0	563	0.0	A	0	596	0.0	A	0
Route 28 WB LT/TH/RT	348	0.3	A	0	469	0.3	A	0	477	0.3	A	0
Tihonet Road NB LT/TH/RT	36	18.0	C	1	40	28.1	D	1	49	35.8	E	2
Tihonet Road SB LT/TH/RT	57	17.4	C	1	62	27.0	D	2	75	33.3	D	2

See notes at end of table.

Table 3.11.8.9. (Continued) Unsignalized Intersection Level-of-Service and Vehicle Queue Summary

Unsignalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
<i>Tihonet Road at Farm-to-Market Road</i>												
<i>Weekday Morning Peak Hour:</i>												
Tihonet Road WB LT/RT	12	9.1	A	0	13	9.2	A	0	13	9.7	A	0
Tihonet Road NB TH/RT	51	0.0	A	0	56	0.0	A	0	108	0.0	A	0
Farm-to-Market Road SB LT/TH	35	1.7	A	0	39	1.7	A	0	51	1.4	A	0
<i>Weekday Evening Peak Hour:</i>												
Tihonet Road WB LT/RT	19	9.1	A	0	21	9.2	A	0	21	9.5	A	0
Tihonet Road NB TH/RT	39	0.0	A	0	44	0.0	A	0	59	0.0	A	0
Farm-to-Market Road SB LT/TH	46	0.5	A	0	50	0.5	A	0	91	0.3	A	0
<i>Tihonet Road at Technology Park Drive</i>												
<i>Weekday Morning Peak Hour:</i>												
Technology Park Drive EB LT/RT	--	--	--	--	--	--	--	--	15	8.9	A	0
Tihonet Road NB LT/TH	--	--	--	--	--	--	--	--	99	4.0	A	0
Tihonet Road SB TH/RT	--	--	--	--	--	--	--	--	50	0.0	A	0
<i>Weekday Evening Peak Hour:</i>												
Technology Park Drive EB LT/RT	--	--	--	--	--	--	--	--	50	8.9	A	0
Tihonet Road NB LT/TH	--	--	--	--	--	--	--	--	59	1.9	A	0
Tihonet Road SB TH/RT	--	--	--	--	--	--	--	--	54	0.0	A	0

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel-of-Service.

^dQueue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; NEB = northeastbound; NWB = northwestbound; SEB = southeastbound; SWB = southwestbound; LT = left-turning movements;

TH = through movements; RT = right-turning movements.

Table 3.11.8.10. Signalized Intersection Level-Of-Service and Vehicle Queue Summary

Signalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50/95 th	V/C	Delay	LOS	Queue 50/95 th	V/C	Delay	LOS	Queue 50/95 th
Route 28 at the I-195 Westbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB TH					0.44	19.0	B	6/8	0.48	20.2	C	7/9
Route 28 SEB RT					0.16	0.2	A	0/0	0.15	0.2	A	0/0
Route 28 NWB LT					0.42	39.0	D	5/8 ^e	0.46	27.0	C	5/7
Route 28 NWB TH					0.35	5.8	A	0/0	0.36	1.8	A	0/0
I-195 westbound ramps SWB LT					0.62	43.5	D	5/6	0.81	54.4	D	6/9
I-195 westbound ramps SWB RT	See Unsignalized Intersection Analysis				0.11	36.2	D	0/1	0.71	44.2	D	5/6
Overall	(Table 3.11.8.9)				0.47	17.7	B	--	0.53	18.6	B	--
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB TH					0.88	32.1	C	17/21	0.89	33.4	C	17/22
Route 28 SEB RT					0.40	0.8	A	0/0	0.40	0.8	A	0/0
Route 28 NWB LT					0.56	44.5	D	8/10 ^e	0.70	52.2	D	9/9 ^e
Route 28 NWB TH					0.44	7.4	A	11/11	0.46	12.3	B	17/13 ^e
I-195 westbound ramps SWB LT					0.81	53.8	D	7/11	0.87	62.0	E	7/12
I-195 westbound ramps SWB RT					0.62	41.3	D	3/5	1.08	>80.0	F	8/11
Overall					0.77	23.5	C	--	0.87	33.9	C	--
Route 28 at the I-195 Eastbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB LT					0.65	24.9	C	6/8	0.64	32.7	C	6/9 ^e
Route 28 SEB TH					0.27	10.2	B	7/9	0.31	14.7	B	8/9
Route 28 NWB TH					0.40	18.2	B	6/9	0.44	19.6	B	7/10
Route 28 NWB RT					0.21	0.3	A	0/0	0.25	0.4	A	0/0
I-195 eastbound ramps NEB LT					0.74	46.5	D	6/8	0.73	45.1	D	6/8
I-195 eastbound ramps NEB LT/TH					0.74	46.5	D	6/8	0.73	45.1	D	6/8
I-195 eastbound ramps NEB RT	See Unsignalized Intersection Analysis				0.20	0.3	A	0/0	0.24	0.3	A	0/0
Overall	(Table 3.11.8.9)				0.54	17.4	B	--	0.56	18.2	B	--
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB LT					0.92	25.6	C	11/15 ^e	0.65	6.7	A	3/4 ^e
Route 28 SEB TH					0.43	9.2	A	12/14 ^e	0.44	2.6	A	3/3 ^e
Route 28 NWB TH					0.72	29.5	C	12/14	1.19	>80.0	F	20/23
Route 28 NWB RT					0.12	0.2	A	0/0	0.18	0.2	A	0/0
I-195 eastbound ramps NEB LT					0.73	45.9	D	6/10	0.73	45.8	D	6/10
I-195 eastbound ramps NEB LT/TH					0.73	45.8	D	6/10	0.73	45.8	D	6/10
I-195 eastbound ramps NEB RT					0.12	0.1	A	0/0	0.13	0.2	A	0/0
Overall					0.79	21.1	C	--	0.83	46.6	D	--

See notes at end of table.

Table 3.11.8.10. (Continued) Signalized Intersection Level-Of-Service and Vehicle Queue Summary

Signalized Intersection/Peak Hour/Movement	2007 Existing				2012 No-Build				2012 Phase A Build			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50/95 th	V/C	Delay	LOS	Queue 50/95 th	V/C	Delay	LOS	Queue 50/95 th
Route 28 at Tremont Road												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB TH	0.50	10.8	B	3/5	0.59	13.2	B	4/6	0.61	13.4	B	5/6
Route 28 SEB RT	0.31	9.7	A	0/1	0.35	10.9	B	0/1	0.35	10.8	B	0/1
Route 28 WB LT/TH	0.33	9.7	A	1/3	0.39	10.9	B	2/4	0.41	11.0	B	3/4
Tremont Road NWB LT/RT	0.72	13.1	B	4/11	0.80	17.0	B	7/15	0.80	17.5	B	7/15
Overall	0.61	11.0	B	--	0.70	13.3	B	--	0.71	13.4	B	--
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB TH	0.55	10.5	B	3/8	0.74	15.7	B	7/13	0.78	17.0	B	8/15
Route 28 SEB RT	0.41	9.4	A	0/2	0.50	11.0	B	0/3	0.50	11.0	B	0/3
Route 28 WB LT/TH	0.35	8.9	A	2/3	0.46	10.5	B	3/5	0.48	10.6	B	3/5
Tremont Road NWB LT/RT	0.67	13.4	B	4/9	0.79	19.3	B	7/11	0.80	19.8	B	7/11
Overall	0.61	10.5	B	--	0.77	13.9	B	--	0.79	14.3	B	--

^aVolume to capacity ratio.

^bControl (signal) delay per vehicle in seconds.

^cLevel-of-Service.

^dQueue length in vehicles.

^e95th percentile queue is metered by upstream signal.

WB = westbound; NEB = northeastbound; NWB = northwestbound; SEB = southeastbound; SWB = southwestbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area.

Unsignalized Intersections

Cranberry Road at Tihonet Road (Carver)

Under 2007 Existing, 2012 No-Build and 2012 Phase A Build conditions, all movements at this unsignalized intersection were shown to operate at LOS A during both the weekday morning and evening peak hours, with negligible vehicle queuing.

Cranberry Road at Federal Road (Carver)

Under 2007 Existing, 2012 No-Build and 2012 Phase A Build conditions, all movements at this unsignalized intersection were shown to operate at LOS A during both the weekday morning and evening peak hours. Vehicle queues at the intersection were shown to range from 0 to 1 vehicle during the peak periods. Phase A of the Project was not shown to result in a significant increase in vehicle queues at the intersection over No-Build conditions (0 to 1 vehicle during the peak periods).

Wareham Street at Hammond Street (Carver)

Under 2007 Existing conditions, the critical movements at this unsignalized intersection (all movements from the private driveway) were shown to operate at LOS B during the weekday morning peak hour and at LOS A during the weekday evening peak hour. Under 2012 No-Build and 2012 Phase A Build conditions, the critical movements were shown to remain operating at LOS B during the weekday morning peak hour and to degrade to LOS B during the weekday evening peak hour as a result of traffic volume increases independent of the Project. Vehicle queues at the intersection were shown to be negligible during the peak periods. All movements along Wareham Street were shown to operate at LOS A under all analysis scenarios.

Route 28 at Lou Avenue (Wareham)

Under 2007 Existing conditions, the critical movements at this unsignalized intersection (all movements from Lou Avenue) were shown to operate at LOS D during the weekday morning peak hour and at LOS E during the weekday evening peak hour. Under 2012 No-Build conditions, the critical movements were shown to degrade to LOS E during the weekday morning peak hour and to LOS F during the weekday evening peak hour as a result of traffic volume increases independent of the Project. Under 2012 Phase A Build conditions, with the addition of Phase A – related traffic volumes, the critical movements were shown to degrade to LOS F during the weekday morning peak hour and to remain operating at LOS F during the weekday evening peak hour. Vehicle queues at the intersection were shown to range from 0 to 21 vehicles during the peak periods. Phase A of

the Project was shown to result in an increase in vehicle queues at the intersection over No-Build conditions ranging from 0 to 19 vehicles during the peak periods. All movements along Route 28 were shown to operate at LOS C or better under all analysis scenarios, with minimal vehicle queuing (0 to 1 vehicle).

Route 28 at the I-195 Westbound Ramps (Wareham)

Under 2007 Existing conditions, the critical movements at this unsignalized intersection (left turn movements from the I-195 westbound off-ramp) were shown to operate at LOS F during both the weekday morning and evening peak hours. Under 2012 No-Build and 2012 Phase A Build conditions, with the installation of a traffic control signal at the intersection and associated geometric improvements in conjunction with the Wareham Crossing project, overall operating conditions at the intersection were shown to improve to LOS B during the weekday morning peak hour and to LOS C during the weekday evening peak hour. Vehicle queues at the intersection were shown to range from 0 to 22 vehicles during the peak periods under 2007 Existing conditions (unsignalized intersection) and from 0 to 22 vehicles under 2012 No Build and 2012 Phase A Build conditions (signalized intersection). Phase A of the Project was shown to result in an increase in vehicle queues at the intersection over No-Build conditions ranging from 0 to 6 vehicles during the peak periods.

Route 28 at the I-195 Eastbound Ramps (Wareham)

Under 2007 Existing conditions, the critical movements at this unsignalized intersection (left turn movements from the I-195 eastbound off-ramp) were shown to operate at LOS F during both the weekday morning and evening peak hours. Under 2012 No-Build conditions, with the installation of a traffic control signal at the intersection and associated geometric improvements in conjunction with the Wareham Crossing project, overall operating conditions at the intersection were shown to improve to LOS B during the weekday morning peak hour and to LOS C during the weekday evening peak hour. Under 2012 Phase A Build conditions, with the addition of Phase A – related traffic volumes, overall operating conditions were shown to remain at LOS B during the weekday morning peak hour and to degrade to LOS D during the weekday evening peak hour. Vehicle queues at the intersection were shown to range from 0 to 19 vehicles during the peak periods under 2007 Existing conditions (unsignalized intersection) and from 0 to 23 vehicles under 2012 No-Build and 2012 Phase A Build conditions (signalized intersection). Phase A of the Project was shown to result in an increase in vehicle queues at the intersection over No-Build conditions ranging from 0 to 9 vehicles during the peak periods.

Route 28 at Tihonet Road (Wareham)

Under 2007 Existing conditions, the critical movements at this unsignalized intersection (northbound movements from Tihonet Road) were shown to operate

at LOS C during both the weekday morning and evening peak hours. Under 2012 No-Build conditions, the critical movements were shown to remain operating at LOS C during the weekday morning peak hour and to degrade to LOS D during the weekday evening peak hour as a result of traffic volume increases independent of the Project. Under 2012 Phase A Build conditions, with the addition of Phase A – related traffic, the critical movements (northbound movements from Tihonet Road) were shown to degrade to LOS D during the weekday morning peak hour and to LOS E during the weekday evening peak hour. Vehicle queues at the intersection were shown to range from 0 to 2 vehicles during the peak periods. Phase A of the Project was not shown to result in a significant increase in vehicle queues at the intersection over No-Build conditions (0 to 1 vehicle during the peak periods). All movements along Route 28 were shown to operate at LOS A under all analysis scenarios with negligible vehicle queuing.

Tihonet Road at Farm-to-Market Road (Wareham)

Under 2007 Existing, 2012 No-Build and 2012 Phase A Build conditions, all movements at this unsignalized intersection were shown to operate at LOS A during both the weekday morning and evening peak hours with negligible vehicle queuing.

Tihonet Road at Technology Park Drive (Wareham)

Under 2012 Phase A Build conditions, all movements at this unsignalized intersection were shown to operate at LOS A during both the weekday morning and evening peak hours with negligible vehicle queuing.

Signalized Intersection

Route 28 at Tremont Road (Wareham)

Under 2007 Existing, 2012 No-Build and 2012 Phase A Build conditions, this signalized intersection was shown to operate at an overall LOS B during both the weekday morning and evening peak hours. Vehicle queues at the intersection were shown to range from 0 to 15 vehicles during the peak periods. Phase A of the Project was not shown to result in a significant increase in vehicle queues at the intersection over No-Build conditions (0 to 2 vehicles during the peak periods).

Sight Distance Measurements

Sight distance measurements were performed at the intersections of Farm-to-Market Road at the Phase A1 driveway and Route 28 at Lou Avenue in accordance with MassHighway and American Association of State Highway and Transportation Officials (AASHTO)²⁸ standards. Both stopping sight distance

²⁸A *Policy on Geometric Design of Highway and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2004.

(SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO and MassHighway standards, at a minimum, sufficient SSD must be provided at an intersection. Table 3.11.8.11 presents the measured SSD and ISD at the intersections of Farm-to-Market Road at the Phase A1 driveway and Route 28 at Lou Avenue

Table 3.11.8.11. Sight Distance Measurements

Intersection/Sight Distance Measurement	Required Minimum (Feet) ^a	Measured (Feet)
<i>Farm-to-Market Road at the Phase A1 Driveway</i>		
<i>Stopping Sight Distance:</i>		
Farm-to-Market approaching from the north	425	561
Farm-to-Market approaching from the south	425	750+
<i>Intersection Sight Distance:</i>		
Looking to the north from the Phase A1 driveway	425	611
Looking to the south from the Phase A1 driveway	425	750+
<i>Route 28 at Lou Avenue</i>		
<i>Stopping Sight Distance:</i>		
Route 28 approaching from the northwest	425	650+
Route 28 approaching from the southeast	425	650+
<i>Intersection Sight Distance:</i>		
Looking to the northwest from Lou Avenue	425	650+
Looking to the southeast from Lou Avenue	425	650+

^aRecommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2004, and based on a 50 mph approach speed for Farm-to-Market Road and Route 28.

As seen in Table 3.11.8.11, the measured sight lines approaching Lou Avenue and the Phase A1 driveway (SSD) and for motorists exiting these locations (ISD) were found to exceed the recommended minimum sight distance requirements for a 50 mph approach speed along Route 28 and Farm-to-Market Road, consistent with the measured 85th percentile vehicle travel speed along these roadways and/or 5 mph above the posted speed limit, whichever was found to be greater.

CONCLUSIONS

Phase A1 of the Project is expected to generate approximately 450 vehicle trips (225 entering and 225 exiting) on an average weekday, with 78 vehicle trips (63 entering and 15 exiting) during the weekday morning peak hour and 69 vehicle trips (19 entering and 50 exiting) during the weekday evening peak hour. Phase A2 of the Project is expected to generate approximately 2,478 vehicle trips (1,239 entering and 1,239 exiting) on an average weekday, with 163 vehicle trips (129 entering and 34 exiting) during the weekday morning peak hour and 214 vehicle trips (58 entering and 156 exiting) during the weekday evening peak hour. In total, Phase A of the Project is expected to generate approximately 2,928 vehicle trips (1,464 entering and 1,464 exiting) on an average weekday, with 241 vehicle trips (192 entering and 49 exiting) during the weekday morning peak hour and 283 vehicle trips (77 entering and 206 exiting) during the weekday evening peak hour.

An analysis of traffic operations at the study area intersections indicates that Phase A of the Project is not expected to result in a significant change in traffic operations or vehicle queuing at the study intersections over anticipated future conditions without the project (No-Build conditions). The majority of the movements at the study intersections were shown to remain operating at LOS D or better during the peak periods under all analysis conditions (Existing, No Build, and Phase A Build). The intersection of Technology Park Drive with Farm-to-Market Road was shown to operate at LOS A during the peak periods with negligible vehicle queuing. Vehicles exiting Lou Avenue at its intersection with Route 28 (Lou Avenue will provide primary access to Phase A2 and will accommodate trips to/from the east on Route 28 destined to Phase A1) were shown to operate at or over capacity (LOS E or F, respectively) during the peak periods with or without Phase A of the Project. This condition is a result of the large volume of conflicting traffic travelling along Route 28 during the peak periods; however, it should be noted that actual operating conditions are likely better than predicted by the analysis model due to gaps created in the traffic stream along Route 28 as a result of the traffic signal system within the Route 28/I-195 interchange area.

RECOMMENDATIONS

A comprehensive transportation mitigation program has been developed for Phase A of the Project that is designed to accommodate the additional traffic expected to be generated by Phase A and planned future development in the area. The major components of the planned mitigation program can be separated into site access and off-site improvements, and include the development of a comprehensive Transportation Demand Management (TDM) program. The elements of the transportation mitigation program are described in the following sections and will be updated, refined and expanded as necessary as future phases of the Project are

proposed and evaluated in subsequent EIRs/PRDs.

SITE ACCESS

Phase A1

Access to Phase A1 of the Project will be provided by way of two driveways that will intersect the south side of Technology Park Drive, a new subdivision road that will intersect the west side of Farm-to-Market Road north of Tihonet Road. It is recommended that the Phase A1 driveways be a minimum of 24 feet in width, accommodating two-way travel, with vehicles exiting the driveway placed under STOP-sign control with illumination provided. Any signs or landscaping adjacent to the Phase A1 driveway intersections with Technology Park Drive and within the Phase A1 site should be designed and maintained so as not to restrict lines of sight to or from the driveways.

Phase A2

Access to Phase A2 of the Project will be provided by way of two new driveways that will intersect the north side of the proposed Route 28-Tihonet Road connector (described below). It is recommended that the driveways be a minimum of 24-feet in width, accommodating two-way travel, with vehicles exiting the driveways placed under STOP-sign control with illumination provided. Any signs or landscaping adjacent to the Phase A2 driveway intersections with connector road and within the Phase A2 site should be designed and maintained so as not to restrict lines of sight to or from the driveways.

Route 28-Tihonet Road Connector

The Route 28-Tihonet Road Connector is a proposed collector roadway that will link Route 28 to Tihonet Road by way of an extension of Lou Avenue. The connector road will intersect the west side of Tihonet Road south of the Route 25/Tihonet Road overpass. It is recommended that the connector road be a minimum of 32-feet in width (paved area) accommodating two (2) 12-foot wide travel lanes separated by a double-yellow centerline. A sidewalk should be provided along one or both sides of the roadway separated from the travelled-way by a two foot wide (minimum) grass strip utility area. If a boulevard-type cross-section is provided, the section should consist of two (2) 16-foot wide travel lanes separated by an 8 to 10-foot wide raised median (a 16 to 18-foot wide median is desirable if left-turn lanes will be provided along the alignment). The roadway alignment (horizontal and vertical) should be designed to accommodate a safe travel speed of 30 to 35 mph. Signs, landscaping and other vertical elements along the roadway alignment should be designed and maintained so as not to restrict sight lines. Further, the connector road approach to Tihonet Road should be placed under STOP-sign control with illumination provided.

OFF-SITE

Route 28 at Lou Avenue

An analysis of operating conditions at this unsignalized intersection indicates that all movements from Lou Avenue currently operate at or are projected to operate at or over capacity (LOS E or F, respectively) during the peak periods independent of Phase A of the Project. Absent improvement, operating conditions are expected to further degrade in the future, again, independent of Phase A of the Project. Recognizing the importance of the intersection of Route 28 at Lou Avenue in providing access to the Project, the Project Proponent will reconstruct Lou Avenue approaching Route 28 to accommodate two exiting travel lanes (separate right and left-turn lanes) and a single entering lane separated by a raised island, and will install a fully actuated traffic signal system at the improved intersection that will be interconnected and coordinated with the existing traffic signals located along the Route 28 corridor to the east of Lou Avenue (Route 28/I-195 westbound ramps and Route 28/I-195 eastbound ramps). A review of the traffic signal warrants (Warrants 1 and 2) presented in the Manual on Uniform Traffic Control Devices (MUTCD)²⁹ indicates that the installation of a traffic control signal will likely be warranted with the completion of the Project. As shown in Table 3.11.8.12, with the recommended geometric improvements and the installation of a traffic control signal, the improved signalized intersection is expected to operate at an overall LOS B during both peak periods under 2012 Phase A Build with Mitigation conditions. These improvements will be designed and constructed by the Project Proponent prior to the issuance of a Certificate of Occupancy for Phase A1 or Phase A2, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

Route 28 at the I-195 Westbound Ramps

An analysis of operating conditions at this signalized intersection indicates that the addition of Phase A-related traffic may result in an increase in delays for movements from the I-195 westbound off-ramp approach during the weekday evening peak hour. In order to improve operating conditions at this intersection, the Project Proponent will design and implement an optimal traffic signal timing, phasing and coordination plan for the intersection of Route 28 at the I-195 westbound ramps within one year of the issuance of a Certificate of Occupancy for either Phase A1 or Phase A2, whichever comes first, subject to receipt of all necessary permits, rights and approvals. As can be seen in Table 3.11.8.12, with the implementation of the planned improvements, all movements at the intersection of Route 28 at the I-195 westbound ramps were shown to operate at LOS D or better under 2012 Phase A Build with Mitigation conditions during both peak periods.

²⁹Manual on Uniform Traffic Control Devices (MUTCD); Federal Highway Administration; Washington, DC; 2003.

Route 28 at the I-195 Eastbound Ramps

An analysis of operating conditions at this signalized intersection indicates that the addition of Phase A-related traffic may result in an increase in delays at the intersection resulting in a slight decrease in the overall level-of-service during the weekday evening peak hour over No-Build conditions (LOS C to LOS D). In order to improve operating conditions at this intersection, the Project Proponent will design and implement an optimal traffic signal timing, phasing and coordination plan for the intersection of Route 28 at the I-195 eastbound ramps within one year of the issuance of a Certificate of Occupancy for either Phase A1 or Phase A2, whichever comes first, subject to receipt of all necessary permits, rights and approvals. As can be seen in Table 3.11.8.12, with the implementation of the planned improvements, overall operating conditions at the intersection of Route 28 at the I-195 eastbound ramps were shown to improve to LOS B during the weekday evening peak hour under 2012 Phase A Build with Mitigation conditions.

Route 28 at Tihonet Road (Wareham)

An analysis of operating conditions at this unsignalized intersection indicates that the addition of Phase A-related traffic may result in a slight increase in motorist delays on the Tihonet Road approaches to Route 28; however, the resulting increase in vehicle queuing was shown to be minimal (0 to 1 vehicle). Independent of Phase A of the Project, it is recommended that a STOP-line be installed on the Tihonet Road southbound approach to Route 28 in order to define the desired stopping point for vehicles on this approach to the intersection, and that the existing single-yellow centerline on the Tihonet Road south leg of the intersection be replaced with a double-yellow centerline in accordance with the centerline pavement marking standards of the MUTCD.

In addition, in an attempt to reduce the frequency of occurrence of motor vehicle collisions at the intersection, a comprehensive review and upgrade of signs and pavement markings at and approaching the intersection will be undertaken subject to the review and approval of MassHighway. These improvements will include the installation of intersection ahead warning signs (graphic symbol); replacement/upgrade of signs and pavement markings; and the trimming of vegetation within the public right-of-way to improve sight lines to and from the intersection. The Project Proponent will implement these improvements prior to the issuance of a Certificate of Occupancy for either Phase A1 or A2 of the Project, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

Cranberry Road at Tihonet Road (Carver)

Independent of Phase A of the Project, it is recommended that a STOP-line be installed on the Tihonet Road approach to Cranberry Road in order to define the

desired stopping point for vehicles on this approach to the intersection. The Project Proponent will complete this improvement prior to the issuance of a Certificate of Occupancy for either Phase A1 or A2 of the Project, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

Cranberry Road at Federal Road (Carver)

Independent of Phase A of the Project, it is recommended that a STOP-line be installed on the Federal Road approach to Cranberry Road in order to define the desired stopping point for vehicles on this approach to the intersection. The Project Proponent will complete this improvement prior to the issuance of a Certificate of Occupancy for either Phase A1 or A2 of the Project, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

Wareham Street at Hammond Street (Carver)

Independent of Phase A of the Project, it is recommended that a STOP-sign and STOP-line be installed on the Hammond Street approach to Wareham Street in order to reinforce the assignment of the vehicular right-of-way at the intersection and to define the desired stopping point for vehicles on the Hammond Street approach. The Project Proponent will complete these improvements prior to the issuance of a Certificate of Occupancy for either Phase A1 or A2 of the Project, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

1

Table 3.11.8.12. Mitigated Signalized Intersection Level-of-Service and Vehicle Queue Summary

Signalized Intersection/Peak Hour/Movement	2012 No-Build				2012 Phase A Build				2012 Phase A Build with Mitigation			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th ./95 th	V/C	Delay	LOS	Queue 50 th ./95 th	V/C	Delay	LOS	Queue 50 th ./95 th
Route 28 at the I-195 Westbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB TH	0.44	19.0	B	6/8	0.48	20.2	C	7/9	0.45	17.9	B	6/10
Route 28 SEB RT	0.16	0.2	A	0/0	0.15	0.2	A	0/0	0.15	0.2	A	0/0
Route 28 NWB LT	0.42	39.0	D	5/8 ^c	0.46	27.0	C	5/7	0.65	35.5	D	4/5 ^c
Route 28 NWB TH	0.35	5.8	A	6/8	0.36	1.8	A	0/0	0.38	1.4	A	0/0
I-195 westbound ramps SWB LT	0.62	43.5	D	5/6	0.81	54.4	D	6/9	0.63	39.1	D	6/7
I-195 westbound ramps SWB RT	0.11	36.2	D	0/1	0.71	44.2	D	5/6	0.55	36.2	D	4/5
Overall	0.47	17.7	B	--	0.53	18.6	B	--	0.53	16.1	B	--
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB TH	0.88	32.1	C	17/21	0.89	33.4	C	17/22	0.88	32.1	C	18/23
Route 28 SEB RT	0.40	0.8	A	0/0	0.40	0.8	A	0/0	0.40	0.8	A	0/0
Route 28 NWB LT	0.56	44.5	D	8/10 ^c	0.70	52.2	D	9/9 ^c	0.85	54.1	D	6/9 ^c
Route 28 NWB TH	0.44	7.4	A	11/11	0.46	12.3	B	17/13 ^c	0.49	0.4	A	0/0 ^c
I-195 westbound ramps SWB LT	0.81	53.8	D	7/11	0.87	62.0	E	7/12	0.71	42.2	D	7/10
I-195 westbound ramps SWB RT	0.62	41.3	D	3/5	1.08	>80.0	F	8/11	0.88	53.4	D	7/10
Overall	0.77	23.5	C	--	0.87	33.9	C	--	0.87	23.1	C	--

See notes at end of table.

Table 3.11.8.12. (Continued) Mitigated Signalized Intersection Level-of-Service and Vehicle Queue Summary

Signalized Intersection/Peak Hour/Movement	2012 No-Build				2012 Phase A Build				2012 Phase A Build with Mitigation			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Route 28 at the I-195 Eastbound Ramps												
<i>Weekday Morning Peak Hour:</i>												
Route 28 SEB LT	0.65	24.9	C	6/8	0.64	32.7	C	6/9 ^e	0.67	30.5	C	6/3 ^e
Route 28 SEB TH	0.27	10.2	B	7/9	0.31	14.7	B	8/9	0.32	2.2	A	2/1
Route 28 NWB TH	0.40	18.2	B	6/9	0.44	19.6	B	7/10	0.45	15.1	B	7/9
Route 28 NWB RT	0.21	0.3	A	0/0	0.25	0.4	A	0/0	0.25	0.3	A	0/0
I-195 eastbound ramps NEB LT	0.74	46.5	D	6/8	0.73	45.1	D	6/8	0.67	40.3	D	6/7
I-195 eastbound ramps NEB LT/TH	0.74	46.5	D	6/8	0.73	45.1	D	6/8	0.67	40.3	D	6/7
I-195 eastbound ramps NEB RT	0.20	0.3	A	0/0	0.24	0.3	A	0/0	0.24	0.3	A	0/0
Overall	0.54	17.4	B	--	0.56	18.2	B	--	0.56	13.0	B	--
<i>Weekday Evening Peak Hour:</i>												
Route 28 SEB LT	0.92	25.6	C	11/15 ^e	0.65	6.7	A	3/4 ^e	0.88	29.1	C	6/11 ^e
Route 28 SEB TH	0.43	9.2	A	12/14 ^e	0.44	2.6	A	3/3 ^e	0.43	0.8	A	0/0 ^e
Route 28 NWB TH	0.72	29.5	C	12/14	1.19	>80.0	F	20/23	0.79	23.3	C	12/15
Route 28 NWB RT	0.12	0.2	A	0/0	0.18	0.2	A	0/0	0.18	0.1	A	0/0
I-195 eastbound ramps NEB LT	0.73	45.9	D	6/10	0.73	45.8	D	6/10	0.80	54.6	D	6/11
I-195 eastbound ramps NEB LT/TH	0.73	45.8	D	6/10	0.73	45.8	D	6/10	0.80	54.6	D	6/11
I-195 eastbound ramps NEB RT	0.12	0.1	A	0/0	0.13	0.2	A	0/0	0.13	0.2	A	0/0
Overall	0.79	21.1	C	--	0.83	46.6	D	--	0.83	17.7	B	--

See notes at end of table.

Table 3.11.8.12. (Continued) Mitigated Signalized Intersection Level-of-Service and Vehicle Queue Summary

Signalized Intersection/Peak Hour/Movement	2012 No-Build				2012 Phase A Build				2012 Phase A Build with Mitigation			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th ./95 th	V/C	Delay	LOS	Queue 50 th ./95 th	V/C	Delay	LOS	Queue 50 th ./95 th
Route 28 at Lou Avenue												
<i>Weekday Morning Peak Hour:</i>									0.64	40.7	D	4/7
Route 28 EB LT									0.31	1.8	A	0/5
Route 28 EB TH									0.80	14.7	B	13/28
Route 28 WB TH/RT									0.28	51.8	D	1/1
Lou Avenue SB LT									0.02	35.2	D	0/1
Lou Avenue SB RT	See Unsignalized Intersection Analysis (Table 3.11.8.9)				See Unsignalized Intersection Analysis (Table 3.11.8.9)				0.76	11.6	B	--
Overall												
<i>Weekday Evening Peak Hour:</i>									0.46	37.1	D	2/4
Route 28 EB LT									0.44	1.7	A	3/3
Route 28 EB TH									0.88	18.0	B	23/27
Route 28 WB TH/RT									0.42	47.5	D	2/3
Lou Avenue SB LT									0.21	38.6	D	1/4
Lou Avenue SB RT									0.82	12.5	B	--
Overall												

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel-of-Service.

^dQueue length in vehicles.

^e95th percentile queue is metered by upstream signal.

EB = eastbound; WB = westbound; NB = northbound; SB = southbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Tihonet Road at Farm-to-Market Road (Wareham)

Independent of Phase A of the Project, it is recommended that a STOP-sign and STOP-line be installed on the Tihonet Road westbound approach to the intersection in order to reinforce the assignment of the vehicular right-of-way at the intersection and to define the desired stopping point for vehicles on this approach. The Project Proponent will complete these improvements prior to the issuance of a Certificate of Occupancy for either Phase A1 or A2 of the Project, whichever comes first, subject to receipt of all necessary permits, rights and approvals.

TRANSPORTATION DEMAND MANAGEMENT PROGRAM

As described herein, the study area is served by public bus service provided by GATRA along the Route 28 corridor and immediately south of the TTP site. Overall, the impact of Phase A of the Project relative to traffic, public transportation, and pedestrians is expected to be minor. However, the following pedestrian and bicycle improvements/accommodations, TDM strategies, and trip reduction measures are proposed with the goal of further minimizing the overall impact of Phase A of the Project. Each of the measures will be refined and expanded as the Project is built-out.

Pedestrian Improvements

As part of Phase A, the Project Proponent will define and enhance pedestrian facilities as follows:

- Sidewalks and pedestrian promenade areas will be provided along Lou Avenue and Technology Park Drive; within the Phase A Project sites; along all circulating roadways within the sites; and along the Phase A driveways extending to the intersecting roadways.
- Lighting will be provided within the Phase A Project sites and around building perimeters.
- Full handicapped access will be provided within the Phase A sites and along the proposed circulating roadways where sidewalks are provided; wheelchair ramps will be provided at all intersections where sidewalks and crosswalks are present; pedestrian crosswalks, pushbuttons and phasing will be provided at all signalized intersections constructed or modified in conjunction with the Phase A of the Project, as appropriate; and crosswalks and associated pedestrian crossing warning signs will be provided at and in advance of pedestrian crossing locations within the Phase A Project sites designed and installed in accordance with the MUTCD.

Bicycle Accommodations

Phase A of the Project will include provision of safe, secure, weather protected bicycle racks and/or storage lockers. Signs will be provided at appropriate locations within the Phase A Project sites directing bicyclists to the bicycle storage facilities. Outside, short-term bicycle parking will be provided by way of bicycle racks located proximate to building entrances. All traffic signals to be constructed or modified in conjunction with Phase A of the Project will include bicycle detection and associated signs and pavement markings, as appropriate.

Traffic Reduction Strategies

In order to reduce single occupant vehicle (SOV) travel associated with Phase A and to encourage the use of alternative modes of transportation, information on several traffic reduction strategies will be made available to employees of Phase A of the Project. The core of successful traffic reduction strategies are ridesharing, public transportation use, alternative work schedules, bicycling, and pedestrian travel, and are discussed below.

Ridesharing Programs

Ridesharing refers to encouraging commuters to ride in vehicles with other commuters rather than drive alone to work. The most common forms of ridesharing are carpools and vanpools. The benefits of such programs include less congestion, reduced fuel consumption, and improved air quality. Keys to the success of such programs could include:

- Carpool/vanpool matching programs through the local Transportation Management Association (TMA);
- Joint programs with area commercial tenants;
- Dissemination of promotional materials to employees;
- Newsletters about the program;
- Coordination with MassRIDES which leases commuter vans and provides administrative and organizational assistance;
- Preferential parking for carpoolers; and
- Guaranteed ride home program.

Ridesharing programs will be encouraged to be implemented by the tenants of Phase A of the Project. Toward this end, the following traffic reduction strategies will be encouraged to be implemented in conjunction with Phase A and will be included as a part of the Tenant Manual for the Project:

- A transportation coordinator will be assigned that will coordinate the traffic reduction program for Phase A of the Project.
- Work with the Towns of Wareham, Carver, and Plymouth; MassHighway; MassRIDES; SRPEDD; and GATRA to develop an effective traffic reduction program for Phase A of the Project.

- Designated parking spaces will be provided within the Phase A Project sites for car/vanpools and alternatively fueled vehicles.
- Information regarding available public transportation resources provided by GATRA, including schedules, fare information, and stop/terminal locations, will be made available to all employees of Phase A of the Project.

In addition, the Project Proponent will work with the town of Wareham, MassHighway, SRPEDD and GATRA to evaluate the feasibility of providing bus service to the Project. The Project Proponent has initiated discussions with GATRA concerning potential bus service to the Project. In anticipation of provision of such service, Technology Park Drive, the Phase A Project sites and the associated driveways have been designed to accommodate the turning and maneuvering requirements of a GATRA bus. Potential locations for bus stops and shelters will be identified within the Phase A Project sites in consultation with GATRA.

Alternative Work Schedules

Flexible working hours allow employees to choose their own starting and finishing times by establishing a required core time such as 9:00 AM to 4:00 PM; this allows employees to vary work schedules and reduces peak-hour demand. The Phase A tenants will be encouraged to evaluate the feasibility of implementing a flextime policy and/or telecommuting for employees in order to reduce peak-hour demand.

LOADING AND DELIVERIES

The Phase A Project sites have been designed to accommodate all loading and delivery functions on-site in a safe and efficient manner. Truck routes and hours of deliveries will be coordinated in order to minimize truck activity during the commuter peak hours. Reasonable efforts will be made to encourage use of service vendors currently delivering in the vicinity of the Phase A Project sites in an effort to reduce the overall number of new trucks in the area.

With implementation of the above recommendations, safe and efficient access will be provided to Phase A of the Project and Phase A can be constructed with minimal impact on the roadway system.

2.16.9 Groundwater

The proposed water supply systems to support Phases A1 and A2 represent a minor extension to an existing municipal water system. No extension or withdrawal from the municipal water system is required or proposed for Phase A3, although bog water management will result in use of the aquifer pursuant to existing Water Management Act permits. These water impacts are accounted for in the NPC form in Section 1. The existing municipal system and bog water management activities withdraw groundwater from an extensive and highly productive aquifer; both are subject to the provisions of current Water Management Act permits. The additional demands represented by Phase A will be met with existing permitted capacity.

The Phase A water withdrawals will have an imperceptible impact to existing water resources in the basin, while supplying a safe, reliable source of potable and bog management water. Groundwater quality impacts from the proposed Phase A1 on-site Title 5 sewage disposal system will be minimized and mitigated by the addition of a nitrogen removal component. Protection of sensitive environmental resources will be accomplished by appropriate Title 5 system siting and construction. Therefore, the cumulative impacts of Phase A with respect to groundwater are not significant.

2.16.10 Water Supply

The municipal water distribution system is located in close proximity to the Phase A1 and A2 areas and the system has adequate and available permitted capacity to meet the projected demands and fire flow requirements of the development. The impacts associated with the Phase A water systems will be minimal, as the new water mains and service connections will be installed within proposed roadways or other cleared areas.

Water conservation will be promoted through metered services, water-efficient landscaping, minimizing developed (landscaped) areas, and installing low-flow plumbing fixtures. The development will be constructed following low impact development principals and current State Plumbing Code for low flow fixtures. Additionally, Phase A3 water use can be accommodated under existing Water Management Act permits. Therefore, the cumulative impacts of Phase A with respect to water supply are not significant.

2.16.11 Wastewater Infrastructure

The proposed on-site sewage disposal system to support Phase A1 will be designed and constructed in accordance with State and local requirements, and will include a nitrogen removal component. Connection to the WWPCF is proposed for Phase A2. No wastewater disposal system is required or proposed for Phase A3. The WWPCF provides a high level of wastewater treatment.

The Phase A1 parcel has ample area and favorable subsurface conditions to support the installation of an on-site sewage disposal system. The system will be sited and designed to minimize impacts to nearby environmental receptors, including nutrient related impacts. Therefore, the cumulative impacts of Phase A with respect to wastewater infrastructure are not significant.

Future development by the Proponent in the areas abutting the Phase A areas will likely result in the construction of new treatment and disposal facilities or in the rehabilitation and expansion of the municipal sewer system. At that time, the Proponent will evaluate the benefit of connecting the Phase A1 development to this infrastructure and abandoning the proposed on-site sewage disposal system.

2.16.12 Utility Infrastructure

The land impacts associated with extending electric, telecommunications and other related commercial utilities to Phase A will be minimal, as the majority of the new service connections will be installed within the footprint of existing roadways (including unimproved agricultural access roads) and proposed roadways and utility easements. Therefore, the cumulative impacts of Phase A with respect to utility infrastructure are not significant, and adequate utility service is available to accommodate the Phase A development.

2.16.13 Greenhouse Gas Analysis

A cumulative summary of the GHG emission evaluation for Phase A is provided in Table 2.16.13.1.

Table 2.16.13.1. Phase A Cumulative GHG Emission Evaluation Summary

GHG Emission Source	Baseline Projects [Tons CO₂ Per Year]	Proposed Projects [Tons CO₂ Per Year]	Estimated Overall Percent Reduction
Building-Related Emissions (Direct and Indirect Sources)	4,526	3,875	14%
Transportation-Related Emissions (Indirect Sources)	8,365	7,972 to 8,365	0% to 4.7%
Total Estimated Emissions:	12,891	11,847 to 12,240	5% to 8%

We note that the Phase A Project represents a relatively small percentage of the entire Tihonet Mixed Use Development Project. As such, it is anticipated that GHG emissions associated with Phase A will be ‘de minimus’ as compared to emissions associated with the entire project.

Section 3.0
Circulation List

3.0 CIRCULATION LIST

* Denotes entities receiving electronic (CD) copies (hard copies are available upon request)

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- 3) Department of Environmental Protection Boston Office
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One Winter Street
Boston, MA 02108
- 4) Department of Environmental Protection, Southeast Regional Office
Attn: MEPA Coordinator
20 Riverside Drive
Lakeville, MA 02347
- 5) Executive Office of Transportation
Attn: Environmental Reviewer
10 Park Plaza, Room 3510
Boston, MA 02116-3969
- 6) Massachusetts Highway Department
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116
- 7) Massachusetts Highway Department, District 5
Attn: MEPA Coordinator
Box 111
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Taunton, MA 02780
- 8) Massachusetts Aeronautics Commission
Attn: MEPA Coordinator
10 Park Plaza, Suite 3510
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- 9) Massachusetts Historical Commission
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- 10) Old Colony Planning Council
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- 11) Southeastern Regional Planning & Economic Development District
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- 12) Town of Carver Board of Selectmen
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- 13) Town of Carver Planning Board
108 Main Street
Carver, MA 02330
- 14) *Richard LaFond, Carver Town Administrator
108 Main Street
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- 15) *Jack Hunter, Carver Town Planner
108 Main Street
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- 16) Town of Carver Conservation Commission
108 Main Street
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- 17) Town of Carver Board of Health
108 Main Street
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- 18) Town of Plymouth Board of Selectmen
11 Lincoln Street
Plymouth, MA 02360

- 19) Town of Plymouth Planning Board
11 Lincoln Street
Plymouth, MA 02360
- 20) *Melissa Arrighi, Acting Town Manager
Town of Plymouth
11 Lincoln Street
Plymouth, MA 02360
- 21) *Lee Hartmann, Director
Department of Planning and Development
Town of Plymouth
11 Lincoln Street
Plymouth, MA 02360
- 22) Town of Plymouth Conservation Commission
11 Lincoln Street
Plymouth, MA 02360
- 23) Town of Plymouth Board of Health
11 Lincoln Street
Plymouth, MA 02360
- 24) Town of Wareham Board of Selectmen
Town Hall
54 Marion Road
Wareham, MA 02571
- 25) Town of Wareham Planning Board
Town Hall
54 Marion Road
Wareham, MA 02571
- 26) *Wareham Community and Economic Development Authority
Town Hall
54 Marion Road
Wareham, MA 02571
- 27) *John Sanguinet, Interim Wareham Town Administrator
Town Hall
54 Marion Road
Wareham, MA 02571

- 28) *Marilyn Whalley, Wareham Community Development Director
Town Hall
54 Marion Road
Wareham, MA 02571
- 29) Town of Wareham Conservation Commission
Town Hall
54 Marion Road
Wareham, MA 02571
- 30) Town of Wareham Board of Health
Town Hall
54 Marion Road
Wareham, MA 02571
- 31) *Michael Martin, Superintendent, Wareham Fire District
2550 Cranberry Highway
Wareham, MA 02571
- 32) Coastal Zone Management
Attn: Project Review Coordinator
251 Causeway Street, Suite 800
Boston, MA 02114
- 33) Division of Marine Fisheries (South Shore)
Attn: Environmental Reviewer
838 South Rodney French Boulevard
New Bedford, MA 02744
- 34) Department of Agricultural Resources
Attn: MEPA Coordinator
16 West Experiment Station
University of Massachusetts
Amherst, MA 01003
- 35) Natural Heritage and Endangered Species Program
Attn: Thomas French
Commonwealth of Massachusetts
Route 135
Westborough, MA 01581

- 36) Massachusetts Bay Transit Authority
Attn: MEPA Coordinator
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- 37) *Wayne Klockner, The Nature Conservancy
205 Portland Street, Suite 400
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- 38) *Jim Munise, Chairman, Wareham Land Trust
P.O. Box 718
Wareham, MA 02571
- 39) *Marie Oliva, Cape Cod Canal Region Chamber of Commerce
70 Main Street
Buzzards Bay, MA 02532-3221
- 40) *Plymouth Area Chamber of Commerce
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10 Cordage Park Circle
Suite 231
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- 41) *Mark Rasmussen, Executive Director Coalition for Buzzards Bay
620 Belleville Avenue
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- 42) *Korrin N. Petersen, Esq., Advocacy Director, Coalition for Buzzards Bay
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- 43) *E. Heidi Ricci, Senior Policy Analyst, Mass Audubon
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- 44) *Robert Wilber, Director of Land Protection, Mass Audubon
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- 45) *David Belluche
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- 46) Plymouth Public Library
132 South Street
Plymouth, MA 02360
- 47) Wareham Free Library
59 Marion Road
Wareham, MA 02571
- 48) Carver Public Library
2 Meadowbrook Way
Carver, MA 02330
- 49) *Sarah Hewins
Plymouth Carver Aquifer Advisory Committee
108 Main Street
Carver, MA 02330
- 50) *Beth Labonte
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352 Turnpike Road
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- 51) *Jed Cornock
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- 52) *Nancy Seidman
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- 53) *Meg Lusardi
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- 54) *Ron Lyberger
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- 55) *Helen Hapgood
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- 56) *Oliver H. Durrell, III
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- 57) *Bob O'Connor
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- 58) *Miles Mechanical Incorporated
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- 59) *Frank Germano
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- 60) *Adam Recchia
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- 61) *David Gould, Environmental Resources Manager
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- 62) *Richard Chretien, Massachusetts Department of Environmental Protection, Bureau of
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- 63) *Valerie Massard, Senior Planner
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- 64) *Erin Kinahan
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- 66) *Robb Johnson
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- 67) *Jean Connaughton
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- 68) *Ted DuMoulin
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20 Over Jordan Road
Wareham, MA 02571
- 69) *Brenda Sampson
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54 Marion Road
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- 70) *Joe Costa, Buzzards Bay National Estuary Program
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- 71) *Robert Gregory, Massachusetts Highway Department, District 5
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- 72) *Dave Janik, Massachusetts Coastal Zone Management
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- 73) *Frank Mezzacappa, Massachusetts Department of Environmental Protection
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- 74) *Charles Kluebek
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54 Marion Road
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- 75) *Elizabeth Pezzoli
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- 76) *Jen Viveiros, Massachusetts Department of Environmental Protection
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- 77) *Edward Pacewicz
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- 78) *Karen Lombard
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- 79) *Anthony Scarsciotti
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- 80) *Brenda Eckstrom
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- 81) *Paul Diodati, Division of Marine Fisheries
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- 83) *Ticia Weare
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- 84) *Stephen Smith, Southeastern Regional Planning & Economic Development District
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- 85) *Nicole Hayes
Allen & Major Associates, Inc.
40 North Main Street
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- 86) *Jeffrey LaFleur
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- 87) *Steve Urbon
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- 88) *Kerri Murphy
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- 89) *Matthew R. Bruce
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2502 Cranberry Highway
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- 90) *Lisa Bindas and Jaci Barnett
91 Maple Spring Road
Wareham, MA 02571
- 91) *Steve McDonough & Gabrielle Lemond
104 Maple Springs Road
Wareham, MA 02571
- 92) *Kevin W. Barrett
Wareham Ford
2628 Cranberry Highway
Wareham, MA 02571
- 93) *Brenda & Phillip Dalrymple
93 Maple Springs Road
Wareham, MA 02571
- 94) *Craig Weston
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17 Meadow Street
Carver, MA 02330
- 95) *Robert Conway
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c/o A.D. Makepeace Company
158 Tihonet Road
Wareham, MA 02571
- 96) *James Nauen
Carver Conservation Commission
15 Old Main Street
Carver, MA 02330
- 97) *Dick Ward
Town of Carver Board of Selectmen
24 West Street
Carver, MA 02330

- 98) *M. Jane Donahue
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- 99) *Bill Lockwood
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- 100) *Dennis Lassige
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- 101) *Ryan Richards
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- 102) *Nancy Savoie, Town Planner
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- 103) *Frank Kowzic
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- 104) *Sandy Slavin
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- 105) *Dave Walters
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- 106) *Chris Reilly, Director
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Wareham, MA 02571
- 107) *Casey Shetterly
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- 108) *John Franey
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Carver, MA 02330
- 109) Energy Facilities Siting Board
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Boston, MA 02110
- 110) Division of Energy Resources
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