CBL: 152-B-1

FOLDER NAME: Traffic Impact Study 11/05

PROJECT: Morrills Crossing [redacted]

ADDRESS: 33 Allen Avenue

Section 7 – Traffic Impact and Access Study

Morrill's Crossing

Portland, Maine

Prepared for **Morrill's Corner, LLC**

Prepared by **VHB/Vanasse Hangen Brustlin, Inc.**
Transportation, Land Development, Environmental Services
101 Walnut Street
P.O. Box 9151
Watertown, Massachusetts 02472
617 924 1770

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Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has been retained by Morrill's Corner, LLC to evaluate the traffic impacts associated with the proposed development of a mixed-use, shopping and residential community located on a largely vacant site on Allen Avenue in Portland. Currently, the site serves as the home of Bruno's restaurant and Portland Boxing, along with several vacant and run-down buildings. VHB has evaluated the existing traffic operations in the area, assessed both the short-term and long-term impacts of the proposed development program, and has identified specific roadway improvements necessary to accommodate both existing and future traffic growth in the area. In addition to physical roadway improvements, specific traffic demand management (TDM) actions are also identified to minimize the impact of motorized vehicles on the area roadway network and to enhance the pedestrian environment throughout the Morrill's Corner area.

This traffic impact and access study serves as "Section 7" of the Traffic Movement Permit application and was prepared in accordance with the Maine Department of Transportation (Maine DOT) and City of Portland's traffic guidelines and in cooperation with the City of Portland's Department of Public Works.

The Site and Its Environment

The site encompasses approximately 20.2 acres of disturbed, but generally undeveloped land located off of Allen Avenue. Currently, the site contains an existing and operational restaurant and athletic boxing club. The site was recently rezoned to permit the proposed development in November of 2004.

Access to the site is proposed via a signalized intersection with Allen Avenue. A one-way (entering) public vehicle access between the abutting neighborhood and the project site is provided as part of this development proposal along with numerous pedestrian connections.

Project Description

The proposed development is located on a site bounded by residential properties to the north (including the 'paper street' known as Princeton Street), Allen Avenue to the west, the Guilford railroad line to the south, and industrial properties to the east. The location of the redevelopment is in the heart of the Morrill's Corner area in the western portion of the City of Portland, Maine and is shown in Figure 1. In general, the proposed project involves the construction of approximately 134,030 sf of new retail space, 45 units of residential properties, along with other supporting uses that are intended to compliment the primary retail uses proposed for the site.

- 65,821-sf supermarket (with an additional 5,624 sf of non-sales mezzanine space)
- 63,765 sf of additional retail
- 23 apartment units
- 20 townhouses
- 2 single-family houses
- 15,462 sf of additional office space
- 15,090 sf of boxing club space (with an additional 11,922 sf of ancillary space)
- 1 multi-purpose field

It should be noted that the site is located within the City of Portland's Urban Compact Zone and, therefore, the City of Portland has delegated review authority of this traffic study. At the request of the City and Maine DOT, a copy of this report will also be forwarded to the Maine DOT for informational purposes.

As part of the new development detailed above, the existing athletic boxing club currently located on the site will be relocated to a new facility in the rear of the site. The existing 3,500-sf Bruno's restaurant and its 3,500 sf of second story office space will also remain on the site in its current location with a small (455-sf) kitchen expansion included. The bingo hall, which previously sat up to 500 participants on a nightly basis, has ceased to operate on the site[1].

The renovated boxing club space will serve to enhance these current uses and will provide improved facilities for users. Specifically, the new building will provide state-of-the-art athletic facilities for the boxing club and office space for day-to-day operations. It is envisioned that the club will host boxing matches, from time to time, as it currently does. No increase in membership enrollment is proposed at the club, although some consideration has been given to the likely increase in support staff (trainers, maintenance staff, etc.) in the preparation of this traffic study.

[1] Although the Bingo Hall has ceased to operate on the site, it was operational when the traffic counts (discussed later in this report) were conducted.

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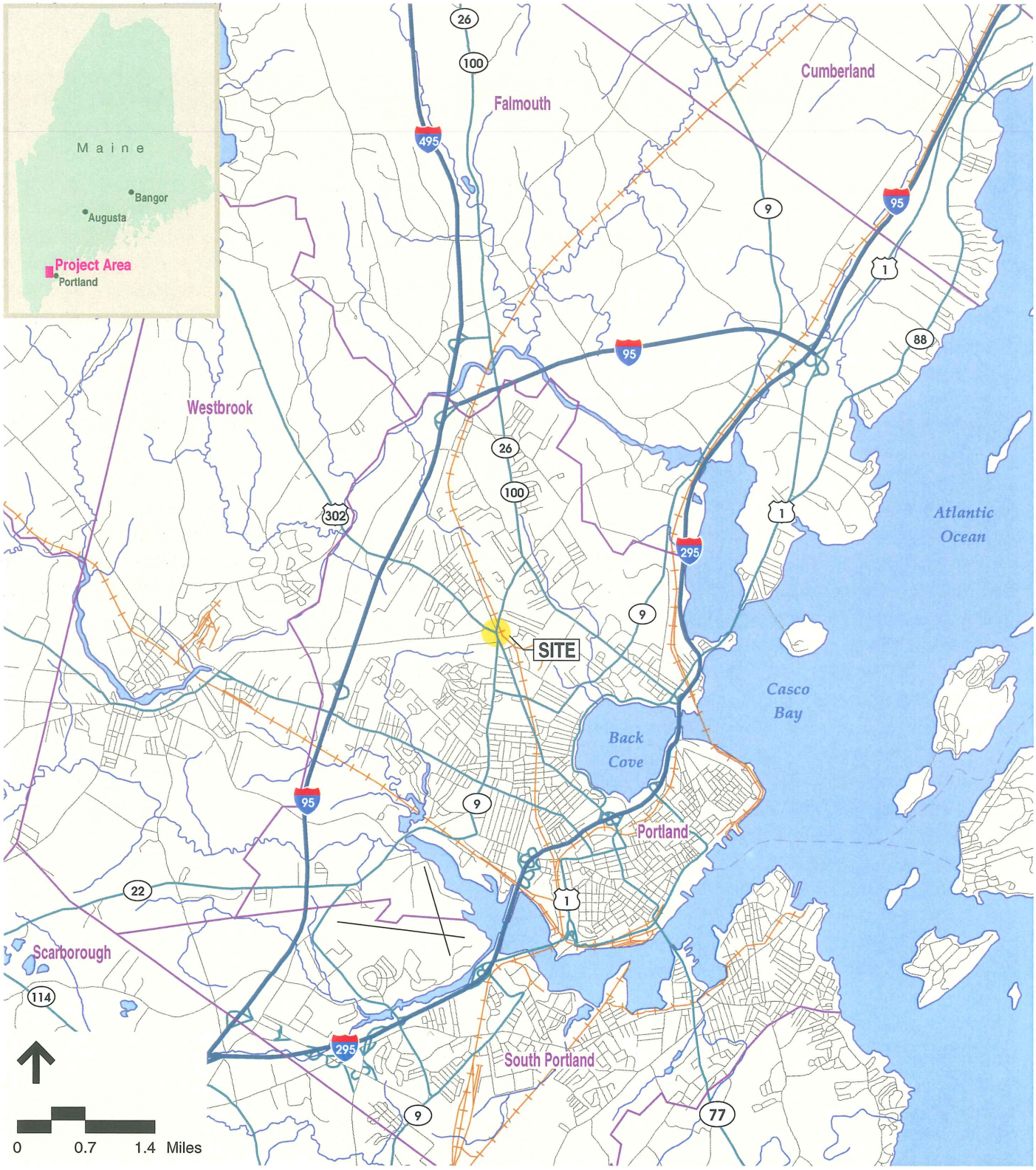

Site Location Map Figure 1

Site Access and Parking

Currently, the site provides several, un-striped parking spaces dispersed around the property to support the varied existing uses. With the proposed redevelopment of the site, approximately 666 parking spaces are planned to support the proposed development program. A conceptual site development plan is shown in Figure 2. Primary access to the site is proposed to be provided via a new signalized intersection located along Allen Avenue approximately 625 feet north of Forest Avenue. To facilitate signalized access at this intersection, the proposed traffic signal will be coordinated with the existing traffic signal system at the Morrill's Corner intersections and the nearby at-grade railroad crossing.

A secondary access to the site is also proposed via a one-way connection into the site from Morrill Street. This access will provide opportunities for residents of the Woodlawn Avenue neighborhood to:

- Access the site without having to conduct a series of left-turns onto Allen Avenue and at the site driveway, and
- Gain access to the project's signalized driveway, thereby providing community members a convenient opportunity to turn left onto Allen Avenue under the control of a traffic signal.

It is important to note that no vehicular access from the site directly into the neighborhood is proposed anywhere on the site.

Study Methodology

As this project is anticipated to generate more than 100 passenger car equivalents (PCEs) during the peak hour of operation, the proponent is required to submit a Traffic Movement Permit application with the Maine DOT. In this case, the City of Portland has delegated review authority over this project and has stated their intention to be the permit granting authority. With this in mind, this traffic study has been developed in conformance with these requirements.

On Thursday, September 15, 2005, the City of Portland conducted a Scoping Meeting to review Sections 1-6 of the Traffic Movement Permit application. This study constitutes Section 7 of the Traffic Movement Permit application.

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Figure 2 November 2005

Conceptual Site Development Plan

Basic Traffic Study Information

In order to effectively present and evaluate the traffic impacts of this project, this traffic assessment has been conducted in three stages. The first stage involved conducting an assessment of existing traffic conditions within the project area, including an inventory of existing roadway geometry; in-field observations of traffic flow along area roadways, daily and peak period traffic counts at key intersections; and an in-depth safety audit of the study area intersections.

The second stage of the study established the framework for evaluating the transportation impacts of the proposed project. Specific travel demand forecasts for the project were assessed along with future traffic demands on the study area roadways due to projected background traffic growth and other proposed area development that will occur, independent of the proposed development. The year 2007, the expected completion date of the project, was selected as the design year for analysis for the preparation of this traffic impact and access study. The traffic analysis conducted in the second phase identifies both existing and projected future roadway capacities in addition to pertinent traffic safety issues.

The third and final stage involved conducting traffic analyses to identify both existing and projected future roadway capacity and demand. From this information, the likely traffic impacts associated with the project can be determined. This analysis was used as the basis for determining if any roadway improvements or measures would be required in support of the site-generated traffic.

2

Existing Conditions

Effective evaluation of the transportation impacts associated with the proposed redevelopment project first requires a thorough understanding of the existing transportation system in the project study area. In order to determine a basis for evaluating the transportation impacts of the proposed redevelopment, the existing roadway system and traffic flow characteristics in the vicinity of the site were reviewed in detail. The existing transportation conditions in the study area include an inventory of roadway geometry and traffic control devices, the collection of daily and peak hour traffic volumes and observations of traffic flow, and a review of recent traffic safety data within the study area. A summary of the pertinent information is presented in this section.

Study Area

The study area includes those locations that could be affected by the proposed project and was determined based on discussions with the City of Portland at a scoping meeting held on September 15, 2005. At this meeting, the City Staff selected the following study area intersections[2] based on a review of the Maine DOT criteria and in review of the likely impacted traffic locations. Based on this assessment, the study area generally includes the following roadways serving the area:

- Forest Avenue
- Stevens Avenue
- Read Street
- Bell Street
- Allen Avenue
- Warren Avenue
- Washington Avenue
- Walton Street

[2] Traffic Movement Permit; State of Maine, Department of Transportation, Traffic Engineering Division; April 2000.

Within these boundaries, the specific study area encompasses twelve specific intersections (six signalized and six unsignalized), and are identified below:

- Forest Avenue at Newton Street/School Driveway (unsignalized)
- Forest Avenue at Warren Avenue (signalized)
- Forest Avenue at Allen Avenue (signalized)
- Forest Avenue at Stevens Avenue/Bishop Street (signalized)
- Forest Avenue at Morrill Street (unsignalized)
- Forest Avenue at Read Street/Adelaide Street (signalized)
- Forest Avenue at Bell Street (unsignalized)
- Allen Avenue at Washington Avenue (signalized)
- Allen Avenue at Woodlawn Avenue (unsignalized)
- Allen Avenue at Northfield Green Drive/Plymouth Street (unsignalized)
- Warren Avenue at Hick Street/driveway (unsignalized)
- the future intersection of Allen Avenue at proposed site driveway (signalized)

In selecting these locations, VHB has conducted a detailed evaluation of the existing conditions that consisted of an inventory of the traffic control; roadway, driveway, and intersection geometrics; the collection of daily and peak period traffic volumes; and a review of recent vehicle crash history. In addition, observations of general traffic flow at each location were also noted along with vehicle queues. The study area intersections are shown graphically in Figure 3.

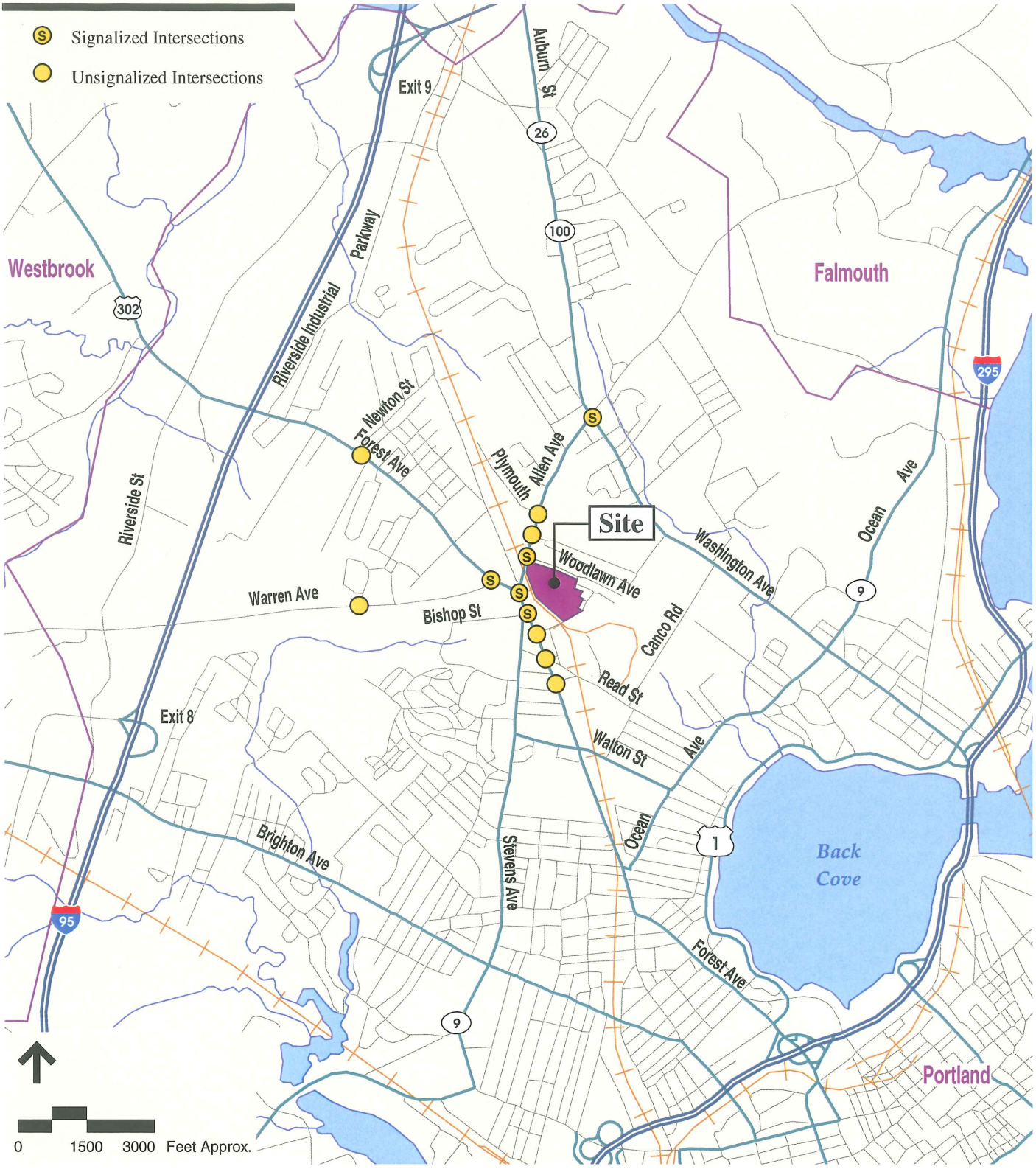
Traffic Control and Lane Use

VHB conducted an inventory of the existing traffic control and roadway geometry along the major travel routes and at the key intersections within the study area. Figure 4 shows the traffic control and observed lane uses at each study area intersection. Detailed descriptions of these roadways and intersections are provided in the Appendix.

Roadway Jurisdiction

According to Maine DOT roadway classification data, the roadways in the immediate vicinity of the project site are comprised of primary state-owned roadways and local urban/secondary roadways. Figure 5 illustrates the local roadway network and corresponding jurisdiction in the area.

As shown, Route 302/100 (Forest Avenue) is a primary, state-owned roadway that runs to and from the north/northwest and south within the vicinity of the site. The posted speed limit in this area is 35 miles per hour (mph). Similarly, Allen Avenue (Route 100), from Forest Avenue to Washington Avenue, Auburn Street, and Brighton



Study Area Intersections Figure 3

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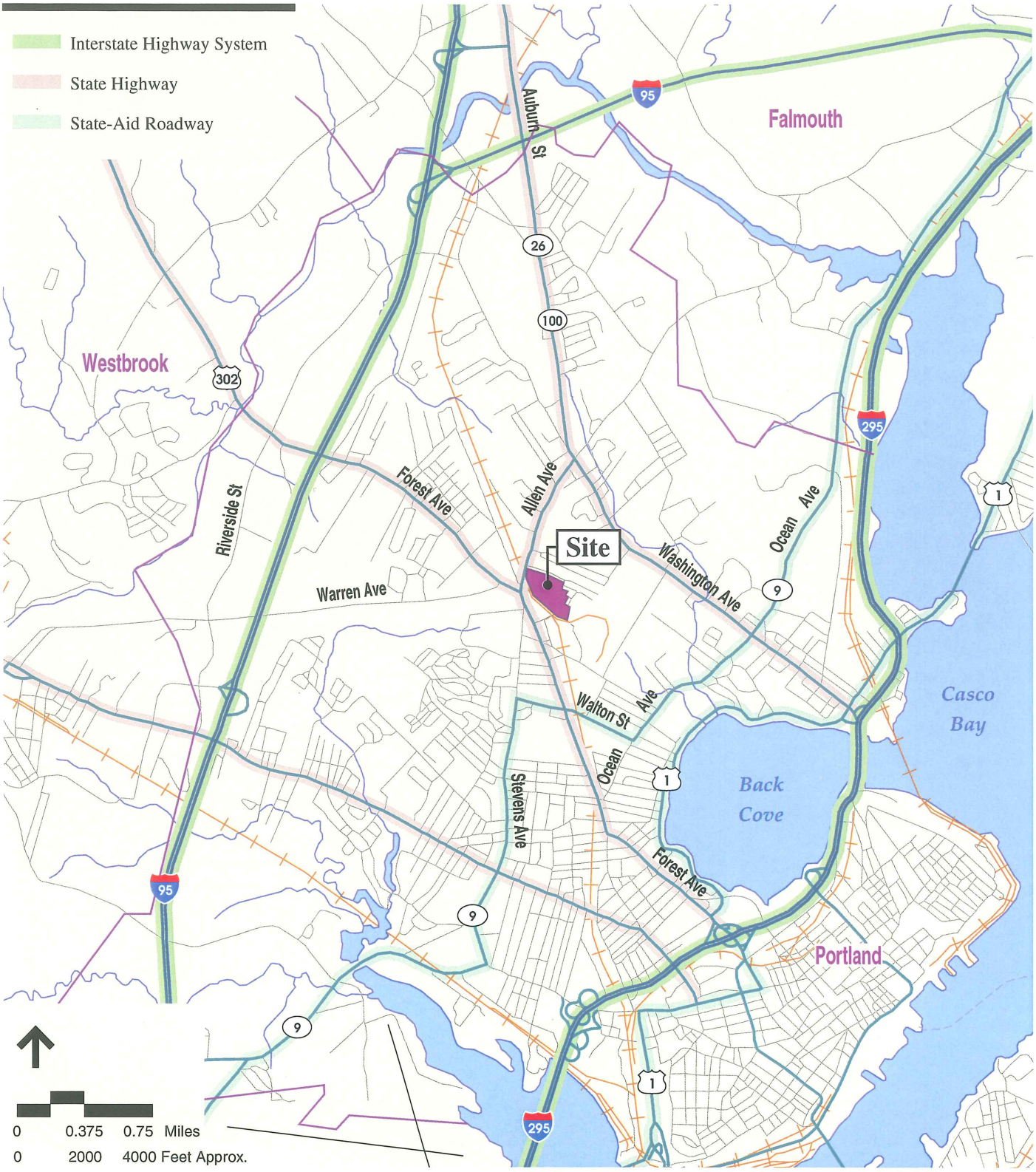
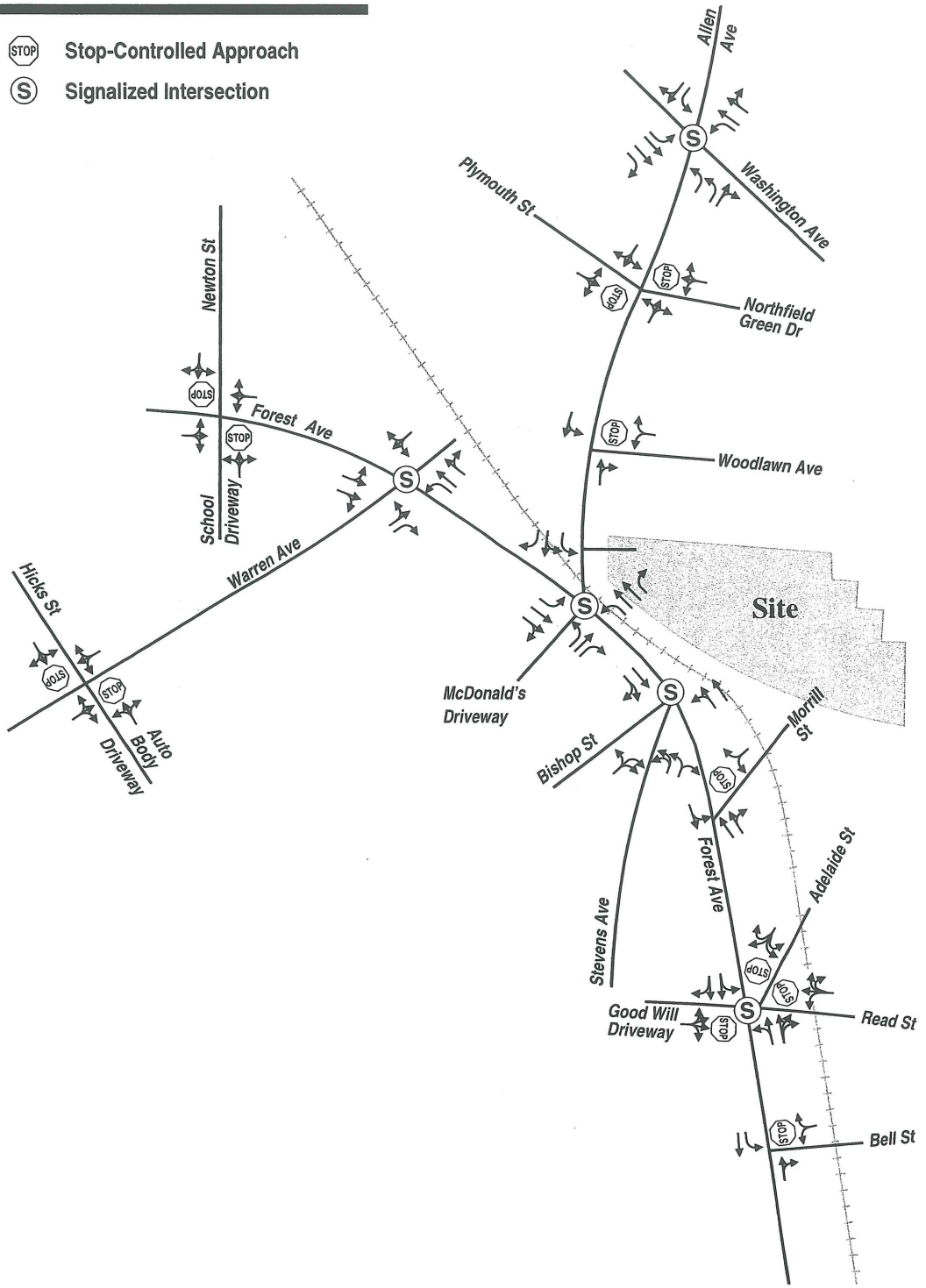


Roadway Jurisdiction Map Figure 4



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Study Area Traffic Control and Observed Lane Use

Figure 5

Avenue are also primary, state-owned and maintained roadways. Stevens Avenue and Ocean Avenue are state-aided local roadways. The remaining roadways that fall within the study area are classified as local urban and/or secondary roadways. These roadways include Woodlawn Avenue, Warren Avenue, Bishop Street, Morrill Street, and Walton Street.

Existing Traffic Volumes

Traffic movement data for the study area were initially collected by VHB in May and June 2004. Because of ongoing construction at the Allen's Corner area of the City during these initial observations, VHB conducted extensive observations of traffic flow in October 2004 along with additional "spot counts" in November 2005 to confirm that the October 2004 data were still valid.

As part of this effort, manual turning movement and classification (TMC) counts were conducted at the twelve study area intersections during peak retail shopping activity periods, which include the weekday evening peak period (4:00 PM - 6:00 PM) and during the Saturday midday peak period (11:00 AM - 2:00 PM). In addition to the TMCs, automatic traffic recorder (ATR) counts were conducted at six locations in May and June of 2004 and supplemented with counts at two locations in November 2005. The TMC and ATR count data is included in the Appendix and the ATR data is summarized in Table 1.

Table 1
Summary of Observed 2004 Traffic Volumes

	Daily		Weekday Evening Peak Hour			Saturday Midday Peak Hour		
Location	Weekday (vpd) [a]	Saturday (vpd)	Volume (vph) [b]	'K' Factor [c]	Predominant Flow	Volume (vph)	'K' Factor	Predominant Flow
Forest Avenue, northwest of Allen Avenue	33,600	28,800	2,490	7.4%	54% WB	2,200	7.6%	50% WB
Stevens Avenue, south of Forest Avenue	11,500	9,300	910	7.9%	52% SB	760	8.2%	53% NB
Warren Avenue, south of Forest Avenue	15,400	12,200	1,070	6.9%	54% NB	1,100	9.0%	53% NB
Allen Avenue, south of Plymouth Street	20,700	19,200	1,460	7.1%	51% SB	1,480	7.7%	54% SB
Forest Avenue, east of Avalon Road	22,900	17,700	1,850	8.1%	59% WB	1,200	6.8%	53% WB
Forest Avenue, southeast of Allen Avenue	35,900	27,600	2,700	7.5%	61% WB	1,990	7.2%	53% NB

Source: automatic traffic recorder (ATR) counts conducted by VHB, Inc. in May and June 2004
a daily traffic expressed in vehicles per day
b peak hour volumes expressed in vehicles per hour
c percent of daily traffic that occurs during the peak hour
WB = Westbound; SB = Southbound; NB = Northbound
Note: Peak hours do not necessarily coincide with the peak hours of the turning movement counts shown on the figures.

As shown in Table 1, the average 2004 weekday daily traffic volume along Allen Avenue in front of the proposed site is approximately 20,700 vehicles per weekday. During a Saturday, this volume drops to approximately 19,200 vehicles per day along the roadway.

Forest Avenue entering the Morrill's Corner area carries approximately 35,900 daily vehicles during a weekday with approximately 27,600 Saturday daily vehicles.

As would be expected of a commuter route between the City of Portland and the surrounding western suburban area, approximately 61 percent of the traffic is traveling outbound from the City during the evening commuter peak hours.

Historical Traffic Volumes

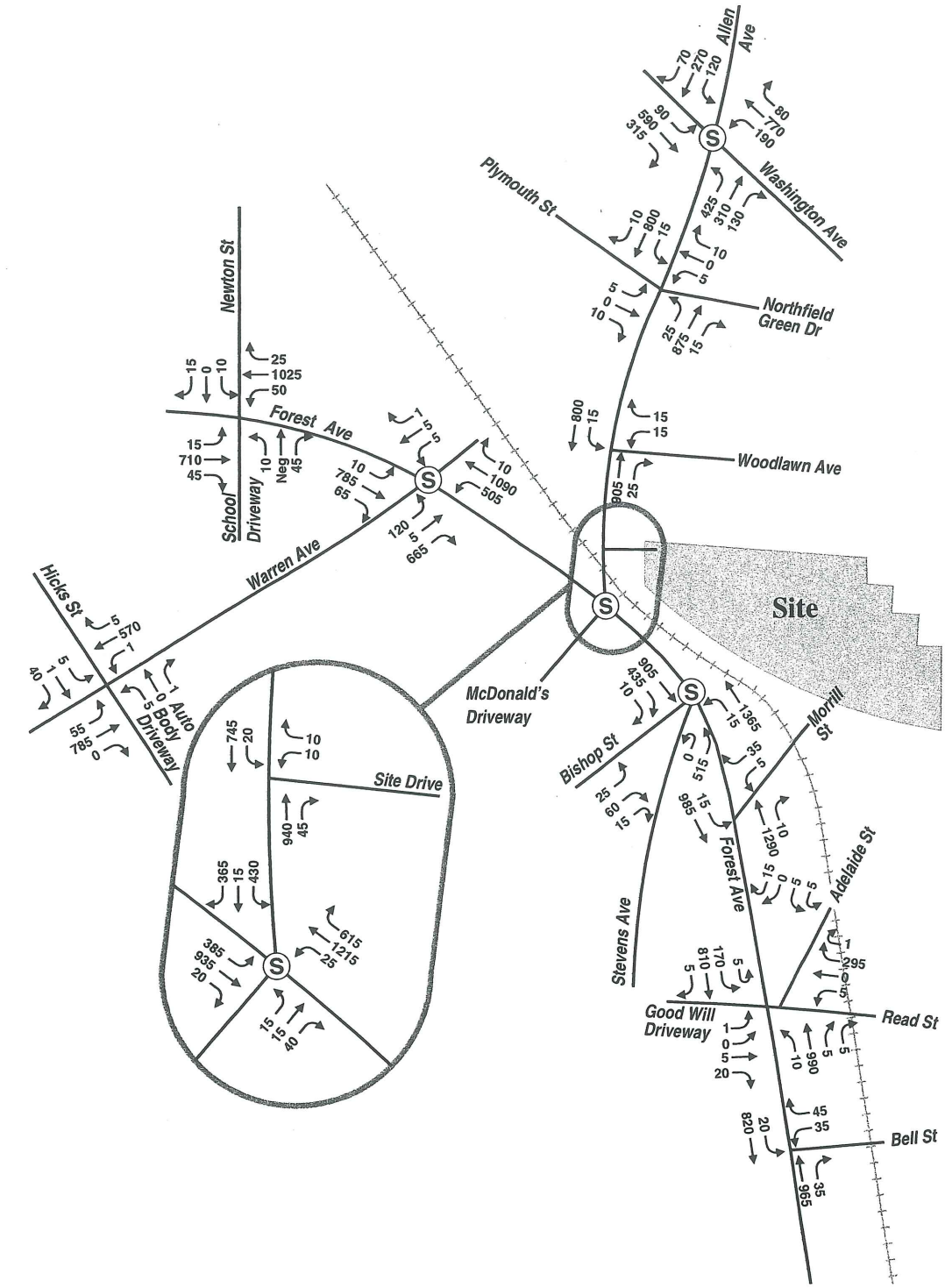
Recognizing that the original traffic counts were conducted in 2004 and that traffic conditions may have changed since then, VHB conducted two ATR "spot counts" in November 2005 to determine if traffic volumes in the area have significantly changed. VHB placed ATR counts on Forest Avenue, northwest of Allen Avenue and on Allen Avenue, south of Plymouth Street, for a period of five days. These traffic counts were then compared to counts conducted in June 2004 to determine what differences, if any, occurred between the dates of these two observations. The results of this comparison are provided in the Table 2 and indicate that daily and peak hour volumes have decreased or remained the same over the past year and a half along these two corridors.

Table 2
Historical Traffic Volumes Comparison

Location	Day	June 2004 Daily [a]	June 2004 Peak Hour [b]	November 2005 Daily	November 2005 Peak Hour
Forest Avenue, northwest of Allen Avenue	Friday	34,419	2,566	30,600	2,327
	Saturday	28,762	2,198	26,886	2,187
Allen Avenue, south of Plymouth Street	Friday	21,273	1,478	18,919	1,440
	Saturday	19,181	1,468	17,457	1,485

Source: automatic traffic recorder (ATR) counts conducted by VHB, Inc. in June 2004 and November 2005
a daily traffic expressed in vehicles per day
b peak hour volumes expressed in vehicles per hour

As shown in Table 2, daily traffic volumes along both Forest Avenue and Allen Avenue have decreased substantially between June 2004 and November 2005. Interestingly, the peak hour volumes have either remained unchanged or have only decreased slightly. Ultimately, the traffic counts performed in 2004 are consistent with or higher than current conditions along both of these roadway segments. For this reason, the data collected in 2004 was assumed to represent a worst-case condition and was, therefore, used in the preparation of this study.



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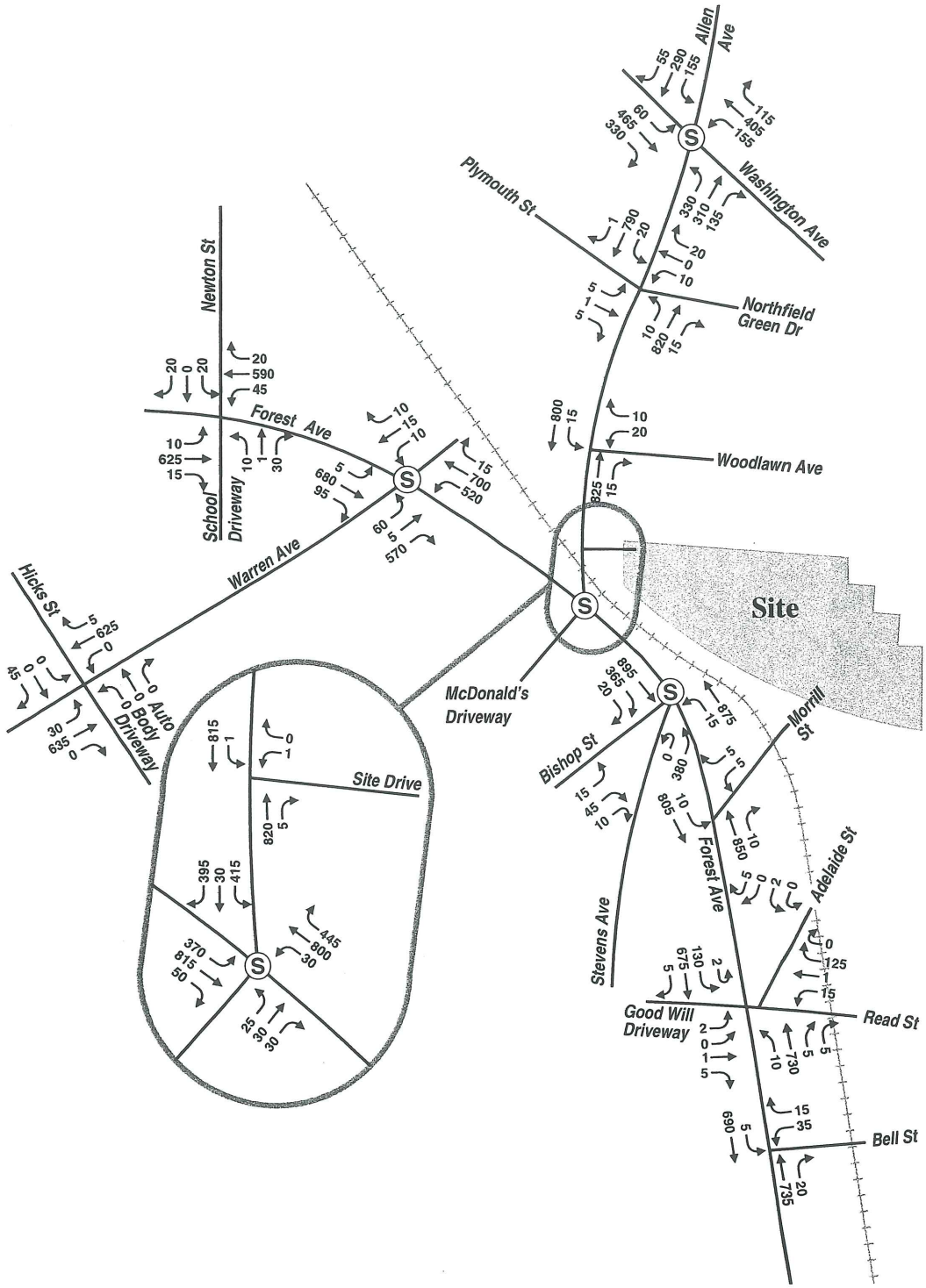
2004 Existing Weekday Evening Design Hour Traffic Volumes

Figure 6



Not to Scale

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2004 Existing Saturday Midday Design Hour Traffic Volumes

Figure 7

Pedestrian and Bicycle Accommodations

On numerous occasions, representatives from Morrill's Corner, LLC and VHB observed and documented the existing, scattered pedestrian amenities throughout the study area. These amenities are in various conditions serving the needs of the businesses and residential properties in the Morrill's Corner area. Most sidewalks, where provided, are approximately five to seven feet wide through the Forest Avenue/Stevens Avenue area. Immediately adjacent to the site, it was noted at a few intersections that wheel-chair ramps and pedestrian push buttons were either nonexistent or did not meet the Americans with Disabilities Act (ADA) standards. In some locations, the pedestrian push buttons did not function, thereby not providing a signal-protected crossing for pedestrians attempting to use that crosswalk.

Additionally, throughout this process, it was noted that there are several areas where school bus and METRO transit bus service pick up locations are located on the opposite side of the roadway from the residential neighborhoods and are not very functional.

Pedestrian activity was noted to be minimal during the majority of the day, however the morning and evening peak commuter hours did exhibit some volume of pedestrian activity throughout the Morrill's Corner area as people were waiting for commuter/school buses or were walking to or from the schools and businesses along Stevens Avenue. In general, the current pedestrian accommodations would be benefited by an upgrade of some pedestrian amenities within the area. Chapter 5 (Transportation Improvements) suggests a number of area-wide improvements aimed at upgrading the current pedestrian and transit services to the region.

Railroad

The current site driveway access on Allen Avenue is located adjacent to the existing grade crossing of Allen Avenue and a mainline track owned by Guilford Rail Systems (GRS). According to a representative from GRS, activity along this track consists of approximately four trains per day on average. As part of this traffic study, VHB monitored train activity crossing Allen Avenue for a one-week period between October 14, 2004 and October 21, 2004[4]. During these observation periods, an average of four trains were observed crossing Allen Avenue during the daylight hours of a typical weekday. Only once was a train observed to come through the study area during peak commuter hour (during the morning peak on Tuesday, October 19, 2004). On no occasion was train traffic documented crossing Allen Avenue during the traditional evening commuter peak hours (between 3:00 PM and 6:00 PM).

[4] Due to equipment issues, no detailed data on train crossings was able to be collected and provided to the City as part this traffic study. A follow-up memorandum documenting the current train crossing tendencies will be forwarded to City when the equipment has be repaired.

The current driveway for the proposed development is located directly north of the existing at-grade crossing. In VHB's observations of roadway conditions, it was noted that the current configuration of the two-gated grade crossing does not protect the driveway exits from the existing site making a left turn onto the crossing during a train movement, even when the gates are down.

In addition to the Allen Avenue crossing, there is an at-grade crossing over Forest Avenue between Allen Avenue and Stevens Avenue. This crossing, while rarely used, reduces the efficiency of the intersection operations due to the tracks being in the middle of the street.

Suggestions are provided in Chapter 5 (Transportation Improvements) aimed at improving both the safety of the railroad crossings as well as their inter-coordination with the current and proposed traffic signals in the area.

Public Transportation

The Greater Portland Transit District, also known as the METRO service, currently provides local bus service within Portland, Westbrook, and Gorham. Four of the eight bus routes provided are within the project's study area. All of the bus routes offer service to and from Downtown Portland. Weekday hours of operation are usually from 6:00 AM to 10:00 PM, except for certain routes when service runs until midnight. The following routes are currently operating within the project study area:

- **Bus Route #2 (Riverton)** runs along Forest Avenue from Riverton Park and Pride's Corner in Westbrook to the Metro Pulse Area in downtown Portland. This bus route runs on 15-minute headways.

- **Bus Route #3 (North Deering)** runs in front of the project site along Auburn Street, Allen Avenue, Stevens Avenue, and Congress Street. This bus route runs approximately every 30 minutes.

- **Bus Route #4 (Westbrook – Exit 80)** travels from Main Street in Westbrook, Maine to Downtown Portland via Brighton Avenue and/or Woodford Street. The bus run varies from 20 to 30 minutes, depending on its intended route.

- **Bus Route #6 (North Deering)** travels along Washington Avenue from Lambert Street to downtown Portland. The bus runs are approximately every 30 minutes.

Figure 8 illustrates the above-mentioned bus routes. Suggestions for coordination with the METRO service are made in Chapter 5 (Transportation Improvements) aimed at providing a bus stop within the proposed development site.

Vehicle Crash History

The next step in the evaluation of the existing traffic conditions in the vicinity of the project site is to perform a detailed safety evaluation of the study area locations. This evaluation consisted of compiling and analyzing crash data and reviewing the existing roadway geometry for design deficiencies. Information on crash data and collision diagrams were compiled by Gorrill-Palmer, Inc. and VHB. This data is contained in the Appendix.

Each June, Maine DOT releases crash data inclusive of the previous year's activity. VHB procured the 2004 crash data and supplemented it with data from 2002 and 2003. A summary of the vehicle crashes in the vicinity of the proposed site is presented in Table 3 and illustrated in Figure 9.

Table 3
Vehicular Crash Summary (2002 – 2004)

Intersection	2002 – 2004 Total Crashes	Crash Rate (Actual)	Critical Rate (Expected)	Critical Rate Factor [a]
Forest Avenue at Newton Street	6	0.33	1.08	0.31
Forest Avenue at Warren Avenue	21	0.60	0.96	0.63
Forest Avenue at Allen Avenue	34	0.73	0.92	0.79
Forest Avenue at Stevens Avenue/Bishop Street	39	1.02	0.95	1.07
Forest Avenue at Morrill Street	12	0.47	0.34	1.38
Forest Avenue at Read Street/Adelaide Street	13	0.50	0.34	1.47
Forest Avenue at Bell Street	4	0.17	0.35	0.49
Allen Avenue at Washington Avenue	37	0.95	0.94	1.01
Allen Avenue at Plymouth St/Northfield Green Dr	6	0.29	0.36	0.81
Allen Avenue at Woodlawn Avenue	3	0.14	0.36	0.39

Source: Maine DOT (June 2005)
a (Actual Crash Rate) / (Intersection Critical Rate) = Critical Rate Factor

Of note in Table 3 is the fact that there are four locations that meet the Maine DOT definition of High Crash Locations (they experience a critical rate factor greater than 1.00 and have experienced eight or more collisions over the most recent three-year period). Those locations are:

- Forest Avenue at Stevens Avenue/Bishop Street
- Forest Avenue at Morrill Street
- Forest Avenue at Read Street
- Allen Avenue at Washington Avenue

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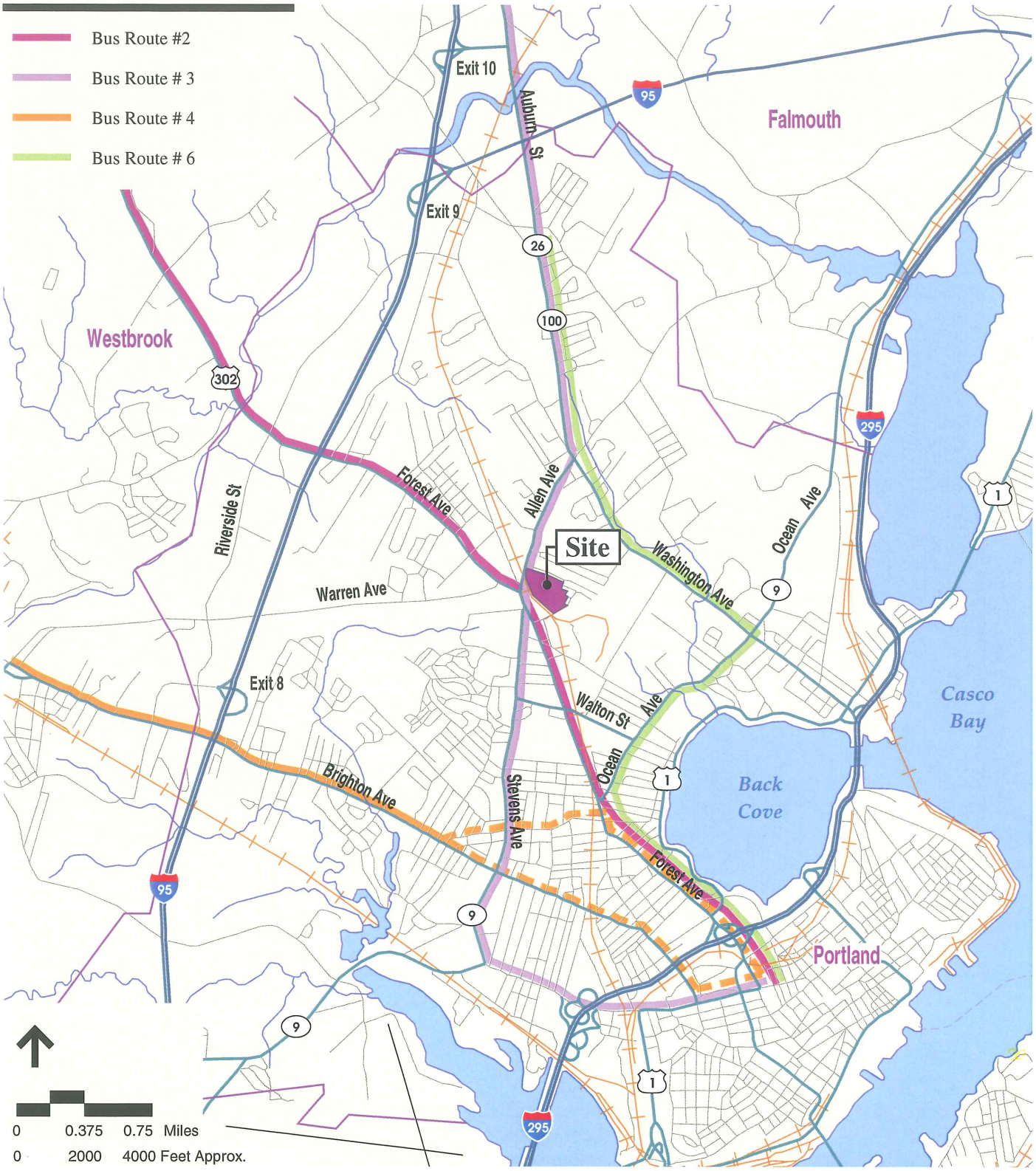
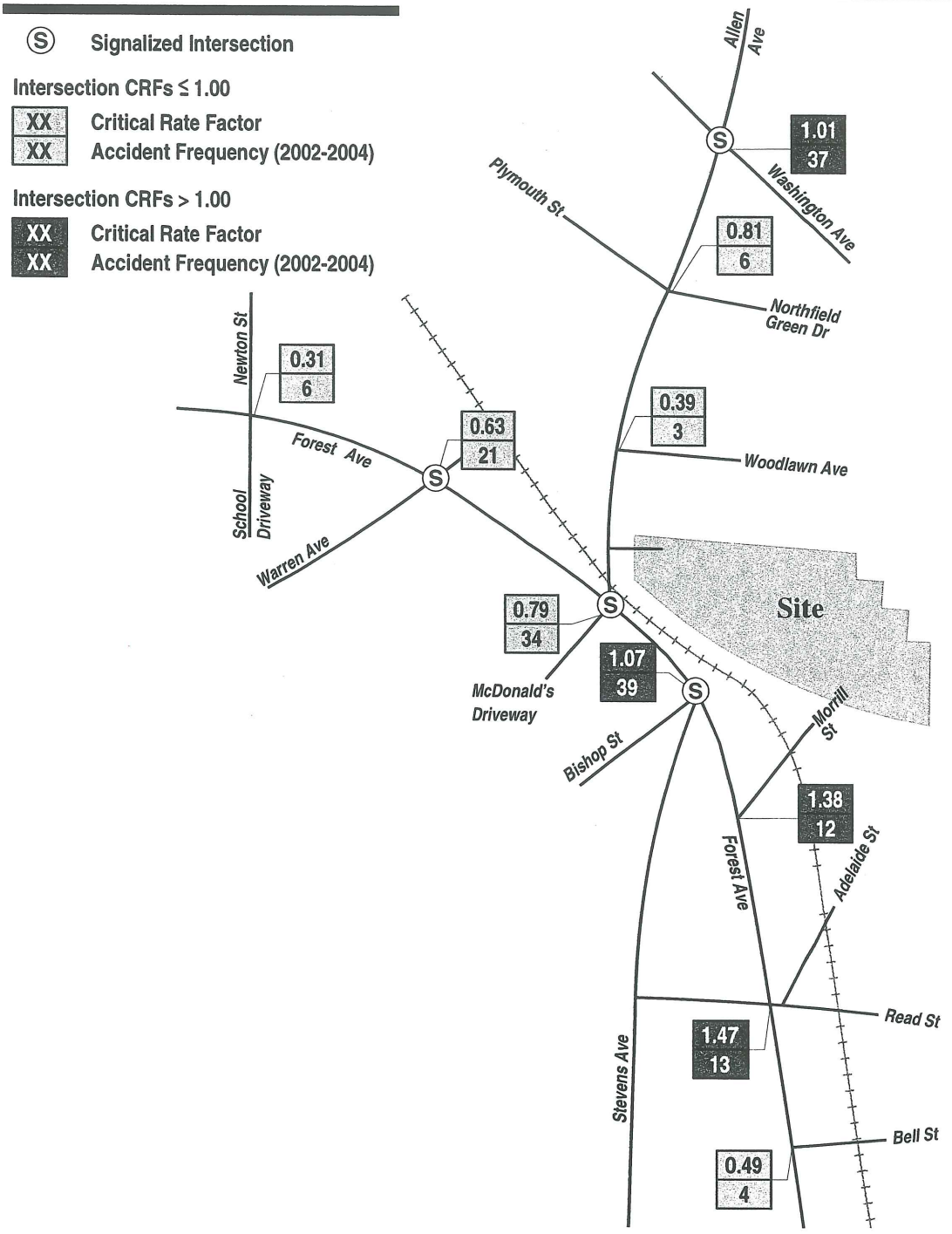


Area Bus Routes Figure 8



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Intersection Vehicle Crash Summary Figure 9

As required by the Maine DOT procedures, vehicle collision diagrams were prepared for each of these locations and a summary discussion is provided in the following section.

Forest Avenue at Stevens/Bishop Street

This intersection has experienced 39 collisions over the past three year period and has a CRF greater than 1.00, qualifying it as a high crash location. The majority of these 39 crashes involved "property damage only" – that is to say nobody was reported as being injured in the incident. Furthermore, many of the crashes were qualified as rear-end and angle-type in nature which are traditionally indicative of congested locations. The traditional countermeasure for these types of conditions is to review the geometry of the intersection to determine if there are any specific flaws inherent in the overall design and, if no flaws are found, to increase the capacity of the intersection through any number of methods. Chapter 5 of this report documents the recommended improvements to this intersection, which include the introduction of additional capacity at this intersection.

Forest Avenue at Morrill Street

This unsignalized intersection has experienced 12 collisions over the past three-year period and has a CRF greater than 1.00 qualifying it as a high crash location per the Maine DOT standards. The majority (seven of 12) of these collisions involved drivers turning into our out of Morrill Street and resulted in drivers being cited for failure to yield to oncoming traffic.

One countermeasure that could be considered at this location would be to restrict the Morrill Street access to right-turn in/out only during peak commuter hours. Alternative means of exiting the Morrill Street area are present through a series of minor streets elsewhere.

Forest Avenue at Read Street/Adelaide Street

Similar to the previous location, this intersection has experienced 13 collisions over the past three year period and has a CRF greater than 1.0. Again, the majority of these collisions (eight of 13) were angle-type collisions involving drivers turning into or out of Read Street.

Allen Avenue at Washington Avenue

Lastly, this intersection has experienced 37 collisions over the previous three-year period and has a CRF over 1.0 which qualifies it as a high crash location according to

the Maine DOT standards. This intersection was recently upgraded as part of a city-sponsored improvement plan for the Allen's Corner area. One of the primary reasons for this upgrade, in addition to increasing its capacity, was to improve the safety of this location. As the results of this crash assessment span the years 2002-2004 and the fact that the improvements were implemented during the summer of 2004, the full benefits of these improvements on the overall safety of the intersection are not yet documented. It is likely that these improvements will serve to reduce the frequency and severity of these historic collisions.

3

Future Conditions

To determine the impacts of the site-generated traffic volumes on the surrounding roadway network, traffic volumes in the study area were projected to the year 2007, which reflects a reasonable projected date of full build out for this project. Independent of the proposed project, volumes on the roadway network under 2007 No-Build (without the project in place) conditions are assumed to include existing traffic, new traffic resulting from background traffic growth, and any traffic resulting from roadway improvements that might adjust traffic patterns through the area. Anticipated site-generated traffic volumes were superimposed upon the 2007 No-Build traffic volume networks to reflect the 2007 Build (with the project in place) conditions within the project study area. The following section provides a discussion of the means and methods used to arrive at these conditions.

Area Roadway Improvements

In addressing future traffic conditions, proposed roadway improvements within the study area were considered. Based on discussions with representatives of the Maine DOT and the City of Portland, there have been two major roadway improvement projects completed in the vicinity of the proposed project site over the past three years. There are also some minor roadway projects in the area being considered that have the potential to affect travel patterns through the Forest Avenue at Read Street and Forest Avenue at Bell Street intersections.

The potential impacts associated with the redevelopment project have been considered within the context of these roadway improvements. A description of the roadway improvements recently completed in the study area and those being considered are provided below.

Morrill's Corner

In the fall of 2003, the Maine DOT, in conjunction with the City of Portland, completed a widening project along a small stretch of Forest Avenue. This project widened Forest Avenue from its former four-lane configuration to a five-lane configuration between the intersections of Forest Avenue at Allen Avenue and Forest Avenue at Warren Avenue. The improvements consisted of widening Forest Avenue to accommodate northbound and southbound exclusive left-turn lanes at Allen Avenue and a northbound exclusive left-turn lane at Warren Avenue. Signal timing and phasing modifications and intersection improvements were also necessary as part of this project.

Allen's Corner

In addition to the completed roadway improvements in the Morrill's Corner area, roadway improvements have recently been completed in the Washington Avenue at Allen Avenue area, more commonly referred to as "Allen's Corner". Improvements at this location included roadway widening, signal upgrades, and pedestrian improvements.

Based on discussions with the city of Portland, the construction for this project was completed in summer 2004.

Forest Avenue at Read Street/Bell Street

The City of Portland has applied for funding through the Biannual Transportation Improvement Program (BTIP) process to widen Forest Avenue from the intersection of Allen Avenue to Bell Street. While currently in the conceptual design stage, this improvement would widen Forest Avenue from its current variable width configuration to a consistent four-lane cross-section from Bell Street to Allen Avenue – essentially serving as a continuation of the previous Forest Avenue improvements completed in 2003 by Maine DOT. In addition to this roadway widening, the improvement would provide signalization of the intersection of Bell Street and Forest Avenue and would convert Read Street to a one-way corridor heading away from Forest Avenue.

No schedule for this improvement is defined at this time, but the project has requested construction funding for Fiscal Year 2007/2008. Due to the uncertainty of this schedule and funding required to advance this effort, no consideration of these improvements was made in the analysis of the roadway network.

Allen Avenue at Plymouth Street

Based on conversations with the City of Portland, consideration is being given to signalizing the intersection of Allen Avenue and Plymouth Street to the north of the project site. At this point in time, no design has been prepared for this upgrade and the signal warrants for the installation of a traffic signal do not appear to be met. VHB has discussed this action with the City and has not anticipated the construction of the signal at this location at this point in time. Should the introduction of a signal at this location become a reality, VHB and/or the City would need to revisit the impacts of this project on this location.

Background Traffic Growth

Traffic growth on area roadways is a function of the expected land development, economic activity, and changes in population demographics. Several methods can be used to estimate this growth. A procedure frequently employed by transportation engineers is to identify estimated traffic generated by planned site-specific developments that would be expected to impact the project study area roadways. An alternative procedure is to estimate an annual percentage increase and apply that increase to study area traffic volumes. For the purpose of this preliminary assessment, both methods were utilized.

Historic Traffic Growth

To determine the average annual traffic growth on study area roadways resulting from regional background growth, historical traffic volumes through the area and a review of the Portland Area Comprehensive Transportation Committee's (PACTS) regional plan update was conducted.

According to the PACTS regional planning model, daily traffic volumes along study area roadways are expected to increase in the area by approximately 0.10 to 0.50 percent per year from 2000 to 2025. Historical traffic volume information previously presented supports this low growth rate with only limited increases in traffic volumes experienced over the past several years, particularly during the peak hour conditions when the majority of the traffic analysis is performed.

Site-Specific Growth

In addition to general historic growth, traffic volumes in the area will be affected by nearby developments. To assess potential growth within the study area,

representatives of the City of Portland and Maine DOT were contacted. Based on these discussions, four specific developments were identified that may influence traffic patterns near the Project site. A discussion of each development follows.

Residential Developments

Two single-family residential subdivisions are proposed on the west side of Allen Avenue. These developments are located generally between Plymouth Street and the railroad tracks along Allen Avenue. The Oak Ridge development consists of 18 single-family homes and the Willow Knoll development consists of 12 single-family homes.

In addition, the construction of one residential subdivision has recently been completed on Harvard and Yale Streets, south of Woodford's Corner. The "Harvard-Yale" development consists of 34 single-family homes, with half of the lots on Harvard Street and half of the lots on Yale Street. Representatives of the City of Portland have indicated that the residents on Harvard Street would be able to access Washington Street only, while those on Yale Street would be able to access Washington Street and Allen Avenue.

Traffic volumes associated with these three developments were estimated and added to the 2007 traffic networks to account for the development's impacts.

Hannaford Supermarket

Finally, an approximately 36,000-sf Hannaford Supermarket was located on the northwest corner of Forest Avenue and Riverside Street, with access/egress driveways on Forest Avenue and Riverside Street. This development recently opened for business but its traffic projections were not included in the counts conducted for this effort. This project is expected to generate between 410 and 430 trips during the weekday evening and Saturday midday peak hours. Although the traffic volumes estimated for the Hannaford project are unlikely to significantly impact the traffic operations within this project's study area, the Hannaford-generated trips were included in the 2007 peak hour traffic networks.

Background Traffic Growth Summary

The previous information notes that, through discussions with area planners and engineers, that there will be only moderate additional vehicles added to the area roadway network over the next two years. In order to account for some traffic growth in the area and to account for the traffic volumes resulting from the various unknown residential developments in the region, ***a conservative one percent per year*** growth

rate was applied to the 2004 Existing traffic volumes. This represents an overall total growth rate in traffic of three percent over the existing volumes. The traffic volume networks for the 2007 No-Build Condition are illustrated in Figures 10 and 11.

Trip Generation

To evaluate the impacts of the proposed development on the study area network, site-generated traffic was estimated and distributed through the study area roadways and intersections.

It is important to note that the development of a mixed use project is a relatively unique land-use in the transportation industry. For this reason, the policies and procedures of the Institute of Transportation Engineers (ITE) were employed in determining the overall traffic impacts of this project. The following section provides a detailed description of the approach to the traffic generation methodologies used in this study.

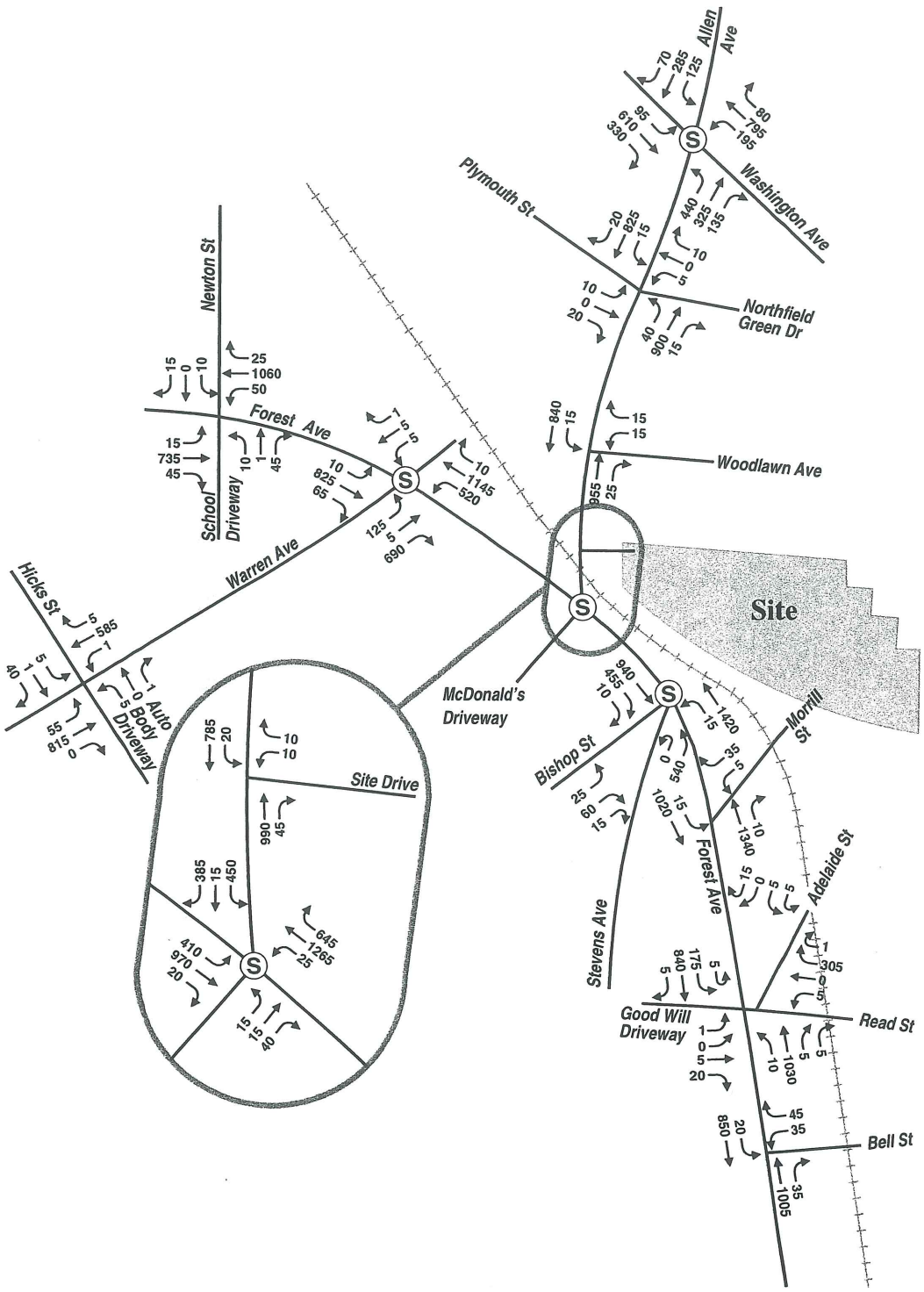
As stated the proposed project involves the construction of 134,030 sf of new retail space, 15,462 sf of additional office space, 45 units of residential properties, a small restaurant expansion, a boxing club expansion, and one multi-purpose field on the site. As noted previously, the existing other uses on the site (the Bruno's Restaurant and associated office space along with the boxing club) will remain within the site plan. The Portland Bingo hall, which once sat up to 500 patrons per night, is no longer on the site.

To evaluate the impact of this development, site-generated traffic was estimated and distributed through the roadway network.

Trip Generation Methodology

To provide an estimate of the number of trips that could be generated by the site with the existing uses as well as trips that can be expected in the future by the proposed retail development, VHB reviewed the trip generation rates published by the Institute of Transportation Engineers (ITE)[5]. This information provides a standardized estimate of the traffic that specific land uses will likely generate during a typical weekday, Saturday and/or peak hour condition.

[5] Trip Generation - Seventh Edition; Institute of Transportation Engineers (ITE); Washington, DC; 2003.



Not to Scale

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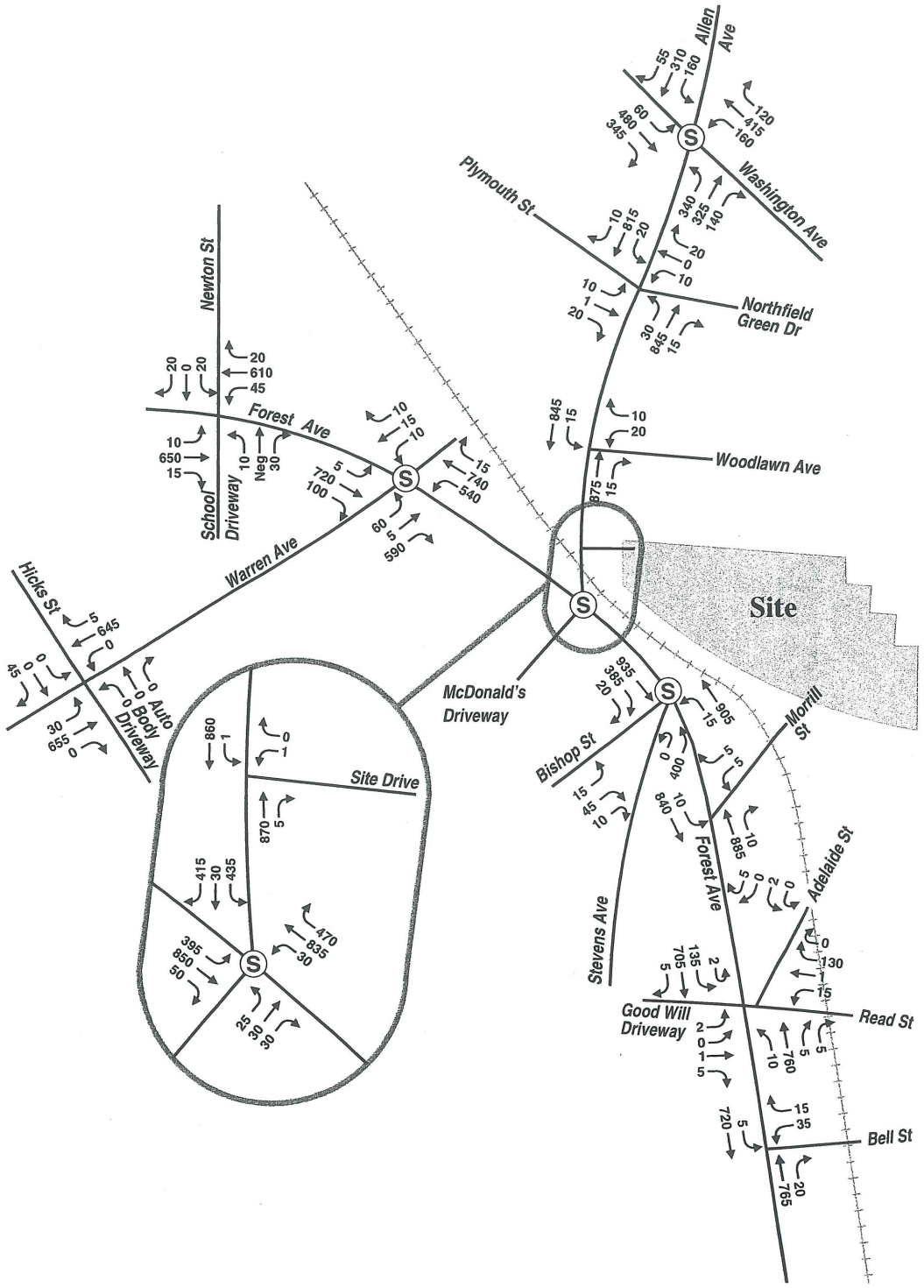
2007 No-Build Weekday Evening Design Hour Traffic Volumes

Figure 10



Not to Scale

Vanasse Hangen Brustlin, Inc.

2007 No-Build Saturday Midday Design Hour Traffic Volumes

Figure 11

Multi-Use Trips

In addition to estimating the number of trips for each land use, one of the attractive pieces of a mixed-use development is the potential for interaction among the residential, office and retail (including supermarket) uses that are proposed as parts of this development. For example, some trips made by apartment residents to the supermarket are expected to occur entirely on site. These types of trips are 'captured' within the multi-use site and do not impact traffic conditions off-site.

ITE has developed a methodology for estimating trip generation at multi-use developments based on information it has collected at several of these sites.[6] This procedure was used to determine the percentage of trips generated by the residential, office and retail components that would occur exclusively within the site during a typical weekday and weekday evening peak hour (the only time periods being studied for which ITE provides multi-use data). The total vehicular trips expected to be generated by the residential, office and retail components during these time periods were reduced accordingly to account for the trips that are expected to occur exclusively within the site.

Residential Trip Generation

As stated, the residential components are divided as follows:

- 23 apartment units
- 20 townhouses
- 2 single-family houses

A summary of the primary trips, the internally captured trips, and the resulting external trips expected to be generated by the residential uses on the site are summarized in Table 4.

[6] Trip Generation Handbook; Institute of Transportation Engineers; Washington, DC; March 2001.

Table 4
Trip Generation Summary – Residential Trips

Time Period	Movement	Primary Trips				Internal Trips [d]	External Trips [e]
		Apartments [a]	Townhouses [b]	Single Family [c]	Total Trips		
Weekday Daily [f]	Enter	75	60	10	145	50	95
	Exit	75	60	10	145	55	90
	Total	150	120	20	290	105	185
Weekday Morning Design Hour [g]	Enter	0	0	0	0	0	0
	Exit	10	5	0	15	0	15
	Total	10	5	0	15	0	15
Weekday Evening Design Hour [g]	Enter	10	5	0	15	5	10
	Exit	5	5	0	10	5	5
	Total	15	10	0	25	10	15
Saturday Daily [f]	Enter	75	55	10	140	0	140
	Exit	75	55	10	140	0	140
	Total	150	110	20	280	0	280
Saturday Midday Design Hour [g]	Enter	5	5	0	10	0	10
	Exit	5	5	0	10	0	10
	Total	10	10	0	20	0	20

a based on ITE LUC 220 (Apartment – average) for 23 dwelling units
b based on ITE LUC 230 (Residential Condominium/Townhouse – average) for 20 dwelling units
c based on ITE LUC 210 (Single Family Detached Housing – average) for 2 dwelling units
d based on the multi-use methodology in ITE Trip Generation Handbook, March 2001
e total residential trips accessing the site driveway
f vehicles per day
g vehicles per hour

As Table 4 indicates, subtracting the internal trips from the total residential trips yields the new residential trips for the proposed development. These are the traffic volumes that can be expected to be 'new' to the study area roadways and intersections as a result of the residential portion of the proposed development.

Office Trip Generation

As mentioned previously, there is some existing and proposed office space on the site. In order to estimate the number of new trips expected to be generated by the additional office space proposed for this site, ITE rates were used to generate trips for the proposed total office space and the existing office space. The existing trips were then subtracted from the total trips to attain the new trips expected to be generated by the additional office space on the site.

A summary of the primary trips, the internally captured trips, the resulting external trips, the existing office trips, and the new trips are summarized in Table 5.

Table 5
Trip Generation Summary – Office Trips

Time Period	Movement	Primary Trips [a]	Internal Trips [b]	External Trips [c]	Existing Office Trips [d]	Total New Office Trips [e]
Weekday Daily [f]	Enter	105	15	90	20	70
	Exit	105	25	80	20	60
	Total	210	40	170	40	130
Weekday Morning Design Hour [g]	Enter	25	0	25	5	20
	Exit	5	0	5	0	5
	Total	30	0	30	5	25
Weekday Evening Design Hour [g]	Enter	5	0	5	0	5
	Exit	25	5	20	5	15
	Total	30	5	25	5	20
Saturday Daily [f]	Enter	25	0	25	0	25
	Exit	25	0	25	0	25
	Total	50	0	50	0	50
Saturday Midday Design Hour [g]	Enter	5	0	5	0	5
	Exit	5	0	5	0	5
	Total	10	0	10	0	10

a based on ITE LUC 710 (General Office – average) for 19,272 sf of gross floor area
b based on the multi-use methodology in ITE Trip Generation Handbook, March 2001
c total office trips accessing the site driveway
d based on ITE LUC 710 (General Office – average) for 3,810 sf of gross floor area
e new office trips accessing site driveway
f vehicles per day
g vehicles per hour

As Table 5 indicates, subtracting the internal and existing trips from the total office trips yields the new office trips for the proposed development. These are the traffic volumes that can be expected to be 'new' to the study area roadways and intersections as a result of the office portion of the proposed development.

Retail Trip Generation

As stated, for the purposes of estimating the traffic generation, the retail components comprise a total of 134,030 sf, divided as follows:

- 65,821-sf supermarket (in addition to 5,624 sf of non-sales mezzanine space)
- 63,765 sf of additional retail

While it has been VHB's experience that Supermarkets located in larger Shopping Centers generate traffic in line with the ITE Shopping Center land use code (which is less than separating the two land uses into two different land uses), VHB agreed to present the traffic generation of the site using separate land uses. This methodology results in a slightly overstated traffic generation during the peak hour condition for the retail component of the site, but should provide the city with a "factor of safety" in reviewing these plans.

Therefore, to estimate the trip generation associated with the retail component of the site, trip generation rates for two separate land uses codes (LUC) were used. Trip

generation projections were made using LUC 850 (Supermarket) for the supermarket and LUC 820 (Shopping Center) for the general retail and Bruno's expansion.

It is important to note that the development of a supermarket on an arterial roadway in an urban environment does not necessarily add new traffic to the surrounding roadways – it simply reroutes a portion of the area traffic volume along these roadways. For example, it is very likely that a number of the future customers of this supermarket development are already shopping at other supermarkets in the greater Portland area. Instead of continuing to shop at these locations, some customers will find that the proposed location at the intersection of two arterial roadways is more convenient to their homes or commuting routes than the stores that they are currently shopping at – thereby reducing the overall length of their trips, but not necessarily the number of trips they are already making. However, for the purposes of this study, traffic generation for the supermarket component of the development was estimated under the assumption that the traffic arriving and departing from the site will be in-line with ITE projections – as is the traditional method of traffic impact engineering

As stated, in addition to the proposed supermarket and retail uses, the existing Bruno's restaurant will expand by approximately 455 sf. It is likely that the larger restaurant will generate more trips than the existing facility, therefore the additional restaurant floor area was added to the proposed general retail space, and the trips for these uses were calculated using ITE data for shopping centers.

Pass-By and Diverted Linked Trips

While the ITE rates estimate all the traffic projected to be associated with each land use, not all of the project traffic will be new to the area roadways. A portion of the traffic generated by the retail uses will be considered *pass-by* traffic. Pass-by traffic consists of vehicles already on the roadways adjacent to the site that are 'attracted' to the services being offered at the site as they are passing through the area as a convenience. The primary destination for these trips is elsewhere and the primary trip will be resumed following the visit to the store. An appropriate example of this is a driver stopping at the supermarket to pick up miscellaneous groceries on their way home from work. While the primary trip for the motorist is between work and home, the convenience of the supermarket on their way home has attracted the driver as they passed by the site. To the naked eye, this motorist does not "add" to traffic in the area, but is simply turning into and out of the project's driveway.

In addition to pass-by trips, the trip generation evaluation included *diverted linked* trips. Diverted linked trips are trips that are attracted to the site from nearby roadways but involve a diversion from that roadway onto another roadway to gain access to the site. Diverted linked trips may add traffic to local roadways in the vicinity of the site, but may not add traffic to the major travel routes nearby. An appropriate example of this would be a motorist traveling along Forest Avenue who

was attracted to the store. While this would represent a new vehicle trip to Allen Avenue, it would not be a new trip to the general area.

For the purposes of this assessment, data contained in the ITE Trip Generation Handbook[7] was utilized. For the general retail portion of the site, a peak hour pass-by rate of 30 percent and a diverted linked rate of 20 percent were utilized. On a daily basis, a rate of 25 percent was used for pass-by trips and a rate of 20 percent was used for diverted linked trips. For the supermarket portion of the site, a peak hour pass-by rate of 35 percent and a diverted linked rate of 30 percent were utilized. On a daily basis, a rate of 25 percent was used for both pass-by and diverted linked trips associated with the supermarket. In other words, there are expected to be approximately 50 percent of the peak hour retail and 35 percent of the peak hour supermarket traffic designated as new to the area roadways.

A summary of the primary trips, the internally captured trips, the resulting external trips, the pass-by trips, the diverted linked trips, and the new trips expected to be generated by the retail space on the site are summarized in Table 6.

able 6
. rip Generation Summary – Retail Trips

Time Period	Movement	Primary Trips			Internal Trips [c]	External Trips [d]	Pass-by Trips [e]	Diverted Linked Trips [f]	New Retail Trips [g]
		Retail [a]	Supermarket [b]	Total Trips					
Weekday Daily [h]	Enter	1,990	3,085	5,075	80	4,995	1,250	1,155	2,590
	Exit	1,990	3,085	5,075	65	5,010	1,250	1,155	2,605
	Total	3,980	6,170	10,150	145	10,005	2,500	2,310	5,195
Weekday Morning Design Hour [i]	Enter	55	210	265	0	265	55	50	160
	Exit	35	135	170	0	170	55	50	65
	Total	90	345	435	0	435	110	100	225
Weekday Evening Design Hour [i]	Enter	175	365	540	10	530	175	140	215
	Exit	190	350	540	5	535	175	140	220
	Total	365	715	1,080	15	1,065	350	280	435
Saturday Daily [h]	Enter	2,690	6,345	9,035	0	9,035	2,260	2,125	4,650
	Exit	2,690	6,345	9,035	0	9,035	2,260	2,125	4,650
	Total	5,380	12,690	18,070	0	18,070	4,520	4,250	9,300
Saturday Midday Design Hour [i]	Enter	265	385	650	0	650	210	165	275
	Exit	245	370	615	0	615	210	165	240
	Total	510	755	1,265	0	1,265	420	330	515

a based on ITE LUC 820 (Shopping Center – regression) for 63,765 sf of gross floor area using 128,406-sf rate
h based on ITE LUC 850 (Supermarket – regression) for 71,445 sf of gross floor area. Saturday daily projections are presented as projected by the ITE, but only includes a sample size of two stores.
based on the multi-use methodology in ITE Trip Generation Handbook, March 2001
u total retail trips accessing the site driveway
e based on the pass-by rates in ITE Trip Generation Handbook, March 2001
f based on the diverted linked rates in ITE Trip Generation Handbook, March 2001
new retail trips on the study area roadway network
vehicles per day
, vehicles per hour

As Table 6 indicates, subtracting the internal, pass-by and diverted linked trips from the total retail trips yields the new retail trips for the proposed development. These

[7] Ibid.

are the traffic volumes that can be expected to be 'new' to the study area roadways and intersections as a result of the retail portion of the proposed development.

Boxing Club, Multi-Purpose Field, and Bingo Hall Considerations

In addition to the residential, office and retail trips to and from the site, the proposed redevelopment will expand the existing boxing club facility and add one multi-purpose field.

Boxing Club

Normal day-to-day activity is expected to occur regularly as it currently does. The only changes to the club will include the addition of state-of-the-art boxing facilities including weights and other exercise equipment for the athletes to use and an additional 11,922 sf of ancillary space. The majority of the ancillary space will be dedicated to office uses, intended mainly to support the boxing club facility. This office space is included in the office trip generation calculation presented previously. While boxing event nights are expected to attract spectators to the club as they currently do, they occur only five to six times per year.

Multi-purpose Field

The addition of a multi-purpose field in the rear of the site will generate trips, as games are likely to attract youth players and parents. ITE rates were used to generate trips for the proposed multi-purpose field.

The bingo hall facility that existed on the site when recent traffic counts were conducted at the site driveway is no longer operational. According to the operator of the bingo hall, the facility seated approximately 500 people on any given night, although the typical evening attendance for this bingo hall was approximately 250 people. Bingo games were played 364 days per year, from approximately 6:30 PM to 9:30 PM. With the elimination of the existing facility on the site, the current traffic associated with this use will also be eliminated from the future traffic conditions.

For the purposes of this assessment, the existing evening peak hour traffic arriving and departing from Bruno's restaurant and the boxing club were assumed to be captured in the existing traffic counts conducted as part of this study. The elimination of the bingo hall will likely result in a loss of traffic greater than the potential traffic gain associated with the boxing club's expanded services. For this reason, no additional traffic associated with the expanded boxing club and no reduction in traffic associated with the removal of the bingo was considered.

A summary of the multi-purpose field trips and the new trips expected to be generated by the residential, office and retail space on the site are summarized in Table 7.

Table 7
Trip Generation Summary – Total Site Trips

Time Period	Movement	Multi-purpose [a]	Net Residential [b]	Net Office [c]	Net Retail [d]	Net New Trips
Weekday Daily [e]	Enter	35	95	70	2,590	2,790
	Exit	35	90	60	2,605	2,790
	Total	70	185	130	5,195	5,580
Weekday Morning Design Hour [f]	Enter	0	0	20	160	180
	Exit	0	15	5	65	85
	Total	0	15	25	225	265
Weekday Evening Design Hour [f]	Enter	15	10	5	215	245
	Exit	5	5	15	220	245
	Total	20	15	20	435	490
Saturday Daily [e]	Enter	60	140	25	4,650	4,875
	Exit	60	140	25	4,650	4,875
	Total	120	280	50	9,300	9,750
Saturday Midday Design Hour [f]	Enter	15	10	5	275	305
	Exit	15	10	5	240	270
	Total	30	20	10	515	575

a based on ITE LUC 488 (Soccer Complex – average) for one field
b taken from Table 3
c taken from Table 4
d taken from Table 5
e vehicles per day
f vehicles per hour

As Table 7 indicates, adding the multi-purpose field trips to the new trips expected to be generated by the residential, office and retail space result in the total new trips for the proposed development. These are the total traffic volumes that can be expected to be 'new' to the study area roadways and intersections as a result of the proposed development.

Table 7 shows that this project will generate approximately 490 additional vehicle trips (245 entering, 245 exiting) on the study area roadways during the weekday evening peak hour. Similarly, this project would likely generate approximately 575 additional vehicle trips (305 entering, 270 exiting) on the study area roadways during the Saturday midday peak hour.

Trip Distribution

The directional distribution of site traffic approaching and departing the development is a function of several variables. These variables include population densities, shopping opportunities, competing uses, existing travel patterns, and the efficiency of the roadways leading to the site. The travel distribution of retail center traffic has

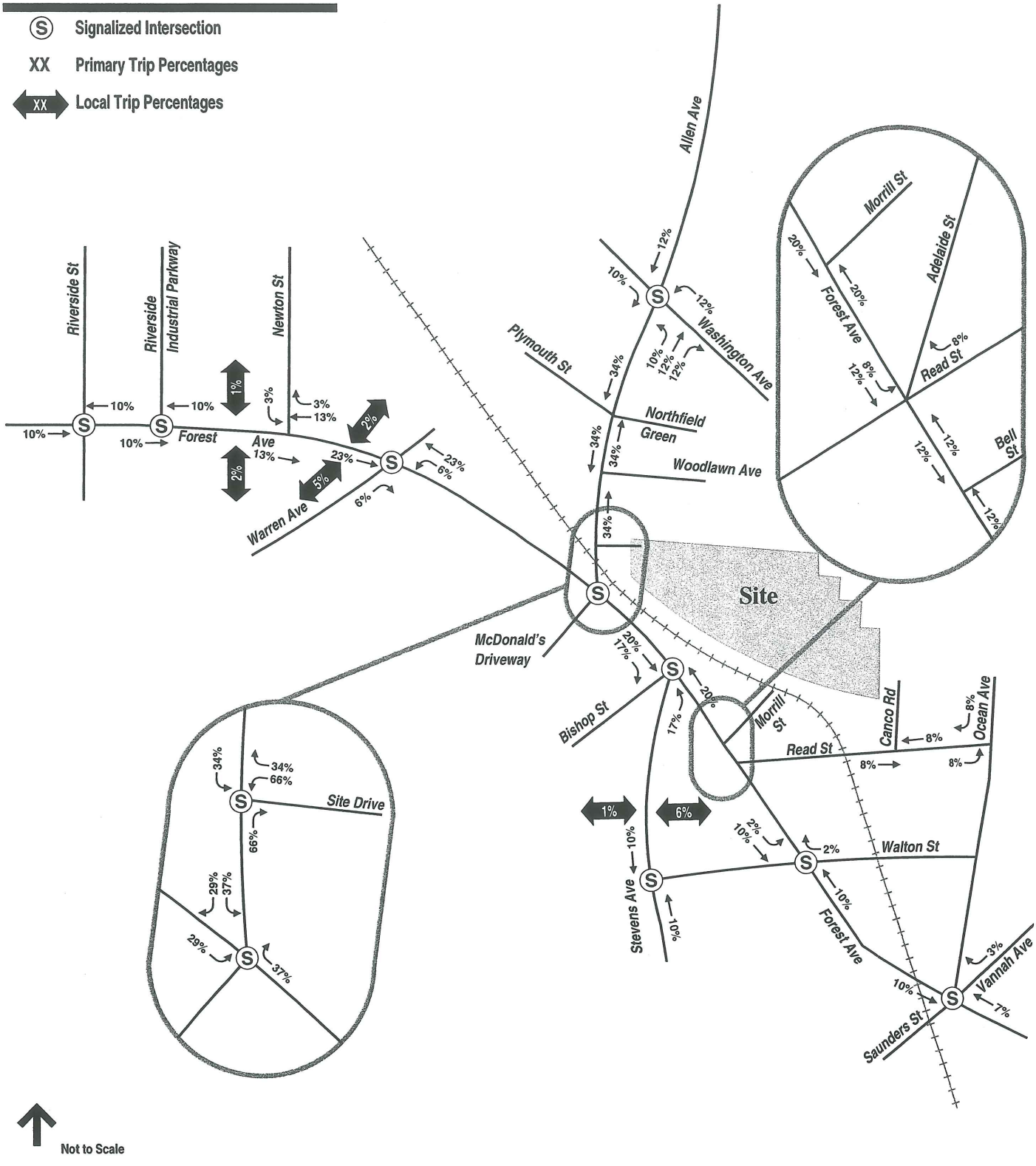
been documented by ITE in Transportation and Land Development[8], as well as by the Urban Land Institute (ULI)[9]. The information provided by these organizations shows that for community retail centers, the primary market area for new trips to and from the development is typically located within a 15- to 20-minute travel distance to the facility. Subsequently, the projected trade area is expected to include portions of Portland, South Portland, Falmouth, Westbrook, Gorham, and Scarborough.

The trip distribution for this project was developed based on a gravity model that uses census tract population data[10] for surrounding communities. The gravity model for the site consisted of two market trade areas, or 'attraction zones,' that were weighted relative to influence. The primary trade area for the proposed development was determined to extend to approximately a two-mile radius from the site, and the secondary trade area extends from the two-mile mark out to the outer periphery of the expected trade area, anywhere between two and eight miles, depending upon the direction. Based on the distribution of population surrounding the project site within the project study area, as well as competing land uses, the arrival and departure directions for project-related traffic were then estimated and adjusted, if appropriate, based on known local factors. The assignment of traffic to specific travel routes was based on the assumption that most motorists will seek the fastest and most direct routes to/from the site.

Due to the substantial population density near the site, the potential trip loss between study intersections was investigated. Local roadway maps and census block information were used to quantify these trips. It was determined that, along Forest Avenue, a certain percentage of site-generated trips would originate within the neighborhoods located off of Forest Avenue and would enter and exit the Forest Avenue corridor at any number of intersections between Warren Avenue and Newton Street. In addition, site-generated trips would enter and exit Stevens Avenue between Forest Avenue and Walton Street. Based on a relatively small population and a limited number of access points, it was determined that some trips would enter and exit Allen Avenue between Plymouth Street and Washington Avenue.

The primary trip distribution network for the new traffic projected to be generated by the proposed site is summarized in Table 8 and shown in Figure 12.

[8] Transportation and Land Development; Second Edition; Institute of Transportation Engineers; Washington, DC; 2002.
[9] Parking Requirements for Shopping Centers: Summary Recommendations and Research Study Report; Urban Land Institute; a study conducted under the direction of ULI by Wilbur Smith and Associates, Inc., and sponsored by the International Council of Shopping Centers.
[10] US Census Bureau; 2000 US Census Data.



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Site-Generated
Primary Trip Distribution

Figure 12

Table 8
Vehicle Trip Distribution Summary

Direction (From/To)	Major Roadway	Percent of Total
North	Allen Ave.	12%
West	Washington Ave.	10%
East	Washington Ave.	12%
North/East	Walton Street	2%
North/East	Read St.	8%
South	Forest Ave.	10%
North	Forest Ave.	23%
West	Warren Ave.	6%
South	Stevens Ave.	17%
Total	--	*100%*

As shown in Table 8, immediately adjacent to the site, traffic can approach from four general directions: from the east and west along Washington Avenue and Warren Avenue and from the north and south along Forest Avenue and Allen Avenue.

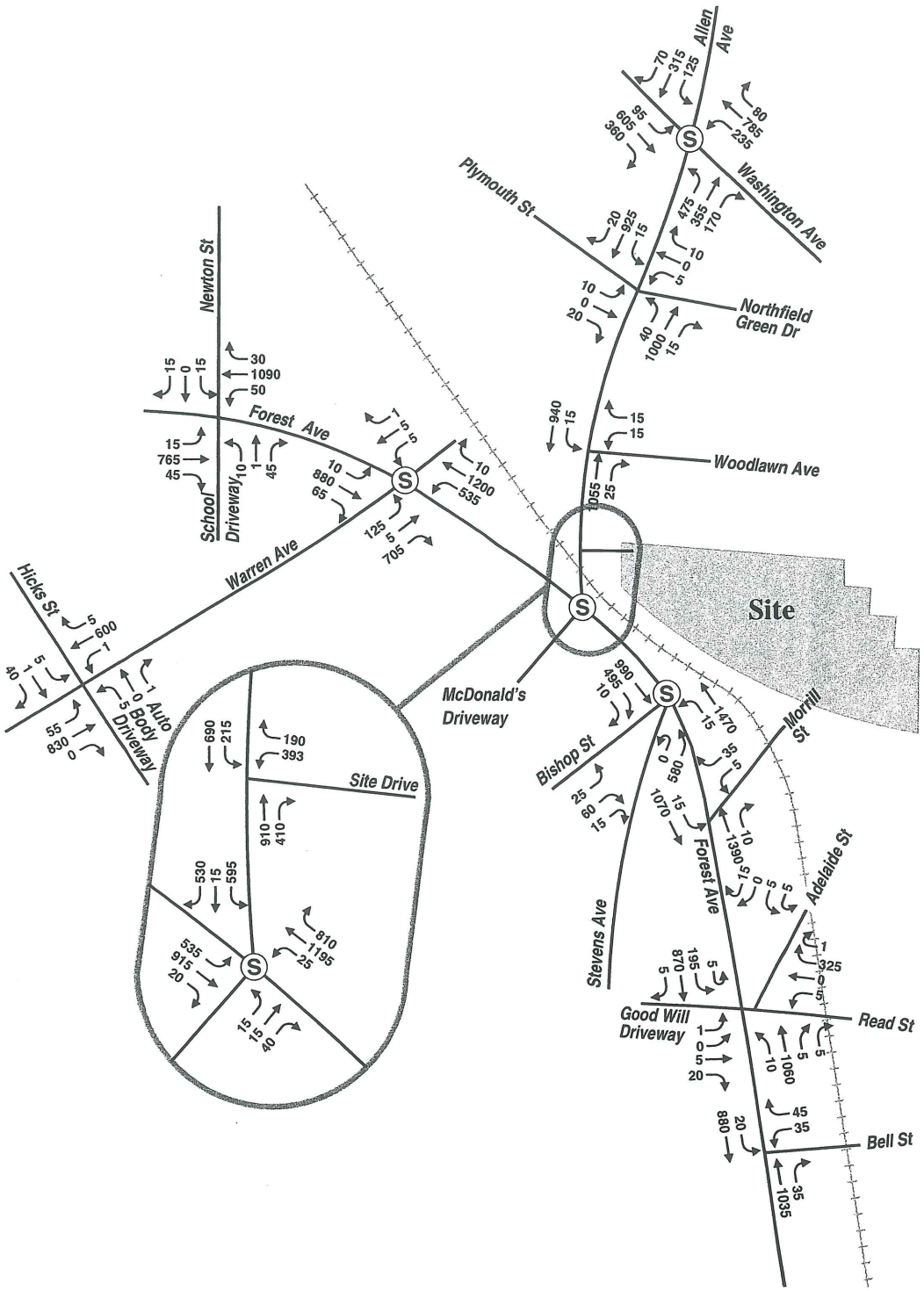
Trip Assignment

The site-generated trips that are expected to be new to the study area were assigned to the study area roadways according to the primary trip distribution network. The estimated pass-by and diverted linked trips were assigned using a weighted distribution of existing traffic volumes on the roadways adjacent to the site. The trip assignment networks for the traffic projected to be generated by the proposed site are provided in the Appendix.

The site-generated traffic volumes were assigned to the roadway network according to the distribution and travel patterns described above, and added to the No-Build traffic volumes to develop the peak hour Build traffic volume networks. The traffic volume networks for the 2007 Build Condition are illustrated in Figures 13 and 14. Traffic volume networks for the site-generated trips are included in the Appendix.

On-site Parking Assessment

Under the current proposal, the proposed project will provide 666 parking spaces on site. The following text presents an assessment of the adequacy of the proposed parking supply based on information provided by the Institute of Transportation Engineers (ITE), the Urban Land Institute (ULI), as well as empirical parking data collected at existing Stop & Shop supermarket sites.

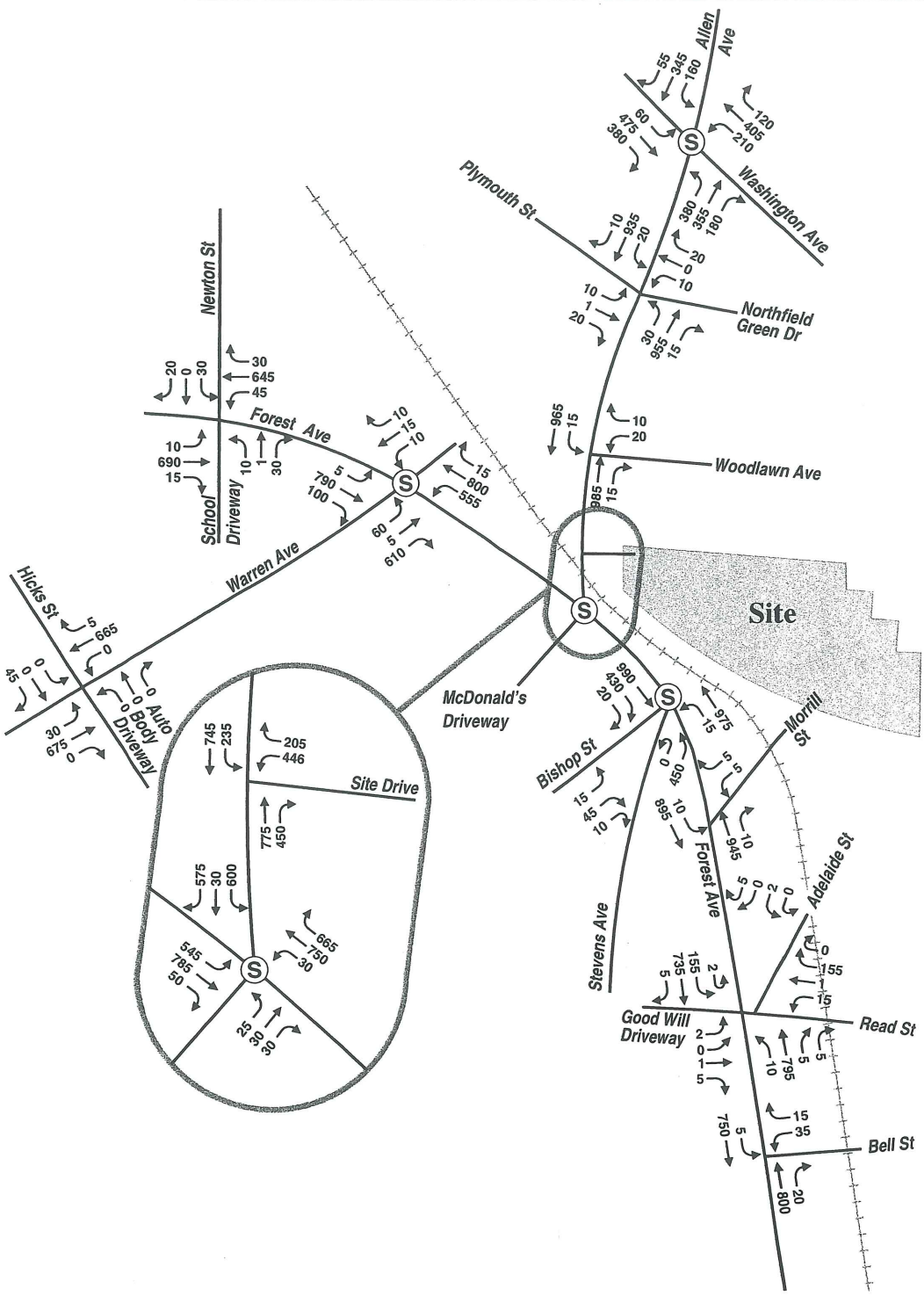


Not to Scale

Vanasse Hangen Brustlin, Inc.

2007 Build Weekday Evening Design Hour Traffic Volumes

Figure 13



Not to Scale

Vanasse Hangen Brustlin, Inc.

2007 Build Saturday Midday
Design Hour Traffic Volumes

Figure 14

ITE Parking Generation

In order to estimate the number of parking spaces required by the proposed redevelopment project, parking generation estimates for the various land uses were derived from the ITE Parking Generation[11] manual using the programmed square footage and/or number of residential units of the buildings under consideration.

In sum, the proposed new development will consist of the following land uses and sizes:

- 65,821-sf supermarket (with an additional 5,624 sf of non-sales mezzanine space)
- 63,765 sf of additional retail
- 23 apartment units
- 20 townhouses
- 2 single-family houses
- 15,462 sf of additional office space
- 15,090 sf of boxing club space (with an additional 11,922 sf of ancillary space)
- 1 multi-purpose field

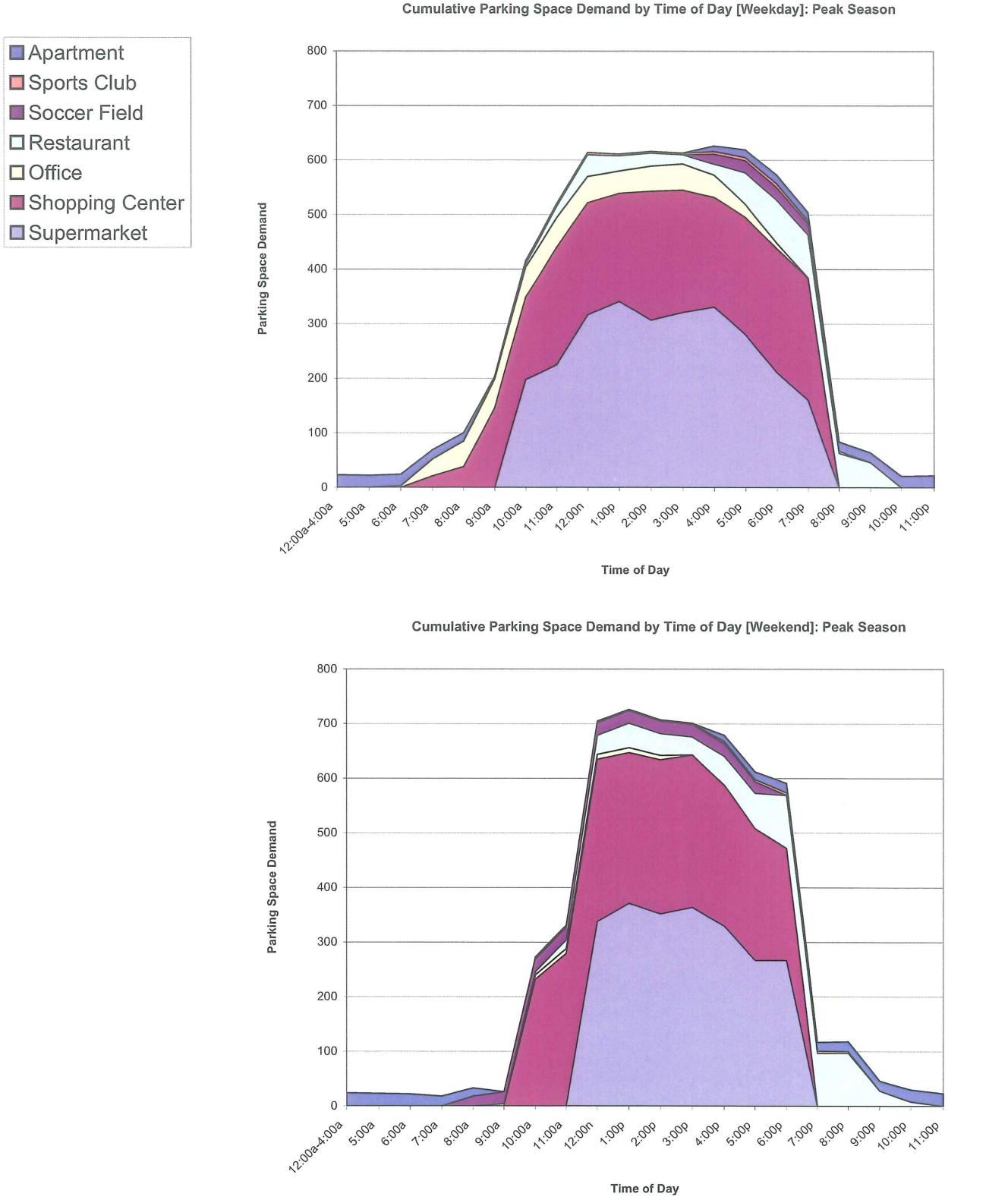
One of the additional benefits of a mixed use development is the ability of the site amenities to support multiple uses. For example, parking spaces used by retail and office uses generally peak in the middle of the day, while parking demand for the residential users generally peaks in the evening. For this reason, a parking space that is used by an office tenant during the typical work day can be used by a resident of the site during the evening.

For this reason, the temporal parking demands for the various land uses on the site were overlaid to determine the overall peak parking demand for the site. The ITE Parking Generation manual provides ranges of temporal parking uses on sites for generic typical parking loading conditions as well as seasonal parking demands. For example, parking associated with office and residential uses are generally constant throughout the course of a year. However, parking demands for retail uses generally peak during the holiday seasons and level-off during the rest of the year.

To estimate parking requirements of the proposed redevelopment, it is first necessary to determine the peak number of occupied parking spaces that can be expected from the various components of the redevelopment project. ITE Parking Generation rates for each of the land uses were applied to their corresponding sizes to calculate the maximum number of parking spaces that this project is expected to generate on a weekday and a Saturday.

[11] Parking Generation; 2nd Edition; Published by the Institute of Transportation Engineers (ITE); Washington D.C.; 1987.

Graphs showing the parking demand by time of day are illustrated in Figures 15 and 16. These graphs provide a summary of the ITE actual parking demands over the course of a day. As the figures indicate, at no point during the course of a typical day does the on-site maximum parking demand exceed the parking supply of 666 spaces – with the exception of the Weekend conditions during the holiday season. During this condition, the demands exceed the supply by only a moderate amount. However, this condition occurs only during weekends in December for no more than four hours per day. In reviewing these conditions with the proponent, their parking experience indicates that these ITE projections are on the high side and will not be a problem for their operations during these few occasions when parking is projected to exceed the supply on the site. The backup data for these graphs are included in the Appendix.



Weekday and Saturday
Parking Demand by Time of Day
Peak Season

Figure 15

4

Traffic Operations Analysis

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to Existing and projected 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. Calculated levels of service classify roadway-operating conditions.

Level-Of-Service Criteria

Level of service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For this study, capacity analyses were completed for signalized and unsignalized intersections outlined in the project study area. Level-of-service designations are reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of each lane or lane group entering the intersection and the LOS designation is for overall conditions at the intersection. For unsignalized intersections, however, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The LOS is only determined for left turns from the main street and all movements from the minor street. The LOS designation is for the most critical movement, which is most often the left turn out of the side street. The evaluation criteria used to analyze area intersections are based on the 2000 Highway Capacity Manual (HCM)[12] and are included in the Appendix.

With regard to the 2007 Build condition with mitigation measures in place, the results of the capacity analyses were evaluated based on Maine DOT's definition of

[12] Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C. (2000).

unreasonable congestion[13]. For the purposes of this project, based on Maine DOT's definitions, unreasonable congestion is defined as:

- The level of service of the intersection will be raised to LOS D or above through Transportation Demand Management techniques.
- The Department finds that it is not reasonably possible to raise the LOS of the intersection to LOS D or above by roadway or intersection improvements.
- The Department finds that improvements cannot be reasonably made because the roadway or intersection is located within a business district or because the implementation of these improvements will adversely affect a historic site.
- The development is located within the compact area of an urban compact municipality in which case the applicant shall be entitled to an exception from the level of service mitigation requirements set forth in these standards. This exception does not exempt the development from meeting safety standards, and greater mitigation measures may be required than otherwise provided in this subsection if needed to address safety issues. The required improvements are limited only to those necessary to mitigate the impacts of the project (which means the applicant is only responsible for returning all approaches to an intersection or a piece of roadway to the current LOS).
- In the case of unsignalized intersections, if traffic with the development in place would not meet the warrant criteria for signalization or auxiliary turning lanes, as set forth in the FHWA's MUTCD, then the Department may reduce the mitigation requirement for those measures so long as the resulting traffic conditions provide for safe traffic movement.
- The development is located in an area designated as a growth area in a local growth management plan that has been found by the State to be consistent with the growth management program.

As will be discussed in Chapter 5 (Transportation Improvements) of this report, the applicant not only meets these requirements, but also meets the conditions set forth in the first condition above as well by returning all approaches to signalized intersections to LOS D or better operations throughout the study area.

Capacity Analysis

Capacity analyses were conducted for the Existing, No-Build, and Build conditions for the signalized and unsignalized study-area intersections.

[13] Traffic Movement Permit; State of Maine, Department of Transportation, Traffic Engineering Division; Chapter 305 Rules, 4.C.(4)(5); April 2000.

Signalized Intersection Capacity Analyses

Capacity analyses were conducted for the four signalized intersections identified in the study area. Capacity analyses were conducted for 2004 Existing conditions and the 2007 No-Build and Build conditions. Additionally, the fourth column on Table 8 provides the 2007 Build condition with the recommended mitigation in place (see Chapter 5 for more information on these actions). A summary of the signalized capacity analyses is presented in Table 9.

Table 9
Signalized Intersection Capacity Analyses Summary

Location	Peak Hour	2004 Existing v/c [a]	2004 Existing Delay [b]	2004 Existing LOS [c]	2007 No-Build v/c	2007 No-Build Delay	2007 No-Build LOS	2007 Build v/c	2007 Build Delay	2007 Build LOS	2007 Build with Mitigation v/c	2007 Build with Mitigation Delay	2007 Build with Mitigation LOS
Forest Avenue at	Weekday Evening	0.77	19	B	0.80	21	C	0.83	22	C	0.83	20	B
Warren Avenue	Saturday Midday	0.71	16	B	0.73	17	B	0.73	23	C	0.76	17	B
Forest Avenue at	Weekday Evening	0.86	36	D	0.90	39	D	0.95	50	D	0.97	37	D
Allen Avenue	Saturday Midday	0.75	27	C	0.79	29	C	0.84	36	D	0.82	27	C
Forest Avenue at	Weekday Evening	0.86	25	C	0.89	29	C	0.93	36	D	0.84	19	B
Stevens Ave/Bishop St	Saturday Midday	0.77	18	B	0.80	19	B	0.85	22	C	0.71	12	B
Allen Avenue at	Weekday Evening	0.75	40	D	0.77	42	D	0.86	48	D	0.86	39	D
Washington Avenue	Saturday Midday	0.67	33	C	0.71	35	C	0.78	41	D	0.80	34	C

a volume to capacity ratio
b average delay per vehicle in seconds
c level of service
n/a not applicable; movement does not exist under these conditions

As shown in Table 9, all of the study intersections currently operate at reasonable levels of service. With the addition of project-related traffic to the roadway network, all locations are expected to continue to operate at acceptable levels of service except the Forest Avenue at Allen Avenue intersection during the evening peak hour. As will be discussed in Chapter 5, with the implementation of additional off-site roadway mitigation, all of the study area intersections will meet or exceed Maine DOT's definition of unreasonable congestion (LOS D or better) with the proposed mitigation measures in place.

Unsignalized Intersection Capacity Analyses

Capacity analyses were conducted for the eight unsignalized intersections identified in the study area. Capacity analyses were conducted for 2004 Existing conditions and the 2007 No-Build and Build conditions. The results of the analyses are shown in Table 10.

Table 10
Unsignalized Intersection Capacity Analyses Summary

Location	Movement	Peak Hour	2004 Existing Condition				2007 No-Build Condition				2007 Build Condition			
			Dem [a]	v/c [b]	Delay [c]	LOS [d]	Dem	v/c	Delay	LOS	Dem	v/c	Delay	LOS
Forest Avenue at	EB LTR	Weekday Evening	56	0.75	98	F	56	0.82	*	F	56	0.91	*	F
Newton Street/School driveway		Saturday Midday	41	0.30	29	D	41	0.32	32	D	41	0.36	37	E
	WB LTR	Weekday Evening	25	0.77	*	F	25	0.87	*	F	30	*	*	F
		Saturday Midday	40	0.49	54	F	40	0.53	61	F	50	0.89	*	F
Forest Avenue at	WB LR	Weekday Evening	40	*	*	F	40	*	*	F	40	*	*	F
Morrill Street		Saturday Midday	10	0.38	*	F	10	0.59	*	F	10	*	*	F
Forest Avenue at	EB LTR	Weekday Evening	26	*	*	F	26	*	*	F	26	*	*	F
Adelaide St/Read St/Good Will		Saturday Midday	8	0.40	*	F	8	*	*	F	8	*	*	F
	WB LTR	Weekday Evening	320	*	*	F	330	*	*	F	350	*	*	F
		Saturday Midday	146	1.06	*	F	151	*	*	F	171	*	*	F
Forest Avenue at	WB LR	Weekday Evening	80	0.67	80	F	80	0.74	97	F	80	0.80	115	F
Bell Street		Saturday Midday	50	0.56	54	F	50	0.61	63	F	50	0.67	76	F
Allen Avenue at	WB LR	Weekday Evening	30	0.28	44	E	30	0.32	52	F	30	0.42	76	F
Woodlawn Avenue		Saturday Midday	30	0.30	47	E	30	0.34	56	F	30	0.48	90	F
Allen Avenue at	EB LTR	Weekday Evening	15	0.21	44	E	30	0.49	71	F	30	0.67	*	F
Plymouth St/Northfield Green Dr		Saturday Midday	11	0.20	60	F	31	0.49	77	F	31	0.73	*	F
	WB LTR	Weekday Evening	15	0.18	44	E	15	0.22	55	F	15	0.30	82	F
		Saturday Midday	30	0.38	54	F	30	0.48	77	F	30	0.72	*	F
Warren Avenue at	NB LTR	Weekday Evening	6	0.09	56	F	6	0.10	61	F	6	0.10	64	F
Hicks St/auto body driveway		Saturday Midday	0	0.00	0	A	0	0.00	0	A	0	0.00	0	A
	SB LTR	Weekday Evening	46	0.20	20	C	46	0.21	21	C	46	0.22	22	C
		Saturday Midday	45	0.11	14	B	45	0.11	14	B	45	0.12	15	B
Allen Avenue at	WB LR	Weekday Evening	20	0.20	32	D	20	0.22	36	E	583	*	*	F
Site driveway		Saturday Midday	1	0.03	33	D	1	0.03	36	E	651	*	*	F

a demand in vehicles per hour for unsignalized intersections; the demand applies to only the most critical street approach or lane group
b volume-to-capacity ratio for the critical movement
c delay of critical approach in seconds per vehicle
d level of service of the critical movement
* v/c exceeds 1.2 or delay exceeds 120 seconds
EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound; L = Left; T = Through; R = Right

As shown in Table 10, there are several unsignalized intersections that are both currently and projected to operate at congested levels of service during at least one of the peak hour conditions. This type of congestion is expected along arterial routes in and around urban environments. While the mainline arterial still operates in an efficient manner, it is sometimes difficult for motorists to exit the side streets (particularly by making a left-turn) during commuter rush hours. This is typical of many of these streets currently and would be expected to remain the same, with or without this proposed development.

It should be noted that several of these locations are being considered for upgrade and/or improvements either as a result of this project or through City-sponsored initiatives. These specifically include the following locations:

Forest Avenue at Adelaide Street/Read Street/parking lot driveway – As part of the Forest Avenue BTIP improvement project, this intersection would be expected to be both widened and traffic flow reversed along Read Street. Specifically, the BTIP proposal calls for the widening of Forest Avenue to provide four lanes of traffic along this corridor (as opposed to the two lanes currently provided) and will convert Read Street to a one-way corridor away from the intersection. Concurrent with this plan, the intersection of Bell Street with Forest Avenue will be signalized to permit traffic traveling out of the Read Street/Canco Road area to easily make a turning movement onto Forest Avenue.

Allen Avenue at Woodlawn Avenue – As noted in the site plan, a one-way connection from the Woodlawn Avenue neighborhood into the site will be provided. This connection will serve two purposes: first, to allow convenient access from the neighborhood into the facility and, second, to permit those residents who live in the neighborhood to access Allen Avenue via the site's signalized access driveway. As noted, there are approximately 30 motorists exiting Woodlawn Avenue during the peak hours observed. Ultimately, it would be up to the individual drivers to determine if they preferred to wait at Allen Avenue to make a left turn from Woodlawn Avenue or to access the site and make their turn at the signal.

Allen Avenue at Plymouth Street – Based on discussions with the City of Portland, this intersection has been the focus of additional study both through the development of several housing projects along Plymouth Street and through City initiatives. Several options are currently on the table to address this intersection and include geometric improvements and/or the potential for signalization. While it does not appear that a signal would be warranted at this location due to the volume of traffic exiting the various side streets, the potential for geometric improvements may provide adequate levels of service at this location.

All the other locations investigated are fairly minimal volume roadways and would be expected to experience similar delays regardless of if this project was constructed or not.

Vehicle Queue Analysis

In addition to the intersection capacity analysis, a vehicle queue analysis was conducted at the signalized study area intersections during the weekday evening peak hour. This analysis was conducted using the Synchro software package, which provides both average and 95th percentile vehicle queue estimates for isolated and coordinated traffic signal systems. The results of the average vehicle queue analysis are summarized below in Table 11.

Table 11
Average Queue Results (in feet)

Location	Movement	2004 Existing Condition PM	2004 Existing Condition Saturday	2007 No-Build Condition PM	2007 No-Build Condition Saturday	2007 Build Condition PM	2007 Build Condition Saturday	2007 Build Condition with Mitigation PM	2007 Build Condition with Mitigation Saturday
Forest Avenue at Warren Avenue	EB L/T	86	34	98	38	101	52	83	38
	EB R	323	171	392	205	419	327	349	211
	WB L/T/R	10	17	11	19	11	26	9	18
	NB L	271	244	307	279	322	390	111	153
	NB T/R	83	38	90	42	96	48	12	17
	SB L/T/R	276	205	313	243	355	317	296	255
Forest Avenue at Allen Avenue	EB L	12	29	12	30	12	19	10	15
	EB T	12	34	12	36	12	23	10	19
	EB R	0	0	0	0	0	0	0	0
	WB L	163	160	171	181	222	233	158	168
	WB L/T	174	170	184	192	234	249	168	177
	WB R	118	136	132	159	214	206	216	146
	NB L	18	23	18	25	18	22	12	12
	NB T	427	304	463	337	417	266	351	175
	NB R	84	85	100	116	190	224	324	138
	SB L	~353	295	~402	335	~503	384	~284	255
	SB T/R	253	232	274	246	208	178	156	143
Forest Avenue at Stevens Avenue / Bishop Street	EB L/R	87	43	87	47	87	53	74	39
	NB L/T	348	153	393	170	396	196	325	165
	SB T	567	446	616	520	697	592	n/a	
	SB R	185	122	198	139	224	162		
	SB T/R	n/a		n/a		n/a		18	30
	NEB L/R	203	128	215	149	~237	194	186	141
Allen Avenue at Washington Avenue	EB L	174	108	185	120	204	148	129	100
	EB T/R	325	269	347	303	421	382	258	243
	WB L	99	102	105	114	105	123	69	85
	WB T/R	264	207	280	236	313	273	202	181
	NB L	151	116	158	129	195	190	125	125
	NB T/R	335	180	358	197	354	208	228	137
	SB L	72	42	77	45	77	49	49	32
	SB T	230	165	247	183	249	196	158	133
	SB R	37	23	45	42	66	102	60	67
Allen Avenue at proposed site drive	EB L/T/R	n/a		n/a		n/a		1	1
	WB L							229	251
	WB R							23	20
	NB T/R							n/a	
	NB T							369	295
	NB R							4	0
	SB L/T							n/a	
	SB L							68	82
	SB T							195	249

EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound; NEB = Northeastbound; L = Left; T = Through; R = Right
~ Volume exceeds capacity. Queue is theoretically infinite.
n/a not applicable; movement does not exist under current condition

As shown in Table 11, the vehicle queue lengths in the Morrill's Corner area generally are similar during all conditions. Under the Build condition, the queue lengths on most of the approaches at the intersection of Forest Avenue at Allen Avenue would increase, but not significantly or to the point of extending beyond the existing or proposed storage lengths. With the mitigation measures in place, the

vehicle queue lengths in the Morrill's Corner area are expected to be reduced to levels that are generally better than those that exist under the No-Build condition.

5

Transportation Improvements

The preceding analysis of existing conditions and projected future traffic demands in the No-Build condition indicate that, in the absence of any physical improvements to the roadway system, traffic operation deficiencies are both present and/or are expected to occur at certain key study area intersections, independent of the proposed project.

This section presents several recommended measures to address both project-related traffic impacts at site access points and at impacted off-site intersections, and also recommends potential improvements at deficient locations that have been identified independent of the proposed project. The finding of this study indicates that the proposed measures not only mitigate project impacts but also contribute to improving overall traffic operations in this area.

Transportation Demand Management (TDM)

Before discussing the physical mitigation being suggested to support this project, it is first necessary to look at means and methods to reduce the amount of vehicles being generated by the development.

As is the case with most mitigation plans for land development projects, traffic impacts involve physical roadway ('capacity-increasing') improvements and traffic control measures. However, many mixed-use developments have had success in attempting to reduce its customers' and employees' reliance on private automobiles through implementation of on-site Traffic Demand Management (TDM) and Traffic System Management (TSM) strategies. Overall, TDM and TSM measures are most effective in combination with other physical means of reducing single occupant vehicles (SOVs). The following text discusses proposed project mitigation and commitments.

One of the City's primary goals in their comprehensive plan is to reduce the project's overall traffic impact through the implementation of TDM measures that are geared toward affecting the demand side of the transportation equation, rather than the

supply side. By their very nature, TDM programs attempt to change people's vehicle-dependent view of the transportation environment. To be successful, they must rely on incentives, or disincentives, to make these shifts in behavior attractive to the commuter or retail customer.[14] Suggested TDM programs are designed to maximize the people-moving capability of the existing transportation infrastructure by increasing the number of persons in a vehicle, providing alternate modes of travel, or influencing the time of, or need to, travel.

TDM measures are most often directed at the types of drivers who rely on repetitive travel such as daily commuting back and forth to the office or weekly trips to a supermarket to do the family shopping. The day-to-day, or week-to-week, regularity of this type of trip and conditions at the workplace, in terms of employer practices such as on-site services, bicycle storage and showers, and shuttle services, impact employee and customer commuter choices.

The term TDM encompasses both alternatives to driving alone and the techniques or supporting strategies that encourage the use of these alternatives[15]. TDM alternatives to driving alone include carpools and vanpools, public and private transit, and non-motorized travel, including bicycling and walking. TDM alternatives can also influence when trips are made. For example, alternative work hours (compressed work weeks, flextime, and telecommuting) can affect what time of day trips are made, or if trips occur at all on certain days. Similarly, the amount of parking provided on a site can influence when customers tend to shop at a given location. For example, a reduction in the number of parking spaces on a site will serve as a deterrent in some instances for customers to shop during the traditionally busy retail times they may find that locating a convenient parking space is difficult. On an area-wide basis, the provision of transit services and promotions can also provide a competitive alternative to drive alone commuting.

TDM strategies are the supporting measures that encourage the use of alternatives to driving alone. TDM strategies include financial incentives, time incentives, provision of new or enhanced commuter services, dissemination of information, and marketing alternative services. TDM strategies include all the incentives and disincentives that increase the likelihood for people to change their existing travel behavior.

A distinction can be drawn between area-wide TDM programs and employer-based TDM programs. Employer-based TDM programs are those run by individual employers or groups of employers, generally located near one another. 'Area-wide' usually refers to a region, municipality, or corridor. Area-wide programs address a more diverse group of travelers traveling to a wide variety of locations at many different times.

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[14] Implementing Effective Traffic Demand Management Measures: Inventory of Measures and Synthesis of Experience, prepared by Comsis Corporation and the Institute of Transportation Engineers, for the U.S. Department of Transportation, DOT-T-94-02, September, 1993, p. I-1.

[15] Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience, prepared by Comsis Corporation and The Institute of Transportation Engineers, for the U.S. Department of Transportation, DOT-T-94-02, September, 1993, P. 1-2.

Traffic Demand Management Plan

To implement a traffic demand management program at the proposed facility, the proponent is proposing a number of measures, which will collectively contribute toward the reduction of vehicular traffic to and from the site. The following text describes in detail the proponent's Traffic Demand Management program.

Ridesharing

The proponent will promote ridesharing via car pools to all of its regular employees. Information regarding carpooling and its benefits will be distributed to new employees, interested carpooler names will be posted in common employee areas, and a notice of interested carpoolers will be listed in a facility newsletter.

Preferential parking spaces for employees that carpool will be designated on the site. An incentive program will be established to encourage employees to rideshare through the provision of financial incentives. A part-time on-site Transportation Coordinator will be identified to ensure that the complete rideshare program, including ride-matching, accommodating work shifts, promotion, incentives, preferential parking, and a guaranteed ride home, is consistently promoted and provided to all the retailers, homeowners, tenants, and office employees.

Bicycle and Pedestrian Measures

Bicycling and walking to the mixed use center will likely be attractive to some employees and local customers due to the proximity of the residential communities to the site. To facilitate both employee and customer bicycle access to the site, secure bicycle storage racks will be provided near the front doors to each of the various developments within the facility. In addition, later in this chapter, there is a discussion on the off-site roadway improvements and the consideration of bicycle accommodations in the roadway design so that commuters and customers not only have safe and convenient access within the site, but also have a safe and efficient means of arriving and departing from the site along some of the public roadways in the area.

Due to the proximity of the site to residential communities, it is also likely that some employees and/or customers may elect to walk to the proposed facility – particularly during fair weather conditions. To encourage walking between the site and the neighborhood, the proponent will be constructing pedestrian pathways along the site's borders with Princeton Street and other residential locations. The specific locations of these connections are shown on the site plans and are somewhat flexible in nature should the residents or City desire alternative locations.

In addition, residents further away from the site may also want to walk to and from this site on fair weather days. To accommodate these pedestrian demands, the off site roadway improvements have considered the logical pedestrian connections throughout the area and have designed reasonable sidewalk and crosswalk connections wherever possible. Specific focus has been given to crossing pedestrians at signalized locations such that there will be little or no vehicle conflicts with those pedestrians crossing under the protection of the traffic signal. A more detailed description of these off-site pedestrian connections is provided later in the section on off-site roadway improvements.

Transit Services

During the public outreach meetings held early on as part of this project, it was identified that transit options to and from this site would be a welcome addition to many of the residents in and around the project site. For this reason, Morrill's Corner, LLC and VHB have met with staff from the Greater Portland METRO bus service to integrate on-site bus drop-off and pick-up locations that work for both the developer's perspective as well as the METRO's perspective.

It is envisioned that similar incentive programs will be offered to the center's customer base in exchange for riding the METRO to and from the facility. These include customers who purchase a certain value of goods within the facility being able to ride home for no charge. Details will be worked out with the METRO providers, but are expected to be similar to what other shopping centers in the area are already providing.

On-site Services

Employees make midday trips during their breaks and lunchtime to conduct personal business. On-site services reduce the need for employees to leave the facility to conduct personal business during the day. Many of the employees will work shorter than eight-hour shifts with typical shifts running from 7:00 AM to 12:00 noon or 1:00 PM; 12:00 noon to 5:00 PM; 5:00 PM to 12:00 midnight; and 11:00 PM to 7:00 AM. These schedules are made to accommodate working parents, older workers, after-school workers, and the like. Subsequently, the level of midday trip-making is less than other types of retail or office because of these shorter work shifts. Combining this fact with the on-site services proposed will result in minimal midday trip making for employee personal business and errands.

Intersection/Roadway Mitigation

The second part of the transportation improvement plan investigated a series of potential intersection and roadway improvement measures. The preceding analysis

of existing and projected future traffic demands in the No-Build condition indicates that traffic operational deficiencies exist or will exist at certain key intersections. This section of the report presents several recommended measures to address project-related traffic impacts at intersections and along roadway locations in the study area.

Site Access Improvements at Allen Avenue

The first stage in the recommended improvements to the roadways surrounding the site is to identify the improvements necessary to gain access to and from the site driveway along Allen Avenue. This section discusses these roadway improvements, which are shown graphically in Figures 17 and 18.

Because of the unique layout of the project site in relation to the rail lines and neighborhood, Morrill's Corner, LLC and VHB developed a site access plan that can be adequately served by only one primary driveway connection onto a regional arterial roadway (Allen Avenue). Given the size of the development and the carrying capacity of Allen Avenue, this one driveway approach can provide adequate access and egress at the site without creating the need for multiple, redundant driveway locations.

The Allen Avenue intersection with the site driveway is intended to serve as the primary access to the site. In order to determine if signalization is warranted at this intersection, an analysis was conducted using the estimated future traffic conditions and procedures defined in the 2000 Manual of Uniform Traffic Control Devices (MUTCD2000). For this study, several warrants were examined. The warrant analysis is presented in the Appendix to this report and the results indicate that signalization is expected to be warranted under the Build design hour conditions. For this reason, an actuated signal is proposed to be installed at this driveway location to control all movements along Allen Avenue and into and out of the project site driveway.

The signal would be coordinated with the existing (and upgraded, see below) signals located at the Morrill's Corner intersections to provide improved traffic flow between all of the traffic systems. Additionally, the signal would be tied into the railroad crossing pre-emption system to shut down vehicular access to the existing at-grade crossing. Pedestrian actuation and crosswalks would also be provided at the intersection to facilitate crossings of Allen Avenue to both bring pedestrians to the opposite side of Allen Avenue and/or into the project site.

In addition to this action, the site access will also require the following roadway geometry actions:

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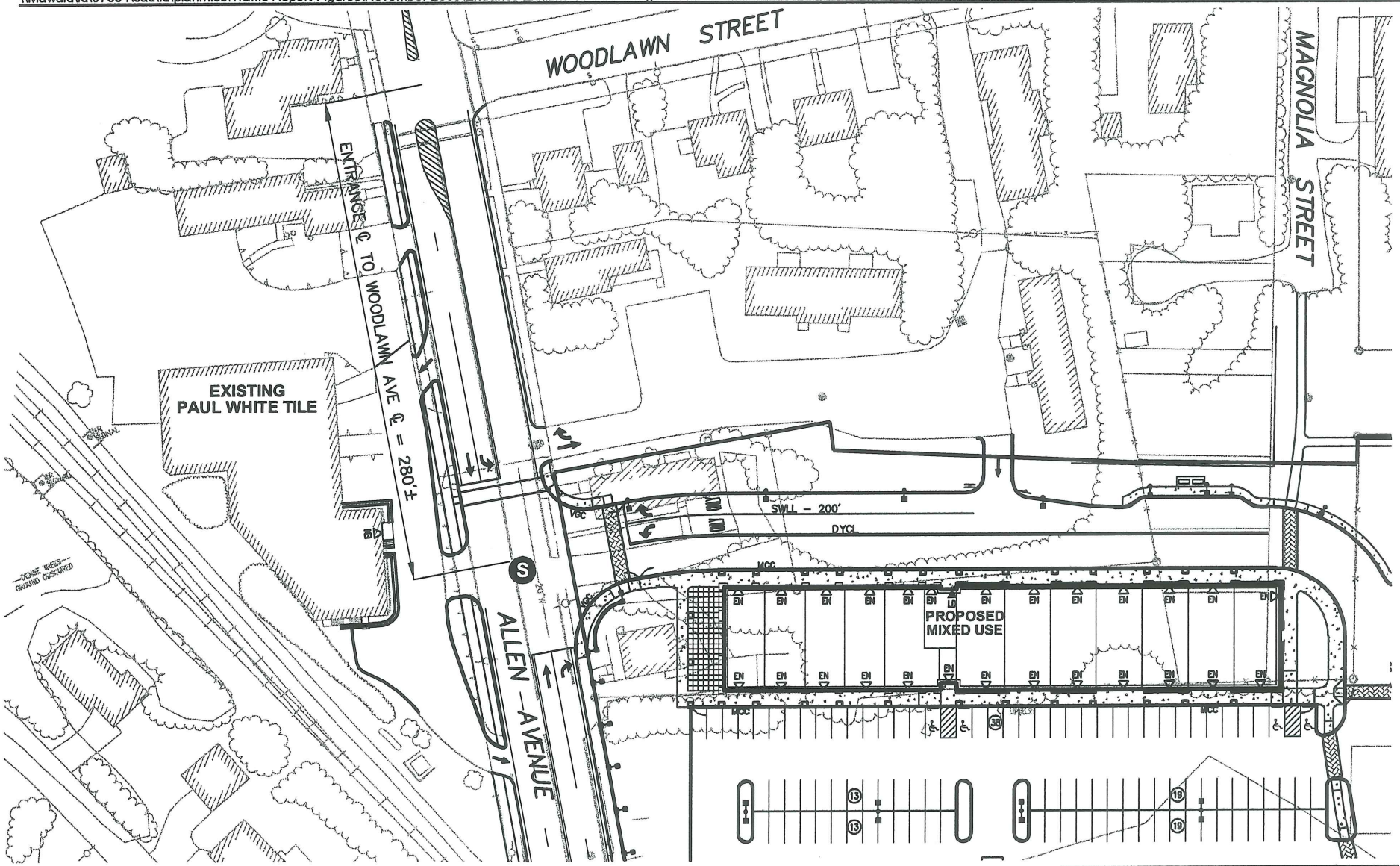

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Figure 17

Conceptual Access Management Improvement
Site Entrance at Allen Avenue

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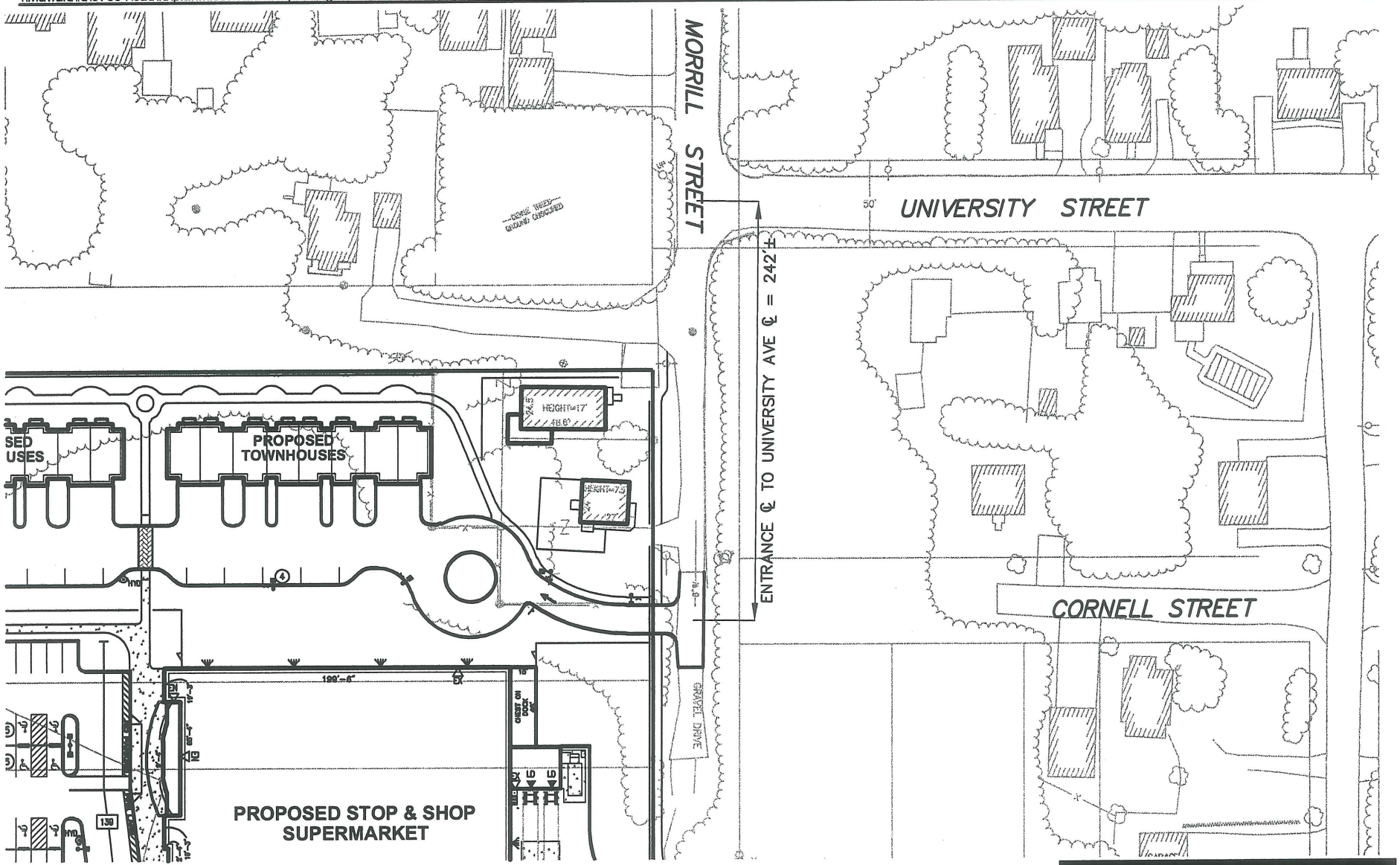

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Figure 18

Conceptual Access Management Improvement
Site Entrance at Morrill Street

- Widen Allen Avenue to provide a consistent four lane cross-section between Forest Avenue and the site drive, tapering down to one lane prior to Woodlawn Drive.
- Create separate left- and right-turn lanes exiting the site along with one entrance lane into the site.
- Provide access from the Paul White Tile building located directly opposite the site driveway into the signal.
- Provide a connection from the Allen Avenue Apartments located immediately adjacent to the site driveway into the Center's main drive aisle which will provide residents and visitors to the apartment development direct access to the signal.
- Provide adequate pedestrian accommodations along the project frontage which would provide a five- to seven-foot sidewalk.
- Provide a pedestrian crossing over Allen Avenue at the site driveway which would be controlled by the signal – thereby providing a safe and protected crossing location for residents seeking to cross Allen Avenue.

In addition to those improvements cited above, there will also need to be right-of-way dedication by the applicant in order to implement these improvements along Allen Avenue. Based on existing information, it appears that this widening can be provided along the site frontage in order to meet the necessary requirements for the installation of the four-lane cross section.

In addition to the main access driveway along Allen Avenue, the applicant is proposing to provide a one-way connection from the Woodlawn Avenue neighborhood directly into the project site. This connection will provide residents of the neighborhood the ability to both:

- Make a left-turn onto Allen Avenue through the project's signalized driveway access without having to wait at the Stop sign at the end of Woodlawn Avenue to make this maneuver, and
- Provide direct access into, but not out of, the project site – therefore eliminating the ability for vehicles to travel and 'cut-through' the Woodlawn Avenue neighborhood that do not belong there.

Because of the nature of the one-way connection, there will not be any traffic exiting the site and traveling through the Woodlawn Avenue neighborhood. In order to return to the neighborhood from the project site, these residents will simply make a right turn at the driveway along Allen Avenue and then make another right turn into Woodlawn Avenue from Allen Avenue. This improvement is intended to improve access out of the Woodlawn Avenue neighborhood without increasing the likelihood of drivers leaving the site and "cutting through" the neighborhood.

Finally, the proponent has identified several potential locations for emergency vehicle access into and out of the site. It is envisioned that these locations will be discussed in greater detail with the City of Portland Fire and Police Departments to

determine the most appropriate location for the emergency access driveway into the site. Currently proposed, this emergency access is located off of Allen Avenue in the vicinity of Bruno's.

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Off-Site Improvements

While the previous section identifies the immediate front-door access requirements for the project, this section identifies the off-site improvements necessary to accommodate the proposed mixed-use development-generated traffic on the surrounding roadway network. The proponent recognizes that the mere addition of new traffic to the area would not serve to improve traffic conditions for the many drivers who travel through the area's arterial roadways on a daily basis. It is for this reason that the future vision of traffic conditions in the area should be made with the understanding that roadway improvements are needed and will be provided by the project proponent as part of the development of this project. In other words, what is out there today for roadway design and layout is not what will be out there upon the completion of this project.

Morrill's Corner

As noted, the Morrill's Corner intersections will serve as the gateway to the project site for the majority of the site's visitors. Both visual observations and capacity analyses indicate that the intersections of Allen Avenue at Forest Avenue and Forest Avenue at Stevens Avenue/Bishop Street currently experience peak commuter hour congestion. While observations conducted between 2001 (prior to the Maine DOT improvements) and 2004 (after the completion of these improvements) clearly show an improvement to the congestion along these roadways, there is still times when traffic conditions are congested in this area.

Forest Avenue is a crucial link between the City of Portland and the Westbrook/Route 302 region to the north and west of the City. The improvements being proposed along this corridor are intended to address the traffic impacts created by the Morrill's Crossing project and preserve the capacity of this corridor into the future. While slightly different in design, these improvements are generally consistent with those improvements being considered in the PACTS BTIP proposal for the Forest Avenue corridor.

In order to both mitigate the traffic impacts at these locations and to improve the operating conditions for all drivers traveling through this corridor, the proponent is committed to the design and construction of major roadway improvements through the Forest Avenue corridor. These improvements will not only address the movement of vehicular traffic through these locations, but will also serve to upgrade the pedestrian and bicycle environment in and around the Morrill's Corner area.

At the request of the City of Portland's Department of Public Works (DPW), the proposed roadway improvements have been modified since the previous project submission to generally match the City's proposal to widen Forest Avenue from Stevens Street to Bell Street. This modification will result in two full inbound lanes along Forest Avenue and two full outbound lanes along Forest Avenue between Stevens Street and Bell Street.

This plan was originally presented in an April 2004 submission to PACTS as part of the Fiscal Year 2007/2008 requests for funding. Not surprisingly, the BTIP application described Forest Avenue corridor as both unsafe and congested with long delays on the side streets trying to access the mainline corridor. It is envisioned that these improvements will address many of the safety issues along the corridor as well as relive the congestion currently experienced along the corridor.

Ultimately, the proposed corridor plan as presented in Figure 19 will both improve the vehicular traffic flow through this area and, moreover, it will also provide both upgraded sidewalks and bicycle amenities along the corridor as a result of the project.

The applicant considers these improvements both critical to the successful mitigation plan for the proposed project and integral to completing the capacity enhancements at Morrill's Corner first started with the Maine DOT improvements completed between Allen Avenue and Warren Avenue in 2002/2003. In addition to the new inbound (to Portland) lane of traffic being proposed, the existing signal equipment at both locations as well as the at-grade railroad crossing will be fully upgraded to state-of-the-art equipment and pre-emption detection. A full discussion of the coordinated traffic signal system is provided in the following sections.

Pedestrian and Bicycle Accommodations

Generally, the Forest Avenue corridor provides 62 feet of right-of-way along most of its length through this area. In certain locations, it was necessary for the applicant to secure additional right-of-way from abutting landowners to provide this consistent 62-foot cross-section.

Given this amount of right-of-way available along this stretch of roadway, it is necessary to attempt to balance bicycle, pedestrian and vehicular traffic flow through this area. VHB worked with the City staff to determine the optimal usage of this available cross-section in order to consider all three modes of travel through this area of Portland.

The first step was to determine the minimum safe lane widths associated with the vehicular traffic in the area. Based on our review of the current lane widths in the area, an 11-foot travel lane was considered for the majority of the study area. This resulted in the need to provide four 11-foot wide through lanes along Forest Avenue

(or 44 feet in total). The remaining right-of-way available provides for nine feet on either side of the vehicular travel ways. Consideration was given to providing the following three scenarios:

- ***Seven-foot sidewalks and two-foot shoulders/bicycle lanes*** – Provides maximum pedestrian comfort and the ability to do some landscaping within the seven-foot sidewalk area; matches current bicycle environment (which is substandard).
- ***Six-foot sidewalks and three-foot shoulders/bicycle lanes*** – Provides average pedestrian comfort with no ability to do any landscaping within the sidewalk area; provides minimal bicycle amenities.
- ***Five-foot sidewalks and four-foot shoulders/bicycle lanes*** – Provides minimum pedestrian comfort with no ability to do any landscaping within the sidewalk area; provides moderate bicycle amenities along the corridor.

For the purposes of this mitigation plan, the first option (seven-foot sidewalks and two-foot shoulders) is being proposed for the Forest Avenue corridor. This proposal is consistent with the design recently constructed by the Maine DOT on the first phase of the Forest Avenue corridor between Warren Avenue and Allen Avenue.

However, in trying to strike a balance between the pedestrian and bicycle needs, VHB suggests that the City consider the second option as a means of providing minimally acceptable bicycle accommodations as well providing pedestrian amenities in excess of the absolute minimum.

Given this suggestion, the applicant is committed to working with the City to determine the ultimate disposition of this design and would be willing to modify the design based upon the City's desires to balance pedestrian and bicycle needs.

Traffic Signal Coordination

Due to the proximity of the proposed traffic signals at the site drive to the Morrill's Corner intersections, the proponent is proposing to coordinate all four of the traffic signals within this area to ensure safe and efficient traffic flow through this corridor. These intersections include:

- Forest Avenue at Warren Avenue,
- Forest Avenue at Allen Avenue,
- Forest Avenue at Stevens Avenue/Bishop Street, and
- Allen Avenue at the site driveway

Applying the coordinated traffic signal system creates the ability to provide enhanced and integrated traffic operations at the signalized intersections, as well as to provide for enhanced vehicle progression along the Forest Avenue corridor. Traffic progression in this context refers to the ability of a motorist to travel through

one or more signalized intersections while minimizing the chance that they would have to stop for a red light. Typically, coordinated traffic signal systems can be designed to minimize vehicle stops and therefore maximize vehicle progression along main-line approaches. Specifically, the traffic signal system will:

- Coordinate traffic movements more effectively within the corridor through the implementation of a coordinated traffic signal timing and phasing plan. This will minimize the delay for vehicles traveling along Forest Avenue northbound and southbound and maximize vehicle progression in this area.
- Regulate traffic flow and minimize queue lengths between all locations such that the traffic flow will typically arrive during the green phase of the signal operations.
- Limit the impact of a train crossing occurring within the system by being able to over-ride all four signal operations to continue to process traffic along Forest Avenue.

System Analysis

Standard highway and intersection analysis techniques (e.g., CINCH, HCS) are limited in that they only account for impacts at a specific intersection. They do not take into account the effects of adjacent intersection operations when determining operational issues at a specific intersection. Queuing, poor signal timings and coordination, as well as fluctuations in traffic volumes, can all impact the operation of an intersection.

To model the corridor accurately and to show the impacts between the adjacent intersections, a standard modeling program that is based on the 2000 Highway Capacity Manual was used. The program, Synchro, provides an analysis tool that models the effect and benefit of traffic signal coordination. Synchro software analyzes traffic signal systems based on evaluation criteria contained in the 2000 Highway Capacity Manual.[16] The analysis is included in the Appendix of this document and generally indicates that operations at all three intersections along Forest Avenue will operate at LOS D or better during the critical weekday evening and Saturday midday peak hour periods. Table 12 provides a summary of traffic levels-of-service at these signalized intersections with and without the proposed mitigation. In addition, implementation of the proposed geometric and traffic signal improvements discussed above will serve to offset existing operational deficiencies, improve existing safety deficiencies, and provide an overall net benefit to existing traffic signal operations in this area.

[16] Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C. (2000).

Table 12
Signalized Intersection Mitigation Impact Capacity Analyses Summary

Location	Time Period	2007 No-Build			2007 Build			2007 Build with Mitigation		
		v/c [a]	Delay [b]	LOS [c]	v/c	Delay	LOS	v/c	Delay	LOS
Forest Avenue at Warren Avenue	Weekday Evening	0.80	21	C	0.83	22	C	0.83	20	B
	Saturday Midday	0.73	17	B	0.73	23	C	0.76	17	B
Forest Avenue at Allen Avenue	Weekday Evening	0.90	39	D	0.95	50	D	0.97	37	D
	Saturday Midday	0.79	29	C	0.84	36	D	0.82	27	C
Forest Avenue at Stevens Ave/Bishop St	Weekday Evening	0.89	29	C	0.93	36	D	0.84	19	B
	Saturday Midday	0.80	19	B	0.85	22	C	0.71	12	B
Allen Avenue at Washington Avenue	Weekday Evening	0.77	42	D	0.86	48	D	0.86	39	D
	Saturday Midday	0.71	35	C	0.78	41	D	0.80	34	C
Allen Avenue at Site driveway	Weekday Evening	n/a			n/a			0.94	31	C
	Saturday Midday							0.91	27	C

a volume to capacity ratio
b average delay per vehicle in seconds
c level of service
n/a not applicable; intersection is not signalized under these conditions

As shown in Table 12, timing improvements at the intersection of Forest Avenue at Warren Avenue would improve traffic conditions at that location. Similarly, the Allen's Corner intersection would also see a slight improvement over the Build conditions.

Most importantly, all three Morrill's Corner intersections are expected to operate at LOS D or better under future 2007 Build conditions with the proposed mitigation measures in place. While this is comparable in many ways to the traffic operations currently experienced along the corridor, it is critical to point out that these levels of operation include the additional traffic associated with the Morrill's Crossing development (in other words, the mitigation program has not only addressed the current traffic deficiencies at the intersections but also accommodated the additional traffic to be generated by the development with no noticeable difference in operating levels).

As shown previously in Table 11, with the mitigation measures in place, the vehicle queue lengths in the Morrill's Corner area are expected to be reduced to levels that are generally better than those that exist under the No-Build condition.

In total, the improvements to the Morrill's Corner intersections will total in excess of $1,000,000 worth of mitigation.

With this improvement in place, the traffic environment in the Morrill's Corner area will improve significantly during the off-peak periods of the day and will meet all Maine DOT and City requirements with respect to the "unreasonable congestion" definitions. These improvements will not only be designed to accommodate the development-related traffic, but will also be effective in reducing the vehicle delays and queues such that the traffic operations at Morrill's Corner will either remain unchanged or improve beyond the current conditions.

Allen's Corner

Concurrent with the improvements at Morrill's Corner, the proponent will make signal timing and phasing adjustments to the Allen's Corner intersections in order to address capacity-related issues identified in the analysis. The proponent will work with the City of Portland to identify these changes, which will result in improved traffic operations for both the project-related traffic and general traffic traveling through the area. One set of potential timing and phasing options have been provided in the Appendix to this report for consideration.

The applicant suggests that a post-development monitoring plan be set in place to determine what improvements could be made to this location once the development is operating.

Forest Avenue at Warren Avenue

Similarly, the intersection of Forest Avenue at Warren Avenue will see some benefit through the implementation of revised signal timing and phasing plans. As part of the larger traffic improvement program proposed below, the applicant will coordinate this traffic signal with the other two signalized locations to improve traffic flow between these locations.

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Commitment to Mitigation and Improvements

The above sections have identified a number of potential improvements designed to mitigate not only the project's impacts on the roadway system, but to accommodate existing and future traffic conditions unrelated to the proposed project. In order to provide a contribution towards the improvements in the area, the proponent is committed to the following mitigation measures:

Design and construct the Morrill's Corner intersection improvements along with the Allen Avenue 'front-door' improvements. Unless otherwise noted, all costs associated with the design and construction of those above-identified improvements will be the responsibility of the project proponent, pending issuance of all necessary state and local permits for construction of the proposed project. The final traffic signal system design will be subject to approval by the City of Portland and the Maine DOT for conformance with local and State design standards. Any necessary right-of-way needed to provide these improvements would also be the responsibility of the applicant.

Institute a Travel Demand Management program for the development occupants. In order to reduce the vehicle trips associated with the development, the proponent will develop and implement a TDM program for the site.