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# TRAFFIC IMPACT STUDY

## 277 Bridge Street

Fairhaven, MA

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# Introduction

Bowman has completed a traffic impact study for the proposed commercial development to be located at 277 Bridge Street in Fairhaven, Massachusetts (herein referred to as the "Project"). This traffic impact study is based on the Layout Plan prepared by Zenith Consulting Engineers, LLC (ZCE) dated July 12, 2023, for a proposed 5,850 square foot (sf) commercial building. The purpose of this traffic impact study is to evaluate existing and projected traffic operations and safety conditions associated with the Project within the study area.

The traffic impact study is based on a review of existing traffic volumes, recent crash data, and the anticipated traffic generating characteristics of the Project. The study examines existing and projected traffic operations (both with and without the Project) at key intersections in the vicinity of the Project site. The study area was selected based on a review of the surrounding roadway network and anticipated trip generating characteristics of the Project. This study provides an analysis of traffic operations during the weekday morning and weekday afternoon peak hours, when the combination of adjacent roadway volumes and Project trips is expected to be the greatest.

Based on the analysis presented in this study, the Project is not expected to have a noticeable impact on the safety and operations of the area roadways. The following report documents these findings.

## Project Description

The existing site, as shown in **Figure 1**, consists of undeveloped land located just east of the Bridge Street Gas development, which includes a Mobil Gas Station, convenience store, and Dunkin' Donuts. The Project would include the construction of a 5,850 square foot (sf) commercial building on the undeveloped land adjacent to Bridge Street Gas. The Project site is bounded by Bridge Street to the north, Bridge Street Gas to the west, industrial properties to the east, and residential properties to the south. Access to the Project site would be shared with the Bridge Street Gas development via the existing unsignalized driveway on the south side of Bridge Street. The proposed site and existing Bridge Street Gas development would intersect as a T-type intersection located approximately 120 feet south of Bridge Street. The approach of the proposed site would be placed under STOP-control.

The Project would include a total of 34 parking spaces for the proposed commercial building, two of which would be accessible spaces adjacent to the building. Two-way circulation would be provided throughout the parking lot and one-way counterclockwise circulation would be provided around the east and north sides of the proposed building for deliveries, dumpster access, and ease of circulation around the rear of the building.

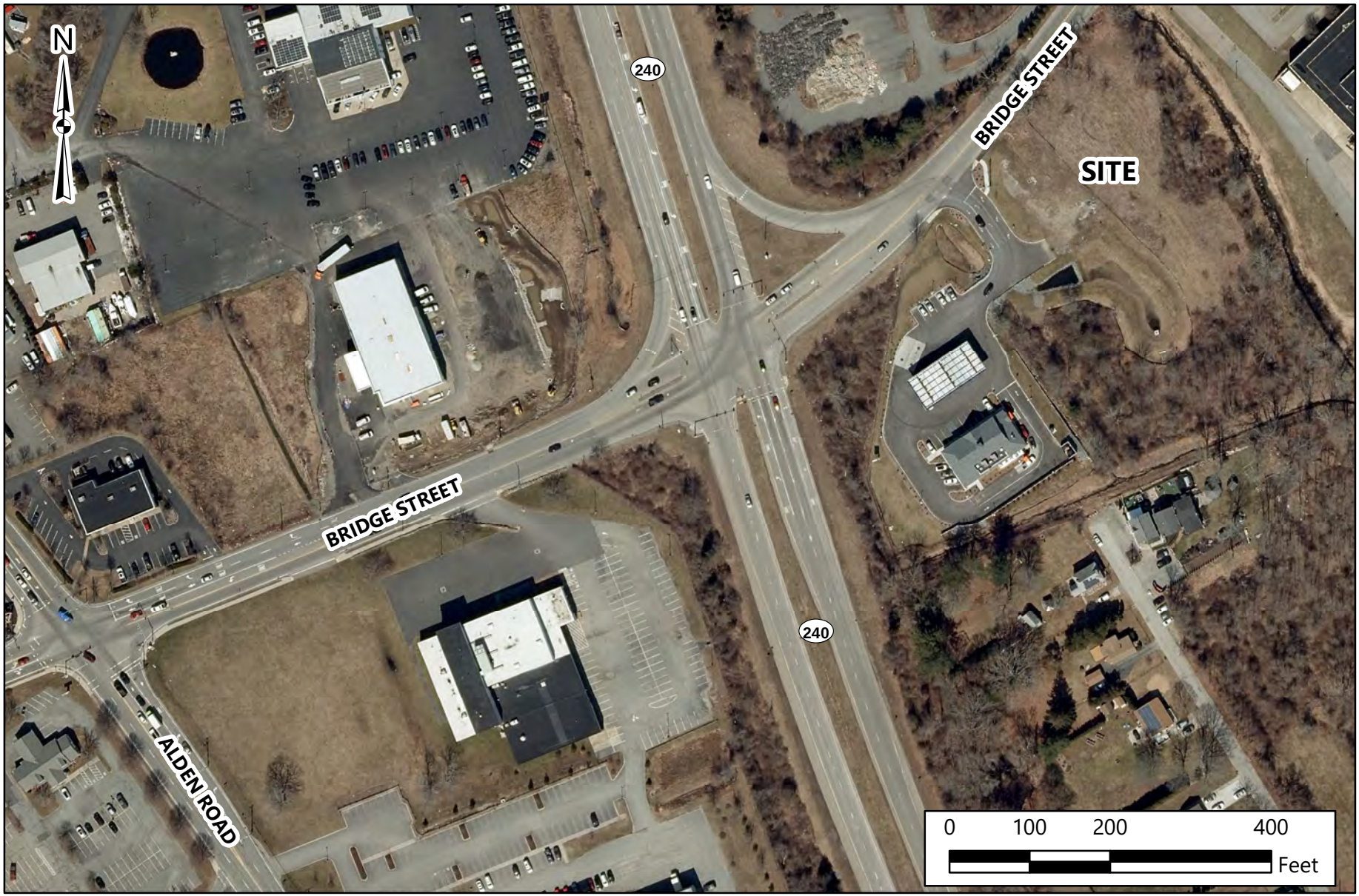


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**Figure 1**
**Project Location**
**277 Bridge Street**
**Fairhaven, MA**

## Study Methodology

This traffic impact study evaluates existing and projected traffic operations within the study area for the weekday morning and weekday afternoon peak hour traffic conditions, when the combination of the adjacent roadway volumes and estimated Project trips would be expected to be the greatest.

The study was conducted in three steps. The first step consisted of an inventory of existing traffic conditions within the Project study area. As part of this inventory, manual turning movement counts were collected in the vicinity of the Project site during the weekday morning and weekday afternoon peak periods. A field visit was also completed to document intersection and roadway geometries. Crash data at the study area intersections was obtained from the Massachusetts Department of Transportation (MassDOT) to determine if the study area intersections have existing traffic safety deficiencies.

The second step of the study builds on the data collected in the first step to establish the basis for evaluating potential transportation impacts associated with the projected future conditions. During the second step, the projected traffic demands associated with planned future developments that could influence traffic volumes at the study area intersections were assessed. Consistent with MassDOT traffic study guidelines, 2023 Existing traffic volumes were forecasted to the future year 2030 to establish 2030 No Build (without Project) conditions and 2030 Build (with Project) conditions.

The third step of this study determined if measures were necessary to improve existing or future traffic operations and safety, minimize potential traffic impacts, and provide safe and efficient access to the Project site.

## Study Area Intersections

The following study area intersections were selected for analysis:

- Route 240 at Bridge Street
- Bridge Street at 277 Bridge Street Site Driveway

The traffic impact study documents existing and future traffic conditions for the study area intersections noted above.

# Existing Conditions

The existing conditions assessment included in this study consists of an inventory of intersection and roadway geometries, an inventory of traffic control devices, the collection of peak period traffic volumes, and a review of recent crash data. The existing conditions in the vicinity of the Project site are summarized below.

## Roadway Network

The study area roadway network characteristics are summarized in **Table 1** and described in further detail below.

**Table 1: Existing Roadway Characteristics**

| Roadway Name | Average Daily Traffic Volumes (vehicles per day) | Roadway Classification (1) | | Number of Travel Lanes | Posted Speed Limit (mph) |
|---|---|---|---|---|---|
| | | Roadway Classification | Roadway Jurisdiction | | |
| Route 240 | 24,100 | Urban Principal Arterial | MassDOT | 4 | 40 |
| Bridge Street | 8,060 | Urban Collector | Town of Fairhaven | 2 | 35 |

(1) Based on data presented in MassDOT's Road Inventory viewer.

### Route 240

Route 240 generally extends in a north-south direction connecting to Interstate 195 north of the Project site to Huttleston Avenue (US Route 6) to the south, where the roadway continues as Sconticut Neck Road. Route 240 is classified as an urban principal arterial under MassDOT jurisdiction and is primarily a four-lane, two-way, median-divided highway except at the intersection with Bridge Street and with US Route 6. Route 240 generally has two approximately 12-foot-wide travel lanes in each direction separated by an approximately 30-foot-wide grass median. Route 240 has approximately 10-foot-wide shoulders on the right side of the roadway and approximately five-foot-wide shoulders on the left side of the roadway in each direction with no sidewalks on either side. Route 240 has a posted speed limit of 40 miles per hour (mph).

### Bridge Street

Bridge Street generally runs in an east-west direction through the Town of Fairhaven and is classified as an urban collector under the Town of Fairhaven jurisdiction. In the vicinity of the site, Bridge Street is a two-lane, two-way roadway with approximately 17-foot-wide travel lanes and approximately one-foot-wide shoulders in each direction. Bridge Street provides access to commercial and residential land uses and has a posted speed limit of 35 mph in the vicinity of the site.

## Signalized Intersections

The following signalized intersection in the vicinity of the site is within the study area:

**Route 240 at Bridge Street**

The signalized intersection of Route 240 at Bridge Street is a four-way intersection with Route 240 forming the north and south legs and Bridge Street forming the east and west legs. The Route 240 northbound approach consists of an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane. The Route 240 southbound approach consists of an exclusive left-turn lane, two through lanes, and a channelized right-turn lane under yield-control. The Bridge Street eastbound approach consists of an exclusive left turn lane, a shared left-turn/through lane, and an exclusive right-turn lane. The Bridge Street westbound approach consists of an exclusive left-turn lane, a through lane, and a channelized right-turn lane under yield-control. A signalized crosswalk is provided across the northbound approach to the intersection.

The intersection is controlled by an actuated-uncoordinated traffic signal with four phases for vehicular traffic, including a lead phase for protected northbound and southbound left turns with an overlap for eastbound right turns, a phase for northbound and southbound traffic, a phase for westbound traffic with an overlap for northbound right turns, and a phase for eastbound traffic. The signalized crosswalk across the northbound approach is controlled by a push-button activated pedestrian phase, during which the southbound left-turn movement also runs.

### Unsignalized Intersections

The following unsignalized intersection in the vicinity of the site are within the study area:

**Bridge Street at 277 Bridge Street Site Driveway**

The unsignalized intersection of Bridge Street at 277 Bridge Street Site Driveway is a three-way intersection with Bridge Street forming the east and west legs and 277 Bridge Street Site Driveway forming the south leg. The driveway currently provides access to the Bridge Street Gas development on site and would share access with the Project. The Bridge Street eastbound and westbound approaches each consist of one shared lane. The northbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane under STOP-control.

### Area Transit Services

Public transportation in Fairhaven is provided by the Southeastern Regional Transit Authority (SRTA) bus routes. Fixed bus Route 211 provides service from the SRTA Terminal to Stop and Shop in Fairhaven via Bridge Street. The closest stop to the site is provided approximately 0.3 miles east of the site on Mill Street, adjacent to the Southcoast VNA facility.

### Pedestrian-Bicycle Facilities

Bridge Street provides an approximately five-foot-wide sidewalk on the south side of the roadway that extends for approximately 300 feet east of the 277 Bridge Street Site Driveway, where there is an uncontrolled crosswalk across Bridge Street. The sidewalk continues east on the north side of Bridge Street towards the intersection with Mill Road.

## Existing Traffic Volumes

To assess peak hour traffic conditions, turning movement counts (TMC) were conducted at the study area intersections during the weekday morning and weekday afternoon peak periods. Additionally, automatic traffic recorder (ATR) data was conducted on Bridge Street within the vicinity of the site.

### *Turning Movement Count Data*

TMCs were conducted on Thursday, December 21, 2023 from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. The results of the turning movement counts are tabulated by 15-minute periods and are provided in **Appendix A**. The four highest consecutive 15-minute intervals during each of these count periods constitute the peak hours that are the basis of the traffic analysis provided in this report. Based on a review of the peak period traffic data, the weekday morning peak hour occurs between 7:30 AM and 8:30 AM and the weekday afternoon peak hour occurs between 4:00 PM and 5:00 PM.

### *Seasonal Variation*

To account for seasonal variation in this area, MassDOT's most recent 2019 Weekday Seasonal Factors and available continuous count station data were reviewed. Based on the MassDOT 2019 Weekday Seasonal Factors, December traffic volumes on urban principal arterials (Route 240) are reflective of average month conditions, and December traffic volumes on urban collectors (Bridge Street) are approximately four percent lower than average month conditions. Based on MassDOT continuous count data collected on Route 140, a nearby urban principal arterial in New Bedford, MA approximately ten miles from the Project site (Station ID 617), December traffic volumes in the area are approximately four percent lower than average month conditions. This is consistent with the MassDOT 2019 Weekday Seasonal Factors for urban collectors. To provide a conservative analysis, the counted December volumes were seasonally adjusted upward by four percent to reflect average month conditions. The MassDOT seasonal adjustment data and count station data is provided in **Appendix B**.

### *Automatic Traffic Recorder Data*

ATR data was collected on Bridge Street, east of the 277 Bridge Street Site Driveway for a 48-hour period from Wednesday, December 20 through Thursday, December 21, 2023. The ATR data is summarized in **Table 2** below and provided in **Appendix A**.

**Table 2: ATR Summary**

| Roadway Name | Direction | Weekday ADT(1) | AM Peak(2) (vph) | PM Peak(3) (vph) | Vehicle Speeds(4) (mph) |
|---|---|---|---|---|---|
| Bridge Street, east of 277 Bridge Street Site Driveway | Eastbound | 4,060 | 647 | 261 | 38 |
| | Westbound | 4,000 | 246 | 459 | 38 |
| | **Total** | **8,060** | **893** | **720** | |

(1) Average Daily Traffic based on ATR conducted from December 20 through December 21, 2023 and seasonally adjusted.
(2) Weekday morning peak hour volumes occurred between 7:30 AM – 8:30 AM.
(3) Weekday afternoon peak hour volumes occurred between 4:00 PM – 5:00 PM.
(4) Based on 85th percentile speeds.

As shown in Table 2, the average daily traffic (ADT) on Bridge Street in the vicinity of the Project site is 8,060 vehicles per day (vpd), with directional traffic split approximately 50/50 between the eastbound and westbound directions. The peak hour traffic volumes indicate that a majority of traffic during the weekday morning peak hour is traveling in the eastbound direction, and a majority of the traffic during the weekday afternoon peak hour is traveling in the westbound direction. The vehicle operating speeds on Bridge Street along the frontage of the site were measured to be 38 mph in both the eastbound and westbound directions. The posted speed limit on Bridge Street is 35 mph.

The resulting 2023 Existing weekday morning and weekday afternoon peak hour traffic volumes are presented in the traffic projection model provided in **Appendix C** and are presented in **Figure 2** and **Figure 3,** respectively.

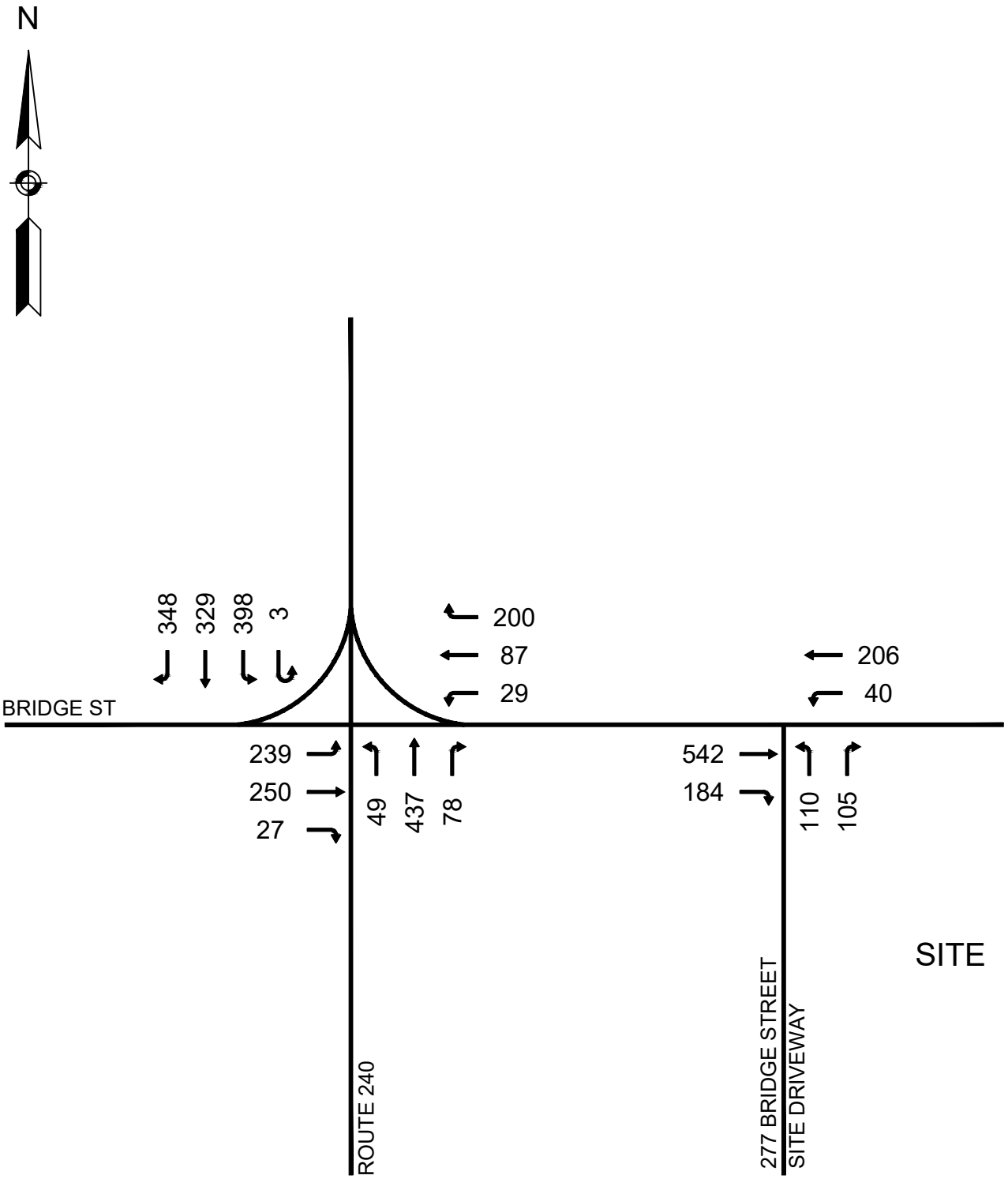




FIGURE 2
2023 EXISTING TRAFFIC VOLUMES
WEEKDAY MORNING

277 BRIDGE STREET
FAIRHAVEN, MA

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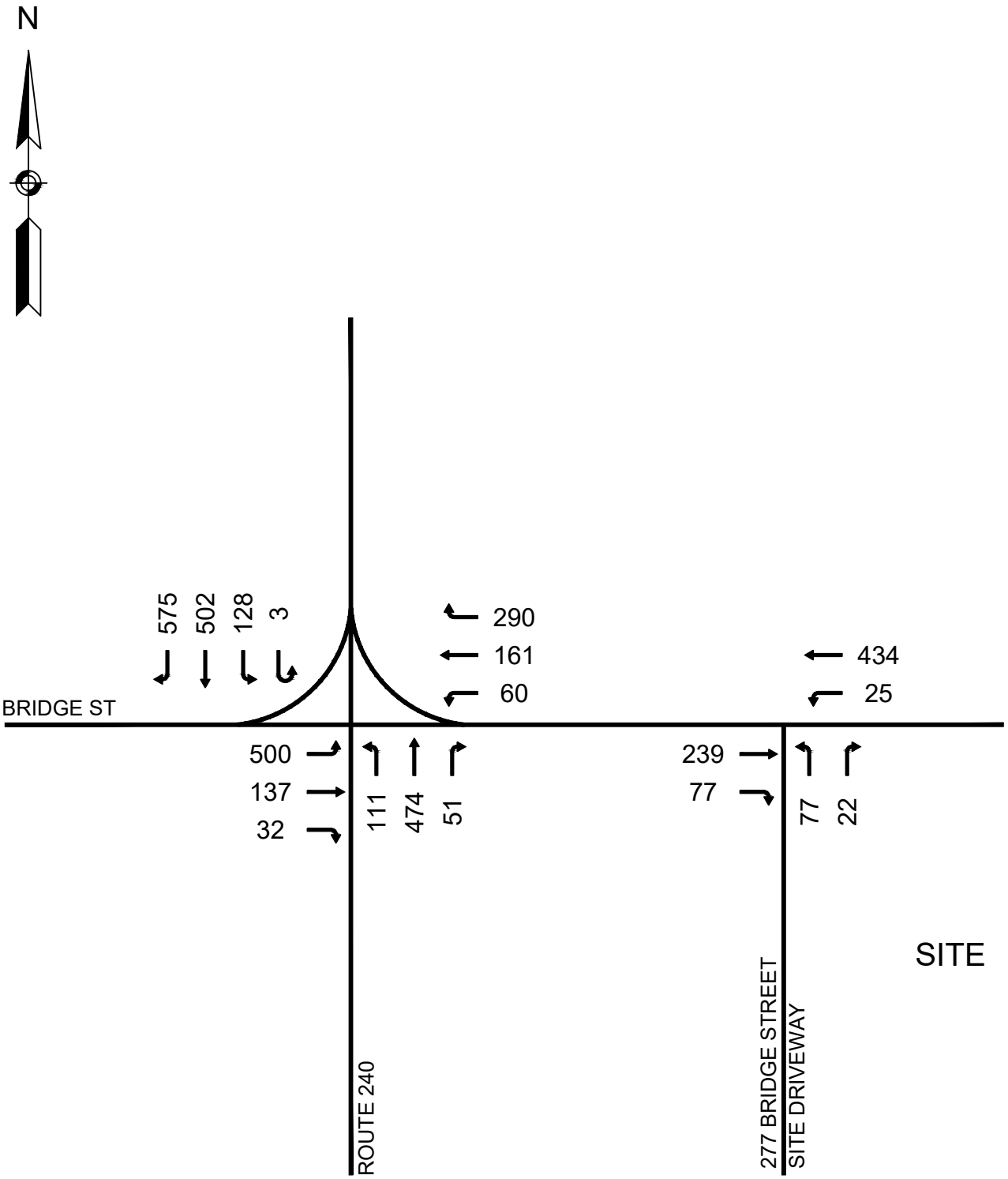


FIGURE 3
2023 EXISTING TRAFFIC VOLUMES
WEEKDAY AFTERNOON

277 BRIDGE STREET
FAIRHAVEN, MA

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## Crash Summary

Crash data at the study area intersections was obtained from MassDOT for the most recent five-year period available. This data includes complete yearly crash summaries for the years 2016 through 2020.

The MassDOT Crash Rate Worksheet calculations were used to determine whether the crash frequencies at the study area intersections were unusually high given the travel demands at each location. The MassDOT Crash Rate Worksheet calculates a crash rate expressed in crashes per million entering vehicles (MEV). The calculated rate is then compared to the average rate for signalized and unsignalized intersections statewide and within MassDOT District 5. For signalized intersections, the statewide average crash rate is 0.78 crashes per MEV and the MassDOT District 5 crash rate is 0.75 crashes per MEV. For unsignalized intersections, the statewide and MassDOT District 5 average crash rates are both 0.57 crashes per MEV.

A detailed summary of the crash data is provided in **Appendix D**. An overall summary of the crash data is provided in **Table 3**, below for each of the study intersections.

**Table 3: Intersection Crash Summary**

| Location | Crash Frequency Per Year | | | | | Total | Average Crash Rate (1) |
|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | | |
| Route 240 at Bridge Street | 15 | 15 | 17 | 10 | 9 | 66 | 1.20 |
| Bridge Street at 277 Bridge Street Site Driveway | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |

(1) Average crash rate per million entering vehicles based on MassDOT Crash Rate Worksheet calculations.

The signalized intersection of Route 240 at Bridge Street is reported to have experienced a total of 66 crashes during the five-year period analyzed, resulting in a crash rate of 1.20 crashes per MEV, which is higher than the statewide and District 5 crash rates for signalized intersections. Of the 66 reported crashes at the intersection, 45 crashes were rear-end collisions, nine crashes were angle collisions, eight crashes were sideswipe collisions, three crashes were single vehicle collisions, and one crash was a head-on collision. Eight of the reported crashes resulted in personal injury, 52 crashes resulted in property damage only, and six crashes were of unknown severity. This intersection was listed as a 2017-2019 Highway Safety Improvement Plan (HSIP) cluster, but was not listed as an HSIP cluster for the most recent 2018-2020 period. No Road Safety Audit has been performed at this intersection.

The unsignalized intersection of Bridge Street at 277 Bridge Street Site Driveway is reported to have experienced no crashes during the five-year period analyzed. The Bridge Street Gas development was opened in 2020. Although crash data available from MassDOT beyond 2020 has not been finalized and considered to be subject to change, crash data for 2021 through 2023 at the 277 Bridge Street Site Driveway was reviewed and there were no reported crashes during this time period.

# Future Conditions

To determine future traffic demands on the study area roadways and intersections, the 2023 Existing traffic volumes were projected to the future-year 2030, in accordance with MassDOT guidelines. Traffic volumes on the study area roadways in 2030 are considered to include existing traffic, as well as new traffic resulting from general growth in the study area and from other planned development projects, independent of the Project. The potential background traffic growth, unrelated to the Project, was considered in the development of the 2030 No Build (without Project) peak hour traffic volumes. The estimated traffic increases associated with the Project were then added to the 2030 No Build volumes to reflect the 2030 Build (with Project) traffic conditions. A description of the development of the 2030 No Build and 2030 Build traffic volume networks is presented below.

## Planned Roadway Improvements

Planned roadway improvement projects can impact travel patterns and future traffic operations. To develop a clearer understanding of future area roadway operations, The Town of Fairhaven Planning & Economic Development Department was consulted. The MassDOT Project Portal was also reviewed to identify other roadway improvement projects in the vicinity of the site. Based on the coordination and review, there are no planned roadway improvement projects that would be anticipated to impact future traffic volumes or patterns in the vicinity of the Project site.

## Background Traffic Growth

Traffic growth is generally a function of changes in motor vehicle use and expected land development within the area. To establish the rate at which traffic on the study area roadways can be expected to grow during the seven-year forecast period (2023 to 2030), both historic traffic growth and planned area developments were reviewed.

### *Historic Traffic Growth*

Background traffic growth accounts for changes in traffic volumes associated with general changes in population and other developments that are not known at this time. An annual background traffic growth rate of 1.0% per year, compounded annually, was established for the study area based on coordination with the Town of Fairhaven Planning & Economic Development Department to grow the 2023 traffic volumes to future year of 2030.

### *Site-Specific Growth*

The Town of Fairhaven Planning & Economic Development Department was contacted to inquire about additional developments in the area that would be anticipated to impact future traffic volumes on the study area roadways.

Acushnet Company Headquarters

The Town of Fairhaven identified the there was a special permit modification for the Acushnet Company headquarters located directly east of the Project site. However, the changes would not result in additional employees or visitors to the site and therefore would not be anticipated to impact traffic volumes in the area.

Self-Storage Facility

The Town of Fairhaven also identified an approximately 81,200 sf self-storage facility proposed to be located on the north side of Bridge Street northeast of the Project. Based on coordination with the Town of Fairhaven, no traffic study was performed for the proposed self-storage facility. To estimate the traffic volumes associated with the proposed self-storage facility, trip generation data from the Institute of Transportation Engineers' (ITE) publication, *Trip Generation Manual, 11th Edition* was reviewed. ITE is a national research organization of transportation professionals and provides traffic generation information for various land uses compiled from studies conducted by members nationwide. This reference establishes vehicle trip rates (in this case expressed in trips per square foot) based on actual traffic counts conducted at similar types of existing land uses. Vehicle trip estimates for the proposed self-storage facility were developed based on data presented for Land Use Code (LUC) 151 (Mini Warehouse). Trips associated with the proposed self-storage facility were distributed onto the study area roadways and intersections based on existing travel patterns identified from the data collected as part of the Project. The trip generation for the self-storage facility is presented in **Appendix E.**

### 2030 No Build Traffic Volumes

The 2023 Existing peak hour traffic volumes were grown by 1.0% per year, compounded annually, over the seven-year study horizon to establish the 2030 baseline volumes. The traffic volumes from the proposed self-storage facility noted above was then added to the 2030 baseline volumes, resulting in the 2030 No Build weekday morning and weekday afternoon peak hour traffic volumes, which are illustrated in **Figure 4** and **Figure 5**, respectively. The 2030 No Build traffic volumes are documented in the traffic projection model presented in **Appendix C**.

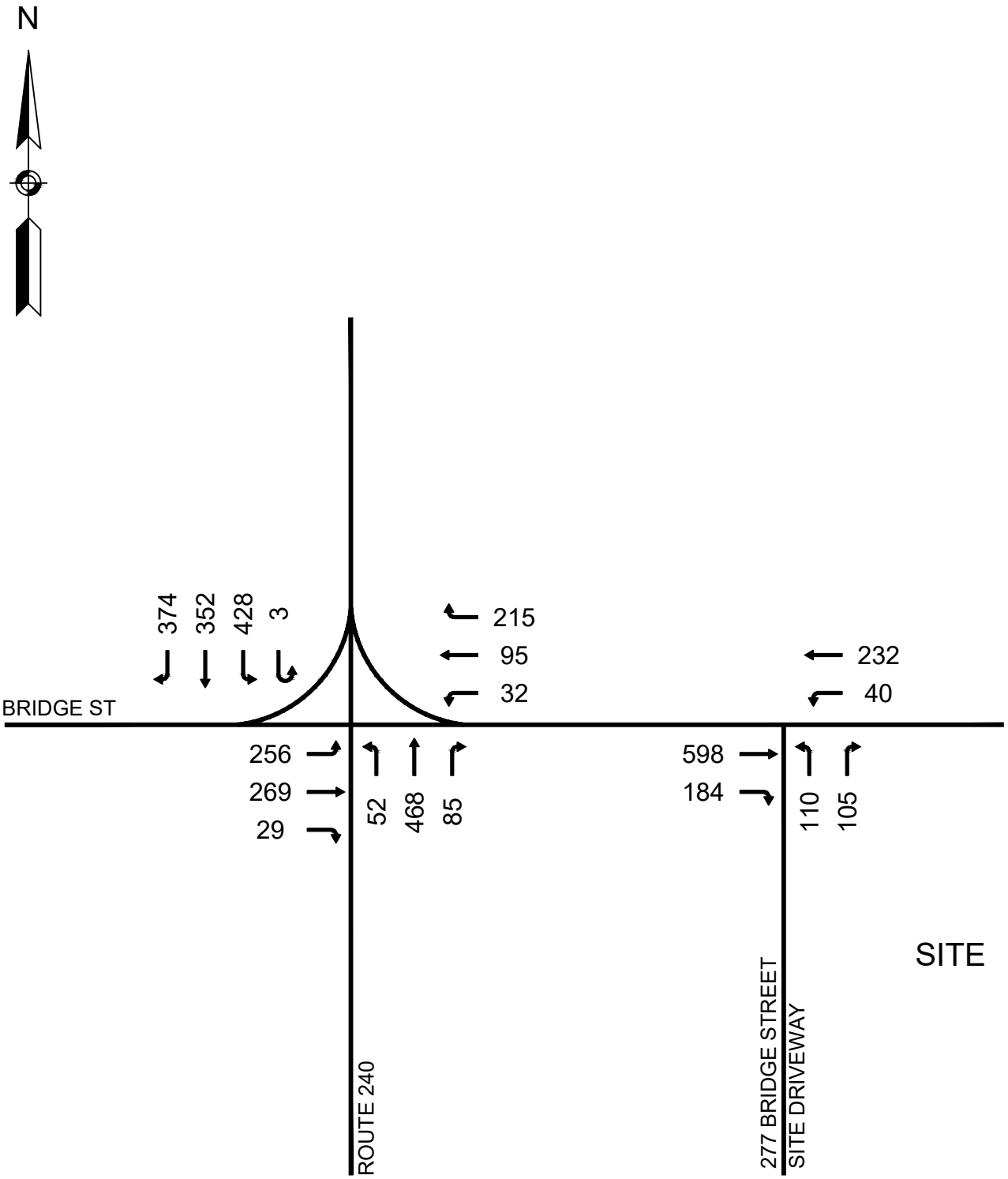




FIGURE 4
2030 NO BUILD TRAFFIC VOLUMES
WEEKDAY MORNING

277 BRIDGE STREET
FAIRHAVEN, MA

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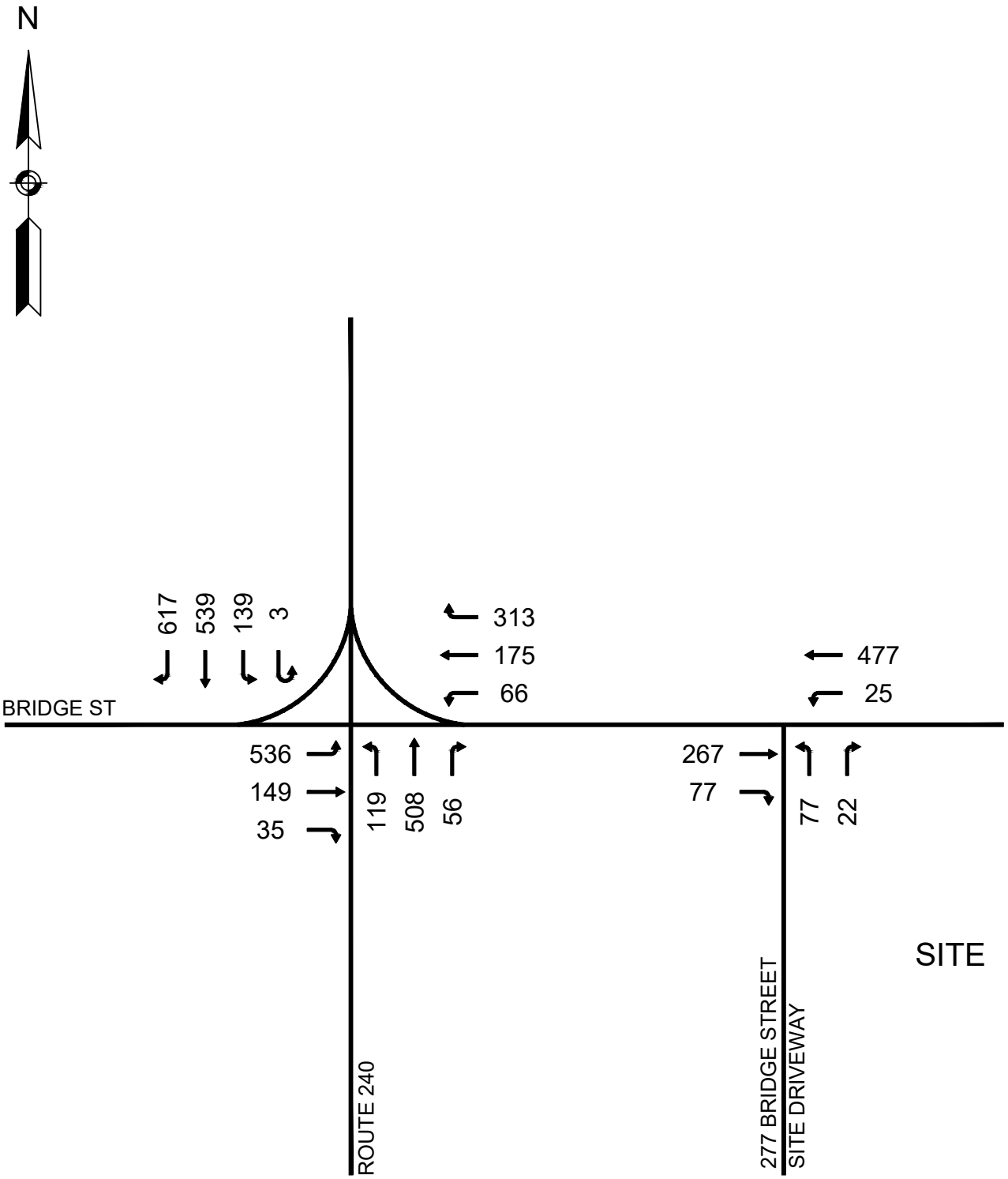


FIGURE 5
2030 NO BUILD TRAFFIC VOLUMES
WEEKDAY AFTERNOON

277 BRIDGE STREET
FAIRHAVEN, MA

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## Trip Generation

To estimate the number of vehicle trips associated with the Project, the ITE *Trip Generation Manual, 11th Edition*, was referenced. Vehicle trip estimates for the Project were developed based on data presented for LUC 822 (Strip Retail Plaza <40k) based on vehicle trips per square foot.

### *Internal Capture*

Since the Project would share access with the existing Bridge Street Gas development, a portion of the trips to/from the Project would be expected to be customers from the existing Mobil Gas Station, convenience store, and Dunkin'. Trips drawn between the shared uses are considered "internal capture" trips, as they are already accessing the Project site for one use while patronizing another, and do not result in an additional vehicle trip to the external roadway network. To be conservative, no reduction for internal capture was applied to the trip generation for the Project.

### *Pass-by Trips*

Not all trips to commercial land uses are considered "new" trips. In fact, a significant portion of the total trips attracted to such land uses are "pass-by" trips. Since pass-by traffic is already on the adjacent roadway network, this portion of the total development traffic is reflected in the existing, base traffic volumes, and does not represent new traffic on the roadway network. Therefore, the total traffic volume associated with the Project is reduced by the pass-by volume to estimate the "new" traffic generated by the Project.

No pass-by data is provided for LUC 822, so similar LUC 821 (Shopping Plaza 40-150k) was reviewed. According to ITE data for LUC 821, 40 percent of the weekday afternoon trips can be attributed as pass-by trips. No pass-by data is provided for weekday morning trips. Therefore, to present a conservative analysis, no pass-by reduction was applied to the weekday morning peak hour trip generation.

A summary of the peak hour trip generation estimates for the Project are shown in **Table 4** below.

**Table 4: Vehicular Trip Generation**

| Land Use | Size | Weekday Morning Peak Hour | | | Weekday Afternoon Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Commercial Trips[1] | 5,850 sf | 12 | 8 | 20 | 27 | 27 | 54 |
| *-Pass-by Trips[2]* | | * | * | * | *-11* | *-11* | *-22* |
| **Net New Trips** | | **12** | **8** | **20** | **16** | **16** | **32** |

(1) ITE Land Use Code 822 (Strip Retail Plaza <40k) based on 5,850 sf.

(2) ITE does not provide pass-by rates for LUC 822. Therefore, the pass-by rate for similar ITE LUC 821 (Shopping Plaza 40-150k) was applied. For LUC 821, 40% of weekday afternoon trips are attributed as "pass-by" trips.

* No data is provided for weekday morning, so to be conservative, no weekday morning trips are attributed as "pass-by" trips.

As shown in **Table 4** above, the Project is estimated to result in approximately 20 new trips (12 entering vehicles and 8 exiting vehicles) during the weekday morning peak hour and approximately 32 new trips (16 entering vehicles and 16 exiting vehicles) during the weekday afternoon peak hour.

### Trip Distribution and Assignment

The traffic estimated to be generated by the Project was distributed onto the study area roadways and intersections based on the existing and logical travel patterns of the adjacent roadways. The resulting arrival and departure patterns are presented in **Figure 6** and are documented in the traffic projection model located in **Appendix C**.

The Project-related traffic was then assigned to the surrounding roadway network based on the Project trip distribution patterns presented in **Figure 6.** The resulting distributed new Project trips are shown in **Figure 7** and **Figure 8** for the weekday morning and weekday afternoon peak hours, respectively.

### 2030 Build Traffic Volumes

To establish the 2030 Build peak hour traffic volumes, the distributed new Project trips shown in **Figure 7** and **Figure 8** were then added to the 2030 No Build peak hour traffic volumes with the distributed pass-by trips to reflect the 2030 Build peak hour traffic volumes. The resulting 2030 Build weekday morning and weekday afternoon peak hour traffic volumes are presented in **Figure 9** and **Figure 10**, respectively. The 2030 Build traffic volumes are documented in the traffic projection model presented in **Appendix C**.

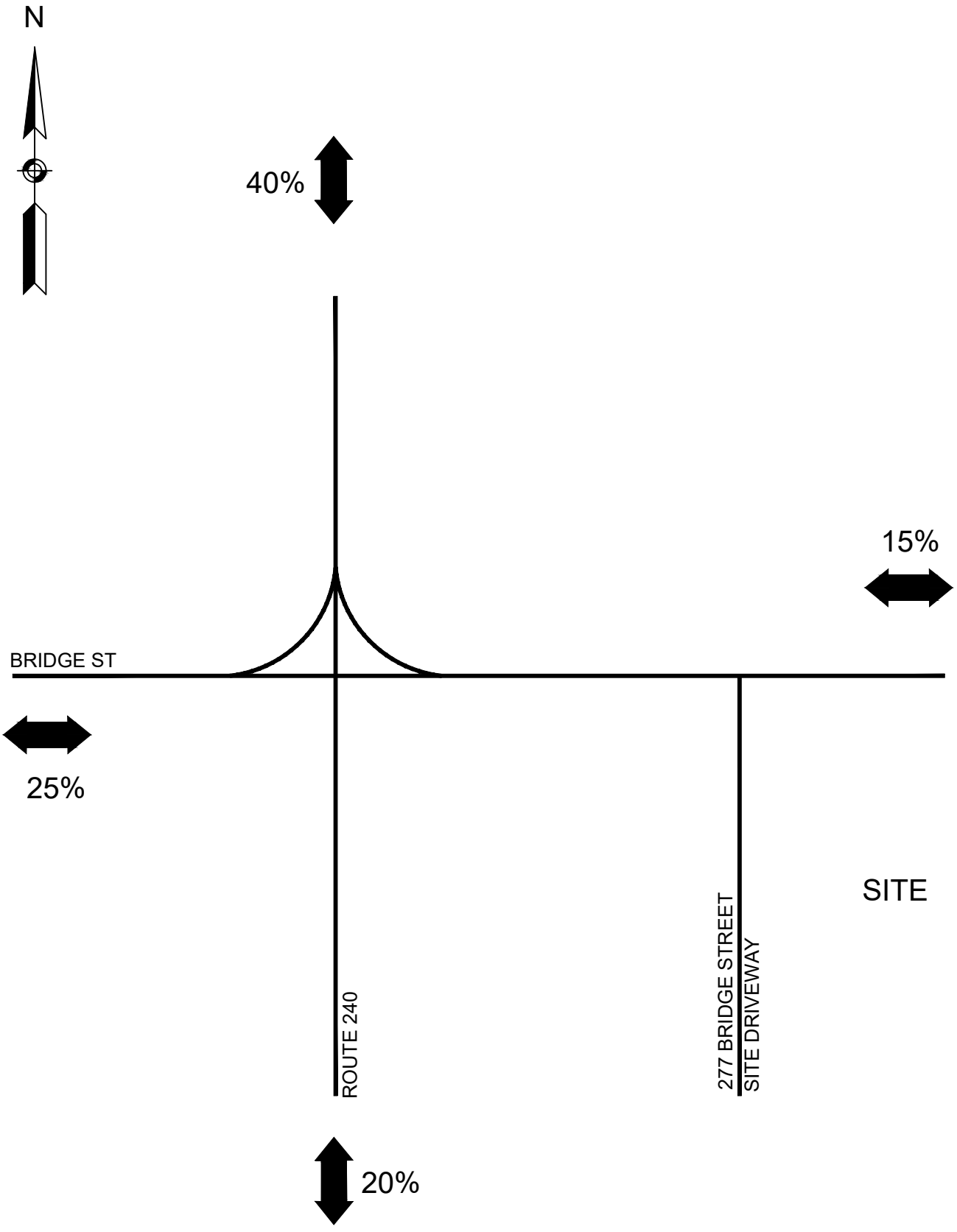


FIGURE 6
NEW PROJECT TRIP DISTRIBUTION
WEEKDAY PEAK HOUR

277 BRIDGE STREET
FAIRHAVEN, MA

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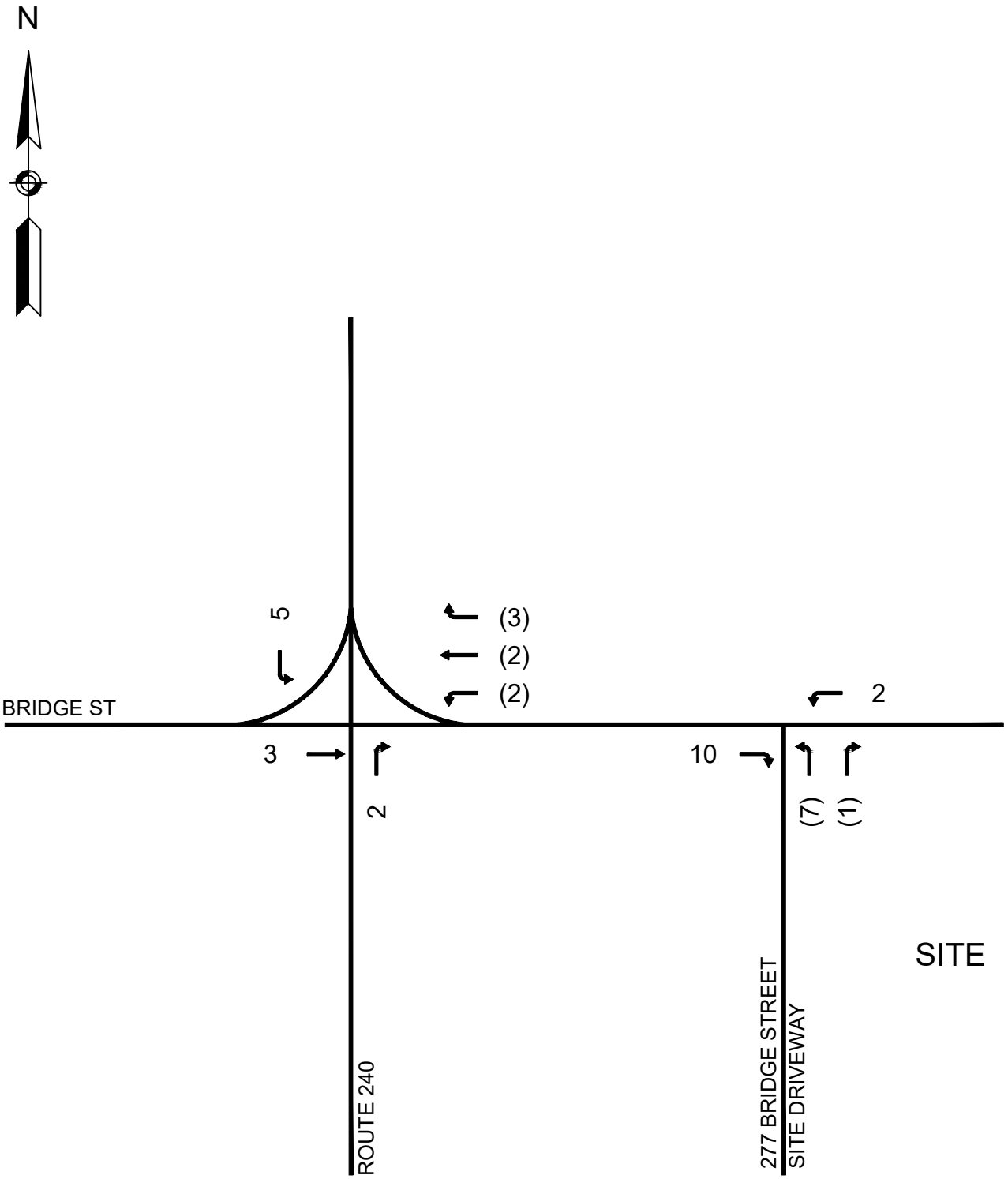
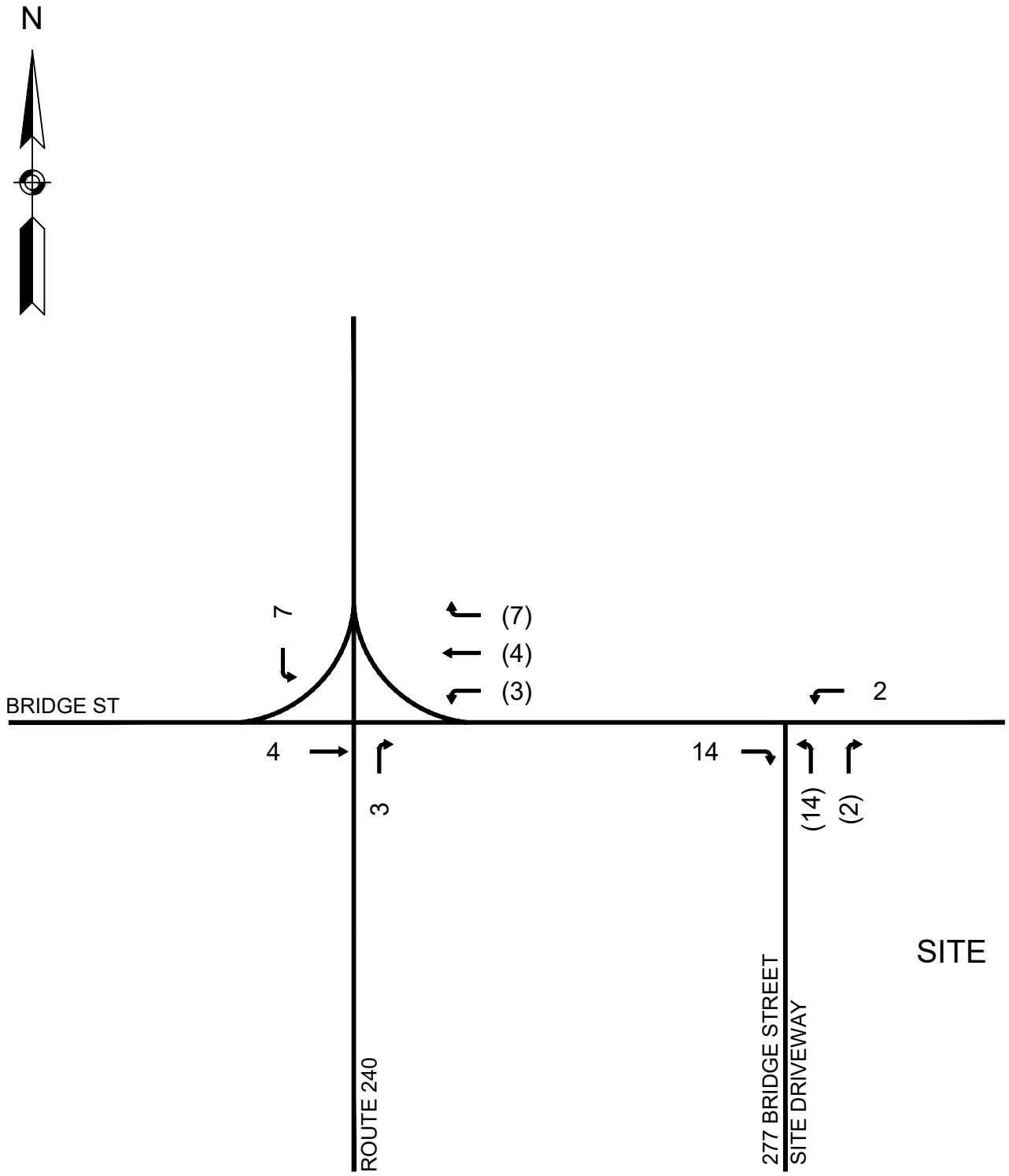



LEGEND
ENTER (EXIT)

| | | |
|---|---|---|
| FIGURE 7<br>NEW PROJECT TRIPS<br>WEEKDAY MORNING | 277 BRIDGE STREET<br>FAIRHAVEN, MA | Bowman |




LEGEND
ENTER (EXIT)

| | | |
|---|---|---|
| FIGURE 8<br>NEW PROJECT TRIPS<br>WEEKDAY AFTERNOON | 277 BRIDGE STREET<br>FAIRHAVEN, MA | Bowman |

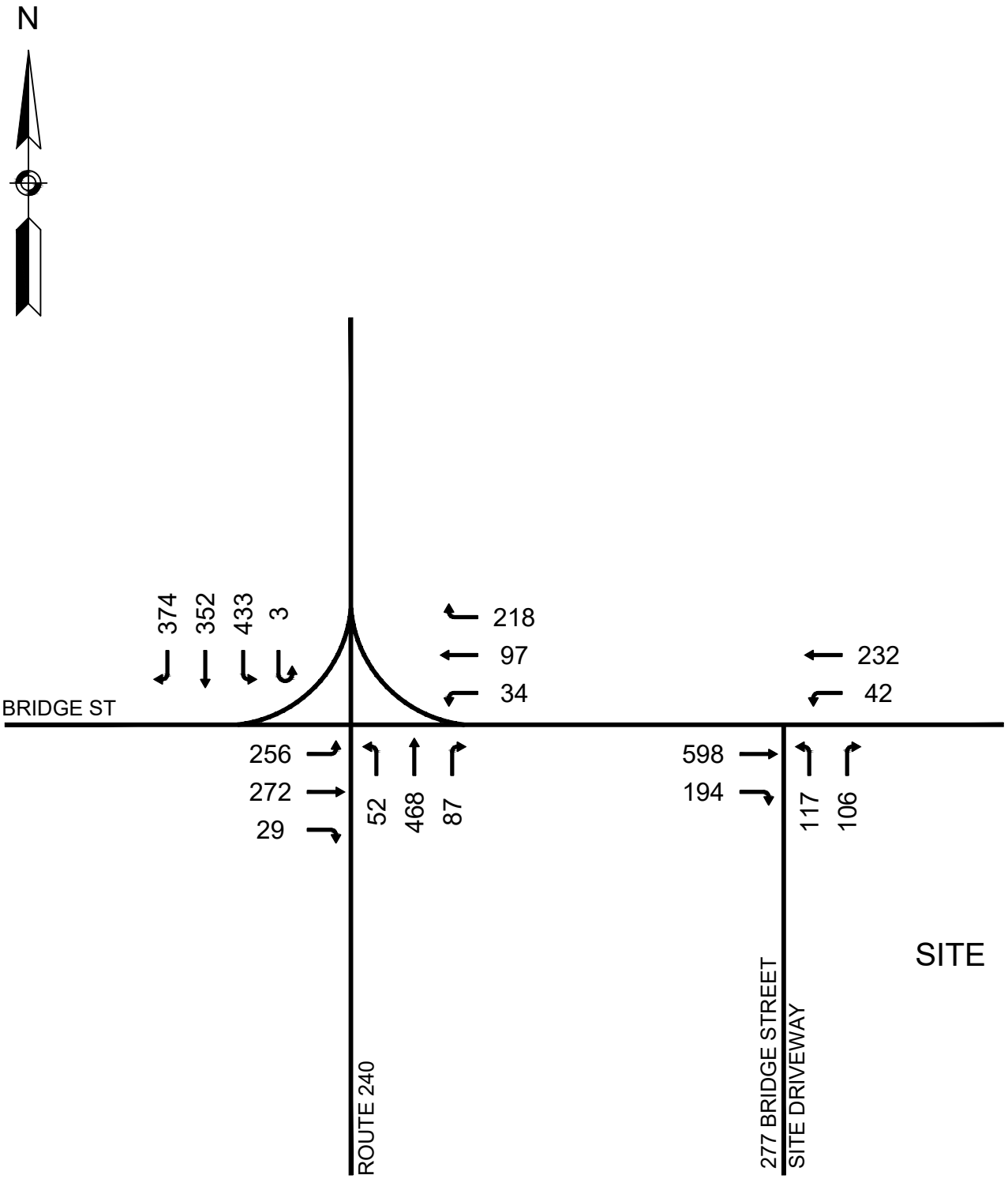



FIGURE 9
2030 BUILD TRAFFIC VOLUMES
WEEKDAY MORNING

277 BRIDGE STREET
FAIRHAVEN, MA

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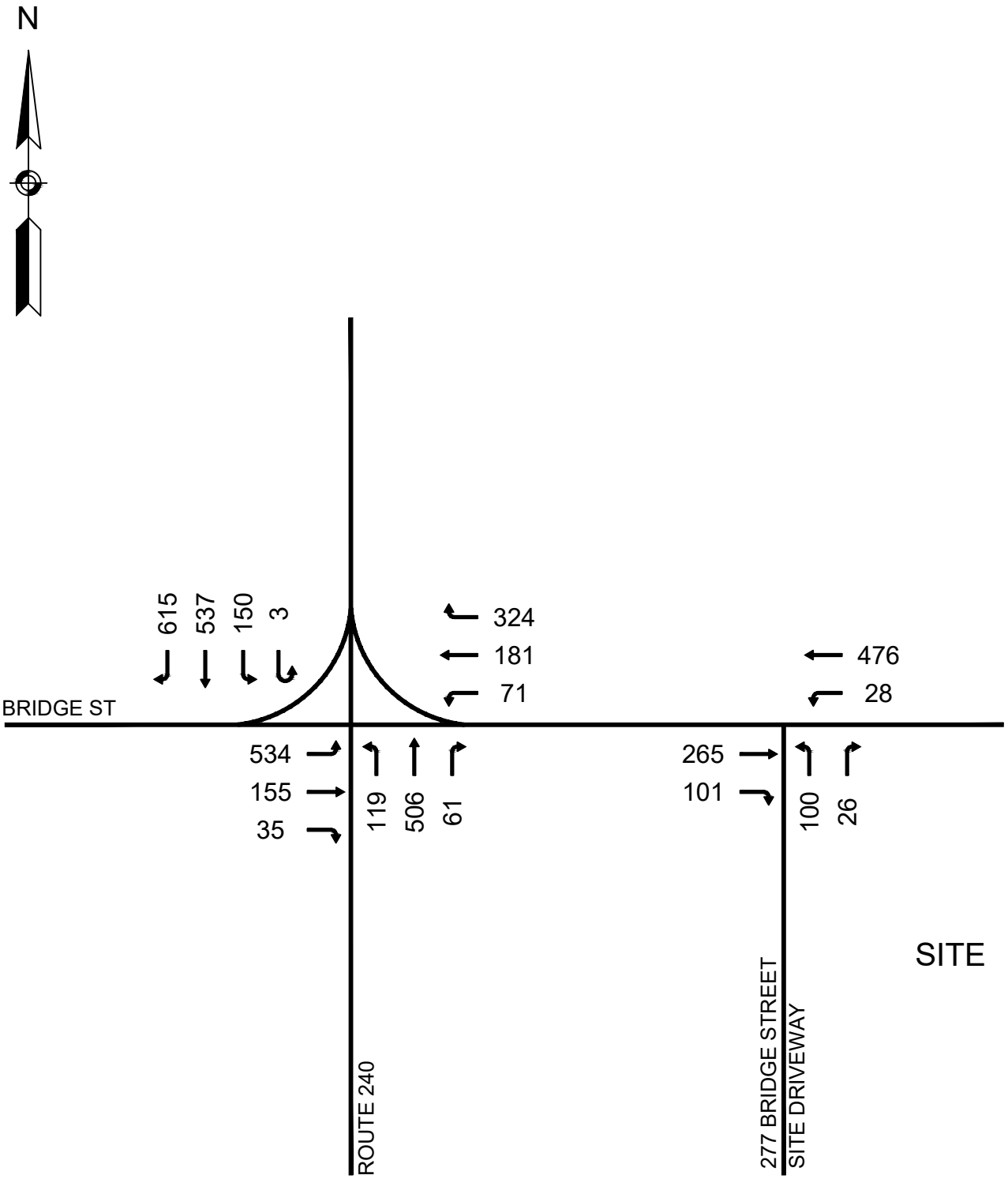


FIGURE 10
2030 BUILD TRAFFIC VOLUMES
WEEKDAY AFTERNOON

277 BRIDGE STREET
FAIRHAVEN, MA

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# Traffic Operations Analysis

In previous sections of this report, the quantity of traffic at the study area intersections has been discussed. This section describes the overall quality of the traffic flow at the study area intersections during the weekday morning and weekday afternoon peak hours. To complete this assessment, intersection capacity analysis was conducted using the Synchro capacity analysis software at the study area intersections under the 2023 Existing, 2030 No Build, and 2030 Build scenarios for the two peak hour traffic conditions. The analysis is based on capacity analysis methodologies and procedures contained in the *Highway Capacity Manual, 6th Edition* (HCM), which are summarized in **Appendix F**. A discussion of the evaluation criteria and a summary of the results of the capacity analysis are presented below.

## Level-of-Service Criteria

Average total vehicle delay is reported as level-of-service (LOS) on a scale of A to F. LOS A represents delays of 10 seconds or less, while LOS F represents delays in excess of 50 seconds for unsignalized intersections and greater than 80 seconds for signalized intersections. A more detailed description of the LOS criteria is provided in **Appendix F**.

## Field Calibration

To confirm that the existing field conditions are consistent with the Synchro capacity analysis software, a field delay and gap acceptance study was conducted at the intersection of Bridge Street at 277 Bridge Street Site Driveway on December 21, 2023 in conjunction with the weekday morning peak period turning movement counts. The delay study was conducted from 7:00 AM to 8:00 AM and the gap acceptance study was conducted from 8:00 AM to 9:00 AM.

### *Delay Study*

The delay study included measuring the number of queued vehicles at the stop controlled northbound approach at the 277 Bridge Street Site Driveway every 15 seconds from 7:00 AM to 8:00 AM. The delay study determined that the average vehicle delay for the approach was 18.6 seconds for left turns and 10.0 seconds for right turns, which would equate to LOS C and LOS B, respectively.

### *Gap Acceptance Study*

The gap acceptance study was conducted from 8:00 AM to 9:00 AM to measure the gaps in traffic that drivers turning onto Bridge Street are willing to accept. The observed gaps being used were compared to the default values in the HCM. Vehicles turning onto Bridge Street from the 277 Bridge Street Site Driveway were observed to accept gaps as small as 4.6 seconds for left turns and as small as 4.2 seconds for right turns, which are less than the HCM default values of 6.4 seconds for left-turns and 6.2 seconds for right-turns.

To measure vehicle operations at the intersection of Bridge Street at 277 Bridge Street Site Driveway, the Synchro capacity analysis was calibrated to reflect an average of the ten smallest accepted gaps for left and right turn

movements separately based on field conditions. A critical gap of 5.8 seconds and 5.1 seconds was applied to the left and right turns, respectively. The delay and gap acceptance observations are provided in **Appendix G.**

### Capacity Analysis Results

Intersection capacity analysis was conducted using Synchro capacity analysis software for the study area intersections to evaluate the 2023 Existing, 2030 No Build, and 2030 Build traffic conditions during the weekday midday, weekday afternoon and Saturday midday peak hours. The peak hour traffic volumes utilized as part of this analysis are provided in the traffic projection model, attached in **Appendix C**.

The Synchro capacity analysis results for the 2023 Existing, 2030 No Build and 2030 Build traffic conditions are presented in **Appendix H**, **Appendix I**, and **Appendix J**, respectively. The capacity analysis results for the signalized and unsignalized study area intersections are presented in **Table 5** and **Table 6** below for the weekday morning and weekday afternoon peak hours, respectively. The results of the specific capacity analysis at the study area intersections are discussed below, with a more detailed summary of the capacity analysis for the study area intersections provided in **Appendix K.**

**Table 5: Overall Signalized Intersection Levels-of-Service**

| Intersection | Peak Hour | 2023 Existing | | | 2030 No Build | | | 2030 Build | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | LOS[1] | Delay[2] | ICU[3] | LOS | Delay | ICU | LOS | Delay | ICU |
| Route 240 at Bridge Street | AM | D | 48.2 | 0.78 | D | 55.0 | 0.82 | E | 56.1 | 0.82 |
| | PM | D | 39.2 | 0.70 | D | 42.4 | 0.73 | D | 42.9 | 0.74 |

(1) Level-of-Service

(2) Average vehicle delay in seconds

(3) Intersection capacity utilization

**Table 6: Unsignalized Intersection Levels-of-Service**

| Intersection | Peak Hour | Approach | Movement | 2023 Existing | | | 2030 No Build | | | 2030 Build | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LOS[1] | Delay[2] | V/C[3] | LOS | Delay | V/C | LOS | Delay | V/C |
| Bridge Street at 277 Bridge Street Site Driveway | AM | NB | Left | D | 32.6 | 0.50 | E | 40.6 | 0.57 | E | 45.2 | 0.62 |
| | | | Right | B | 14.2 | 0.23 | C | 15.1 | 0.25 | C | 15.2 | 0.26 |
| | PM | NB | Left | C | 20,7 | 0.30 | C | 23.4 | 0.33 | D | 27.5 | 0.45 |
| | | | Right | A | 9.8 | 0.04 | B | 10.0 | 0.04 | B | 10.1 | 0.04 |

(1) Level-of-Service

(2) Average vehicle delay in seconds

(3) Volume to Capacity Ratio

From Table 5, the signalized intersection of Route 240 at Bridge Street is shown to currently operate at overall LOS D during the weekday morning and weekday afternoon peak hours. Under the 2030 No Build condition, the intersection is projected to continue to operate at overall LOS D during the weekday morning and weekday afternoon peak hours. Under the 2030 Build condition, the intersection is projected to operate at overall LOS E during the weekday morning peak hour and at overall LOS D during the weekday afternoon peak hour.

At the unsignalized intersection of Bridge Street at 277 Bridge Street Site Driveway, the critical stop-controlled northbound left-turn 277 Bridge Street Site Driveway approach is shown to currently operate at LOS D during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour. The stop-controlled northbound right-turn 277 Bridge Street Site Driveway movement is shown to operate at LOS B during the weekday morning peak hour and LOS A during the weekday afternoon peak hour. Under the 2030 No Build condition, the northbound left-turn approach is projected to operate at LOS E during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour. The northbound right-turn approach is projected to operate at a LOS C during the weekday morning peak hour and LOS B during the weekday afternoon peak hour. Under the 2030 Build condition, the northbound left-turn approach is projected to continue to operate at LOS E during the weekday morning peak hour and at LOS D during the weekday afternoon peak hour. The northbound right-turn movement is anticipated to continue to operate at LOS C and LOS B during the weekday morning and weekday afternoon peak hours, respectively. For the critical northbound left-turn movement from the 277 Bridge Street Site Driveway during the weekday morning peak hour, the increase in average vehicle delay from 2030 No Build to 2030 Build conditions is projected to be less than five seconds.

### Site Access and Circulation

Access to the Project site would be provided via the existing unsignalized driveway that currently provides access to the Bridge Street Gas development. The driveway provides an exclusive left-turn lane and an exclusive right-turn lane exiting the site and operates under STOP-control. The proposed site and existing Bridge Street Gas development would intersect as a T-type intersection located approximately 120 feet south of Bridge Street. The approach from the proposed Project site would consist of a shared through/right-turn lane and be placed under STOP-control. Vehicles could travel through to the Bridge Street Gas development or turn right to exit the site.

With the Project in place, a total of 34 parking spaces would be provided, two of which would be accessible spaces adjacent to the proposed building. Of the 34 parking spaces, 15 spaces would be provided in the lot south of the building and 19 spaces would be provided in the lot west of the building. Two-way circulation, with 13-foot-wide travel lanes, would be provided throughout the parking lot and one-way counterclockwise circulation, with a 20-foot-wide travel lane, would be provided around the east and north sides of the proposed building for deliveries, dumpster access, and ease of circulation around the rear of the building.

### Sight Distance

A field review of the available sight distance was conducted at the existing unsignalized 277 Bridge Street Site Driveway intersection with Bridge Street. The American Association of State Highway and Transportation Officials

(AASHTO) publication, *A Policy on Geometric Design, 2018 Edition,* defines minimum sight distances at intersections and was used to conduct this assessment.

The minimum sight distance is based on the required stopping sight distance (SSD) for vehicles traveling along the main road. According to AASHTO, "If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient time to anticipate and avoid collisions." The 85th percentile speeds collected on Bridge Street, east of the Project site, were used to establish the sight distance criteria at the 277 Bridge Street Site Driveway, as shown in **Table 7**.

**Table 7: Stopping Sight Distance Evaluation**

| Site Driveway Location | Approaching | Speed Limit (mph) | 85th % Speed (mph) | SSD(1) Required (ft) | SSD Measured (ft) | Meets Required SSD? |
|---|---|---|---|---|---|---|
| Bridge Street at 277 Bridge Street Site Driveway | Eastbound | 35 | 38 | 280 | 320 | Yes |
| | Westbound | 35 | 38 | 280 | 600+ | Yes |

(1) Stopping sight distance (see AASHTO equations 3-2 and 3-3) for the 85th percentile speeds.

As shown in Table 7, the available SSD for vehicles approaching the 277 Bridge Street Site Driveway exceed the minimum SSD requirements for the 85th percentile speeds on Bridge Street. It is recommended that existing and proposed vegetation be maintained and all plantings in the vicinity of the sight lines remain below 2.5-feet in height.

## Conclusion

The existing site consists of undeveloped land located just east of the Bridge Street Gas development. The Project would include the construction of a 5,850-sf commercial building. Access to the Project site would be shared with the Bridge Street Gas development via the existing unsignalized driveway on the south side of Bridge Street. The driveway provides an exclusive left-turn lane and an exclusive right-turn lane exiting the site. The proposed site and existing Bridge Street Gas development would intersect as a T-type intersection located approximately 120 feet south of Bridge Street. The approach of the proposed site would be placed under STOP-control. With the Project in place, a total of 34 parking spaces would be provided, two of which would be accessible spaces adjacent to the proposed building. Two-way circulation would be provided throughout the parking lot and one-way counterclockwise circulation would be provided around the east and north sides of the proposed building for deliveries, dumpster access, and ease of circulation around the rear of the building.

Based on data available from the Institute of Transportation Engineers' (ITE) publication, *Trip Generation Manual, 11th Edition*, the Project is estimated to generate approximately 20 new trips (12 entering vehicles and 8 exiting vehicles) during the weekday morning peak hour and approximately 32 new trips (16 entering vehicles and 16 exiting vehicles) during the weekday afternoon peak hour.

With the Project in place under 2030 Build conditions, the intersection of Route 240 at Bridge Street is shown to experience an increase of less than two seconds in overall average vehicle delay from 2030 No Build conditions during the weekday peak hours.

The 277 Bridge Street Site Driveway northbound left-turn approach is shown to experience an increase in average vehicle delay of less than five seconds during the critical weekday morning peak hour from 2030 No Build to 2030 Build conditions.

The available SSD for vehicles approaching the 277 Bridge Street Site Driveway exceed the minimum SSD requirements for the 85$^{th}$ percentile speeds recorded on Bridge Street. It is recommended that existing and proposed vegetation be maintained and all plantings in the vicinity of the sight lines remain below 2.5-feet in height.

Based on the analysis presented in this study, the Project is not expected to have a noticeable impact on the safety and operations of the area roadways.