
Traffic Impact and Access Study

To: Mr. Austin Turner, P.E.
Principal
Bohler
352 Turnpike Road
Southborough, MA 01772

Reg: CarMax Auction Facility
34 Eskow Road
Worcester, Massachusetts

From: Shaun P. Kelly, Sr. Project Manager
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Project #: 24018

INTRODUCTION

Chappell Engineering Associates, LLC (CEA) has conducted this Traffic Impact and Access Study (TIAS) to identify the anticipated traffic impacts associated with a proposed CarMax auto auction facility to be located at 34 Eskow Road in Worcester, Massachusetts. The proposed project involves the construction of a new 7,125± square foot (sf) automobile auction center with access provided via the extension of Eskow Road from Southwest Cutoff (Route 20). The project will provide a total of 5.71± acres for the vehicle staging area, which will accommodate a total of 897 vehicles.

This study evaluates existing traffic and safety characteristics of area roadways and intersections expected to accommodate the majority of project-related traffic, provides an estimate of the expected trip generation characteristics of the project, evaluates the impact of that traffic on the adjacent roadways and intersections, and determines the necessity for improvements to the area roadway system. This study was prepared in general conformance with the City of Worcester, Massachusetts Environmental Policy Act (MEPA) regulations (301 CMR 11.00), and Massachusetts Department of Transportation (MassDOT) guidelines for the preparation of traffic impact assessments.

As documented in this study, the proposed development is not expected to result in a notable increase to area traffic as compared to future No-Build conditions. In comparison to existing area traffic volumes, the project represents only a minor increase of approximately 5 percent or less during peak hours of roadway traffic, during the auction days when project-related traffic is highest. During non-auction days increases are expected to be lower. The intersection of Eskow

Road with Southwest Cutoff provides sufficient sight distance to allow for safe access to the project.

PROJECT DESCRIPTION AND HISTORY

The project involves the construction of a new approximately 7,125± square foot (sf) CarMax auto auction facility, located at 34 Eskow Road in Worcester, Massachusetts. Access to the site is proposed via Eskow Road to Southwest Cutoff (Route 20). The project will provide a total of 5.71± acres for the vehicle staging area, which will accommodate a total of 897 vehicles. During typical operations it is expected that approximately 500 vehicles per week will be auctioned, which will occur on a single day. The location of the project site, in relation to the surrounding transportation roadway network is displayed in Figure 1.

EXISTING CONDITIONS

Study Area

Evaluation of the traffic impacts associated with the project requires an examination of existing and projected traffic volumes, the volume of traffic expected to be generated by the project, and the impact that this traffic will have on the adjacent streets and intersections. The study area scope for this assessment includes locations expected to accommodate the majority of project-related traffic, including the following intersections:

1. Southwest Cutoff at Eskow Road
2. Southwest Cutoff at Massasoit Road/Millbury Avenue
3. Grafton Street (Route 122) at Route 20 eastbound ramps
4. Grafton Street (Route 122) at Route 20 westbound ramps

Figure 1
Site Location Map



The study area intersections and roadways are described in detail below, with the study area intersections displayed in Figure 2.

Figure 2
Study Area Intersections



Southwest Cutoff (Route 20) is classified as an urban principle arterial (U3) under MassDOT jurisdiction. The corridor traverses the study area in a general east-west orientation between the Town of Millbury to the west and the Town of Shrewsbury to the east. In the vicinity of the site, Southwest Cutoff provides an approximate 12-foot lane of travel in each direction, separated by a painted double-yellow centerline. An approximate 9-foot paved shoulder is provided along both sides of the corridor in the vicinity of the project site. Sidewalk is not provided along either side

of the corridor within the study area. On-street parking is prohibited along both sides of the corridor. The posted speed limit along Southwest Cutoff, in the vicinity of the project site, is 45 miles per hour (mph). Land use along the corridor consists primarily of commercial uses.

Grafton Street (Route 122) is classified as an urban other principle arterial (U3) under City of Worcester jurisdiction. The corridor traverses the study area in a general north-south orientation between Washington Square to the north and the Town of Millbury to the south. Grafton Street provides an approximate 12- to 16-foot lane of travel in each direction, separated by a painted double-yellow centerline. Sidewalk is provided along both sides of the corridor within the study area. On-street parking is prohibited along the corridor within the study area. The speed limit on Grafton Street is unposted and therefore the city-wide speed limit of 30 mph is the regulatory speed limit. Land use along the corridor consists primarily of a mix of commercial and residential uses.

Eskow Road is classified as a local road (U7) under City of Worcester jurisdiction. The corridor traverses the study area in a general north-south orientation between its northern dead-end terminus and Southwest Cutoff to the south. Eskow Road provides an approximate 15-foot lane of travel in each direction. Sidewalk is not provided along either side of the corridor. On-street parking is permitted along both sides of the corridor. The speed limit on Eskow Road is unposted and therefore the city-wide speed limit of 30 mph is the regulatory speed limit. Land use along the corridor consists of commercial uses.

Massasoit Road is classified as an urban minor arterial (U4) under City of Worcester jurisdiction. The corridor traverses the study area in a general north-south orientation between Grafton Street to the north and Southwest Cutoff to the south. Massasoit Road provides an approximate 12- to 16-foot lane of travel in each direction within the study area, separated by a painted double-yellow centerline. Sidewalk is not provided along either side of the corridor within the study area. On-street parking is prohibited between 2:00 AM and 6:00 AM from December through April along the corridor. The posted speed limit on Massasoit Road, within the study area, is 30 mph. Land use along the corridor consists primarily of residential uses.

Millbury Avenue is classified as an urban minor arterial (U4) under City of Worcester jurisdiction. The corridor traverses the study area in a general north-south orientation between the Southwest Cutoff to the north and the Town of Millbury to the south. Millbury Avenue provides an approximate 16-foot lane of travel in each direction, separated by a painted double-yellow centerline. Sidewalk is provided along the western side of the corridor in the vicinity of the site. On-street parking is prohibited along the corridor in the vicinity of the site. The posted speed limit on Millbury Avenue, in the vicinity of the site, is 30 mph. Land use along the corridor consists primarily of residential uses.

Massasoit Road and Millbury Avenue intersect Southwest Cutoff from the north and south, respectively, to form a four-way intersection that operates under traffic signal control. The Southwest Cutoff eastbound approach provides an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. The Southwest Cutoff westbound approach provides an exclusive left-turn lane, two through lanes, and an exclusive right-turn lane. The Millbury Avenue

northbound approach and the Massasoit Road southbound approach each provide a shared left-turn/through lane and an exclusive right-turn lane. The traffic signal at this location operates under a three-phase signal sequence, with protected phasing for left-turns on the eastbound and westbound approaches. An overlap phase is also provided for northbound right-turns from Millbury Avenue in conjunction with this protected phase. Sidewalk is provided along the southern side of Southwest Cutoff and the western side of Millbury Avenue, with painted crosswalks provided across all four approaches to this intersection. Land use in the vicinity of this intersection consists of commercial and residential uses.

Eskow Road and a private driveway intersect Southwest Cutoff from the north and south, respectively, to form a four-way intersection that operates under stop control. The Southwest Cutoff eastbound and westbound approaches provide a single general purpose lane of travel, with a wide shoulder that motorists typically utilize to bypass vehicles turning left at this location. The private driveway northbound approach provides a single general purpose travel lane. The Eskow Road southbound approach provides a single general purpose travel lane that flares to greater than sixty feet at its intersection with Southwest Cutoff, allowing vehicles turning right to bypass vehicles turning left from the corridor. Sidewalk is not provided at this intersection. Land use in the vicinity of this intersection consists of commercial uses.

The Route 20 eastbound ramps intersect Grafton Street from the west to form a three-way intersection that operates under stop control. All approaches provide a single general purpose travel lane, with the Route 20 eastbound ramp flaring at its intersection with Grafton Street, which allows vehicles turning right to bypass vehicles turning left from the corridor. Sidewalk is provided along both sides of Grafton Street at this intersection, with a painted crosswalk provided across the eastbound approach. Land use in the vicinity of this intersection consists of commercial and residential uses.

The Route 20 westbound ramps and a private driveway intersect Grafton Street from the west and east, respectively, to form a four-way intersection that operates under STOP-sign control. All approaches provide a single general purpose travel lane, with the Route 20 westbound ramp flaring at its intersection with Grafton Street, which allows vehicles turning right to bypass vehicles turning left from the corridor. Sidewalk is provided along both sides of Grafton Street at this intersection, with a painted crosswalk provided across the eastbound approach. Land use in the vicinity of this intersection consists of commercial and residential uses.

Traffic Volumes

Base traffic conditions within the study area were developed by conducting manual turning movement and vehicle classification counts (TMC's) at the study area intersections in May of 2024. The TMC's were conducted during the weekday AM peak period (7:00 to 9:00 AM), the weekday PM peak period (4:00 to 6:00 PM) and the Saturday midday peak period (11:00 AM to 2:00 PM). These time periods and dates were chosen as they typically represent the peak time

periods for both weekday commuter traffic and commercial traffic. An automatic traffic recorder (ATR) count was also conducted on Eskow Road to identify traffic volumes along the corridor over an extended period. Additionally, traffic count data collected by MassDOT on Southwest Cutoff were reviewed to identify daily traffic volumes along this corridor. All traffic count data are provided in the Appendix.

The count data indicate that in the vicinity of the project site, the weekday AM peak hour generally occurs between 7:30 and 8:30 AM, the weekday PM peak hour generally occurs between 4:15 to 5:15 PM, with the Saturday midday peak hour generally occurring between 11:15 AM and 12:15 PM. Individual intersection peak hours were used to provide a conservative assessment.

To determine if the count data needed to be adjusted to represent annual average month conditions consistent with MassDOT guidelines for traffic impact assessment, historical traffic volume data were obtained from MassDOT's Seasonal Weekday Adjustment Factor file. This document provides a monthly adjustment factor based on the roadway classification of the study roadways. Based on MassDOT seasonal adjustment data for the roadway classifications previously identified, May traffic volumes are approximately 7 to 12 percent higher than average annual conditions. As such, no seasonal adjustment factors were applied to the collected data. The MassDOT Seasonal Adjustment Factor file is provided in the Appendix.

The MassDOT *Traffic and Safety Engineering 25% Design Submission Guidelines* were updated on May 31, 2022. These new directives note that traffic volume data collected after March 1, 2022, are no longer subject to any adjustments to represent pre-pandemic traffic volume conditions, except in areas where land use is predominantly office. Therefore, since the traffic volume data were collected in May 2024, and land use in the area is predominantly commercial and residential, COVID adjustments do not need to be applied to the data. Table 1 summarizes the 2024 Existing peak hour traffic volumes on the study area roadways, based on the ATRs and TMCs, with the 2024 Existing weekday AM, weekday PM and Saturday midday peak hour traffic flow networks provided on Figure 3.

As summarized in Table 1, on a typical weekday Southwest Cutoff, in the vicinity of the project site, currently accommodates 26,230 vehicles per day (vpd) on a typical weekday, including 1,886 vehicles per hour (vph) during the weekday AM peak hour and 2,253 vph during the weekday PM peak hour. On a typical Saturday, Southwest Cutoff accommodates 21,636 vpd, including 1,911 vph during the Saturday midday peak hour.

On a typical weekday Eskow Road currently accommodates 349 vpd, including 19 vph during the weekday AM peak hour and 32 vph during the weekday PM peak hour. On a typical Saturday, Eskow Road currently accommodates 101 vpd, including 13 vph during the Saturday midday peak hour.

Figure 3
 2024 Existing
 Peak Hour Traffic Volumes

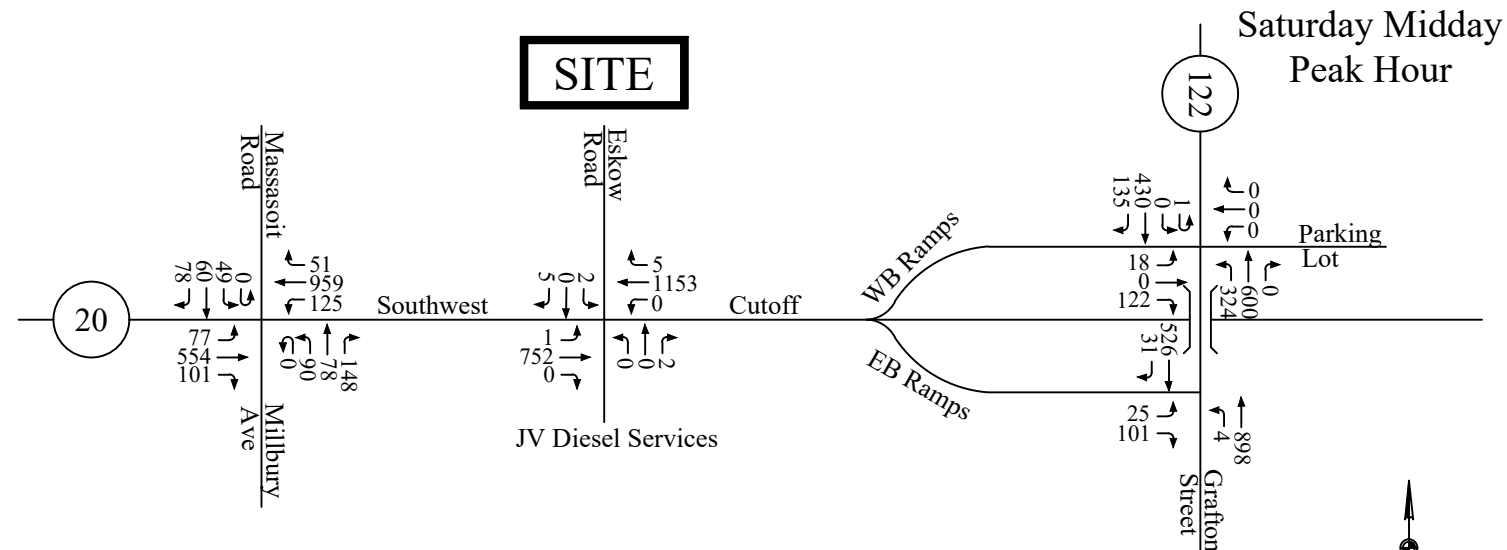
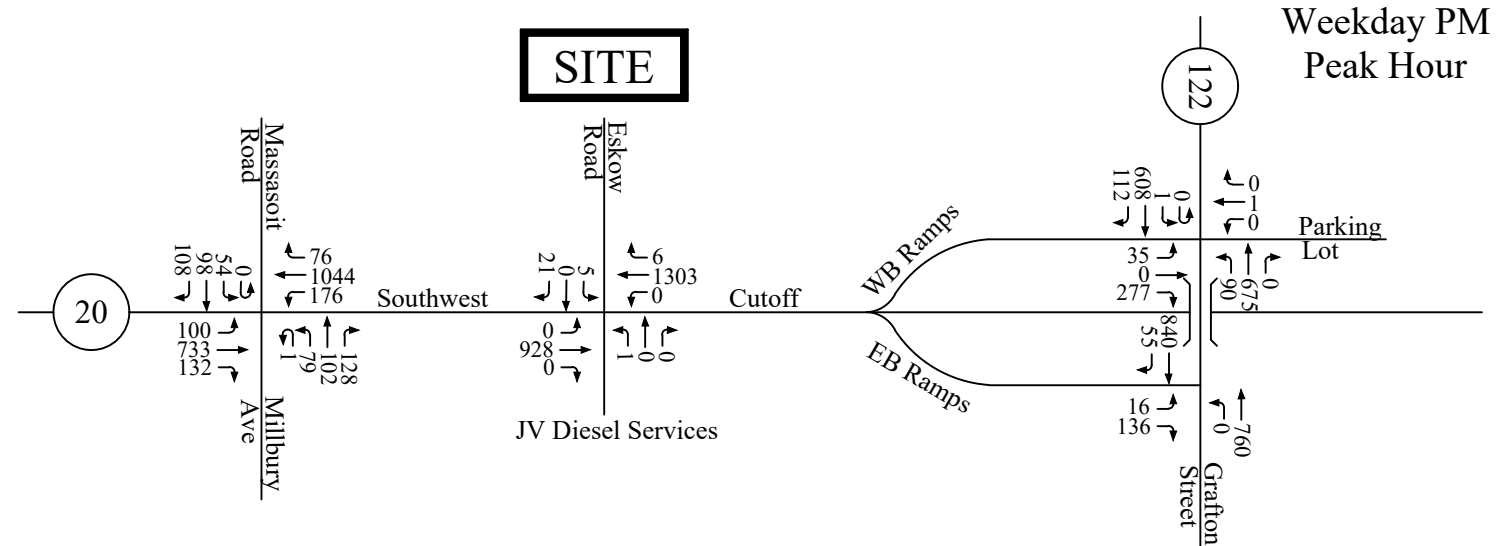
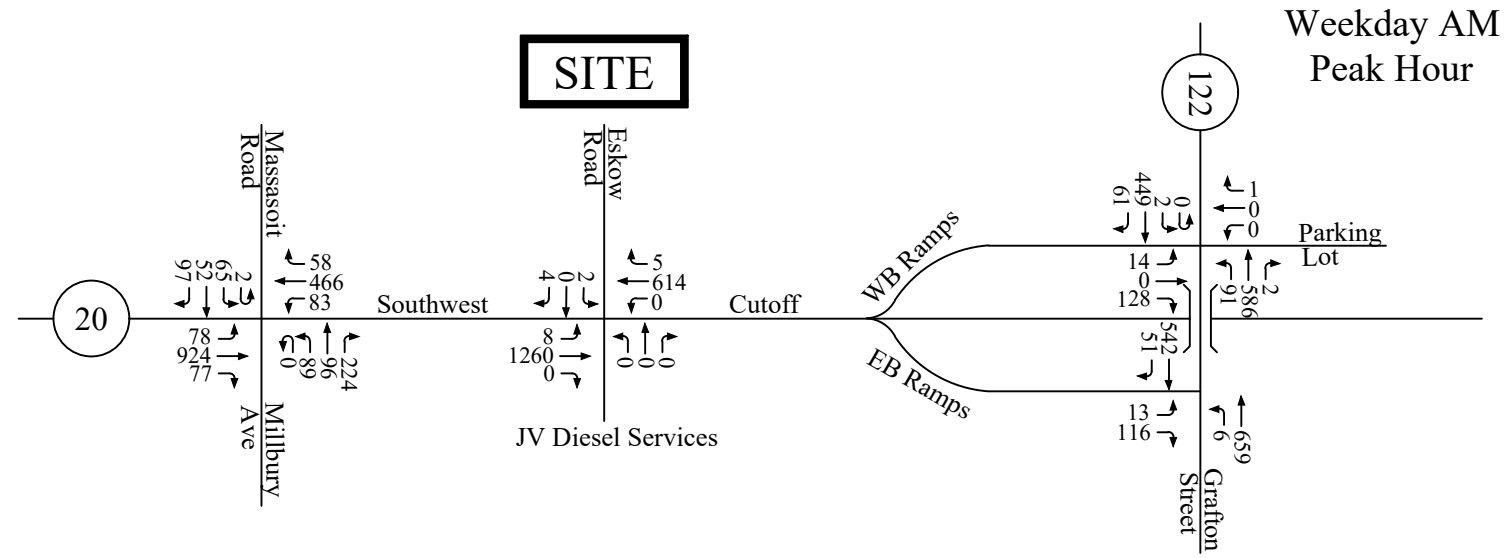


Table 1
Existing Traffic Volume Summary

| Location/Time Period | Daily Volume ^a | Peak Hour Volume ^b | K Factor ^c | Directional Distribution ^d |
|-------------------------------------|---------------------------|--|-----------------------|---------------------------------------|
| Southwest Cutoff (Route 20): | | | | |
| Weekday | 26,230 | Weekday AM: 1,886 Weekday PM: 2,253 | 7.2% 8.6% | 67% EB 59% WB |
| Saturday | 21,636 | Saturday Midday: 1,911 | 8.8% | 61% WB |
| Eskow Road: | | | | |
| Weekday | 349 | Weekday AM: 19 Weekday PM: 32 | 5.4% 9.2% | 68% NB 81% SB |
| Saturday | 101 | Saturday Midday: 13 | 12.9% | 54% SB |

^a In vehicles per day.

^b In vehicles per hour.

^c Percentage of daily traffic occurring during the peak hour.

^d NB = northbound; SB = southbound; EB = eastbound, WB = westbound.

Vehicle Speeds

Speed measurements were conducted by way of radar speed detection along Southwest Cutoff, in the vicinity of Eskow Road, to identify operating speeds during off peak hours. The results of the speed measurements are summarized in Table 2.

Table 2
Observed Travel Speeds^a

| Location/Direction | Regulatory Speed Limit | Average Speed | 85 th Percentile Speed ^b |
|------------------------------------|------------------------|---------------|--|
| Southwest Cutoff (Route 20) | | | |
| Eastbound | 45 | 44 | 48 |
| Westbound | 45 | 39 | 43 |

^a In miles per hour (mph).

^b Speed at, or below which 85 percent of all observed vehicles travel.

As shown in Table 2, the average travel speed along Southwest Cutoff, adjacent to the site was determined to be 44 mph in the eastbound direction and 39 mph in the westbound direction, slightly below the regulatory speed limit, likely due to the proximity to the traffic signal at Southwest

Cutoff with Massasoit Road and Milbury Avenue. The 85th percentile speed in the eastbound direction was recorded to be slightly higher than the regulatory speed limit with traffic traveling at 48 mph, while the 85th percentile speed in the westbound direction was recorded to be just under the regulatory speed limit with traffic traveling at 43 mph. As such, the 85th percentile travel speed was utilized for the eastbound direction, with the 45 mph speed limit utilized for westbound traffic along the corridor.

Sight Distance

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the intersection of Eskow Road with Southwest Cutoff to determine if the available sight distances for vehicles exiting the site meet or exceed the minimum distances required for approaching vehicles to safely stop.

The available sight distances were compared with minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO).¹ AASHTO is the national standard by which vehicle sight distance is calculated, measured, and reported. The MassDOT and the Executive Office of Energy and Environmental Affairs (EEA) require the use of AASHTO sight distance standards when preparing traffic impact assessments and studies, as stated in their guidelines for traffic impact assessments.

Sight distance is the length of roadway ahead that is visible to the driver. Stopping Sight Distance (SSD) is the minimum distance required for a vehicle traveling at a certain speed to safely stop before reaching a stationary object in its path. The values are based on a driver perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavements. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Stopping sight distance is measured from an eye height of 3.5 feet to an object height of 2 feet above street level, equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

Intersection sight distance (ISD) is provided on minor street approaches to allow the drivers of stopped vehicles a sufficient view of the major roadway to decide when to enter the major roadway. By definition, ISD is the minimum distance required for a motorist exiting a minor street to turn onto the major street, without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet above street level. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle). When the minor street is on an upgrade that exceeds 3 percent, grade correction factors are applied.

¹*A Policy on Geometric Design of Highways and Streets, 7th Edition*; American Association of State Highway and Transportation Officials (AASHTO); 2018.

SSD is generally more important as it represents the minimum distance required for safe stopping while ISD is based only upon acceptable speed reductions to the approaching traffic stream. However, the ISD must be equal to or greater than the minimum required SSD in order to provide safe operations at the intersection. In accordance with the AASHTO manual, *“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 sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”* Accordingly, ISD should be at least equal to the distance required to allow a driver approaching the minor road to safely stop.

The available intersection sight distance at the intersection of Eskow Road with Southwest Cutoff were measured and compared to minimum requirements as established by AASHTO. The 85th percentile travel speeds were utilized to identify the required sight distance. The measured and required sight distances are shown in Table 3.

Table 3
Sight Distance Summary

| Location/Direction | Sight Distance (feet) | | |
|---------------------------------------|-----------------------|-------------------------------------|------------------------------|
| | Measured | Minimum Required (SSD) ^a | Desirable (ISD) ^b |
| Eskow Road at Southwest Cutoff | | | |
| East of intersection | 900+ | 360 | 533 |
| West of intersection | 750+ | 360 | 430 |

^a Values based on AASHTO SSD requirements for 85th percentile travel speeds on each corridor.

^b Values based on AASHTO ISD requirements for 85th percentile travel speeds on each corridor.

As shown in Table 3, the available sight distances at the intersection of Eskow Road with Southwest Cutoff well exceed the minimum required SSD distances in each direction, with the desirable ISD distances also met in both directions at the intersection of Southwest Cutoff with Eskow Road.

Access to the project will be provided via the extension of Eskow Road to the project site. To ensure the sight lines internal to the project site are unimpeded, it is recommended that any proposed landscaping or signs in the vicinity of internal intersections with Eskow Road be kept low (maximum 2 feet in height from street level), or set back outside the sight triangles (as defined by AASHTO) so as not to impede the available sight distances.

Crash History

Crash data for the study intersections were obtained from MassDOT for the period between 2015 and 2019, the latest five years of available data. Data for 2020 were not reviewed as traffic volumes were significantly lower along area roadways during the COVID-19 pandemic. A summary of the MassDOT crash data is provided in Table 4. Additionally, in accordance with MassDOT guidelines for traffic impact assessments, the motor vehicle crash rate was calculated for each study area intersection and compared with the statewide and district-wide averages. An intersection crash rate is a measure of the frequency of accidents compared to the volume of traffic through an intersection and is presented in crashes per million entering vehicles (crashes/mev). For signalized intersections, the statewide average rate is 0.78 crashes/mev and the district wide (District 3) accident rate is 0.89 crashes/mev. For unsignalized intersections, the statewide average rate is 0.57 crashes/mev and the district wide crash rate is 0.61 crashes/mev. A comparison of the calculated crash rate to the average crash rate can be used to establish the significance of crash occurrence and whether or not potential safety problems exist. The crash rate worksheets are provided in the Appendix.

Table 4
Crash Summary

| Location | Number of Crashes | | | Severity ^a | | | Crash Type ^b | | | | | | % During Wet/Icy Conditions |
|--|-------------------|-----------|-------------------------|-----------------------|----|---|-------------------------|----|----|----|----|---|-----------------------------|
| | Total | Avg./Year | Crash Rate ^c | PD | PI | U | CM | RE | SS | HO | SV | U | |
| Southwest Cutoff at Massasoit Road and Millbury Avenue | 46 | 9.2 | 0.77 | 29 | 14 | 3 | 18 | 15 | 5 | 4 | 4 | 0 | 13% |
| Route 20 WB Ramps at Route 122A | 24 | 4.8 | 0.63 | 20 | 2 | 2 | 6 | 12 | 2 | 0 | 4 | 0 | 33% |
| Route 20 EB Ramps at Route 122A | 18 | 3.6 | 0.39 | 14 | 2 | 2 | 3 | 15 | 0 | 0 | 0 | 0 | 39% |
| Southwest Cutoff at Eskow Road | 9 | 1.8 | 0.19 | 4 | 3 | 2 | 4 | 3 | 2 | 0 | 0 | 0 | 44% |

Source: MassDOT Traffic Operations Safety Management System – 2015 through 2019 data.

^a PD = property damage only; PI = personal injury; 0 value indicates severity not reported.

^b CM = cross movement/angle; RE = rear end; SS = sideswipe; HO = head-on; SV= single vehicle; U= unknown.

^c Measured in accidents per million entering vehicles.

As summarized in Table 4, the intersection of Southwest Cutoff with Massasoit Road and Millbury Avenue experienced a total of forty-six (46) reported motor vehicle crashes over the five-year review period, averaging approximately nine (9) motor vehicle collisions per year. Approximately 13 percent of reported collisions occurred under wet or icy roadway conditions. The calculated crash rate of 0.77 crashes/mev falls below both the district-wide and statewide average crash rates for signalized intersections in this MassDOT District, however this location is designated as a Highway Safety Improvement Program (HSIP) crash cluster location for 2019-2021. Of the forty-six reported collisions, the majority (29 out of 46) resulted in property damage only, with no fatalities reported over the five-year review period. The majority of crashes were either angle or rear-end type collisions.

The intersection of the Route 20 westbound ramps with Grafton Street experienced a total of twenty-four (24) reported motor vehicle crashes over the five-year review period, averaging approximately five (5) motor vehicle collisions per year. Approximately 33 percent of reported collisions occurred under wet or icy roadway conditions. The calculated crash rate of 0.63 crashes/mev is slightly higher than both the district-wide and statewide average crash rates for unsignalized intersections. Of the twenty-four reported collisions, the vast majority of crashes (20 out of 24) resulted in property damage only, with no fatalities reported over the five-year review period. The majority of collisions were rear-end type collisions.

The intersection of the Route 20 eastbound off-ramp with Grafton Street experienced a total of eighteen (18) reported motor vehicle crashes over the five-year review period, averaging approximately four (4) motor vehicle collisions per year. Approximately 39 percent of reported collisions occurred under wet or icy roadway conditions. The calculated crash rate of 0.39 crashes/mev falls below both the district-wide and statewide average crash rates for unsignalized intersections. Of the twenty-four reported collisions, the vast majority of crashes (14 out of 18) resulted in property damage only, with no fatalities reported over the five-year review period. The vast majority of collisions were rear-end type collisions.

The intersection of Southwest Cutoff with Eskow Road experienced a total of nine (9) reported motor vehicle crashes over the five-year review period, averaging approximately two (2) motor vehicle collisions per year. Approximately 44 percent of reported collisions occurred under wet or icy roadway conditions. The calculated crash rate of 0.19 crashes/mev falls well below both the district-wide and statewide average crash rates for unsignalized intersections. Of the nine reported collisions, four (4) resulted in property damage only and three (3) resulted in personal injury, with two crashes not reporting the severity. Collisions at this location included angle, rear-end and sideswipe collisions.

Public Transportation

The project site is not directly served by public transportation services. The nearest public transportation services are provided by the Worcester Regional Transit Authority (WRTA) via the Bus Route 5 – Southwest Commons vis Grafton Street. This bus route provides service between the Union Station Hub, Billings Square, South Plaza and Broad Meadow Brook off Massasoit Road, approximately two-thirds of a mile from Eskow Road. Public transportation schedules are provided in the appendix of this report.

FUTURE CONDITIONS

Traffic Growth

Future traffic conditions were projected to the year 2031, representing a 7-year design horizon consistent with state requirements for traffic impact analysis. To project traffic conditions within this design horizon, two components of traffic growth were included. First, an annual average traffic growth rate was determined to account for general population growth and smaller development projects (such as residential developments) that may impact traffic along roadways in the site vicinity. Based on traffic count data published by MassDOT at count location located along Southwest Cutoff (Station 3896), in proximity to the project site, traffic volumes have generally shown little growth over the last ten years, absent fluctuations in the years surrounding the COVID-19 pandemic. However, in order to account for potential unforeseen growth in area traffic, a conservative 1.0 percent per year compounded background growth rate was applied to all study area traffic volumes traveling on roadways adjacent to the site.

Second, any planned or approved specific developments in the area that would generate a significant volume of traffic on study area roadways within the next seven years were included. Based on a review of currently proposed development projects in the City of Worcester, no background development projects were identified that are expected to influence area traffic volumes within the study area, beyond the aforementioned one percent growth rate.

Roadway Improvement Projects

Based on a review of MassDOT roadway and traffic signal improvement projects, there are currently no planned roadway improvements within the study area.

No-Build Conditions

The 2031 No-Build conditions were accordingly developed by applying a compounded 1.0 percent annual growth rate (7.2 percent over seven years) to the existing adjacent street and intersection volumes. The 2031 No-Build weekday AM, weekday PM and Saturday midday peak-hour traffic-flow networks are displayed on Figure 4.

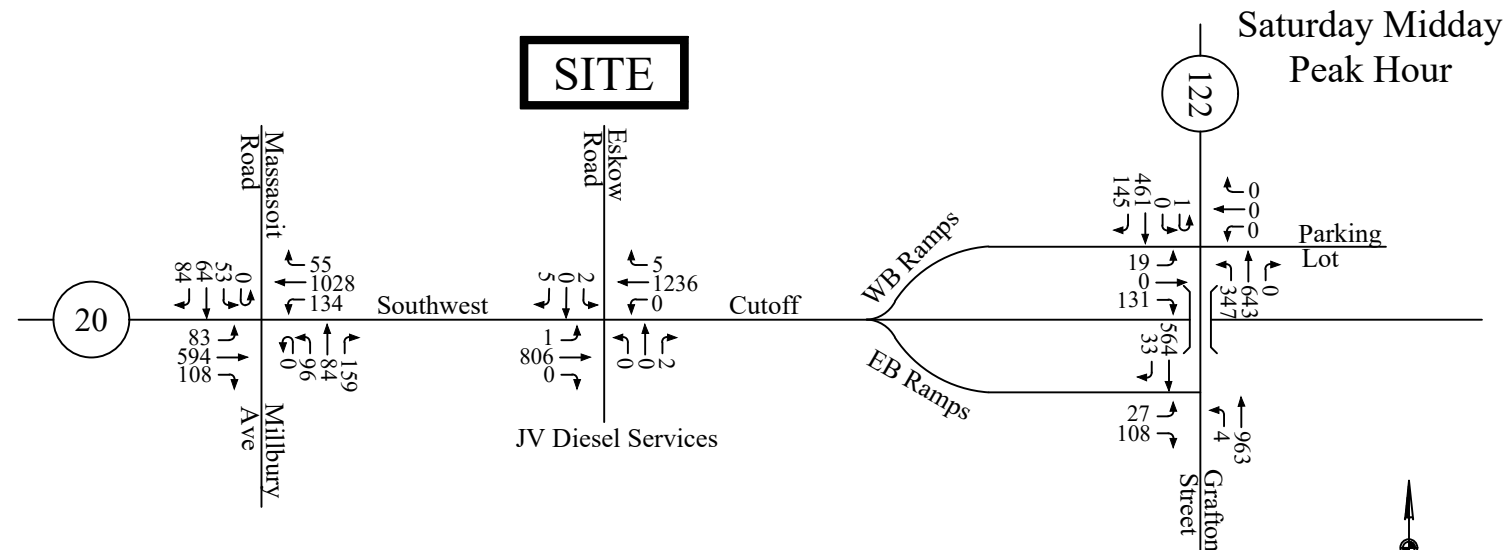
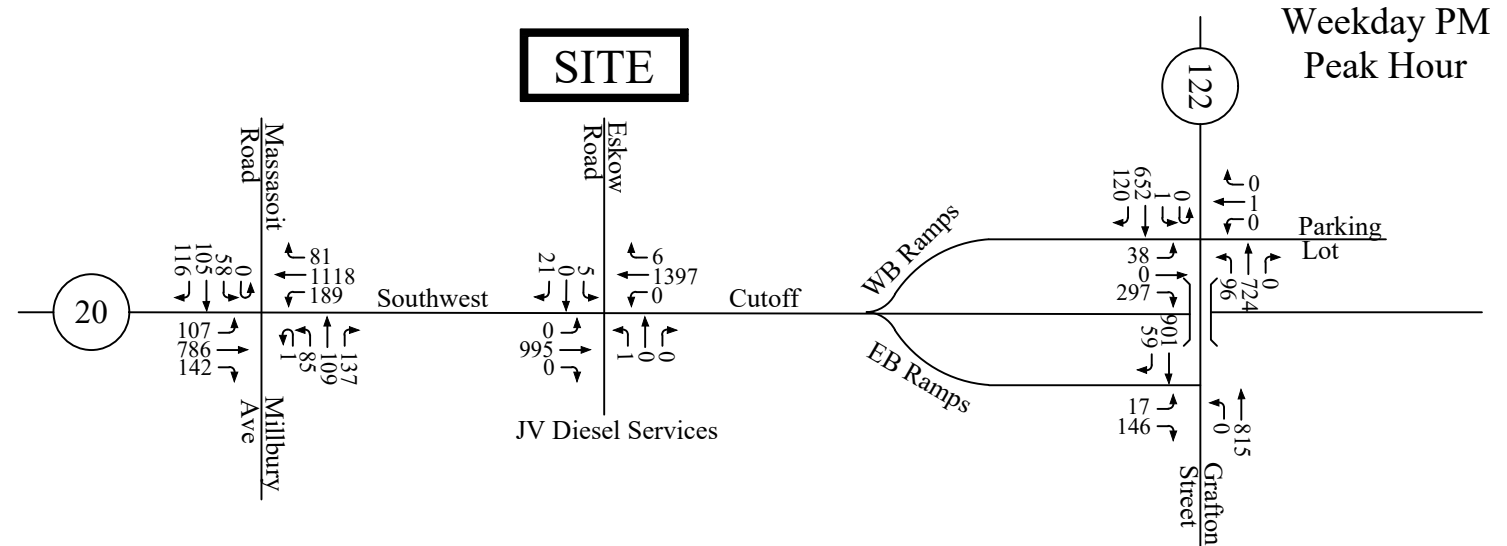
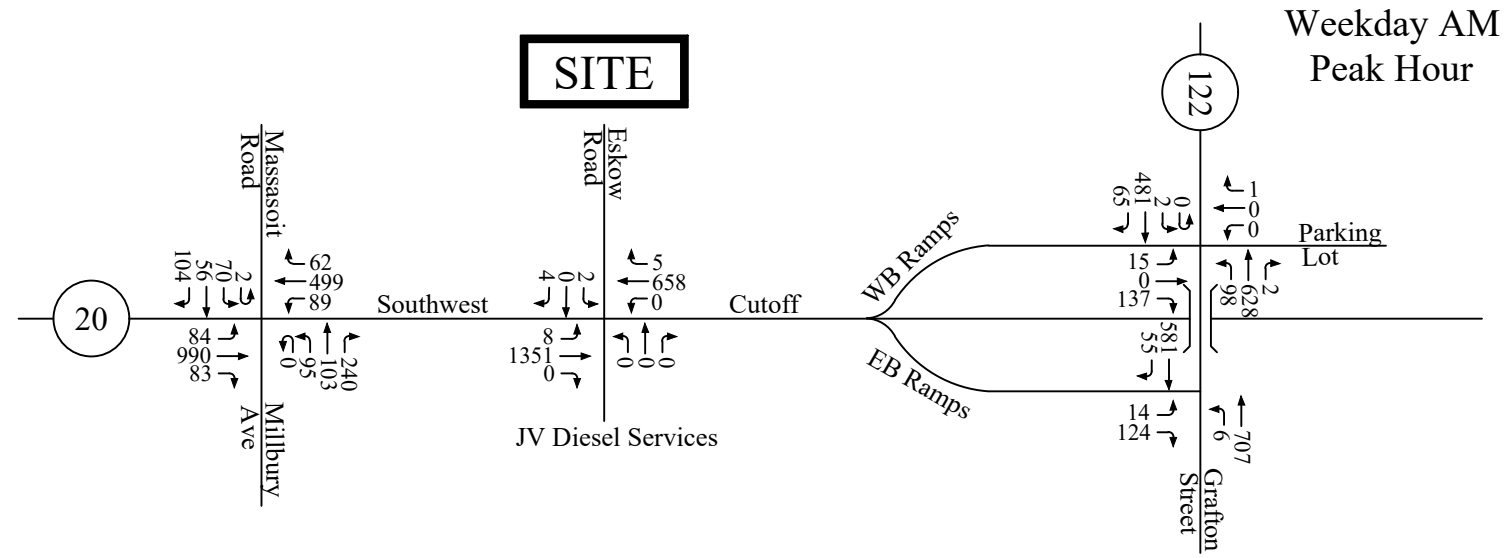
Trip Generation

In order to identify the anticipated trip generation characteristics of the project, empirical trip generation data provided by CarMax for similar auction facilities were reviewed. As previously noted, CarMax anticipated the auctioning of approximately 500 vehicles per week, which will occur on a single day. For the purpose of this assessment, traffic impacts during an auction day were reviewed. The impacts during all other days are expected to be significantly lower. It is also noted that since COVID-19, a significant amount of auction activity occurs online, resulting in less customer activity to and from the site on auction day. However, for the purpose of this assessment no reduction to the anticipated trip generation was applied to account for online sales.

The following summarizes the breakdown of employee, delivery and customer traffic on both typical days and auction days.

- ***CarMax Employees*** – the CarMax facility is expected to employ a total of twenty-two (22) full-time employees, resulting in 22 inbound trips during the weekday morning and 22 outbound trips during the weekday evening, distributed over the two-hour commuter period.
- ***Inventory Supply Trucks*** – the CarMax facility is expected to receive inventory via twelve inventory supply trucks that would arrive prior to auction day. These deliveries are expected to be dispersed throughout the day. To provide a conservative assessment, delivery traffic have been included in the daily and peak hour trip generation projections, although they would not coincide with auction sale days.
- ***Dealer Trucks*** – CarMax anticipates that approximately 125 vehicles will leave the facility on auction day by way of dealer trucks that can carry, on average three (3) vehicles, resulting in 42 dealer trucks arriving during the hours of 7:00 to 10:00 AM, and departing between the hours of 12:00 and 2:00 PM.
- ***Dealer Drive Offs*** – CarMax also anticipates that a significant number of vehicles will exit the facility via dealer drive offs, where dealers arrive in a single vehicle with a number of drivers, who depart the site in the purchased vehicle, resulting in more outbound than inbound traffic. CarMax anticipates approximately 125 dealer drive offs, which typically occur between 12:00 and 5:00 PM.

Figure 4
 2031 No-Build
 Peak Hour Traffic Volumes



- **Customer Traffic** – CarMax anticipates that a maximum of 150 customers will arrive and depart the site on auction days, with customers typically arriving between 7:00 and 10:00 AM and departing between 11:00 AM and 2:00 PM. It is noted that this estimate is likely conservative based on consultation with CarMax, as many of their auction sales, particularly since COVID-19, occur online and do not result in any customer traffic to or from the site on auction day. Instead this traffic is dispersed over the next forty-eight hours when customers are required to retrieve their purchases vehicle.

For the purpose of this assessment, the weekday AM and weekday PM trip generation for the project was applied to the weekday traffic conditions, with the midday auction traffic volumes applied to the Saturday midday, where traffic volumes are generally higher than the corresponding weekday AM peak conditions.

The trip generation projections for the project are summarized in Table 5. The trip generation data are provided in the Appendix.

Table 5
Trip Generation Summary

| Time Period | Employees ^a | Inventory Supply Trucks ^b | Dealer Trucks ^c | Dealer Drive Offs ^d | Auction Customers ^e | Total |
|----------------------------------|------------------------|--------------------------------------|----------------------------|--------------------------------|--------------------------------|------------------|
| Weekday Daily | 44 | 24 | 84 | 125 | 300 | 577 |
| Weekday AM Peak Hour | | | | | | |
| Enter | 11 | 1 | 14 | 0 | 50 | 76 |
| Exit | <u>0</u> | <u>1</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>1</u> |
| Total | 11 | 2 | 14 | 0 | 50 | 77 |
| Weekday PM Peak Hour | | | | | | |
| Enter | 0 | 1 | 0 | 0 | 0 | 1 |
| Exit | <u>11</u> | <u>1</u> | <u>0</u> | <u>25</u> | <u>0</u> | <u>37</u> |
| Total | 11 | 2 | 0 | 25 | 0 | 38 |
| Saturday Daily | 44 | 24 | 84 | 125 | 300 | 577 |
| Saturday Midday Peak Hour | | | | | | |
| Enter | 0 | 1 | 0 | 0 | 0 | 1 |
| Exit | <u>0</u> | <u>1</u> | <u>21</u> | <u>25</u> | <u>50</u> | <u>97</u> |
| Total | 0 | 2 | 21 | 25 | 50 | 98 |

^a Based on twenty-two total employees, with 50% arriving and departing during the weekday AM and weekday PM peak hours on both non-auction and auction days.

^b Based twelve inventory supply trucks arriving daily on non-auction days.

^c Based on 42 dealer trucks, carrying on average 3 vehicles, arriving and departing on auction days only.

^d Based on 125 dealer drive offs where multiple drivers arrive per vehicle on auction days only.

^e Based on 150 auction customers arriving and departing on auction days only.

As summarized in Table 5, on a typical auction weekday (over a twenty-four hour period) the proposed CarMax is expected to result in a total of 577 new vehicle trips (226 entering and 351 exiting), including 77 new vehicle trips (76 entering and 1 exiting) during the weekday AM peak hour and 38 new vehicle trips (1 entering and 37 exiting) during the weekday PM peak hour. It is noted that these projections are expected to be conservative given that a significant percentage of vehicle sales occur online and do not result in trips to or from the facility on auction day.

On a typical Saturday, assuming a worst-case scenario where auction sales occur, the proposed CarMax facility is expected to generate 577 new vehicle trips (226 entering and 351 exiting), including 98 vehicle trips (1 entering and 97 exiting) during the Saturday midday peak hour.

In order to evaluate the most conservative (high) impact of project-related traffic, the auction day trip generation were utilized for analysis purposes for both weekdays and Saturdays. It is noted that project-related impacts would be significantly lower during all other days when auctions do not occur. Specifically, during non-auction days, the daily traffic flows are expected to be less than 100 vehicle trips per day, with the exception of the day before auction day when it is expected that 50 potential customers will arrive to view vehicles over the course of the day, resulting in approximately 120 daily trips would occur.

Trip Distribution

Additional trips expected to be generated by the project were distributed onto the local roadway network, based on a review of existing trip distribution patterns and anticipated commuter patterns for employee trips.

Based on a review of existing traffic patterns, including vehicles currently arriving and departing existing businesses off Eskow Road, it is expected that 70 percent of project-related traffic will be oriented to and from Southwest Cutoff, west of the site, with the remaining 30 percent arriving to and from Southwest Cutoff, east of the site. To the west of the site, Southwest Cutoff provides connections to both the Route 146 corridor and the MassPike (Interstate 90), the two major highways providing regional access to the study area. Smaller percentages of traffic, amounting to approximately 5 percent, are expected to arrive and depart via either Grafton Street, to the north or south, or via Massasoit Road and Millbury Avenue.

The trip distribution patterns are displayed on Figure 5. Based on these patterns, project-related traffic increases were distributed onto the study area roadways and intersections as displayed in Figure 6.

Figure 5
Trip Distribution Map

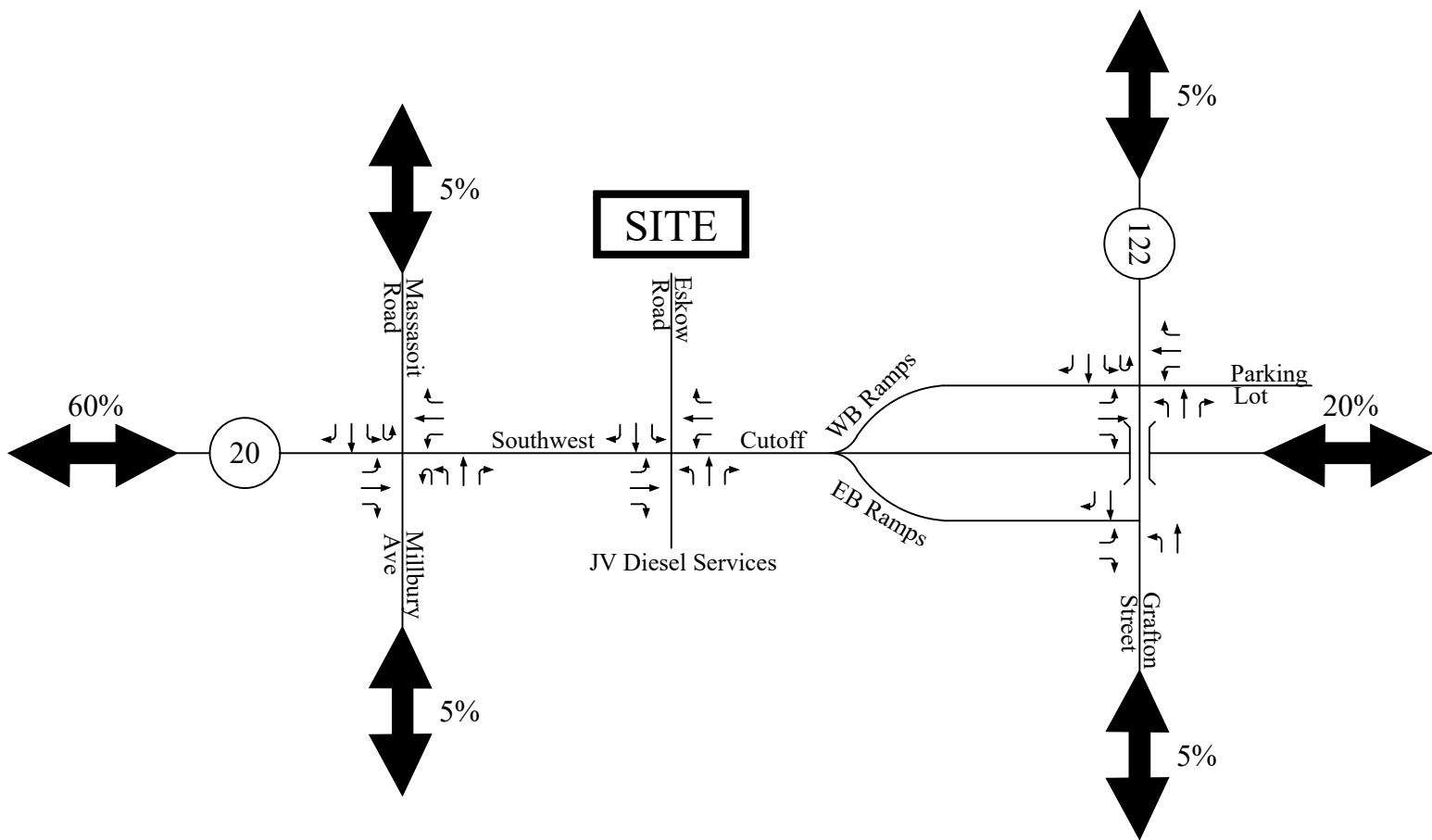
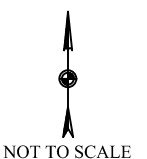
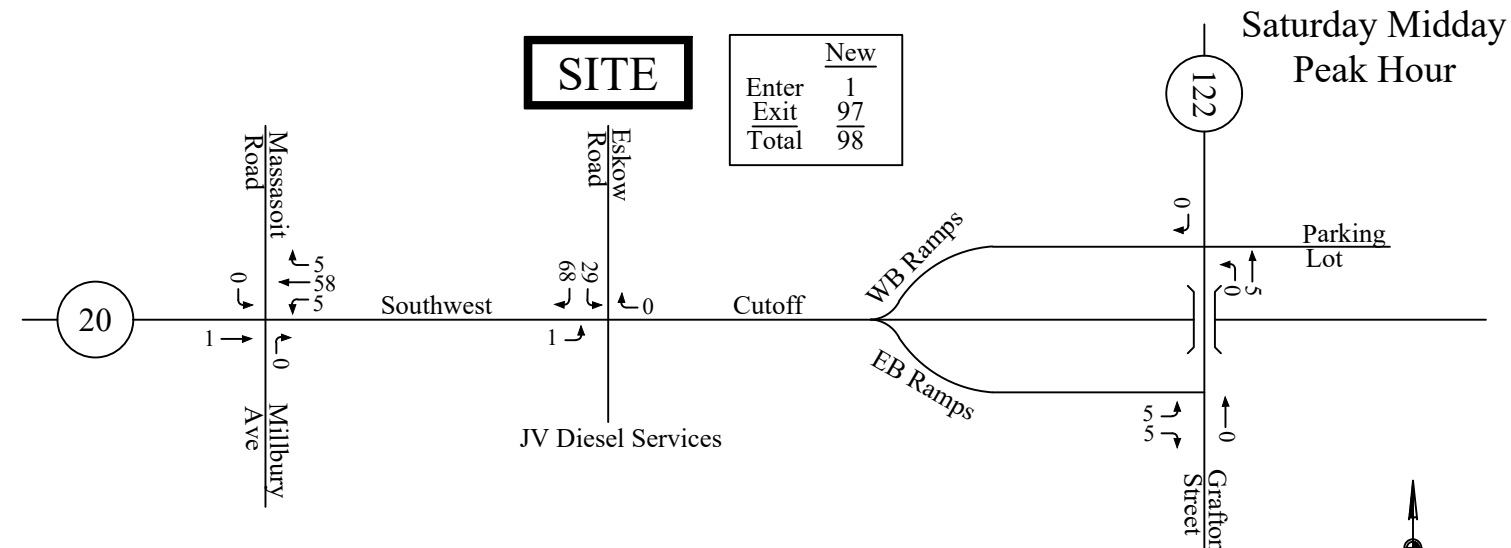
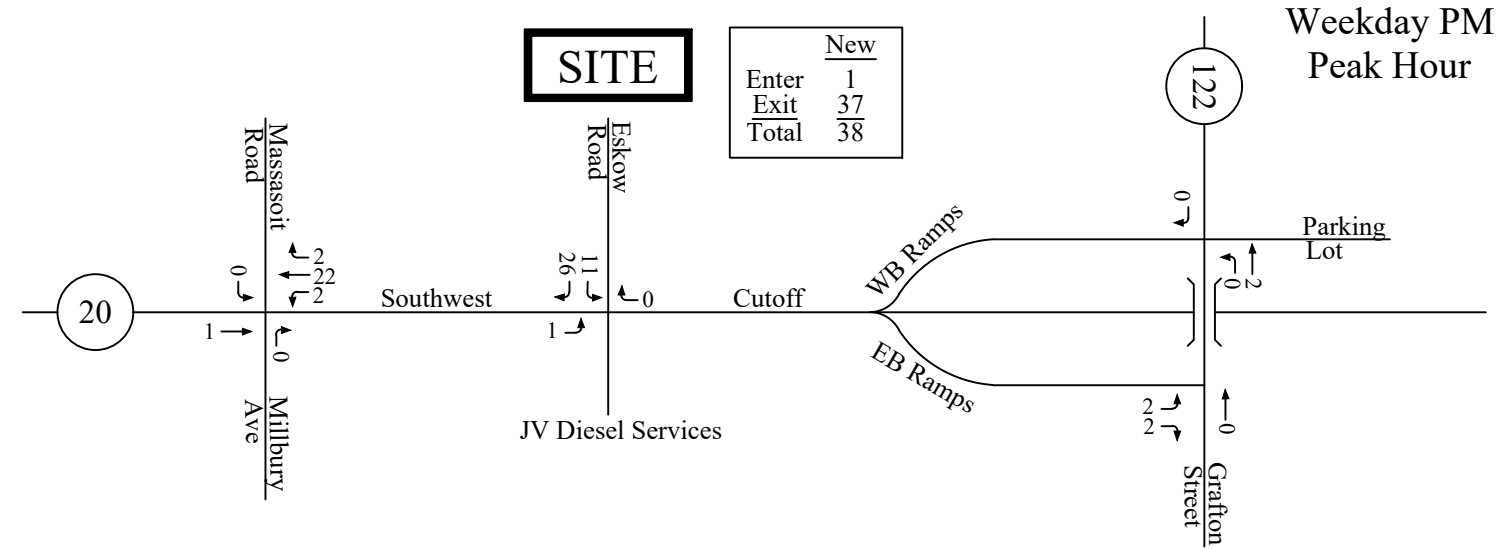
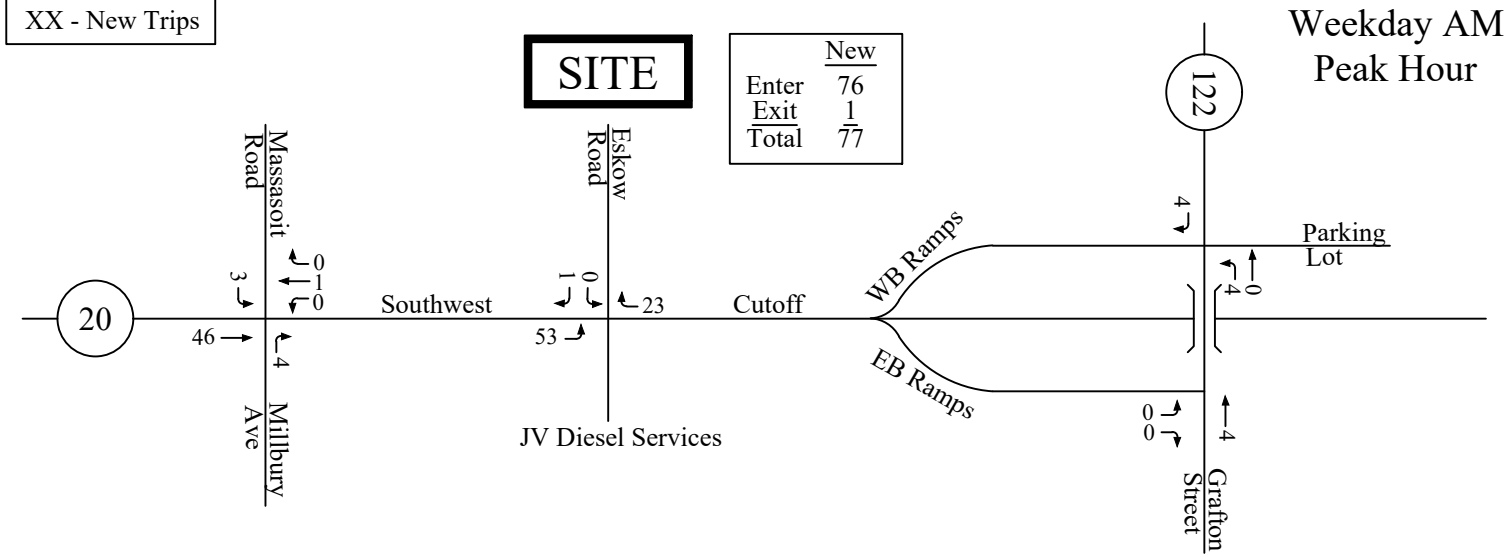


Figure 6
 Project Generated
 Peak Hour Traffic Volumes

XX - New Trips



Build Conditions

Future 2031 Build condition traffic volumes were developed by applying the project-related traffic volumes to the 2031 No-Build condition. The 2031 Build weekday AM, weekday PM and Saturday midday peak hour traffic volume networks are graphically depicted on Figure 7.

Project-related traffic increases generally result in only minimal increases to overall intersection traffic volumes, as compared to No-Build conditions. Specifically, during peak hours of roadway traffic, overall intersection volumes are expected to increase by less than 5 percent during peak hours of roadway traffic. This level of increase falls within typical levels of daily fluctuation of area traffic and is not expected to result in any notable change to area traffic conditions.

Site Access, Parking and On-Site Circulation

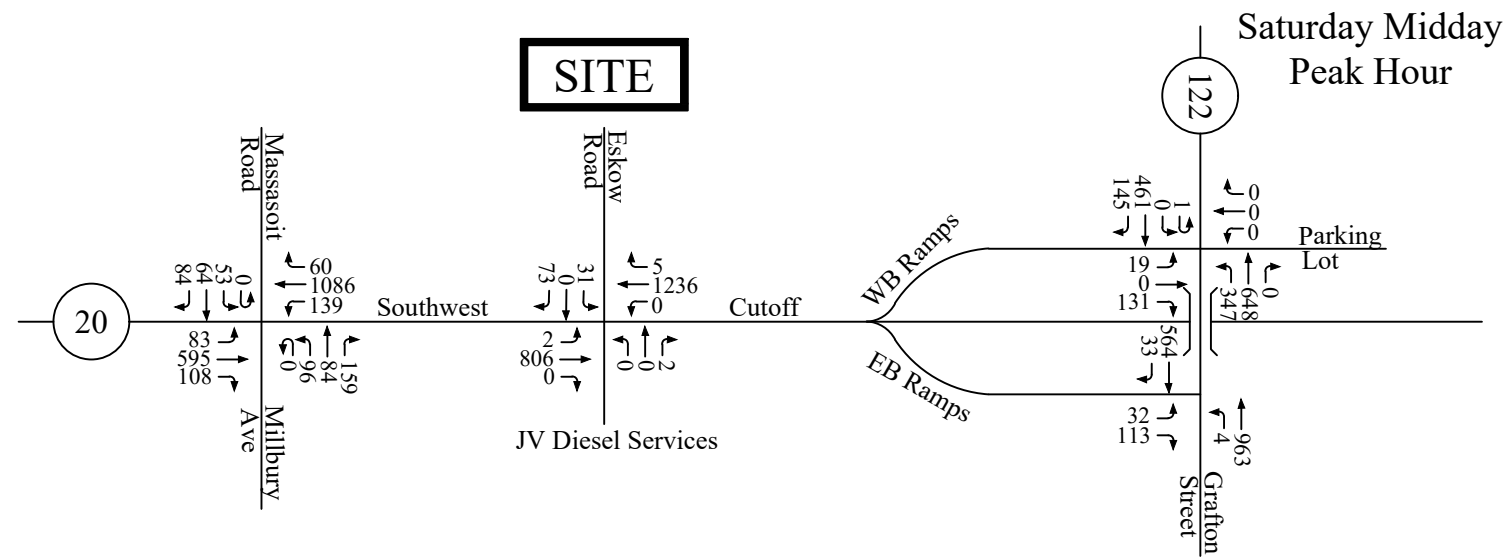
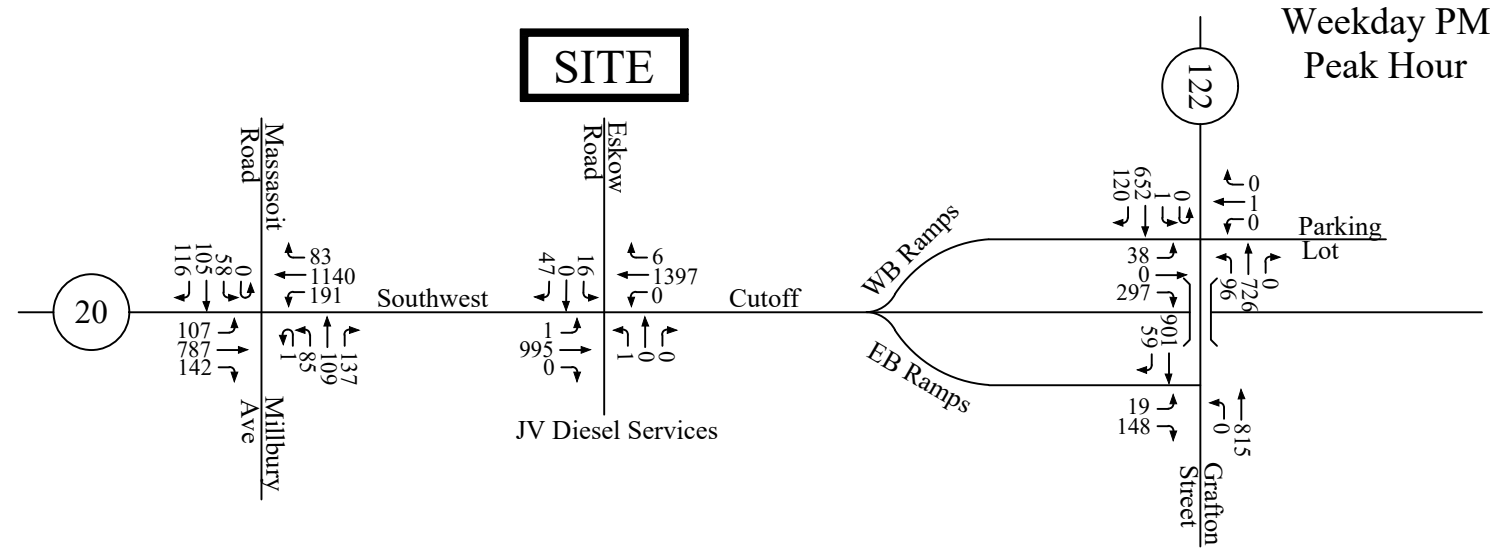
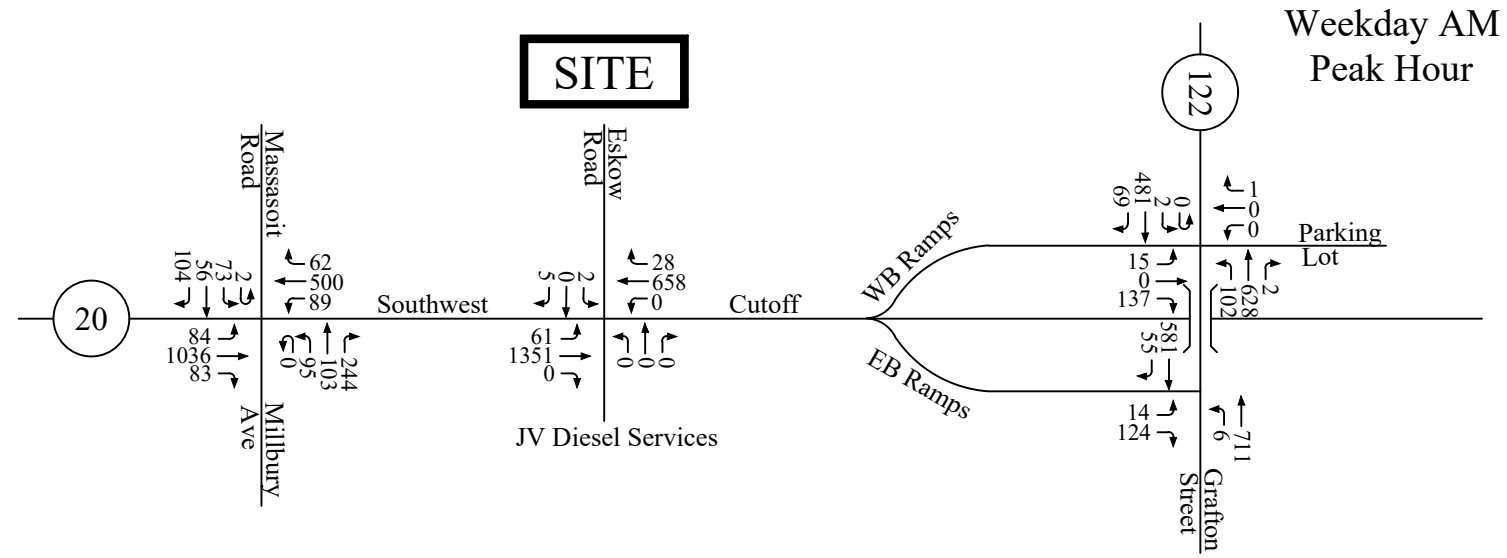
Access to the site will be provided via the extension of Eskow Road into the project site. It is recommended that the proposed access drive provide a minimum of 24-feet in width to accommodate a single 12-foot entering and exiting lane of travel. All signs and pavement markings installed in conjunction with the project will be installed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) design criteria.

CAPACITY ANALYSIS

Level-of-service (LOS) analyses were conducted at the study area intersections under existing and projected volume conditions to determine the effect that the additional site-generated traffic will have on traffic operations. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual*² (HCM) and is described in the Appendix. For signalized intersections, the maximum back of queue during an average signal cycle and a 95th percentile signal cycle was calculated for each lane group during the peak periods studied. The back of queue is the length of a backup of vehicles from the stop line of a signalized intersection to the last car in the queue that is required to stop, regardless of the signal indication. The length of this queue depends on a number of factors including signal timing, vehicle arrival patterns, and the saturation flow rate. For unsignalized intersections, the 95th percentile queue represents the length of queue of the critical minor-street movement that is not expected to be exceeded 95 percent of the time during the analysis period (typically one hour). The queue length is a function of the capacity of the movement and the movement's degree of saturation. The Synchro analysis program was used for all capacity analyses. The unsignalized intersection analyses were calibrated to reflect actual observed delays at the intersection of Southwest Cutoff at Eskow Road. Existing parameters were obtained from observations made in the field during peak times.

² *Highway Capacity Manual 2010*; Transportation Research Board; Washington, DC; 2010.

Figure 7
 2031 Build
 Peak Hour Traffic Volumes



The level-of-service and queue results for signalized and unsignalized intersections are presented in Tables 6 and 7, respectively and are discussed below. All analysis worksheets are provided in the Appendix.

Signalized Intersections

As summarized in Table 6, under 2024 Existing conditions, the intersection of Southwest Cutoff with Massasoit Road and Millbury Avenue currently operates at an overall LOS C during the weekday AM peak hour, the weekday PM peak hour and the Saturday midday peak hour. Under future 2031 No-Build conditions, this location is projected to continue to operate at an overall LOS C during the weekday AM peak hour, the weekday PM peak hour and the Saturday midday peak hour. Under 2031 Build conditions, this location is projected to continue to operate at an overall LOS C during the weekday AM peak hour, the weekday PM peak hour and the Saturday midday peak hour, with project-related traffic increases resulting in increases to overall delays of less than 2 seconds per vehicle.

Unsignalized Intersections

As shown in Table 7, under 2024 Existing conditions, critical movements at the intersection of the Route 20 eastbound off-ramp with Grafton Street, all turns from the Route 20 off-ramp, currently operate at LOS D or better during the weekday AM, weekday PM and Saturday midday peak hours. Under future 2031 No-Build conditions, all turns from the Route 20 eastbound off-ramp are projected to continue to operate at LOS D or better during the weekday AM, weekday PM and Saturday midday peak hours. Under future 2031 Build conditions, all turns from the Route 20 eastbound off-ramp are projected to continue to operate at LOS D or better during the weekday AM, weekday PM and Saturday midday peak hours, with project related traffic increases resulting in minor increases to off-ramp delays, of less than 2 seconds per vehicle.

Under 2024 Existing conditions, critical movements at the intersection of the Route 20 westbound off-ramp with Grafton Street, all turns from the Route 20 westbound off-ramp, currently operate at LOS C during the weekday AM peak hour and at LOS F during the weekday PM and Saturday midday peak hours. Under future 2031 No-Build conditions, all turns from the Route 20 westbound off-ramp are projected to operate at LOS D during the weekday AM peak hour and at LOS F during the weekday PM and Saturday midday peak hours. Under future 2031 Build conditions, all turns from the Route 20 westbound off-ramp are projected to continue to operate at LOS D during the weekday AM peak hour and at LOS F during the weekday PM and Saturday midday peak hours, with no notable project related traffic increases to off-ramp delays.

Table 6
Signalized Intersection Level-of-Service Analysis Summary

| Location/Peak Hour/Movement | 2024 Existing | | | | | 2031 No-Build | | | | | 2031 Build | | | | |
|--|------------------|--------------------|------------------|-------------------|-------------------|---------------|-------------|----------|------|------|------------|-------------|----------|------|------|
| | V/C ^a | Delay ^b | LOS ^c | 50 Q ^d | 95 Q ^e | V/C | Delay | LOS | 50 Q | 95 Q | V/C | Delay | LOS | 50 Q | 95 Q |
| Southwest Cutoff at Massasoit Rd. and Millbury Ave. | | | | | | | | | | | | | | | |
| <i>Weekday AM Peak Hour</i> | | | | | | | | | | | | | | | |
| EB Left | 0.41 | 40.4 | D | 43 | 88 | 0.44 | 41.6 | D | 47 | 93 | 0.45 | 41.7 | D | 47 | 93 |
| EB Thru/Right | 0.85 | 29.8 | C | 267 | 352 | 0.90 | 33.2 | C | 297 | 430 | 0.92 | 36.0 | D | 318 | 462 |
| WB Left | 0.44 | 41.2 | D | 47 | 92 | 0.48 | 42.5 | D | 51 | 98 | 0.48 | 42.7 | D | 51 | 98 |
| WB Thru | 0.39 | 17.7 | B | 101 | 139 | 0.41 | 17.9 | B | 110 | 150 | 0.41 | 17.8 | B | 110 | 150 |
| WB Right | 0.10 | 1.1 | A | 0 | 6 | 0.10 | 1.3 | A | 0 | 8 | 0.10 | 1.3 | A | 0 | 8 |
| NB Left/Thru | 0.45 | 26.9 | C | 91 | 150 | 0.50 | 28.2 | C | 98 | 161 | 0.50 | 28.5 | C | 98 | 161 |
| NB Right | 0.28 | 11.5 | B | 64 | 108 | 0.31 | 12.5 | B | 74 | 120 | 0.32 | 12.7 | B | 75 | 122 |
| SB Left/Thru | 0.28 | 24.1 | C | 49 | 95 | 0.33 | 25.2 | C | 54 | 103 | 0.35 | 25.7 | C | 56 | 106 |
| SB Right | 0.18 | 4.0 | A | 0 | 26 | 0.19 | 4.6 | A | 0 | 30 | 0.20 | 4.6 | A | 0 | 30 |
| Overall | -- | 24.0 | C | -- | -- | -- | 25.9 | C | -- | -- | -- | 27.3 | C | -- | -- |
| <i>Weekday PM Peak Hour</i> | | | | | | | | | | | | | | | |
| EB Left | 0.50 | 42.7 | D | 56 | 107 | 0.54 | 44.4 | D | 60 | 114 | 0.54 | 44.4 | D | 60 | 114 |
| EB Thru/Right | 0.74 | 24.4 | C | 206 | 276 | 0.78 | 25.7 | C | 22 | 305 | 0.78 | 25.7 | C | 229 | 306 |
| WB Left | 0.83 | 65.6 | E | 102 | 219 | 0.90 | 77.2 | E | 11 | 238 | 0.91 | 79.7 | E | 112 | 242 |
| WB Thru | 0.77 | 25.1 | C | 271 | 355 | 0.82 | 27.0 | C | 30 | 400 | 0.83 | 27.8 | C | 311 | 442 |
| WB Right | 0.11 | 1.9 | A | 0 | 15 | 0.12 | 2.2 | A | 0 | 17 | 0.12 | 2.3 | A | 0 | 18 |
| NB Left/Thru | 0.45 | 26.9 | C | 86 | 151 | 0.51 | 29.0 | C | 94 | 165 | 0.51 | 29.0 | C | 94 | 165 |
| NB Right | 0.15 | 6.0 | A | 16 | 46 | 0.17 | 7.4 | A | 23 | 55 | 0.17 | 7.4 | A | 23 | 55 |
| SB Left/Thru | 0.43 | 26.2 | C | 91 | 116 | 0.50 | 28.0 | C | 10 | 126 | 0.50 | 28.0 | C | 100 | 126 |
| SB Right | 0.24 | 5.1 | A | 0 | 19 | 0.26 | 5.1 | A | 0 | 19 | 0.26 | 5.0 | A | 0 | 19 |
| Overall | -- | 25.7 | C | -- | -- | -- | 27.9 | C | -- | -- | -- | 28.3 | C | -- | -- |
| <i>Saturday Midday Peak Hour</i> | | | | | | | | | | | | | | | |
| EB Left | 0.35 | 37.6 | D | 38 | 83 | 0.38 | 28.9 | D | 43 | 88 | 0.38 | 39.2 | D | 43 | 88 |
| EB Thru/Right | 0.57 | 20.5 | C | 131 | 181 | 0.59 | 20.8 | C | 144 | 197 | 0.58 | 20.6 | C | 144 | 197 |
| WB Left | 0.57 | 44.5 | D | 63 | 136 | 0.62 | 47.9 | D | 71 | 150 | 0.64 | 49.5 | D | 75 | 158 |
| WB Thru | 0.72 | 23.6 | C | 224 | 295 | 0.75 | 24.4 | C | 247 | 324 | 0.78 | 25.4 | C | 268 | 351 |
| WB Right | 0.08 | 0.2 | A | 0 | 1 | 0.08 | 0.4 | A | 0 | 2 | 0.09 | 0.8 | A | 0 | 5 |
| NB Left/Thru | 0.36 | 24.0 | C | 68 | 131 | 0.39 | 25.2 | C | 78 | 140 | 0.40 | 25.5 | C | 80 | 140 |
| NB Right | 0.15 | 2.6 | A | 0 | 29 | 0.16 | 3.2 | A | 4 | 34 | 0.16 | 3.2 | A | 4 | 34 |
| SB Left/Thru | 0.23 | 22.3 | C | 44 | 91 | 0.26 | 23.2 | C | 51 | 98 | 0.26 | 23.4 | C | 52 | 98 |
| SB Right | 0.14 | 2.6 | A | 0 | 17 | 0.16 | 3.3 | A | 0 | 20 | 0.16 | 3.1 | A | 0 | 20 |
| Overall | -- | 21.7 | C | -- | -- | -- | 22.5 | C | -- | -- | -- | 23.1 | C | -- | -- |

^a Volume-to-capacity ratio.

^b Average control delay in seconds per vehicle.

^c Level of service.

^d 50th percentile queue in feet, assuming 25 feet per vehicle.

^e 95th percentile queue in feet, assuming 25 feet per vehicle.

Table 7
Unsignalized Intersection Level-of-Service Analysis Summary

| Location/Peak Hour/Movement | 2024 Existing | | | | 2031 No-Build | | | | 2031 Build | | | |
|---|------------------|--------------------|------------------|--------------------|---------------|-------|-----|-------|------------|-------|-----|-------|
| | V/C ^a | Delay ^b | LOS ^c | Queue ^d | V/C | Delay | LOS | Queue | V/C | Delay | LOS | Queue |
| Grafton Street at Route 20 Eastbound Ramp | | | | | | | | | | | | |
| <i>Weekday AM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.31 | 17.7 | C | 25 | 0.35 | 19.2 | C | 50 | 0.35 | 19.2 | C | 50 |
| NB All | 0.01 | 0.1 | A | 0 | 0.01 | 0.1 | A | 0 | 0.01 | 0.1 | A | 0 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| <i>Weekday PM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.31 | 29.2 | D | 75 | 0.55 | 33.7 | D | 75 | 0.55 | 34.5 | D | 75 |
| NB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| <i>Saturday Midday Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.25 | 19.9 | C | 25 | 0.29 | 22.2 | C | 25 | 0.34 | 23.8 | C | 25 |
| NB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| Grafton Street at Route 20 Westbound Ramps | | | | | | | | | | | | |
| <i>Weekday AM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.47 | 24.9 | C | 50 | 0.50 | 26.6 | D | 75 | 0.50 | 26.6 | D | 75 |
| WB All | 0.01 | 13.1 | B | 0 | 0.01 | 13.1 | B | 0 | 0.01 | 13.1 | B | 0 |
| NB All | 0.12 | 1.3 | A | 0 | 0.12 | 1.3 | A | 0 | 0.12 | 1.3 | A | 0 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| <i>Weekday PM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.79 | 48.9 | E | 175 | 0.84 | 62.7 | F | 200 | 0.84 | 62.7 | F | 200 |
| WB All | 0.05 | 55.0 | F | 0 | 0.07 | 67.0 | F | 0 | 0.07 | 67.0 | F | 0 |
| NB All | 0.12 | 1.2 | A | 0 | 0.13 | 1.2 | A | 0 | 0.13 | 1.2 | A | 0 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| <i>Saturday Midday Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.79 | 56.2 | F | 50 | 1.05 | 76.9 | F | 75 | 1.05 | 76.9 | F | 75 |
| WB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| NB All | 0.38 | 3.8 | A | 50 | 0.41 | 4.0 | A | 50 | 0.41 | 4.0 | A | 50 |
| SB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |

^a Volume-to-capacity ratio.

^b Average control delay in seconds per vehicle.

^c Level of service.

^d 95th percentile queue in feet, assuming 25 feet per vehicle.

Table 7 (Continued)
Unsignalized Intersection Level-of-Service Analysis Summary

| Location/Peak Hour/Movement | 2024 Existing | | | | 2031 No-Build | | | | 2031 Build | | | |
|---------------------------------------|------------------|--------------------|------------------|--------------------|---------------|-------|-----|-------|------------|-------|-----|-------|
| | V/C ^a | Delay ^b | LOS ^c | Queue ^d | V/C | Delay | LOS | Queue | V/C | Delay | LOS | Queue |
| Southwest Cutoff at Eskow Road | | | | | | | | | | | | |
| <i>Weekday AM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.01 | 0.6 | A | 0 | 0.01 | 0.9 | A | 0 | 0.09 | 6.7 | A | 0 |
| WB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| NB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| SB Left | 0.03 | 31.3 | D | 0 | 0.04 | 37.8 | E | 0 | 0.04 | 47.4 | E | 0 |
| SB Right | 0.01 | 10.1 | B | 0 | 0.01 | 10.3 | B | 0 | 0.01 | 10.3 | B | 0 |
| <i>Weekday PM Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.1 | A | 0 |
| WB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| NB All | 0.00 | 44.0 | E | 0 | 0.06 | 59.6 | F | 0 | 0.06 | 59.6 | F | 0 |
| SB Left | 0.13 | 39.5 | E | 0 | 0.17 | 52.9 | F | 25 | 0.26 | 58.6 | F | 25 |
| SB Right | 0.13 | 14.1 | B | 25 | 0.16 | 14.9 | B | 25 | 0.16 | 14.9 | B | 25 |
| <i>Saturday Midday Peak Hour</i> | | | | | | | | | | | | |
| EB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.1 | A | 0 |
| WB All | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 | 0.00 | 0.0 | A | 0 |
| NB All | 0.01 | 10.8 | B | 0 | 0.01 | 11.1 | B | 0 | 0.01 | 11.1 | B | 0 |
| SB Left | 0.02 | 21.3 | C | 0 | 0.03 | 24.0 | C | 0 | 0.23 | 28.8 | D | 25 |
| SB Right | 0.02 | 12.3 | B | 0 | 0.02 | 12.8 | B | 0 | 0.22 | 14.8 | B | 25 |

^a Volume-to-capacity ratio.

^b Average control delay in seconds per vehicle.

^c Level of service.

^d 95th percentile queue in feet, assuming 25 feet per vehicle.

Under 2024 Existing conditions, critical movements at the intersection of Southwest Cutoff with Eskow Road, left-turns from Eskow Road, currently operate at LOS D during the weekday AM peak hour, at LOS E during the weekday PM peak hour, and at LOS C during the Saturday midday peak hour. Under 2031 No-Build conditions, left-turns from Eskow Road are projected to operate at LOS E during the weekday AM peak hour, at LOS F during the weekday PM peak hour, and at LOS C during the Saturday midday peak hour. Under 2024 Build conditions, left-turns from Eskow Road are projected to continue to at LOS E during the weekday AM peak hour and at LOS F during the weekday PM peak hour, and to operate at LOS D during the Saturday midday peak hour. Delays for left-turns from Eskow Road are projected to increase by approximately 5 to 10 seconds as compared to future 2031 No-Build conditions, with no notable impact to vehicle queuing. Under all analysis conditions, mainline traffic on Southwest Cutoff operates at LOS A, with right-turns from Eskow Road operating at LOS B conditions.

CONCLUSIONS

Existing and future traffic conditions at the study area intersections have been described and analyzed with respect to traffic operations and the impact of the proposed project. Conclusions of this effort and recommendations are presented below.

- The project entails the construction of a new approximately 7,125± square foot (sf) CarMax auto auction facility. The project will provide a total of 5.71± acres for the vehicle staging area, which will accommodate a total of 897 vehicles. It is expected that the facility will auction 500 vehicles on a typical auction day.
- Access to the site is proposed via the extension of Eskow Road from Southwest Cutoff (Route 20).
- A review of the available sight lines intersection of Southwest Cutoff with Eskow Road reveals no safety issues, with the required sight distances exceeded at both locations.
- It is recommended that any proposed landscaping or signs in the vicinity of this intersection be kept low (maximum 2 feet in height from street level), or set back outside the sight triangles (as defined by AASHTO) so as not to impede the available sight distances.
- Based on empirical data collected at operational CarMax auction facilities, traffic generation is highest during auction days and is expected to amount to 577 daily vehicle trips (226 entering and 351 exiting), including 77 new vehicle trips (76 entering and 1 exiting) during the weekday AM peak hour and 38 new vehicle trips (1 entering and 37 exiting) during the weekday PM peak hour.
- On a typical Saturday auction day, the proposed CarMax facility is expected to generate 577 daily vehicle trips (226 entering and 351 exiting), including 98 vehicle trips (1 entering and 97 exiting) during the Saturday midday peak hour.
- On all other days outside of auction days, the facility is expected to typically generate less than 100 daily trips, with the exception of the day before auctions, when approximately 120 daily vehicle trips are expected.
- Once distributed onto the local roadway network, peak hour increases in traffic at any study area location are expected to result in only minor increases in peak hour traffic volumes of less than 5 percent as compared to future No-Build conditions.
- Project-related traffic increases result in no notable impacts to area traffic operations, with minimal increases to both delays and vehicle queuing projected.

- Minimal queuing is projected on the Eskow Road approach to Southwest Cutoff, with maximum queues expected to continue to extend one vehicle or less during peak hours.
- All new sidewalk internal to the project should be designed and constructed to meet applicable Americans with Disabilities Act (ADA) design criteria. All new signs and pavement markings installed in conjunction with the project will be installed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) design criteria.

In summary, during auction days, which will only occur once per week, the project is expected to result in only minor increases to vehicle delays and queuing, that will result in no notable change in area traffic operations. Impacts during non-auction days will be significantly lower, with less than 100 daily vehicle trips expected on the majority of days. The proposed site access via Eskow Road will continue to provide safe access, with acceptable traffic operations and queuing on the Eskow Road approach to Southwest Cutoff.