

Traffic and Park Study Proposed Car Wash

Naperville, Illinois



Prepared For:

Christianson Companies

KLOA
Kenig, Lindgren, O'Hara, Aboona, Inc.

August 8, 2023

1. Introduction

This report summarizes the methodologies, results, and findings of a traffic impact study conducted by Kenig, Lindgren, O'Hara, Aboona, Inc. (KLOA, Inc.) for a proposed car wash to be located in Naperville, Illinois. The car wash is to be located as an outlot parcel in the northwest portion of the Lowe's Home Improvement Store (Lowe's) located on the east side of IL 59 bounded by Beebe Drive on the north and an access road on the south. As proposed, the car wash is to consist of an approximate 5,250 square-foot tunnel car wash with 15 vacuum stations, three employee parking spaces, and one ADA parking space and will eliminate 112 existing parking spaces serving the Lowe's. Access to the car wash will be provided via the existing access and circulation systems serving the Lowe's.

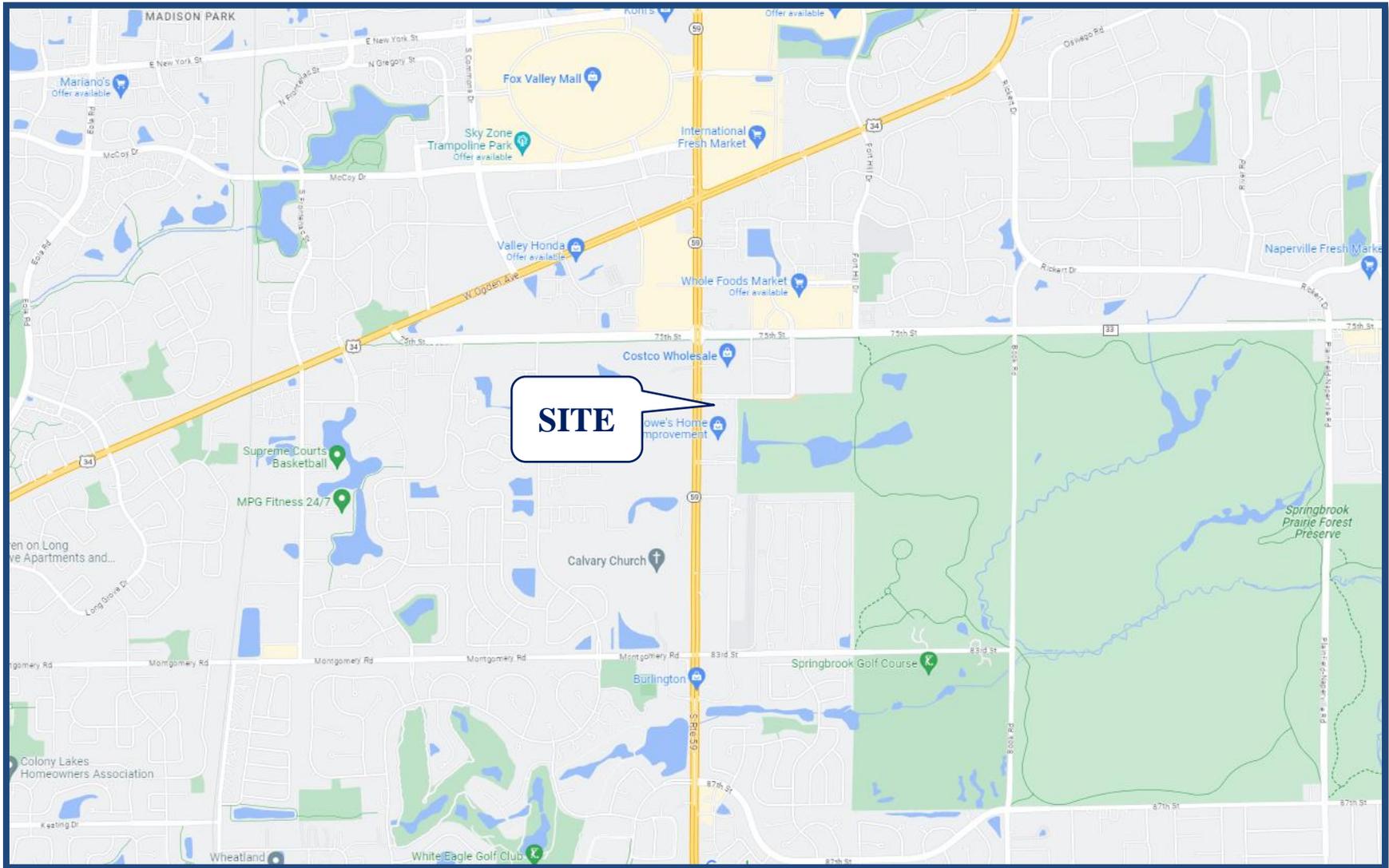
The purpose of this study was to examine background traffic conditions, assess the impact that the proposed car wash will have on traffic conditions in the area, and determine if any roadway or access improvements are necessary to accommodate traffic generated by the proposed car wash. In addition, a parking study was performed to ensure that the Lowe's will continue to provide sufficient parking with the addition of the car wash. **Figure 1** shows the location of the Lowe's in relation to the area roadway system. **Figure 2** shows an aerial view of the Lowe's and the outlot parcel.

The sections of this report present the following:

- Existing roadway conditions
- A description of the proposed car wash
- Directional distribution of the car wash traffic
- Vehicle trip generation for the car wash
- Future traffic conditions including access to the car wash
- Traffic analyses for the weekday evening and Saturday midday peak hours
- Recommendations with respect to adequacy of the site access and adjacent roadway system
- Parking evaluation of the existing Lowe's and the addition of the proposed car wash

Traffic capacity analyses were conducted for the weekday evening and Saturday midday peak hours for the following conditions:

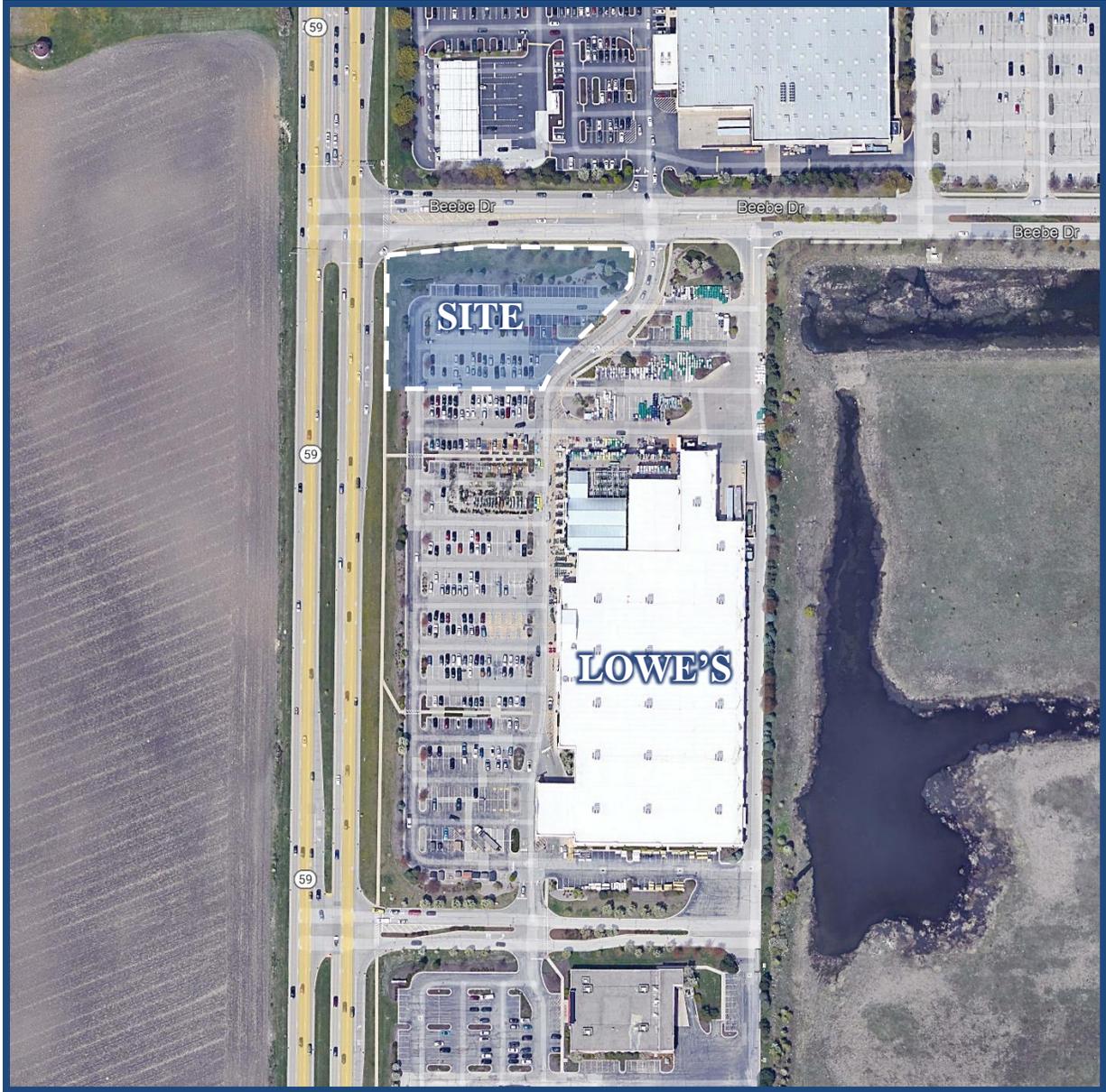
1. Existing Conditions – Analyzes the capacity of the existing roadway system using existing peak hour traffic volumes.
2. Year 2029 Total Projected Conditions – Analyzes the capacity of the future roadway system using the traffic volumes that include the existing traffic volumes, ambient area growth not attributable to any particular development, and the traffic estimated to be generated by the proposed car wash.



Site Location

Figure 1

*Proposed Car Wash
Naperville, Illinois*



Aerial View of Site

Figure 2

2. Existing Conditions

The following provides a description of the geographical location of the site, physical characteristics of the area roadway system including lane usage and traffic control devices, and existing peak hour traffic volumes.

Site Location

The car wash is to be as an outlot parcel in the northwest portion of the Lowe's located on the east side of IL 59 bounded by Beebe Drive on the north and an access road on the south. Land uses in the area consist of residential subdivisions to the east, commercial uses to the north and south, and vacant land to the west. A Costco store is located directly north of the Lowe's and a Staples office store and an Ashley Homestore are located directly south of the Lowe's, which share an access road with the Lowe's. The Calvary Church is located to the southwest of the Lowe's.

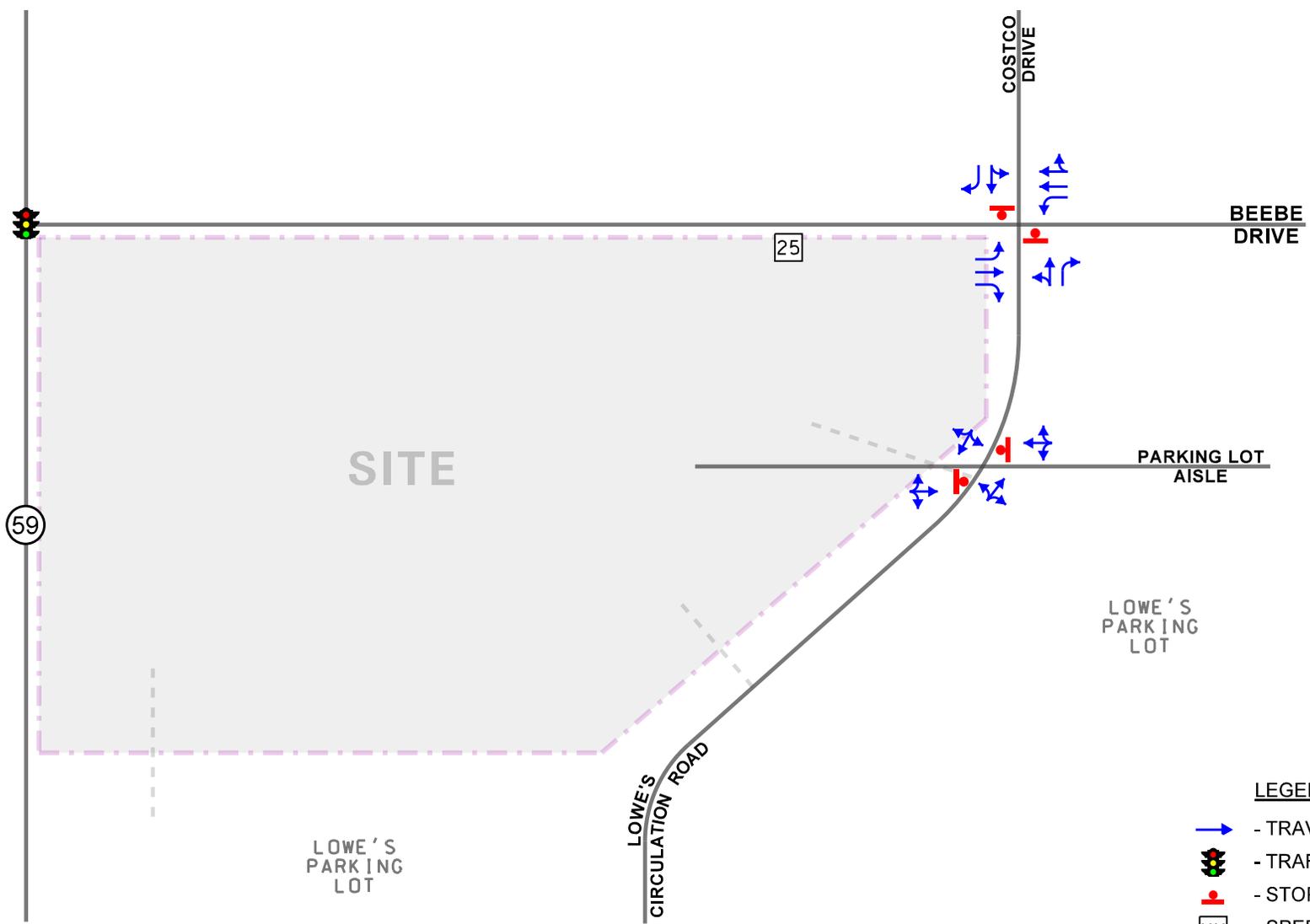
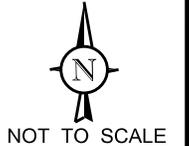
Existing Roadway System Characteristics

The characteristics of the existing roadways near the car wash are described below and illustrated in **Figure 3**.

Beebe Drive is a local road that extends in a quarter circle between IL 59 and Audrey Avenue and serves several commercial uses including the Lowe's, Costco, and a Walmart Supercenter. It generally has a five-lane cross-section and is under traffic signal control at its intersections with IL 59 and 75th Street. Separate left-turn lanes are provided at most intersections and access drives, including IL 59 (dual), the Lowe's west access road/Costco west access drive, and 75th Street. The Lowe's east access road is restricted to right-turn in/right-turn out movements via the landscaped median along Beebe Drive. Beebe Drive has a posted speed limit of 25 mph and is under the jurisdiction of the City of Naperville.

Access to the Lowe's is provided via one access road on IL 59 and two access roads on Beebe Drive as summarized below:

- The IL 59 access road is located on the east side of IL 59 approximately 1,100 feet south of Beebe Drive and also serves the Staples and Ashley Homestore. This access road has one lane in each direction divided by a landscaped median. At its intersection with IL 59, the access road has a separate left-turn lane and a separate right-turn lane that are under stop sign control.
- The Lowe's west access road is located on the south side of Beebe Drive approximately 450 feet east of IL 59 and is aligned opposite the Costco west access drive. The Lowe's west access road has a two-lane cross section that extends to the IL 59 access road and serves as the Lowe's primary north-south circulation road. At its intersection with Beebe Drive, both the Lowe's west access road and the Costco west access drive have one inbound lane and two outbound lanes with the outbound lanes striped for a shared left-turn/through lane and a separate right-turn lane. The outbound lanes are under stop sign control.



- LEGEND**
- TRAVEL LANE
 - TRAFFIC SIGNAL
 - STOP SIGN
 - SPEED LIMIT

Car Wash
Naperville, Illinois

Existing Roadway Characteristics

KLOA
Kenig, Lindgren, O'Hara, Aboona, Inc.
Job No: 23-128 Figure: 3

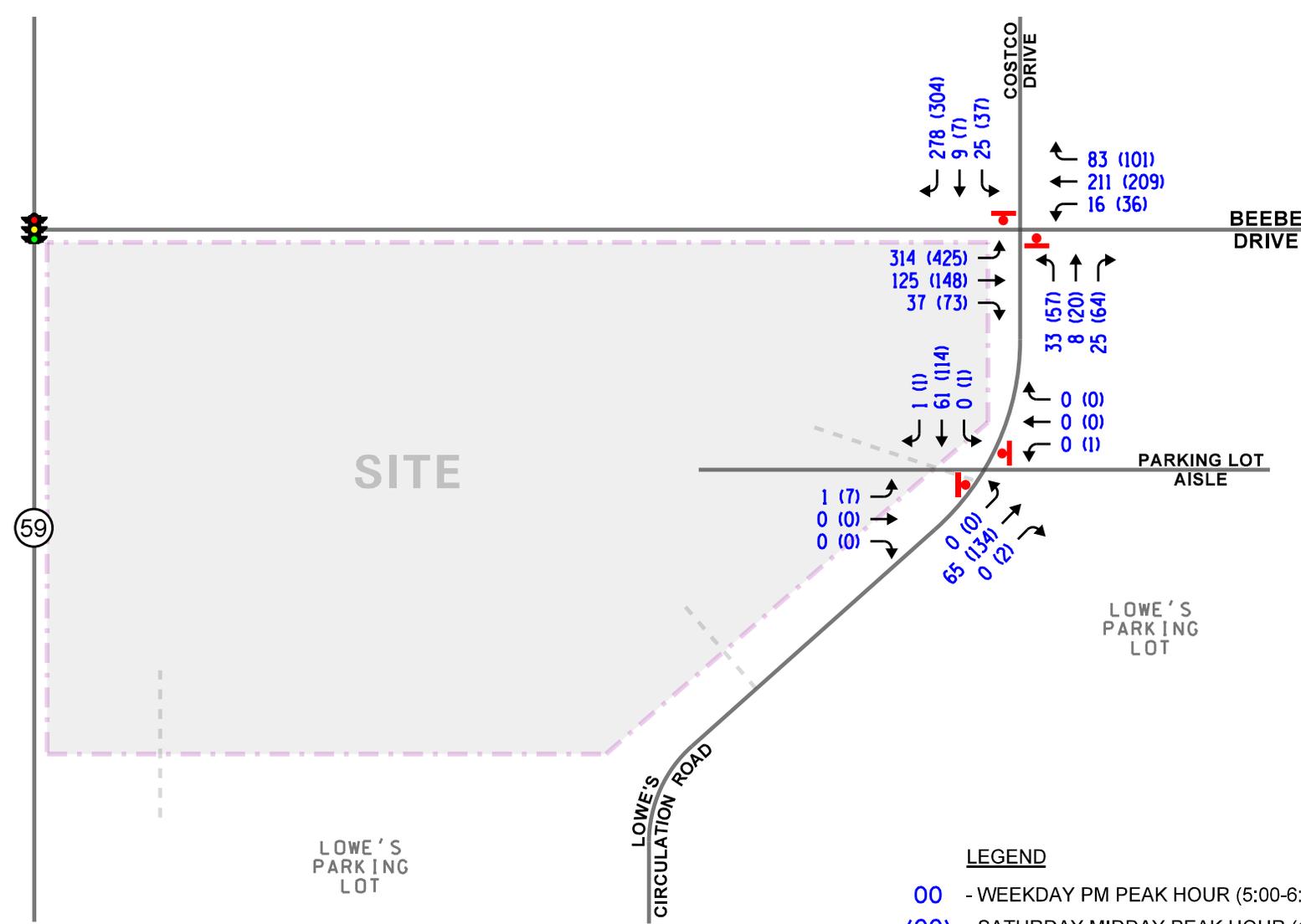
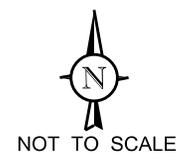
- The Lowe’s east access road is located on the south side of Beebe Drive approximately 610 feet east of IL 59 and is restricted to right-turn in/right-turn out movements only via the landscaped median along Beebe Drive. This access road has a two-lane cross-section that extends to the IL 59 access road and serves as the Lowe’s secondary north-south circulation road. At its intersection with Beebe Drive, the access road provides one inbound lane and one outbound lane that are restricted to right-turn movements only. The outbound lane is under stop sign control.

Existing Traffic Volumes

To determine current traffic conditions within the study area, KLOA, Inc. conducted peak period traffic, pedestrian, and bicycle counts using Miovision Video Scout Collection Units at the following two intersections:

- Beebe Drive with the Lowe’s west access road and Costco west access drive
- Lowe’s primary north-south circulation road with the northern parking aisle

The counts were conducted during the weekday evening (4:00 P.M. to 6:00 P.M.) and Saturday midday (noon to 2:00 P.M.) peak periods on Thursday and Saturday, April 27 and 29. The results of the traffic counts indicate that the peak hours of traffic generally occur between 5:00 P.M. and 6:00 P.M. during the weekday evening peak period and between 12:30 P.M. and 1:30 P.M. during the Saturday midday peak period. Copies of the traffic count summary sheets are included in the Appendix. **Figure 4** illustrates the existing peak hour traffic volumes.



LEGEND

- 00** - WEEKDAY PM PEAK HOUR (5:00-6:00 PM)
- (00)** - SATURDAY MIDDAY PEAK HOUR (12:30-1:30 PM)

Car Wash
Naperville, Illinois

Existing Traffic Volumes



Job No: 23-128 Figure: 4

3. Traffic Characteristics of the Proposed Car Wash

To properly evaluate future traffic conditions in the surrounding area, it was necessary to determine the traffic characteristics of the proposed car wash, including the directional distribution and volumes of traffic that it will generate.

Proposed Site and Car Wash Plan

As proposed, the site will be developed with an automatic car wash that is to consist of an approximate 5,250 square-foot tunnel car wash with 15 vacuum stations, three employee parking spaces, and one ADA parking space. Direct access to the car wash will be provided via two internal access drives located on the west side of the Lowe's primary north-south circulation road and will be replacing two existing parking aisles serving the parking lot.

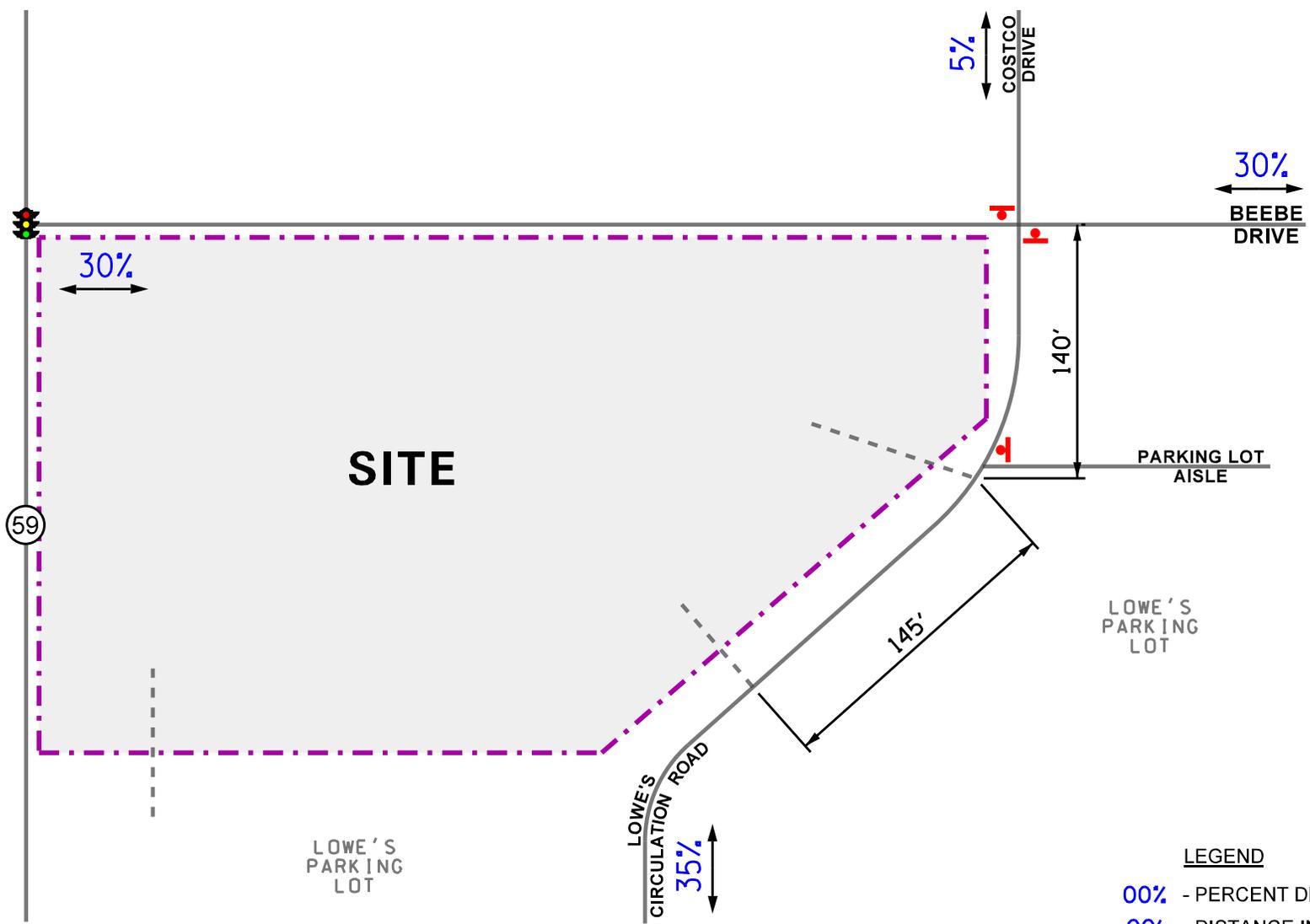
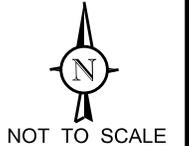
- The north access drive will provide inbound only access to the approach lanes to the pay stations and the entrance to the car wash tunnel entrance, which are located on the north and west sides of the car wash, respectively. This access drive will provide one wide inbound lane.
- The south access drive will provide outbound only access from the car wash and the vacuum stations/employee parking located on the south side of the car wash. This access drive will provide two outbound lanes.

In addition, the western north-south circulation road will extend into the southwest corner of the site and will provide cross-access between the Lowe's parking lot and the vacuum stations/employee parking.

A copy of the preliminary site plan is included in the Appendix.

Directional Distribution of Site Traffic

The directions from which traffic will approach and depart the site were estimated based on existing travel patterns, as determined from the traffic counts. **Figure 5** illustrates the directional distribution of vehicles to/from the proposed car wash.



Car Wash
Naperville, Illinois

Directional Distribution



Job No: 23-128 Figure: 5

Trip Generation Estimates

The number of peak hour vehicle trips to be generated by the proposed car wash was estimated based on the “Automated Car Wash” (Land-Use Code 948) trip rates published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition. It is important to note that surveys conducted by ITE have shown that a considerable number of trips made to car washes are diverted from the existing traffic on the roadway system. This is particularly true during the weekday morning and evening peak hours when traffic is diverted from the home-to-work and work-to-home trips. Such diverted trips are referred to as pass-by traffic. However, in order to present a conservative analysis, no reductions were assumed in the estimated traffic to be generated by the car wash. It should be noted that the Saturday peak hour trip rates provided in the ITE *Trip Generation Manual* for an automated car wash is based on only one survey. As such, for the purposes of the study, it was assumed that the car wash will generate approximately the same volume of traffic during the Saturday midday peak hour as estimated for the weekday evening peak hour. **Table 1** summarizes the trips estimated to be generated by the car wash. Copies of the ITE trip generation graphs are included in the Appendix.

Table 1
PEAK HOUR SITE-GENERATED TRAFFIC VOLUMES

ITE Land-Use Code	Type/Size	Weekday Evening Peak Hour			Saturday Midday Peak Hour		
		In	Out	Total	In	Out	Total
948	Car Wash – (1 Tunnel)	39	39	78	39	39	78

Car Wash Operation and Circulation

The single-lane automatic car wash tunnel will be an exterior-only car wash system and will have a counterclockwise circulation. The entrance to the car wash drive-through system is located on the west side of the site. Vehicles will enter from the Lowe’s primary north-south circulation road and will proceed along the north side of the site to enter the three approach/stacking lanes and individually gated, automatic pay stations to select and pay for their car wash options. The gates meter the traffic flow proceeding to the car wash tunnel entrance and will open in sequence based on the order of vehicle payment. Once the gate is lifted for the respective lane, the individual vehicle will perform a U-turn to proceed towards the entrance to the tunnel. At the entrance to the car wash tunnel, the driver will remain in the vehicle and the car wash will automatically pull the vehicle through the tunnel. After exiting the tunnel, the traffic will travel to the vacuum stations or exit the car wash via the southern access drive.

Car Wash Stacking

According to the site plan, the approach/stacking lanes can accommodate a total of approximately 33 vehicles between the three pay stations and the Lowe's main north-south circulation road. In addition, there is storage for approximately four to five vehicles between the pay stations and the entrance to the tunnel. As such, the plan provides a total stacking of approximately 37 to 38 vehicles between the car wash entrance and the Lowe's main north-south circulation road.

Car Wash Wayfinding and Traffic Control Signage

The following wayfinding and traffic control signage is recommended:

- Wayfinding signage should be posted to guide vehicles to the car wash stacking area.
- Wayfinding signage should be posted at the exit of the car wash tunnel to direct vehicles exiting the car wash to the south access drive to exit the site or to the vacuum stations.
- "Do Not Enter" signs should be posted at the south access drive and the one-way circulation road from the car wash tunnel indicating the one-way operation of the access drive and circulation road.

Vacuum Stations

The 15 vacuum stations will be located on the south side of the site and served via an east-west, two-way drive aisle. Access to the vacuum stations/employee parking will be provided via cross-access at the northwest corner of the site and outbound access via the south access drive.

Peak Day Operations

Typical of any car wash, its peak operations (design day) typically occur after a weather event such as a snowfall or a rain event. Based on historical data from other car washes, this typically occurs 12 to 15 times per year. When this peak demand occurs, the following operational procedures should be implemented:

- Increase the service rate of the tunnel to the maximum it can process.
- Provide staff at critical locations within the circulation system during peak periods at the car wash to help direct and manage the flow of traffic through the site. Critical internal locations where staff should be located include at the pay stations and at the exit of the car wash.

4. Projected Traffic Conditions

The total projected traffic volumes include the existing traffic volumes, increase in background traffic due to growth, and the traffic estimated to be generated by the proposed car wash.

Car Wash Traffic Assignment

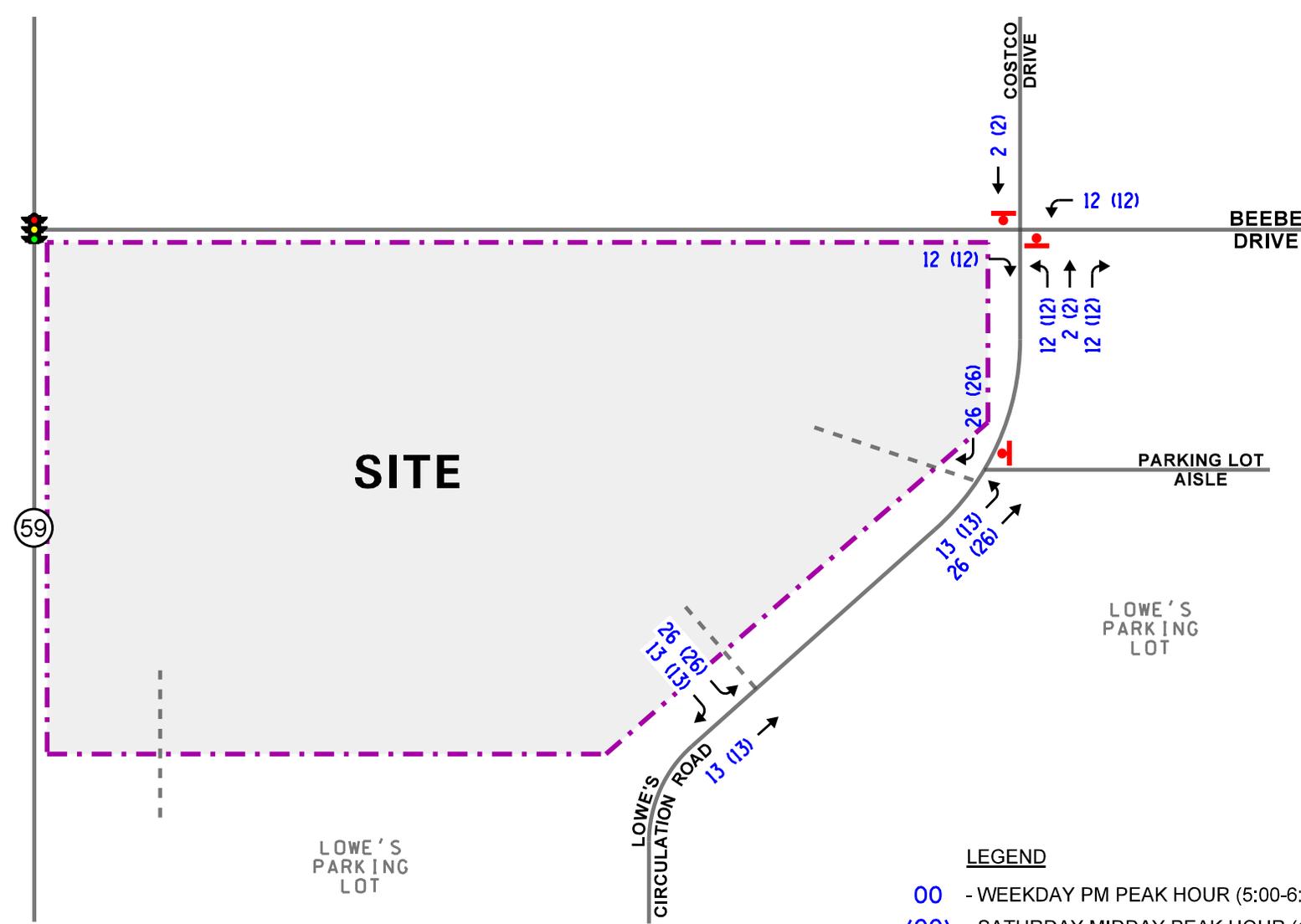
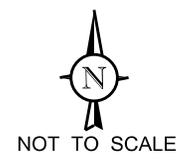
The estimated weekday evening and Saturday midday peak hour traffic volumes that will be generated by the proposed car wash were assigned to the roadway system in accordance with the previously described directional distribution (Figure 5). The traffic assignment for the car wash is illustrated in **Figure 6**.

Background (No-Build) Traffic Conditions

The existing traffic volumes (Figure 4) were increased by a regional growth factor to account for the increase in existing traffic related to regional growth in the area (i.e., not attributable to any particular planned development). Given that most of the land along Beebe Drive has been developed, the Beebe Drive existing through traffic volumes were increased by an annually compounded growth rate of one percent per year for six years (one-year buildout plus five years) for a total of approximately six percent to represent Year 2029 no-build conditions.

Year 2029 Total Projected Traffic Volumes

The Year 2029 total projected traffic volumes include the existing traffic plus the additional growth in background traffic plus the traffic estimated to be generated by the proposed car wash. **Figure 7** shows the Year 2029 total projected traffic volumes.

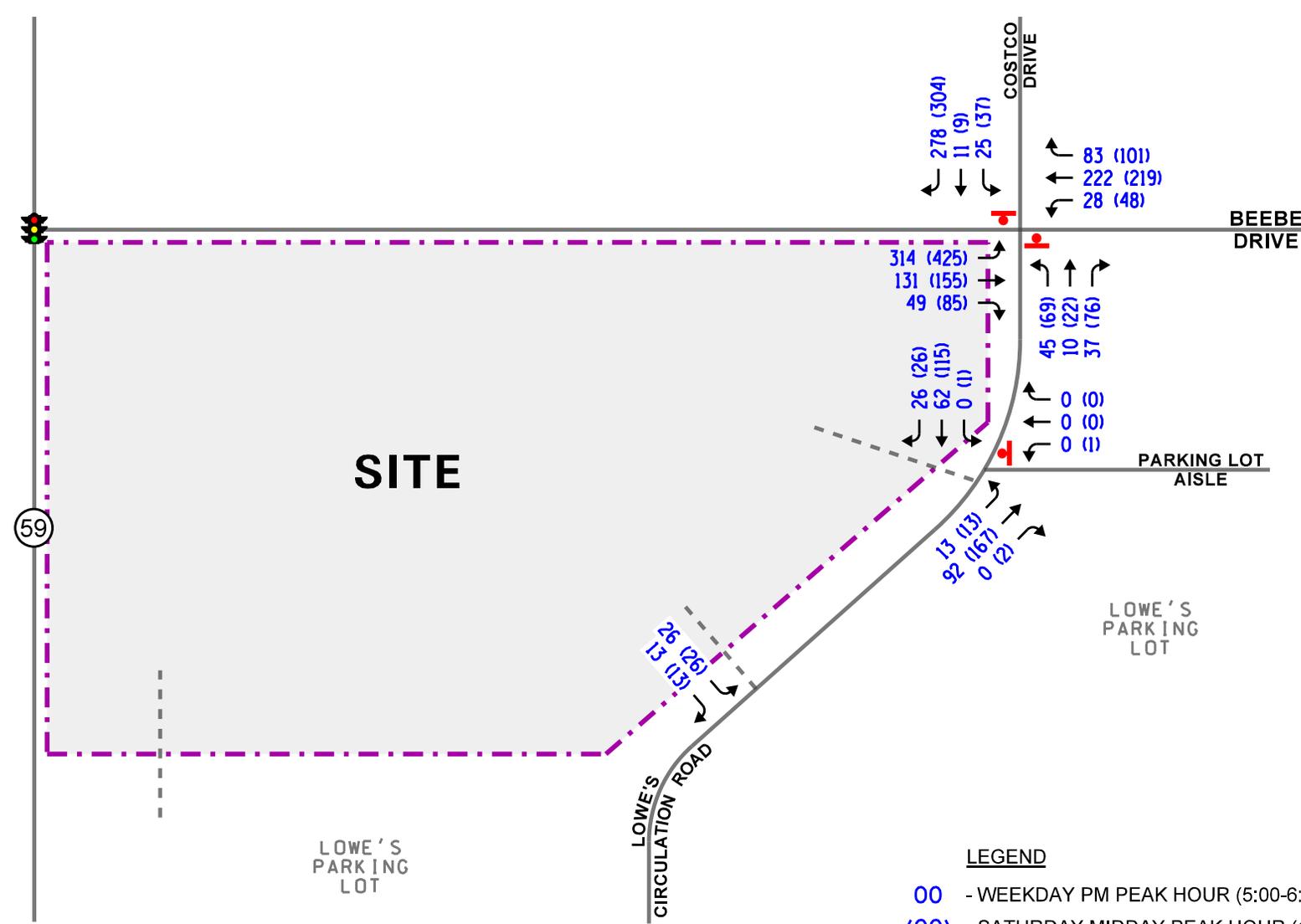
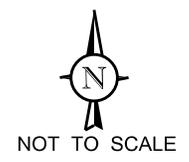


- LEGEND**
- 00 - WEEKDAY PM PEAK HOUR (5:00-6:00 PM)
 - (00) - SATURDAY MIDDAY PEAK HOUR (12:30-1:30 PM)

Car Wash
Naperville, Illinois

Site-Generated Traffic Volumes

KLOA
Kenig, Lindgren, O'Hara, Aboona, Inc.
Job No: 23-128 Figure: 6



LEGEND
 00 - WEEKDAY PM PEAK HOUR (5:00-6:00 PM)
 (00) - SATURDAY MIDDAY PEAK HOUR (12:30-1:30 PM)

Car Wash
 Naperville, Illinois

Year 2029 Total Traffic Volumes

KLOA
 Kenig, Lindgren, O'Hara, Aboona, Inc.
 Job No: 23-128 Figure: 7

5. Traffic Analysis and Recommendations

The following provides an evaluation conducted for the weekday evening and Saturday midday peak hours. The analysis includes conducting capacity analyses to determine how well the roadway system and access roads/drives are projected to operate and whether any roadway improvements or modifications are required.

Traffic Analyses

Roadway and adjacent or nearby intersection analyses were performed for the weekday evening and Saturday midday peak hours for the Year 2023 existing and Year 2029 total traffic volumes.

The traffic analyses were performed using the methodologies outlined in the Transportation Research Board's *Highway Capacity Manual (HCM)*, 6th Edition and analyzed using Synchro/SimTraffic 11 software. The analysis for the traffic-signal controlled intersection were accomplished using actual cycle lengths, phasings, and offsets to determine the average overall vehicle delay and levels of service.

The analyses for the unsignalized intersections determine the average control delay to vehicles at an intersection. Control delay is the elapsed time from a vehicle joining the queue at a stop sign (includes the time required to decelerate to a stop) until its departure from the stop sign and resumption of free flow speed. The methodology analyzes each intersection approach controlled by a stop sign and considers traffic volumes on all approaches and lane characteristics.

The ability of an intersection to accommodate traffic flow is expressed in terms of level of service, which is assigned a letter from A to F based on the average control delay experienced by vehicles passing through the intersection. The *Highway Capacity Manual* definitions for levels of service and the corresponding control delay for signalized intersections and unsignalized intersections are included in the Appendix of this report.

Summaries of the traffic analysis results showing the level of service and overall intersection delay (measured in seconds) for the Year 2023 existing and Year 2029 total projected conditions are presented in **Tables 2** and **3**. A discussion of the intersections follows. Summary sheets for the capacity analyses are included in the Appendix.

Table 2

CAPACITY ANALYSIS RESULTS – EXISTING CONDITIONS – UNSIGNALIZED

Intersection	Weekday Evening Peak Hour		Saturday Midday Peak Hour	
	LOS	Delay	LOS	Delay
Beebe Drive with Lowe’s West Access Road/Costco West Access Drive				
• Northbound Left Turn/Through	D	34.0	F	99+
• Northbound Right Turn	A	8.8	A	9.2
• Southbound Left Turn/Through	D	25.1	F	99+
• Southbound Right Turn	B	11.2	B	11.7
• Eastbound Left Turn	A	8.8	A	9.6
• Westbound Left Turn	A	7.6	A	7.8
Lowe’s Middle North-South Circulation Road with Parking Drive Aisle				
• Eastbound Approach	A	9.4	B	10.4
• Westbound Approach	A	0.1	B	10.3
• Northbound Left Turn	A	0.1	A	0.1
• Southbound Left Turn	A	0.1	A	7.5
LOS = Level of Service Delay is measured in seconds.				

Table 3

CAPACITY ANALYSIS RESULTS – PROJECTED CONDITIONS – UNSIGNALIZED

Intersection	Weekday Evening Peak Hour		Saturday Midday Peak Hour	
	LOS	Delay	LOS	Delay
Beebe Drive with Lowe’s West Access Road/Costco West Access Drive				
• Northbound Left Turn/Through	E	42.7	F	99+
• Northbound Right Turn	A	8.9	A	9.4
• Southbound Left Turn/Through	D	27.4	F	99+
• Southbound Right Turn	B	11.3	B	11.8
• Eastbound Left Turn	A	8.9	A	9.6
• Westbound Left Turn	A	7.6	A	7.8
Lowe’s Middle North-South Circulation Road with Parking Aisle and Car Wash Access Drive				
• Westbound Approach	A	0.1	B	11.1
• Northbound Left Turn	A	7.4	A	7.5
• Southbound Left Turn	A	0.1	A	7.6
LOS = Level of Service Delay is measured in seconds.				

Discussion and Recommendations

The following summarizes how the intersections are projected to operate and identifies any roadway and traffic control improvements necessary to accommodate the facility-generated traffic.

Beebe Drive with Lowe's West Access Road and Costco West Access Drive

The results of the capacity analysis indicate that all critical movements at this intersection currently operate at Level of Service (LOS) D or better during the weekday evening and Saturday midday peak hours except the southbound and northbound left-turn/through movements, which currently operate at LOS F during the Saturday midday peak hour. This is due to the high volume of traffic traveling to and from the Costco, particularly the eastbound-to-northbound left-turn and the southbound-to-westbound right-turn movements. During the Saturday peak hour, the outbound (northbound) left-turn movement/through movement from the Lowe's experiences some additional delay and queueing, with the maximum queue extending from Beebe Drive to just past the location of the car wash north access drive.

Under Year 2029 total projected conditions, all of the critical movements at this intersection are projected to continue to operate at LOS D or better during the weekday evening and Saturday midday peak hours except the southbound and northbound left-turn/through movements, which are projected to continue to operate at LOS F during the Saturday midday peak hour. In addition, the northbound left-turn/through movement is projected to operate on the threshold between LOS D/E during the weekday evening peak hour. Further, the maximum queue of the outbound (northbound) left-turn/through movement from the Lowe's will continue to extend past the location of the car wash north access drive. It is important to note the following concerning the operation of this intersection:

- As indicated previously, the Lowe's has direct access to IL 59 via the access road that extends along the south side of the Lowe's site. Further, the majority of the outbound (northbound) left-turn/through movements from the Lowe's are making a left turn to Beebe Drive to access IL 59. As such, the Lowe's and the car wash traffic has an alternative way to access IL 59.
- The impact of the queueing from the outbound (northbound) left-turn/through movement will have a limited impact on the operation of the north access drive to the car wash as this access drive will be restricted to inbound movements only.

Crash Data

Crash data was obtained from the City of Naperville for the intersection of Beebe Drive with the Lowe’s access drive and the Costco access drive for the previous approximately 5.5 years (2018 through 2023). **Table 4** summarizes the results of the crash data. A total of 17 crashes occurred at the intersection in approximately 5.5 years, which averages to approximately three crashes per year. Of the 17 crashes, only four of the crashes involved potential injuries. In addition, only five of the crashes involved a vehicle entering the intersection from the Lowe’s access drive with a vehicle traveling west on Beebe Drive, which could be attributed to reduced sight distance for the vehicles looking east from the Lowe’s access drive.

Table 4

CRASH DATA

BEEBE DRIVE WITH LOWE’S ACCESS DRIVE AND COSTCO ACCESS DRIVE

Year	Number of Crashes	Number of Potential Injury Crashes	Crashes Involving Vehicles Existing the Lowe’s Access Drive with Westbound Beebe Road Traffic
2018	1	0	0
2019	4	1	2
2020	2	1	0
2021	0	0	0
2022	8	1	3
2023	2	1	0
Total	17	4	5

Sight Distance Study

It should be noted that Beebe Drive has a landscaped island east of the Lowe’s access drive/Costco access drive with the first tree located approximately 210 feet east of the intersection. Per the request of the City of Naperville, a preliminary horizontal sight distance study was performed to determine if a vehicle stopped at the Lowe’s access drive has sufficient sight distance to make a left turn onto Beebe Drive or to cross Beebe Drive to enter the Costco. While intersection sight distance is desirable, *A Policy on Geometric Design of Highways and Streets* (Green Book) published by the American Association of State Highway and Transportation Officials (AASHTO) indicates that, at a minimum, the location of a side road or access road must meet the minimum stopping sight distance requirements.

As discussed previously, Beebe Drive has a posted speed limit of 25 mph. **Table 5** shows the minimum stopping sight distance and intersection sight distance required along Beebe Drive for a posted 25 mph speed limit (design speed of 30 mph) based on the Illinois Department of Transportation (IDOT) *Bureau of Design and Environment (BDE)* Manual and the Green Book. The preliminary sight distance study is located in the Appendix.

Table 5
MINIMUM SIGHT DISTANCE

	25 mph Posted Speed Limit (30 mph Design Speed)
Stopping Sight Distance	200 feet
Intersection Sight Distance	375 feet

The following summarizes the results of the sight distance study:

- *Stopping Sight Distance.* The location of the access drive meets the minimum stopping sight distance requirements without any sight obstructions from the trees within the Beebe Drive median.
- *Intersection Sight Distance.* The location of the access drive meets the minimum intersection sight distance. However, the sight line extends through the trees in the Beebe Drive median. While sight lines are partially obstructed by the trees, as **Figure 7** shows, vehicles stopped at the Lowe’s access drive can see between the trees within the Beebe Drive median.

As such, the location of the access drive meets the minimum stopping sight distance and minimum intersection sight distance. However, to meet the intersection sight distance, motorists must look through the trees within the Beebe Drive median. Any enhancement to the sight lines for the traffic exiting the Lowe’s access drive will require the trimming and/or removal of the trees in the Beebe Drive median. In addition, consideration should be given to trimming the landscaping in the southeast corner of the intersection.

Operation of Car Wash Access Drive

All the critical movements to and from the two car wash access drives are projected to operate at LOS A during both peak hours. The excellent level of service is due to the lower volume of traffic currently traversing the Lowe’s main north-south circulation road and projected to be traversing the access drives and the fact that both access drives will be restricted to one-way operations.



Views Looking East

Figure 7

6. Parking Evaluation

As indicated previously, the proposed car wash will eliminate a total of 112 parking spaces serving the Lowe's. As part of this study, a parking evaluation was performed to determine if sufficient parking will be available to meet the peak parking demand of the Lowe's and the car wash.

Lowe's Existing Parking Inventory and Demand

In order to determine the existing parking inventory and demand of the Lowe's, parking surveys were performed at the existing store. The parking surveys were performed every hour from 9:00 A.M. to 9:00 P.M. on Friday and Saturday, May 5 and 6, 2023. **Table 6** shows and the following summarizes the results of the existing parking surveys:

- According to the Lowe's site plan, the store has a total of approximately 619 parking spaces. However, only approximately 400 parking spaces were available when the parking surveys were performed due to outdoor sales and storage of containers located within the parking lot.
- On Friday, May 5, the Lowe's had a peak parking demand of 138 vehicles that occurred at 1:00 PM. Only 35 percent of the 400 available parking spaces were occupied and only 22 percent of the 619 total parking spaces were occupied.
- On Saturday, May 6, the Lowe's had a peak parking demand of 174 vehicles that occurred at 4:00 PM. Only 44 percent of the 400 available parking spaces were occupied and only 28 percent of the 619 total parking spaces were occupied.

As such, it can be seen that the existing parking supply at the Lowe's is more than sufficient to meet its current peak parking demand.

Projected Parking Inventory and Demand

The addition of the proposed car wash will require the elimination of a total of 112 existing parking spaces located in the northwest corner of the Lowe's site. As such, the Lowe's store will have a total of 507 parking spaces. Further, the number of parking spaces available on the days the parking surveys were performed would be reduced from 400 to 288 parking spaces.

The only parking the car wash is projected to generate is for its employees and patrons who use the vacuum stations. As indicated previously, the car wash is to provide 15 vacuum stations, three employee parking spaces, and one ADA parking space, which should be sufficient to meet the peak parking demand of the car wash. As such, other than eliminating the 112 existing parking spaces, the car wash is not anticipated to add any additional parking demand to the existing Lowe's parking conditions.

Table 6
 LOWE'S CURRENT PARKING SURVEYS

	Parking Occupancy and Inventory	
	Friday, May 5, 2023	Saturday, May 6, 2023
9:00 AM	100	89
10:00 AM	114	98
11:00 AM	123	114
12:00 PM	122	124
1:00 PM	138	139
2:00 PM	136	142
3:00 PM	110	155
4:00 PM	92	174
5:00 PM	90	153
6:00 PM	96	121
7:00 PM	89	96
8:00 PM	64	57
9:00 PM	55	48
Available Parking Spaces	400	400

Evaluation

With a peak parking demand of 174 parked vehicles and the elimination of the 112 existing parking spaces, only 35 percent of the total parking spaces (507) and 60 percent of the parking spaces (288) that were available when the surveys were performed will be occupied. At a minimum, 114 parking spaces will be available. As such, the reduced parking supply that will result from the addition of the car wash will be more than sufficient to meet the peak parking demand of the Lowe's and the car wash.

7. Conclusion

Based on the preceding evaluation, the following conclusions and recommendations have been made:

- The total volume of new traffic to be generated by the car wash will be reduced due to the fact that it will generate a significant number of pass-by trips.
- Access to the Lowe's is provided via one access drive on IL 59 and two access drives on Beebe Drive as summarized below:
 - The IL 59 access road is located on the east side of IL 59 approximately 1,100 feet south of Beebe Drive and also serves the Staples and Ashley Homestore. This access road has one lane in each direction divided by a landscaped median. At its intersection with IL 59, the access road has a separate left-turn lane and a separate right-turn lane that are under stop sign control.
 - The Lowe's west access road is located on the south side of Beebe Drive approximately 450 feet east of IL 59 and is aligned opposite the Costco west access drive. The Lowe's west access road has a two-lane cross section that extends to the IL 59 access road and serves as the Lowe's primary north-south circulation road. At its intersection with Beebe Drive, both the Lowe's west access road and the Costco access drive have one inbound lane and two outbound lanes with the outbound lanes striped for a separate left-turn lane and a shared through/right-turn lane. The outbound lanes are under stop sign control.
 - The Lowe's east access road is located on the south side of Beebe Drive approximately 610 feet east of IL 59 and is restricted to right-turn in/right-turn out movements only via the landscaped median along Beebe Drive. This access road has a two-lane cross-section that extends to the IL 59 access road and serves as the Lowe's secondary north-south circulation road. At its intersection with Beebe Drive, the Lowe's east access road provides one inbound lane and one outbound lane that are restricted to right-turn movements only. The outbound lane is under stop sign control.
- Direct access to the car wash will be provided via two internal access drives located on the west side of the Lowe's primary north-south circulation road and will be replacing two existing parking aisles serving the parking lot.
 - The north access drive will provide inbound only access to the approach lanes to the pay stations and the entrance to the car wash tunnel entrance which are located on the north and west side of the car wash. This access drive will provide one wide inbound lane.

- The south access drive will provide outbound only access from the car wash and the vacuum stations/employee parking located on the south side of the car wash. This access drive will provide two outbound lanes.

In addition, the western north-south circulation road will extend into the southwest corner of the site and will provide cross-access between the Lowe's parking lot and the vacuum stations and the employee parking.

- The proposed access system will be adequate in accommodating the traffic projected to be generated by the proposed car wash.
- The results of the capacity analyses have shown that the existing roadway system generally has sufficient reserve capacity to accommodate the traffic to be generated by the car wash and no roadway improvements or traffic control modifications are required.
- The following wayfinding and traffic control signage is recommended:
 - Wayfinding signage should be posted to guide vehicles to the car wash stacking area.
 - Wayfinding signage should be posted at the exit of the car wash tunnel to direct vehicles exiting the car wash to the south access drive to exit the site or to the vacuum stations.
 - "Do Not Enter" signs should be posted at the south access drive and the one-way circulation access road from the car wash tunnel indicating the one-way operation of the access drive and circulation road.
- On peak days (after a snowfall or a rain event), the following operational procedures should be implemented:
 - Increase the service rate of the tunnel to the maximum it can process.
 - Provide staff at critical locations within the circulation system at the car wash to help direct and manage the flow of traffic through the site. Critical internal locations where staff should be located include at the pay stations and at the exit of the car wash.

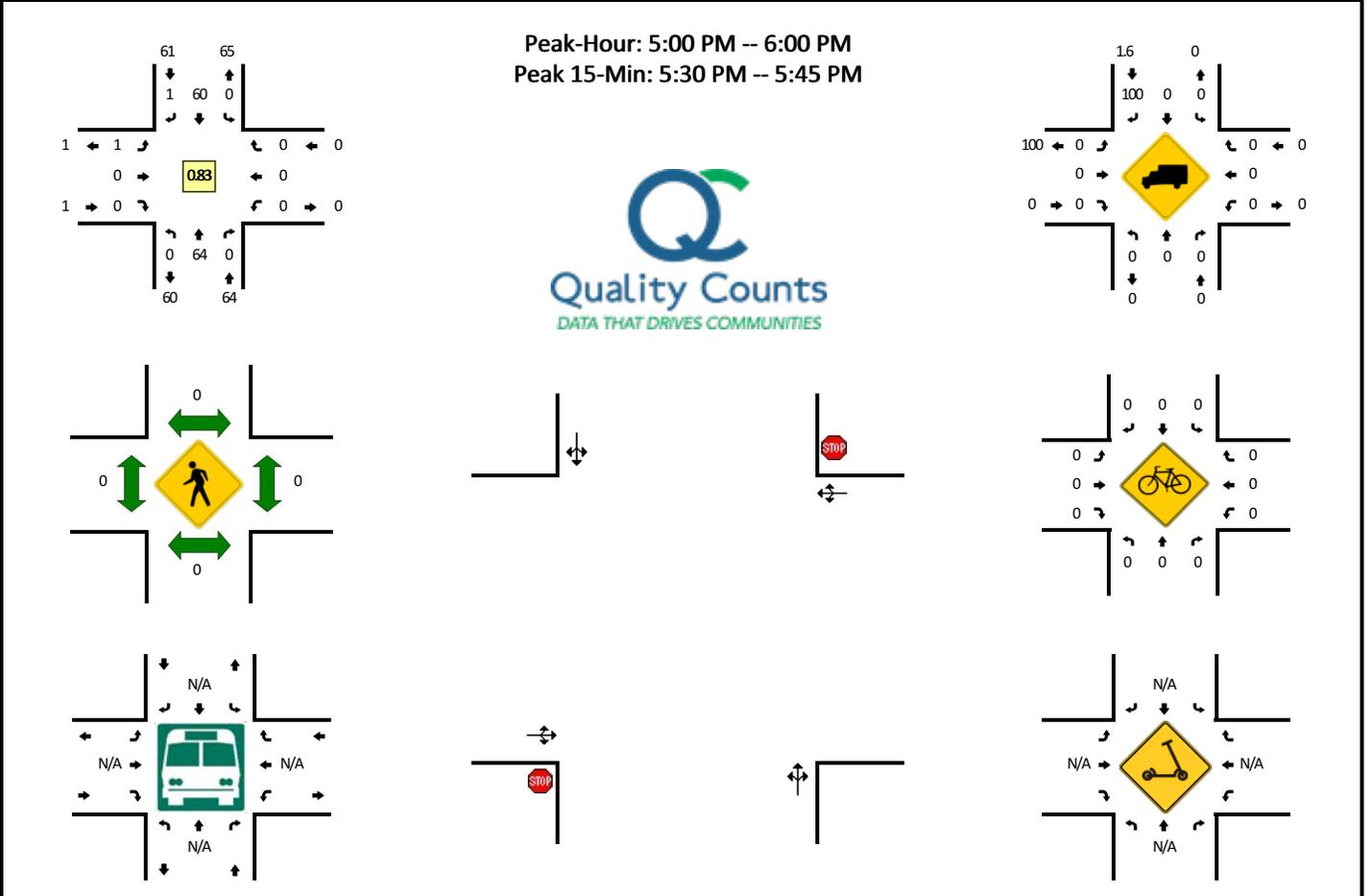
Appendix

Traffic Count Summary Sheets
Preliminary Site Plan
ITE Trip Generation Sheets
Level of Service Criteria
Capacity Analysis Summary Sheets
Preliminary Sight Distance Study

Traffic Count Summary Sheets

LOCATION: Access Rd to Beebe Dr -- Lowe's Parking Dwy
CITY/STATE: Naperville, IL

QC JOB #: 16179403
DATE: Thu, Apr 27 2023

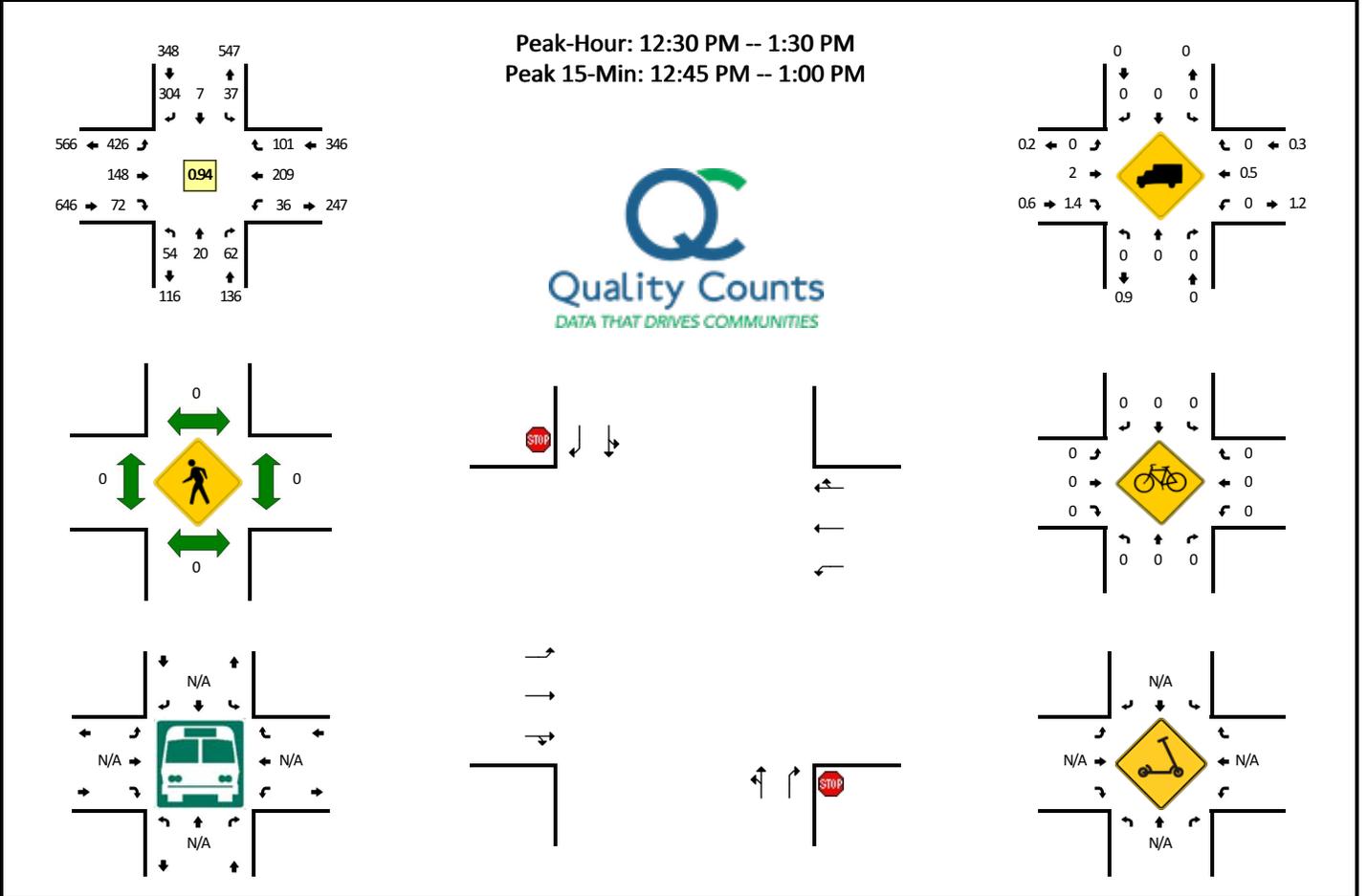


15-Min Count Period Beginning At	Access Rd to Beebe Dr (Northbound)				Access Rd to Beebe Dr (Southbound)				Lowe's Parking Dwy (Eastbound)				Lowe's Parking Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	28	0	0	0	15	0	0	0	0	0	0	0	0	0	0	43	
4:15 PM	0	21	0	0	0	13	0	0	0	0	0	0	0	0	0	0	34	
4:30 PM	0	15	0	0	0	8	0	0	0	0	0	0	0	1	0	0	24	
4:45 PM	0	7	0	0	0	14	0	0	1	0	0	0	0	0	0	0	22	123
5:00 PM	0	17	0	0	0	12	0	0	0	0	0	0	0	0	0	0	29	109
5:15 PM	0	14	0	0	0	19	0	0	1	0	0	0	0	0	0	0	34	109
5:30 PM	0	20	0	0	0	17	1	0	0	0	0	0	0	0	0	0	38	123
5:45 PM	0	13	0	0	0	12	0	0	0	0	0	0	0	0	0	0	25	126
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	80	0	0	0	68	4	0	0	0	0	0	0	0	0	0	152	
Heavy Trucks	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments:

LOCATION: Costco Dwy/Lowe's Dwy -- Beebe Dr
CITY/STATE: Naperville, IL

QC JOB #: 16179402
DATE: Sat, Apr 29 2023



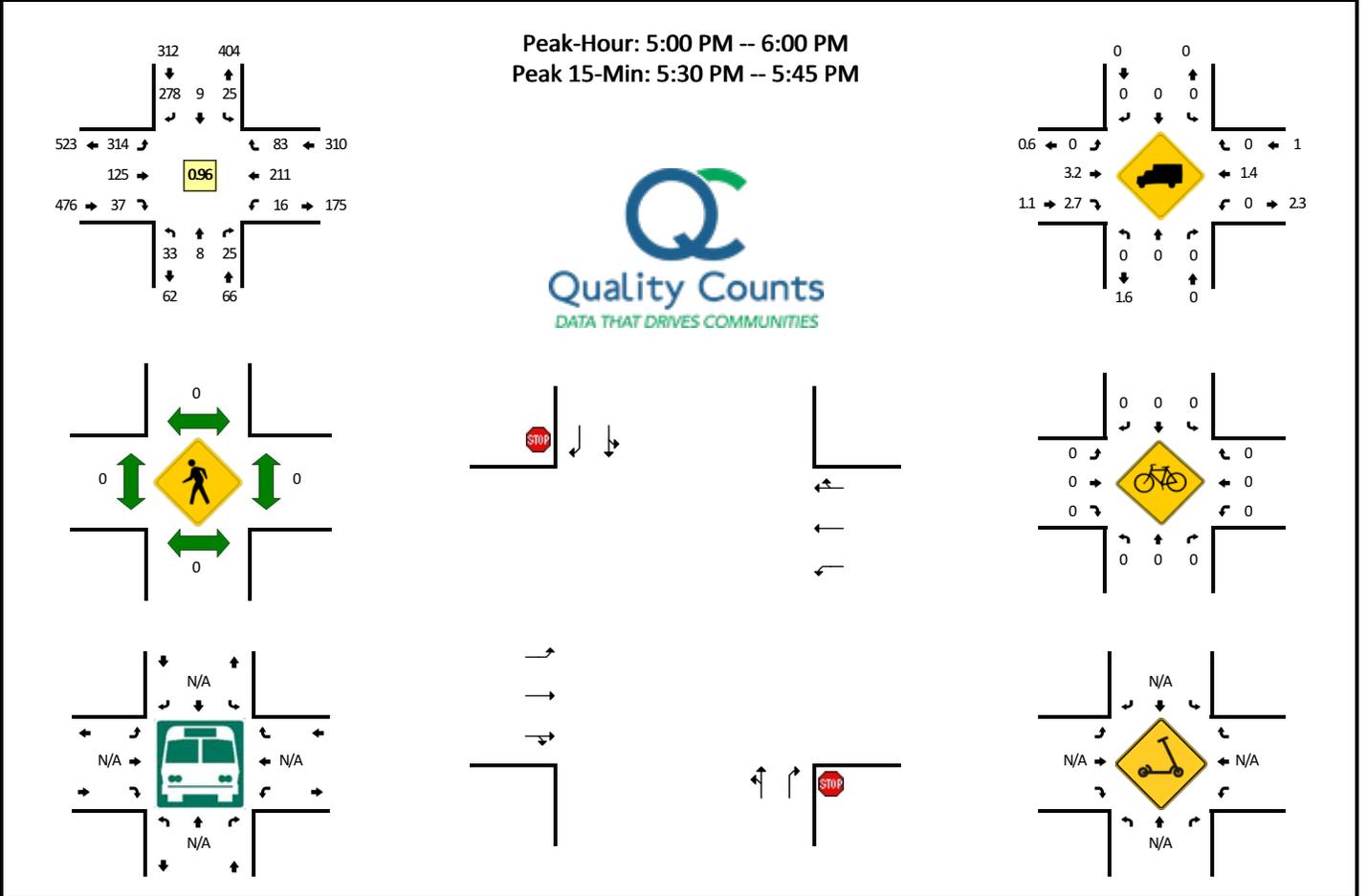
15-Min Count Period Beginning At	Costco Dwy/Lowe's Dwy (Northbound)				Costco Dwy/Lowe's Dwy (Southbound)				Beebe Dr (Eastbound)				Beebe Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	16	5	14	0	5	3	69	0	80	32	20	0	15	57	20	0	336	
12:15 PM	9	3	14	0	4	1	53	0	107	38	14	0	5	54	20	0	322	
12:30 PM	15	3	13	0	9	2	80	0	113	33	25	0	9	41	27	0	370	
12:45 PM	10	7	13	0	12	1	86	0	114	37	22	0	10	57	23	0	392	1420
1:00 PM	9	4	15	0	9	4	70	0	97	38	8	0	11	52	28	0	345	1429
1:15 PM	19	6	21	1	7	0	68	0	102	40	17	0	6	59	23	0	369	1476
1:30 PM	17	6	4	0	8	1	96	0	97	48	9	0	10	44	27	0	367	1473
1:45 PM	11	4	10	0	10	1	80	0	105	35	23	0	8	51	26	0	364	1445

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	40	28	52	0	48	4	344	0	456	148	88	0	40	228	92	0	1568	
Heavy Trucks	0	0	0		0	0	0		0	4	4		0	4	0		12	
Buses																		
Pedestrians		0				0				0				0				0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments:

LOCATION: Costco Dwy/Lowe's Dwy -- Beebe Dr
CITY/STATE: Naperville, IL

QC JOB #: 16179401
DATE: Thu, Apr 27 2023

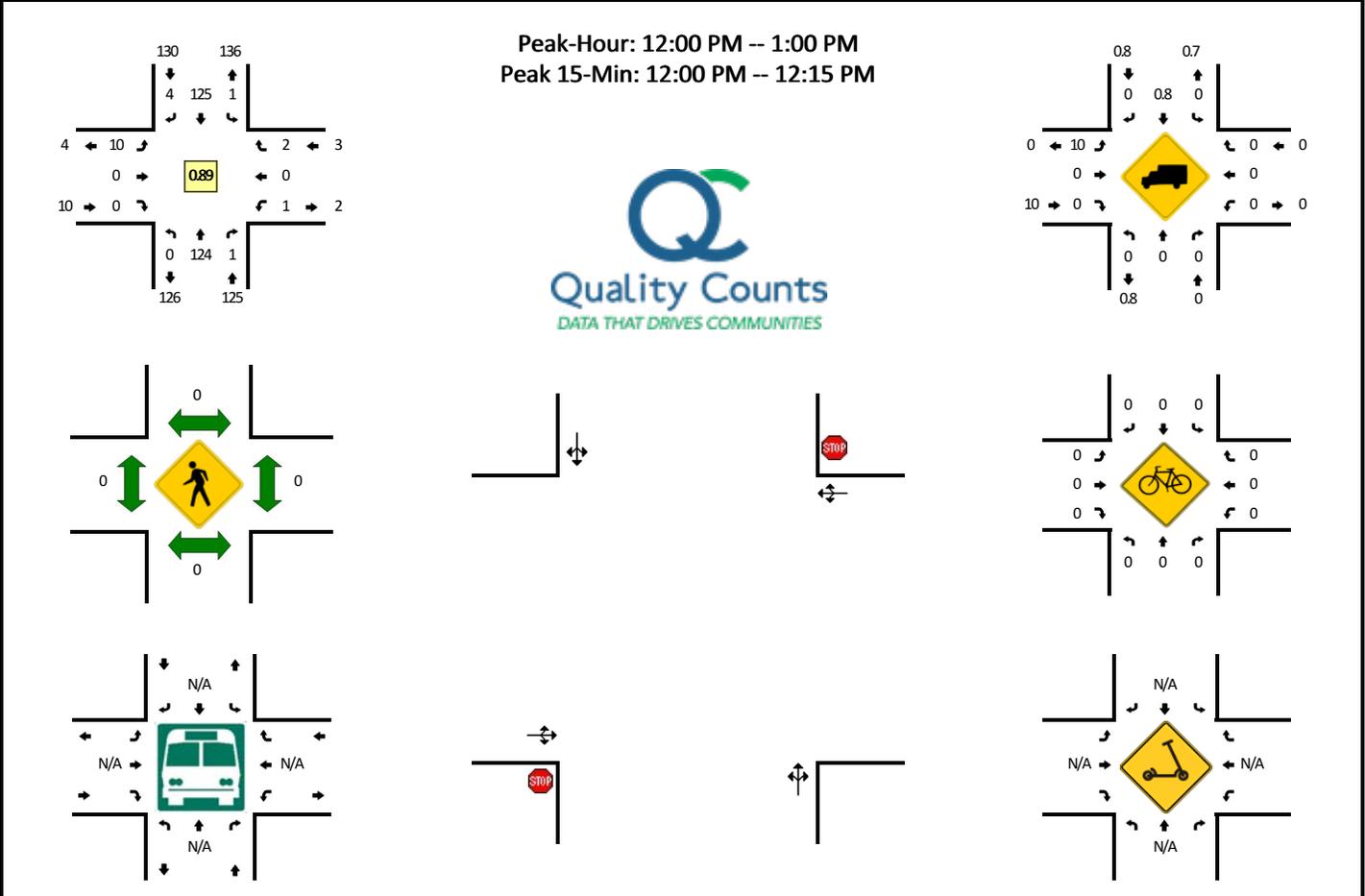


15-Min Count Period Beginning At	Costco Dwy/Lowe's Dwy (Northbound)				Costco Dwy/Lowe's Dwy (Southbound)				Beebe Dr (Eastbound)				Beebe Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	12	1	15	0	7	1	52	0	82	34	13	0	1	53	21	0	292	
4:15 PM	10	5	6	0	7	1	66	0	61	40	8	0	4	44	20	0	272	
4:30 PM	8	1	6	0	5	1	57	0	80	34	5	1	3	44	16	0	261	
4:45 PM	6	0	2	0	5	1	66	0	59	40	9	0	3	58	19	0	268	1093
5:00 PM	7	4	5	0	7	2	71	0	83	32	6	0	4	45	19	0	285	1086
5:15 PM	10	1	6	0	8	1	60	0	79	37	14	1	5	48	16	0	286	1100
5:30 PM	10	2	8	0	6	4	68	0	77	32	9	0	5	62	21	0	304	1143
5:45 PM	6	1	6	0	4	2	79	0	74	24	8	0	2	56	27	0	289	1164
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	40	8	32	0	24	16	272	0	308	128	36	0	20	248	84	0	1216	
Heavy Trucks	0	0	0		0	0	0		0	4	4		0	0	0		8	
Buses																		
Pedestrians		0				0				0				0				0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments:

LOCATION: Access Rd to Beebe Dr -- Lowe's Parking Dwy
CITY/STATE: Naperville, IL

QC JOB #: 16179404
DATE: Sat, Apr 29 2023



15-Min Count Period Beginning At	Access Rd to Beebe Dr (Northbound)				Access Rd to Beebe Dr (Southbound)				Lowe's Parking Dwy (Eastbound)				Lowe's Parking Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	0	32	0	0	0	38	1	0	4	0	0	0	0	0	0	0	75	
12:15 PM	0	31	1	0	0	20	2	0	1	0	0	0	0	0	2	0	57	
12:30 PM	0	31	0	0	1	35	0	0	2	0	0	0	0	0	0	0	69	
12:45 PM	0	30	0	0	0	32	1	0	3	0	0	0	1	0	0	0	67	268
1:00 PM	0	28	0	0	0	22	0	0	2	0	0	0	0	0	0	0	52	245
1:15 PM	0	45	2	0	0	25	0	0	0	0	0	0	0	0	0	0	72	260
1:30 PM	0	32	0	0	1	17	0	0	0	0	0	0	0	0	0	0	50	241
1:45 PM	0	28	0	0	0	31	0	0	2	0	0	0	0	0	0	0	61	235
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	128	0	0	0	152	4	0	16	0	0	0	0	0	0	0	300	
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Buses																		
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Scoters																		

Comments:

Preliminary Site Plan

ITE Trip Generation Sheets

Level of Service Criteria

LEVEL OF SERVICE CRITERIA

Signalized Intersections		
Level of Service	Interpretation	Average Control Delay (seconds per vehicle)
A	Favorable progression. Most vehicles arrive during the green indication and travel through the intersection without stopping.	≤ 10
B	Good progression, with more vehicles stopping than for Level of Service A.	$> 10 - 20$
C	Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear. Number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.	$> 20 - 35$
D	The volume-to-capacity ratio is high and either progression is ineffective or the cycle length is too long. Many vehicles stop and individual cycle failures are noticeable.	$> 35 - 55$
E	Progression is unfavorable. The volume-to-capacity ratio is high and the cycle length is long. Individual cycle failures are frequent.	$> 55 - 80$
F	The volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.	> 80
Unsignalized Intersections		
Level of Service	Average Total Delay (sec/veh)	
A	0 - 10	
B	$> 10 - 15$	
C	$> 15 - 25$	
D	$> 25 - 35$	
E	$> 35 - 50$	
F	> 50	
Source: <i>Highway Capacity Manual</i> , 6 th Edition.		

Capacity Analysis Summary Sheets
Weekday Evening Peak Hour – Existing Conditions

Intersection												
Int Delay, s/veh	7.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗			↖	↖		↖	↖
Traffic Vol, veh/h	314	125	37	16	211	83	33	8	25	25	9	278
Future Vol, veh/h	314	125	37	16	211	83	33	8	25	25	9	278
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	135	-	-	65	-	-	-	-	55	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	3	3	0	2	0	0	0	0	0	0	0
Mvmt Flow	327	130	39	17	220	86	34	8	26	26	9	290

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	306	0	0	169	0	0	953	1144	85	1020	1120	153
Stage 1	-	-	-	-	-	-	804	804	-	297	297	-
Stage 2	-	-	-	-	-	-	149	340	-	723	823	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1266	-	-	1421	-	-	217	202	963	194	208	872
Stage 1	-	-	-	-	-	-	347	398	-	693	671	-
Stage 2	-	-	-	-	-	-	844	643	-	388	391	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1266	-	-	1421	-	-	112	148	963	145	152	872
Mov Cap-2 Maneuver	-	-	-	-	-	-	159	205	-	210	228	-
Stage 1	-	-	-	-	-	-	257	295	-	514	663	-
Stage 2	-	-	-	-	-	-	549	635	-	272	290	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	5.8			0.4			24.5			12.7		
HCM LOS							C			B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	166	963	1266	-	-	1421	-	-	214	872
HCM Lane V/C Ratio	0.257	0.027	0.258	-	-	0.012	-	-	0.165	0.332
HCM Control Delay (s)	34	8.8	8.8	-	-	7.6	-	-	25.1	11.2
HCM Lane LOS	D	A	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	1	0.1	1	-	-	0	-	-	0.6	1.5

HCM 6th TWSC
 8: Lowe`s Access Drive & Parking Access Drive

06/07/2023

Intersection												
Int Delay, s/veh	0.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	0	0	0	0	0	65	0	0	61	1
Future Vol, veh/h	1	0	0	0	0	0	0	65	0	0	61	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	1	0	0	0	0	0	0	78	0	0	73	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	152	152	74	152	152	78	74	0	0	78	0	0
Stage 1	74	74	-	78	78	-	-	-	-	-	-	-
Stage 2	78	78	-	74	74	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	820	743	993	820	743	988	1538	-	-	1533	-	-
Stage 1	940	837	-	936	834	-	-	-	-	-	-	-
Stage 2	936	834	-	940	837	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	820	743	993	820	743	988	1538	-	-	1533	-	-
Mov Cap-2 Maneuver	820	743	-	820	743	-	-	-	-	-	-	-
Stage 1	940	837	-	936	834	-	-	-	-	-	-	-
Stage 2	936	834	-	940	837	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.4	0	0	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1538	-	-	820	-	1533	-	-
HCM Lane V/C Ratio	-	-	-	0.001	-	-	-	-
HCM Control Delay (s)	0	-	-	9.4	0	0	-	-
HCM Lane LOS	A	-	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	-	0	-	-

Capacity Analysis Summary Sheets
Saturday Midday Peak Hour – Existing Conditions

Intersection												
Int Delay, s/veh	32.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕			↗	↗		↗	↗
Traffic Vol, veh/h	426	148	73	36	209	101	57	20	64	37	7	304
Future Vol, veh/h	426	148	73	36	209	101	57	20	64	37	7	304
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	135	-	-	65	-	-	-	-	55	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	0	2	2	0	1	0	0	0	0	0	0	0
Mvmt Flow	453	157	78	38	222	107	61	21	68	39	7	323

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	329	0	0	235	0	0	1293	1507	118	1347	1493	165
Stage 1	-	-	-	-	-	-	1102	1102	-	352	352	-
Stage 2	-	-	-	-	-	-	191	405	-	995	1141	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1242	-	-	1344	-	-	122	122	918	111	124	857
Stage 1	-	-	-	-	-	-	229	290	-	643	635	-
Stage 2	-	-	-	-	-	-	798	602	-	266	278	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1242	-	-	1344	-	-	~ 50	75	918	57	77	857
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 50	75	-	57	77	-
Stage 1	-	-	-	-	-	-	145	184	-	408	617	-
Stage 2	-	-	-	-	-	-	477	585	-	138	177	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	6.3			0.8			232			32.3		
HCM LOS							F			D		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	55	918	1242	-	-	1344	-	-	59	857
HCM Lane V/C Ratio	1.489	0.074	0.365	-	-	0.028	-	-	0.793	0.377
HCM Control Delay (s)	\$ 417.2	9.2	9.6	-	-	7.8	-	-	174.3	11.7
HCM Lane LOS	F	A	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	7.5	0.2	1.7	-	-	0.1	-	-	3.5	1.8

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	0	0	1	0	0	0	134	2	1	114	1
Future Vol, veh/h	7	0	0	1	0	0	0	134	2	1	114	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	0	0	1	0	0	0	149	2	1	127	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	280	281	128	280	280	150	128	0	0	151	0	0
Stage 1	130	130	-	150	150	-	-	-	-	-	-	-
Stage 2	150	151	-	130	130	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	676	631	927	676	632	902	1470	-	-	1442	-	-
Stage 1	878	792	-	857	777	-	-	-	-	-	-	-
Stage 2	857	776	-	878	792	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	675	630	927	675	631	902	1470	-	-	1442	-	-
Mov Cap-2 Maneuver	675	630	-	675	631	-	-	-	-	-	-	-
Stage 1	878	791	-	857	777	-	-	-	-	-	-	-
Stage 2	857	776	-	877	791	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.4		10.3		0		0.1	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1470	-	-	675	675	1442	-	-
HCM Lane V/C Ratio	-	-	-	0.012	0.002	0.001	-	-
HCM Control Delay (s)	0	-	-	10.4	10.3	7.5	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Capacity Analysis Summary Sheets
Weekday Evening Peak Hour – Projected Conditions

Intersection												
Int Delay, s/veh	7.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕			↗	↗		↗	↗
Traffic Vol, veh/h	314	131	49	28	222	83	45	10	37	25	11	278
Future Vol, veh/h	314	131	49	28	222	83	45	10	37	25	11	278
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	135	-	-	65	-	-	-	-	55	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	3	3	0	2	0	0	0	0	0	0	0
Mvmt Flow	327	136	51	29	231	86	47	10	39	26	11	290

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	317	0	0	187	0	0	995	1191	94	1059	1173	159
Stage 1	-	-	-	-	-	-	816	816	-	332	332	-
Stage 2	-	-	-	-	-	-	179	375	-	727	841	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1255	-	-	1399	-	-	202	189	951	181	194	864
Stage 1	-	-	-	-	-	-	341	393	-	661	648	-
Stage 2	-	-	-	-	-	-	811	621	-	386	383	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1255	-	-	1399	-	-	102	137	951	131	140	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	144	193	-	193	212	-
Stage 1	-	-	-	-	-	-	252	290	-	488	634	-
Stage 2	-	-	-	-	-	-	518	608	-	264	283	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	5.6			0.6			29.1			13.1		
HCM LOS							D			B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	151	951	1255	-	-	1399	-	-	198	864
HCM Lane V/C Ratio	0.379	0.041	0.261	-	-	0.021	-	-	0.189	0.335
HCM Control Delay (s)	42.7	8.9	8.9	-	-	7.6	-	-	27.4	11.3
HCM Lane LOS	E	A	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	1.6	0.1	1	-	-	0.1	-	-	0.7	1.5

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	0	0	0	13	92	0	0	62	26
Future Vol, veh/h	0	0	0	0	0	0	13	92	0	0	62	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	0	0	0	16	111	0	0	75	31

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	234	234	91	234	249	111	106	0	0	111	0	0
Stage 1	91	91	-	143	143	-	-	-	-	-	-	-
Stage 2	143	143	-	91	106	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	725	670	972	725	657	948	1498	-	-	1492	-	-
Stage 1	921	823	-	865	782	-	-	-	-	-	-	-
Stage 2	865	782	-	921	811	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	719	663	972	719	650	948	1498	-	-	1492	-	-
Mov Cap-2 Maneuver	719	663	-	719	650	-	-	-	-	-	-	-
Stage 1	911	823	-	855	773	-	-	-	-	-	-	-
Stage 2	855	773	-	921	811	-	-	-	-	-	-	-

Approach	EB		WB			NB		SB		
HCM Control Delay, s	0		0			0.9		0		
HCM LOS	A		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1498	-	-	-	-	1492	-	-
HCM Lane V/C Ratio	0.01	-	-	-	-	-	-	-
HCM Control Delay (s)	7.4	0	-	0	0	0	-	-
HCM Lane LOS	A	A	-	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-	0	-	-

Capacity Analysis Summary Sheets
Saturday Midday Peak Hour – Projected Conditions

Intersection												
Int Delay, s/veh	50.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↕		↖	↕			↕	↗		↕	↗
Traffic Vol, veh/h	426	155	85	48	219	101	69	22	76	37	9	304
Future Vol, veh/h	426	155	85	48	219	101	69	22	76	37	9	304
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	135	-	-	65	-	-	-	-	55	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	0	2	2	0	1	0	0	0	0	0	0	0
Mvmt Flow	453	165	90	51	233	107	73	23	81	39	10	323

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	340	0	0	255	0	0	1340	1558	128	1389	1550	170
Stage 1	-	-	-	-	-	-	1116	1116	-	389	389	-
Stage 2	-	-	-	-	-	-	224	442	-	1000	1161	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1230	-	-	1322	-	-	113	114	905	104	115	851
Stage 1	-	-	-	-	-	-	225	285	-	612	612	-
Stage 2	-	-	-	-	-	-	764	580	-	264	272	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1230	-	-	1322	-	-	~ 44	69	905	50	70	851
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 44	69	-	50	70	-
Stage 1	-	-	-	-	-	-	142	180	-	387	588	-
Stage 2	-	-	-	-	-	-	448	557	-	132	172	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	6.2	1	\$ 361.6	39.8
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	48	905	1230	-	-	1322	-	-	53	851
HCM Lane V/C Ratio	2.017	0.089	0.368	-	-	0.039	-	-	0.923	0.38
HCM Control Delay (s)	\$ 655.8	9.4	9.6	-	-	7.8	-	-	224.6	11.8
HCM Lane LOS	F	A	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	9.8	0.3	1.7	-	-	0.1	-	-	4	1.8

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	0.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	1	0	0	13	167	2	1	115	26
Future Vol, veh/h	0	0	0	1	0	0	13	167	2	1	115	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	1	0	0	14	186	2	1	128	29

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	360	361	143	360	374	187	157	0	0	188	0	0
Stage 1	145	145	-	215	215	-	-	-	-	-	-	-
Stage 2	215	216	-	145	159	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	599	569	910	599	560	860	1435	-	-	1398	-	-
Stage 1	863	781	-	792	729	-	-	-	-	-	-	-
Stage 2	792	728	-	863	770	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	594	562	910	594	553	860	1435	-	-	1398	-	-
Mov Cap-2 Maneuver	594	562	-	594	553	-	-	-	-	-	-	-
Stage 1	854	780	-	783	721	-	-	-	-	-	-	-
Stage 2	783	720	-	862	769	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	0		11.1			0.5			0.1		
HCM LOS	A		B								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1435	-	-	-	594	1398	-	-
HCM Lane V/C Ratio	0.01	-	-	-	0.002	0.001	-	-
HCM Control Delay (s)	7.5	0	-	0	11.1	7.6	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0	-	-

Preliminary Sight Distance Study

IDOT BDE MANUAL - CHAPTER 31

$$SSD = 1.47 Vt + 1.075 \frac{V^2}{a}$$

where: SSD = Stopping Sight Distance, ft (m)
V = design speed, mph (km/h)
t = brake time, 2.5 seconds
a = driver deceleration, ft/s² (m/s²)

$$200 = 1.47 (30)(2.5) + 1.075 \left(\frac{900}{11.2} \right)$$

POSTED SPEED LIMIT = 25 MPH
DESIGN SPEED = 30 MPH



200' STOPPING SIGHT DISTANCE

BEEBE DRIVE

14.4'

375' INTERSECTION SIGHT DISTANCE (PASSENGER VEHICLE)

LOWE'S ACCESS DRIVE

IDOT BDE MANUAL - CHAPTER 36

b = ISD = 1.467 V_{major} t_c
where: b = length of sight triangle along the major road or ISD, ft (m)
ISD = Intersection Sight Distance, ft (m)
V_{major} = design speed of major road, mph (km/h)
t_c = critical gap for entering or crossing the major road, sec

$$\text{Passenger Vehicle ISD} = (1.467)(30)(7.5+1) = 375 \text{ ft}$$

LOWES STORE
CAR WASH
NAPERVILLE, ILLINOIS

SIGHT DISTANCE STUDY
LOOKING EAST ALONG BEEBE DRIVE FROM THE LOWE'S ACCESS DRIVE

DRAWN: MD
DATE: 08-07-23
PROJECT # 23-128
EXHIBIT: A

CHECKED: MW
REV:

