

## DRAFT TECHNICAL MEMORANDUM

Date: July 26, 2022  
To: Jack Varozza, PE, City of Roseville  
From: John Gard, PE, RSP<sup>1</sup>, Fehr & Peers  
Subject: ***Focused Access Evaluation for Blue Oaks Commerce Center***

RS22-4207

This memorandum presents the data collection, analysis, and recommendations of our focused access review of Blue Oaks Commerce Center (BOCC), which is situated south of Blue Oaks Boulevard and east of Industrial Avenue in the City of Roseville (refer to **Figure 1** for project location). Our review specifically focuses on two driveways planned on Industrial Avenue that would serve the project's industrial uses. The remainder of this memorandum is organized into the following sections:

- I. Existing Conditions
- II. Project Travel Characteristics
- III. Project Access Review
- IV. Recommendations

### **I. Existing Conditions**

#### ***Roadway Network***

The following roadways would provide direct vehicular access to the BOCC:

Industrial Avenue – is a two-lane north-south collector street that begins at Washington Boulevard and extends northerly through Roseville into unincorporated Placer County. Along the project frontage, it has a posted speed limit of 45 miles per hour (mph). The travel lanes are divided by either left-turn pockets or a paved median. Industrial Avenue parallels SR 65 between Roseville and Lincoln and is a time-competitive alternate route when SR 65 becomes congested.

Freedom Way – is a two-lane east-west street that begins at Industrial Avenue and terminates at Washington Boulevard. Along the project frontage, it has a posted speed limit of 40 mph and two undivided 16-foot wide travel lanes.

Fidelity Way – is a two-lane north-south street that begins at Blue Oaks Boulevard and terminates at Freedom Way. Along the project frontage, it has a posted speed limit of 30 mph and two undivided 16-foot wide travel lanes. Movements at the Blue Oaks Boulevard/Fidelity Way intersection are controlled by a traffic signal, though northbound left-turns are prohibited.

### Industrial Avenue/Freedom Way Intersection

This T-intersection is controlled by a traffic signal. The southbound left-turn movement operates with a flashing yellow arrow, which requires motorists to yield to oncoming traffic (see **Image 1**). If southbound motorists are required to wait in the left-turn lane for an extended period of time (while waiting to find a gap in northbound traffic), the flashing yellow arrow changes into a solid green arrow, converting the southbound left-turn from a permitted to protected movement.



**Image 1: Flashing yellow arrow for southbound left-turn lane on Industrial Avenue**

## ***Truck Routes***

Within the City of Roseville, there are two types of truck routes: Surface Transportation Assistance Act (STAA) routes and local routes. STAA routes allow large trucks to operate on the interstate freeway system and certain primary routes. These trucks, referred to as STAA trucks, are longer than California legal trucks. On surface streets, STAA routes are designated either as Terminal or Service Access routes. Terminal routes are approved by the agency with jurisdiction over the roadway to enable the truck to reach its ultimate destination. Service Access routes allow STAA trucks to exit the interstate onto a local road, for one mile only, for food, fuel, lodging, or repair.

According to the City of Roseville website<sup>1</sup>, STAA Terminal routes exist on Industrial Avenue along its entire length within the City. An STAA Terminal route also exists on the entirety of Fidelity Way. A

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<sup>1</sup> [11X17 \(civiclive.com\)](http://11X17.civiclive.com)

California legal truck route exists on the entirety of Freedom Way. Thus, a variety of established truck routes are located in the immediate proximity of the project site. Based on June 2022 traffic counts (described in detail below), trucks constitute about 8% of AM peak hour traffic and 3% of PM peak hour traffic at this intersection.

## **Traffic Volumes**

Traffic volumes on Industrial Avenue and Freedom Way were collected from the City's ITS traffic count database for Tuesday – Thursday, May 10-12, 2022. Schools were in session at the time of the counts. The average daily traffic across the three weekdays was 11,200 vehicles on Industrial Avenue north of Freedom Way and 8,100 vehicles south of Freedom Way. Freedom Way east of Industrial Avenue carried 4,800 daily vehicles.

Traffic volumes during the AM and PM peak periods at the Industrial Avenue/Freedom Way intersection were also obtained from the City's ITS traffic count database for the same three days in May 2022. The busiest hour of travel during the morning occurred from 7:45 to 8:45 AM. The busiest hour of travel during the evening occurred from 4 to 5 PM. **Figure 2** shows the existing AM and PM peak hour traffic volumes (averaged for the three days), lane configurations, and traffic control at this intersection.

The City's ITS count database does not provide data regarding vehicle queue lengths. Accordingly, Fehr & Peers retained NDS to conduct traffic volume and maximum queue length counts on several different weekdays in June and July 2022. The first count was conducted on Wednesday, June 29, 2022 and yielded an unexpectedly high southbound left-turn volume of 458 vehicles from 4-5 PM.<sup>2</sup> Because of this anomaly, a second set of observations was conducted from 4-5 PM on Thursday, July 7, 2022. One last observation was made on Monday, July 11, 2022. **Table 1** shows the results of these data collection efforts.

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<sup>2</sup> The City's ITS count database was queried and showed a near identical southbound left-turn volume as the traffic count, indicating the observation was not erroneous. The ITS count database showed that mid-week volumes tend to be in range of 180 to 240 vehicles per hour. The anomaly on this particular day could have been caused by any number of atypical conditions such as severe SR 65 congestion resulting in diverted traffic to Industrial Avenue, construction activity, special events, or other effects.

TABLE 1 TRAFFIC VOLUMES AND MAXIMUM QUEUES AT INDUSTRIAL AVENUE/FREEDOM WAY			
15-Minute Time Period Starting at:	Southbound Left-Turn		Northbound Through/Right Volume
	Volume	Maximum Queue	
<i>Wednesday, June 29, 2022<sup>1</sup></i>			
7:00 AM	13	1	43
7:15 AM	9	1	58
7:30 AM	12	1	72
7:45 AM	14	1	88
8:00 AM	23	2	67
8:15 AM	10	1	61
8:30 AM	29	2	59
8:45 AM	30	1	58
4:00 PM	132	4	49
4:15 PM	125	4	57
4:30 PM	134	5	58
4:45 PM	67	4	62
5:00 PM	76	5	46
5:15 PM	40	2	88
5:30 PM	54	1	50
5:45 PM	21	2	39
<i>Thursday, July 7, 2022<sup>2</sup></i>			
4:00 PM	38	5	71
4:15 PM	43	4	59
4:30 PM	41	9	89
4:45 PM	57	10	74
<i>Monday, July 11, 2022<sup>3</sup></i>			
4:45 PM	42	5	63
Notes:			
<sup>1</sup> Traffic and queuing observations conducted by NDS.			
<sup>2</sup> Traffic volumes from City's ITS count database. Queuing observations conducted by NDS.			
<sup>3</sup> Traffic volumes from City's ITS count database. Queuing observations conducted by Fehr & Peers.			
Source: Fehr & Peers, 2022.			

On Wednesday, June 29, 2022, a maximum queue of five vehicles was observed during the PM peak hour. One incidence of this queue is shown in **Image 2** based on the camera placed at the intersection by NDS. During the observation period on Monday, July 11, 2022, a maximum queue of five vehicles was also observed as shown in **Image 3**.



**Image 2: Maximum queue of 5 vehicles in southbound left-turn lane during PM peak hour on Wednesday, June 29, 2022**



**Image 3: Maximum queue of 5 vehicles in southbound left-turn lane during PM peak hour on Monday, July 11, 2022 (note that the protected green arrow had been activated)**

Neither video nor photography were available for the count on Thursday, July 7, 2022. NDS staff confirmed the accuracy of this data with the technician who performed the observations.

It is apparent from field observations, review of video collected on June 29, 2022, and the observed maximum queues themselves that many factors (beyond simply the left-turn volume) affect the number of vehicles queued in the southbound left-turn lane. Following is a list of those factors:

1. Level of northbound through/right traffic – these vehicles have the right-of-way and prevent southbound left-turns from occurring.
2. Random versus platooned arrivals on southbound Industrial Avenue – in some instances, vehicles arrived in large platoons (caused by a slow traveling lead vehicle). This quickly filled up the left-turn lane.
3. Driver uncertainty – some motorists appeared unfamiliar with the flashing yellow indication, waiting in the turn lane despite no approaching northbound traffic.

In summary, with respect to vehicle queues in the southbound left-turn lane, maximum queues of 5 vehicles during the PM peak hour are typical, though longer queues can develop under certain conditions (as was evidenced on July 7<sup>th</sup>). Additionally, since Industrial Avenue and Freedom Way are truck routes, trucks comprise a portion of the left-turn demand. As shown in Image 2, the maximum queue on June 29<sup>th</sup> included a truck, thereby resulting in a queue that was about 175 feet long.<sup>3</sup>

## ***Collision History***

City of Roseville staff provided data from its collision database for the segment of Industrial Avenue between the Blue Oaks Boulevard overcrossing and Galilee Road for the four-year period from June 2018 to June 2022. **Table 2** shows the results. Note that the southbound left-turn flashing yellow arrow had been installed prior to 2018.

This table shows 9 total collisions at the Industrial Avenue/Freedom Way intersection over the four-year period. Injuries were reported for 7 of the 9 collisions, but no fatalities occurred. The majority (6 of 9) were multi-vehicle broadside collisions involving southbound left-turn and northbound through motorists. No collisions involved bicyclists or pedestrians. Additionally, no collisions were reported along Industrial Avenue immediately north or south of the intersection.

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<sup>3</sup> Note that the 5<sup>th</sup> vehicle in the queue was positioned north of the terminus of the northbound Class II bike lane. The rear bumper of that vehicle was positioned about 180 feet north of the southbound left-turn stop bar, meaning that queued vehicles occupied an average of 36 feet of turn lane space. This is due to the truck that was present and the nature of the permissive left-turn, which tends to result in more of a “rolling queue” versus a stationary queue.

<b>TABLE 2: COLLISION HISTORY IN PROJECT VICINITY</b>							
<b>Date</b>	<b>Location</b>	<b>Collision Type</b>	<b>Primary Collision Factor Violation</b>	<b>Multi-Vehicle Collision?</b>	<b>Injury Collision?</b>	<b>Fatal Collision?</b>	<b>Bicycle or Pedestrian Involved?</b>
8/27/2018	Industrial Ave/ Freedom Way	Rear-End	Unsafe Speed	Yes	No	No	No
12/11/2018	Industrial Ave/ Freedom Way	Broadside	Other Hazardous Movement	Yes <sup>1</sup>	No	No	No
1/10/2019	Industrial Ave/ Freedom Way	Broadside	Improper Turning	Yes	Yes	No	No
1/11/2019	Industrial Ave/ Freedom Way	Head-On	Auto R/W Violation	Yes <sup>1</sup>	Yes	No	No
1/28/2019	Industrial Ave/ Freedom Way	Head-On	Auto R/W Violation	Yes <sup>1</sup>	Yes	No	No
5/18/2019	Industrial Ave/ Freedom Way	Broadside	Auto R/W Violation	Yes <sup>1</sup>	Yes	No	No
8/1/2020	Industrial Ave/ Freedom Way	Hit Object	Improper Turning	No	Yes	No	No
10/13/2020	Industrial Ave/ Freedom Way	Broadside	Auto R/W Violation	Yes <sup>1</sup>	Yes	No	No
2/10/2021	Industrial Ave/ Freedom Way	Broadside	Auto R/W Violation	Yes <sup>1</sup>	Yes	No	No

Notes:

1. Involved a collision between a southbound left-turning vehicle and northbound through vehicle.

Source: City of Roseville collision database, June 2018 – June 2022.

## II. Project Travel Characteristics

### ***Project Land Uses and Access***

The portion of the BOCC under study is shown on **Figure 3**. As shown, this portion of BOCC is situated east of Industrial Avenue on both sides of Freedom Way. According to the site plan (source: *Blue Oaks Commerce Center*, VLMK Engineering+Design, March 2022), the following land uses are planned on each parcel:

- North Parcel – two industrial buildings with a total of 119,000 square feet of floor space.
- South Parcel – two industrial buildings with a total of 189,280 square feet of floor space.

In total, the two parcels would comprise 308,280 square feet of industrial space.

A total of 7 driveways would serve the two parcels. Driveways 1 and 2 would be situated along Industrial Avenue, driveways 3 through 6 would be situated on Freedom Way (directly opposite each other), and driveway 7 would be situated on Fidelity Way. *This study analyzes what turning movements should be allowed at Driveways 1 and 2. For analysis purposes, both driveways are assumed to permit all turning movements so as to understand travel demands, queuing, etc. under this condition.*

Driveways 1 and 2 are described in more detail below:

- Driveway 1 on Industrial Avenue – has already been constructed with curb returns and driveway apron in place. It is situated 215 feet north of Freedom Way.<sup>4</sup> The driveway would be 40 feet wide, consist of a 100-foot throat depth, and have curb return radii of 20 feet. A northbound 120-foot right-turn deceleration lane is present. The southbound left-turn at the Industrial Avenue/Freedom Way intersection is 260 feet in length and extends beyond this driveway.
- Driveway 2 on Industrial Avenue – has already been constructed with curb returns and driveway apron in place. It is situated 275 feet south of Freedom Way and 340 feet north of the driveway serving 8880 Industrial Avenue.<sup>5</sup> The driveway would be 40 feet wide, consist of a 100-foot throat depth, and have curb return radii of 20 feet. The driveway is situated along a section of Industrial Avenue that has a continuous 650-foot northbound acceleration/deceleration lane that becomes a right-turn lane at Freedom Way. The median of Industrial Avenue is paved with a width of 12 feet in the driveway vicinity.

The following page shows photos of each driveway.

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<sup>4</sup> Referenced from the near curb return of the adjacent intersection to the centerline of the driveway.

<sup>5</sup> Referenced from the centerline of each driveway.



Image 4: View looking southbound on Industrial Avenue at Driveway 1 entrance



Image 5: View looking northbound on Industrial Avenue toward Driveway 2

### Trip Generation

The “Industrial Park” (Land Use Code 130) category from the *Trip Generation Manual, 11<sup>th</sup> Edition* (ITE 2021) was chosen to estimate the project’s trip generation and is defined as follows:

An industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities. Some parks in the database have a large number of small businesses and others have one or two dominant industries.

**Table 3** shows the project’s estimated weekday AM and PM peak hour trip generation. As shown, the North and South parcels would generate a combined 104 trips during each of the AM and PM peak hours. Trips during these two periods would be highly directional, with about 80% being inbound in the AM peak hour and outbound during the PM peak hour.

TABLE 3 PROJECT TRIP GENERATION										
Land Use	ITE Code	Quantity	AM Peak Hour of Adjacent Street				PM Peak Hour of Adjacent Street			
			Trip Rate <sup>1</sup>	Vehicle Trips			Trip Rate <sup>1</sup>	Vehicle Trips		
				In	Out	Total		In	Out	Total
Industrial Park (North Parcel)	130	119 KSF	0.34	32	8	40	0.34	8	32	40
Industrial Park (South Parcel)	130	189.28 KSF	0.34	52	12	64	0.34	14	50	64
Total			-	<b>84</b>	<b>20</b>	<b>104</b>	-	<b>22</b>	<b>82</b>	<b>104</b>
Notes:										
<sup>1</sup> Trip rates from the <i>Trip Generation Manual, 11<sup>th</sup> Edition</i> (Institute of Transportation Engineers, 2021). Source: Fehr & Peers, 2022.										

Data from the *Trip Generation Manual* also provides insights into the relative amount of passenger vehicle versus truck traffic at industrial parks. ITE data includes truck trip rate data and total trip rate data for three specific sites. Key findings from this data were:

- During the AM peak hour, trucks ranged from 11 to 13 percent of total trips at the three sites, for an average of 12 percent trucks.
- During the PM peak hour, trucks ranged from 4 to 12 percent of total trips at the three sites, for an average of 8 percent trucks.

This suggests that about 10 trucks are expected to enter/exit the two parcels during each peak hour.

### Trip Distribution

**Table 4** displays the project’s estimated trip distribution. As shown, separate distribution percentages were derived for passenger vehicles (i.e., primarily employee trips) versus trucks. Whereas passenger vehicles are expected to be generally oriented in proportion to the location of residences, truck trip distribution is more aligned with truck routes and key destinations.

As shown, an estimated 15% of project trips would be distributed to/from the north on Industrial Avenue. Industrial Avenue is expected to be utilized by 20% of outbound project trips to travel westbound on Blue Oaks Boulevard (via Alantown Drive) toward Foothills Boulevard.

<b>TABLE 4 PROPOSED PROJECT TRIP DISTRIBUTION</b>			
<b>Trip Distribution</b>	<b>Passenger Vehicles</b>	<b>Trucks</b>	<b>Weighted <sup>1</sup></b>
Blue Oaks Blvd toward SR 65 (East)	50%	60%	51%
Blue Oaks Blvd toward Foothills Blvd (West)	20%	15%	20%
Industrial Avenue toward Sunset Blvd (North)	15%	15%	15%
Industrial Avenue toward Washington Blvd (South)	5%	5%	5%
Freedom Way toward Washington Blvd (South)	10%	5%	10%
Total			101% <sup>2</sup>
Notes:			
<sup>1</sup> Weighting is 90% passenger vehicles and 10% trucks (see previous page).			
<sup>2</sup> Sum exceeds 100% due to rounding.			
Source: Fehr & Peers, 2022.			

### Trip Assignment

It is unlikely that project trips distributed to/from the east (i.e., on SR 65 or Washington Boulevard) would use project driveways situated on Industrial Avenue given the proximity and convenience of other more easterly driveways.

Conversely, it is also possible that some trips destined for Industrial Avenue will choose to use driveways on Fidelity Way or Freedom Way, which carry considerably less traffic compared to Industrial Avenue. The traffic assignments that follow consider these behaviors.

**Figure 4** shows the existing plus project volumes at the Industrial Avenue/Freedom Way intersection and Driveways 1 and 2 on Industrial Avenue. As shown, Driveways 1 and 2 would each carry 15 or fewer vehicles per hour. The project would cause very modest changes in traffic volumes at the Industrial Avenue/Freedom Way intersection.

### **III. Project Access Review**

The project access review focuses on the following project driveway aspects:

1. Sight distance analysis for southbound left-turn at Driveway 1
2. Maximum queue lengths at Driveways 1 and 2
3. Conflict points in southbound left-turn lane on Industrial Avenue at Driveway 1

#### ***Sight Distance Analysis for Southbound Left-Turn at Driveway 1***

Motorists desiring to turn left into Driveway 1 could encounter sight distance limitations due to southbound queued vehicles in the Industrial Avenue/Freedom Way southbound left-turn lane. Since Industrial Avenue is posted with a 45 mph speed limit, a design speed of 50 mph was selected for the analysis. **Figure 5** shows that under conditions present in Image 5 (i.e., queue of 5 vehicles including one truck), a southbound left-turning vehicle at Driveway 1 would have 375 feet of available sight distance. This is less than the 440 feet required (refer to Figure 5 for calculation details). Thus, insufficient sight distance would be provided for the southbound left-turn into Driveway 1.

#### ***Maximum Queue Lengths at Driveways 1 and 2***

The modest volumes (15 vehicles per hour or less) turning into and out of Driveways 1 and 2 suggest that maximum queues would typically be one or two vehicles. Both driveways would have throat depths of 100 feet, which is sufficient for either four passenger vehicles, or one truck and one passenger vehicle.

It is possible to stripe a 175-foot southbound left-turn lane in the Industrial Avenue median serving Driveway 2. This would provide adequate stacking for vehicles turning into this driveway.

#### ***Conflict Points in Southbound Left-Turn at Driveway 1***

Field observations revealed many motorists on southbound Industrial Avenue enter the Freedom Way left-turn at its beginning (versus merging into the lane 100 feet further south for instance). This behavior is especially common among motorists who are following a slower lead vehicle. If southbound left-turns were permitted at Driveway 1 within this turn lane, continuing southbound motorists would encounter vehicles stopped in the turn lane, waiting to turn into Driveway 1. This would introduce a clear and obvious conflict area, which could lead to an increase in rear-end collisions.

Additionally, since queued left-turning vehicles already spill back to Driveway 1, it would not be possible to stripe separate left-turn lanes serving both Driveway 1 and Freedom Way.

## IV. Recommendations

Based on the data and analyses presented in this memorandum, the following recommendations are offered at each driveway:

### Driveway 1

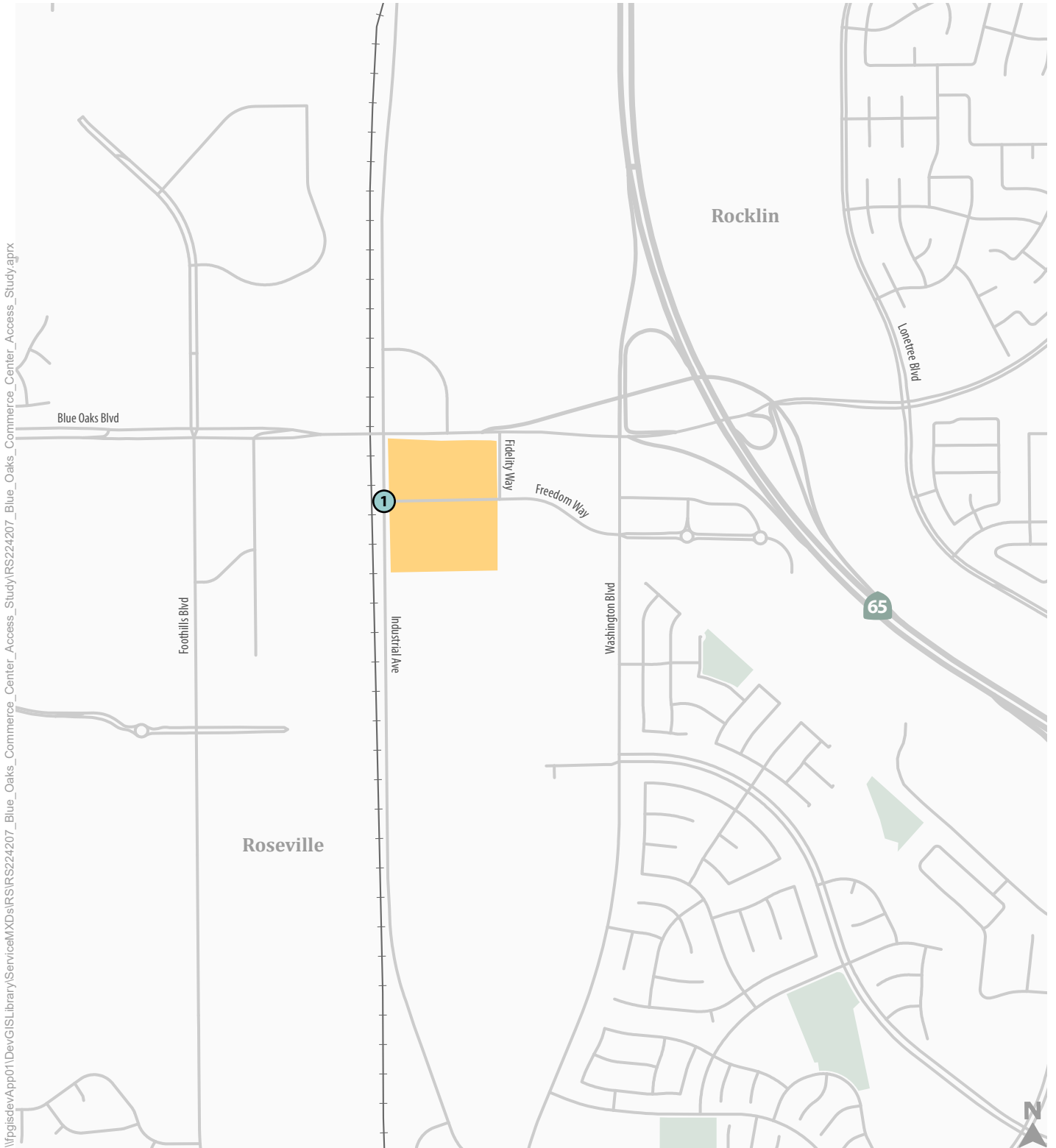
1. Restrict inbound and outbound movements to right-turns only by constructing a narrow, raised curb on the east edge of the median/left-turn lane. The raised curb would begin 100 feet north of the driveway centerline and end 75 feet south of the driveway centerline.<sup>6</sup>
2. Post a One Way Only sign within the raised curb visible to vehicles exiting Driveway 1.
3. Post a No U-Turn sign at the north end of the raised curb or in the adjacent median.

### Driveway 2

1. Stripe a 175-foot southbound left-turn lane within the paved median to serve this driveway.
2. Permit all turning movements.

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<sup>6</sup> A raised curb could be constructed similar to what exists on portions of Hazel Avenue (STAA route) north of Oak Avenue in Sacramento County. The recommended extents of the raised curb consider the minimum distance required to deter direct left-turns, while also not extending the raised curb an excessive distance.



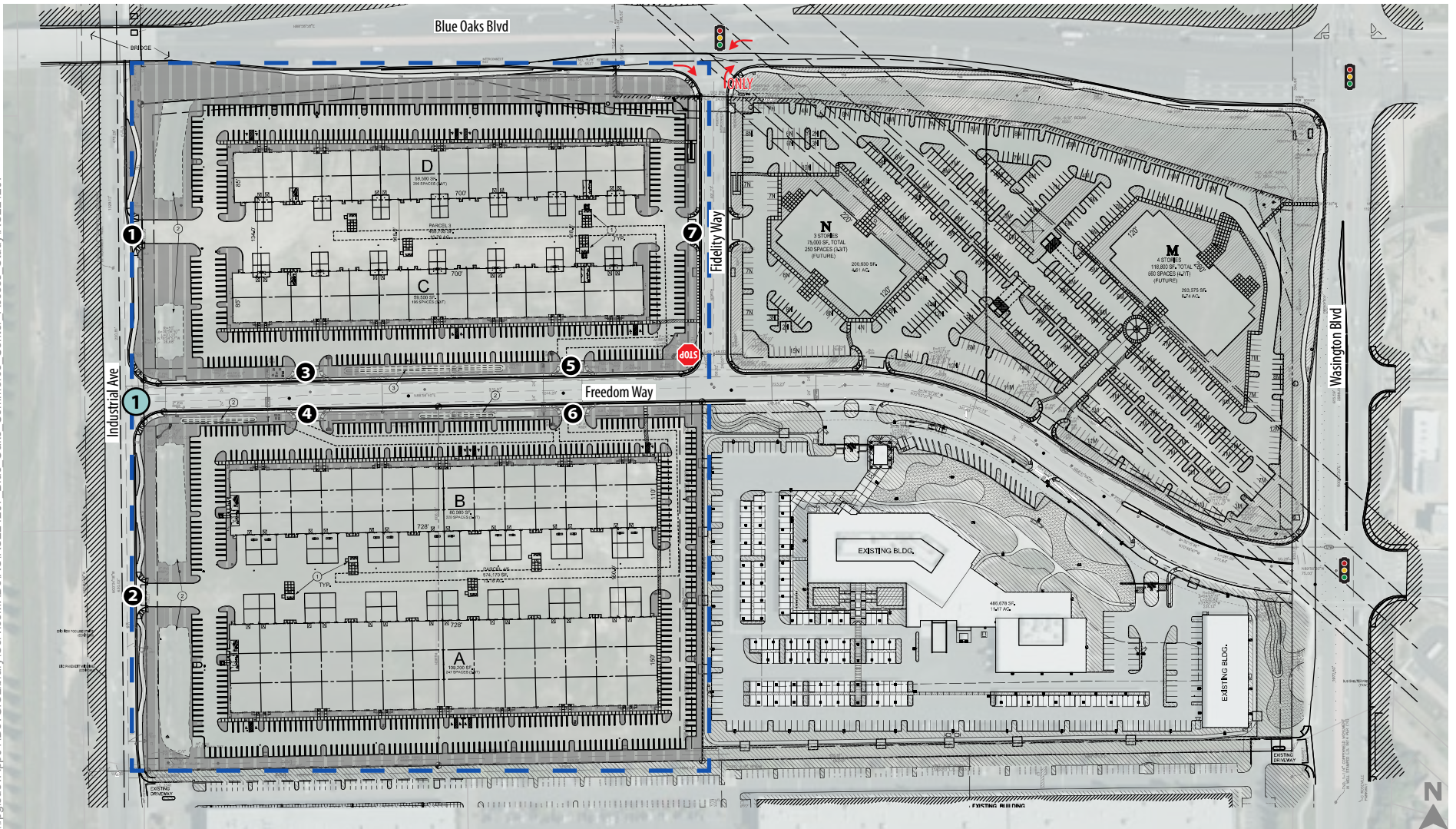
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- 1 Study Intersection
- Portion of BOCC Currently Under Study

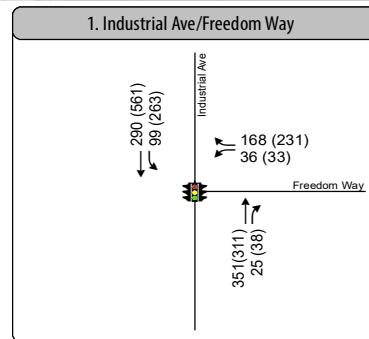
Figure 1

## Project Location





- Project Driveway
- Portion of BOCC Currently Under Study
- Stop Sign
- Traffic Signal



- Study Intersection
- Turn Lane
- AM (PM)** Peak Hour Traffic Volume
- Traffic Signal

Figure 2

## Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions



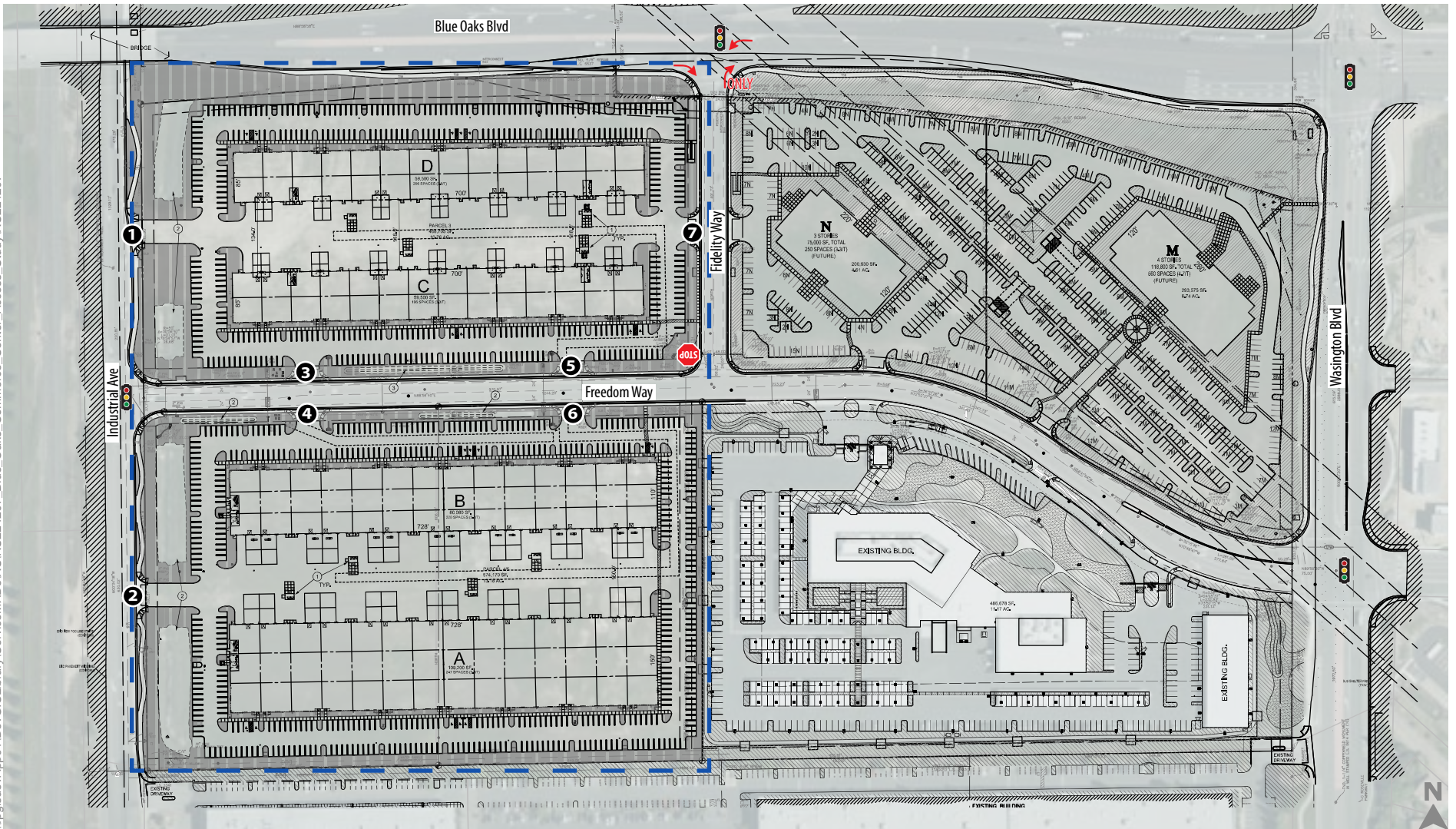


Figure 3

# Project Site Plan



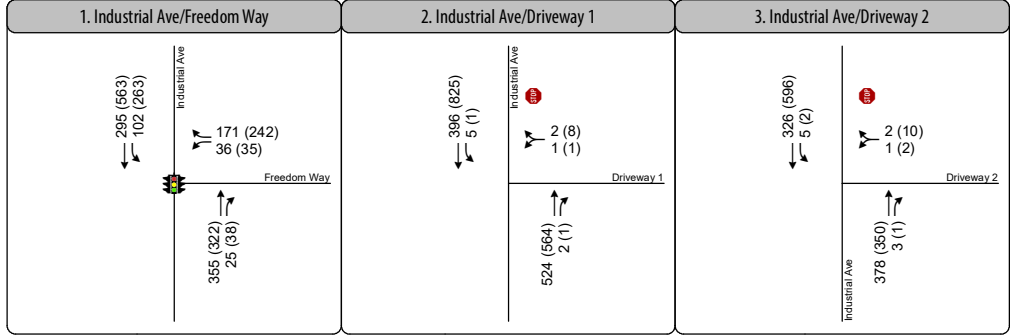
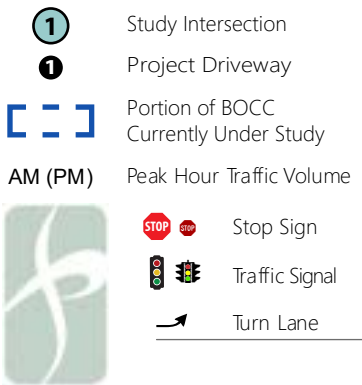
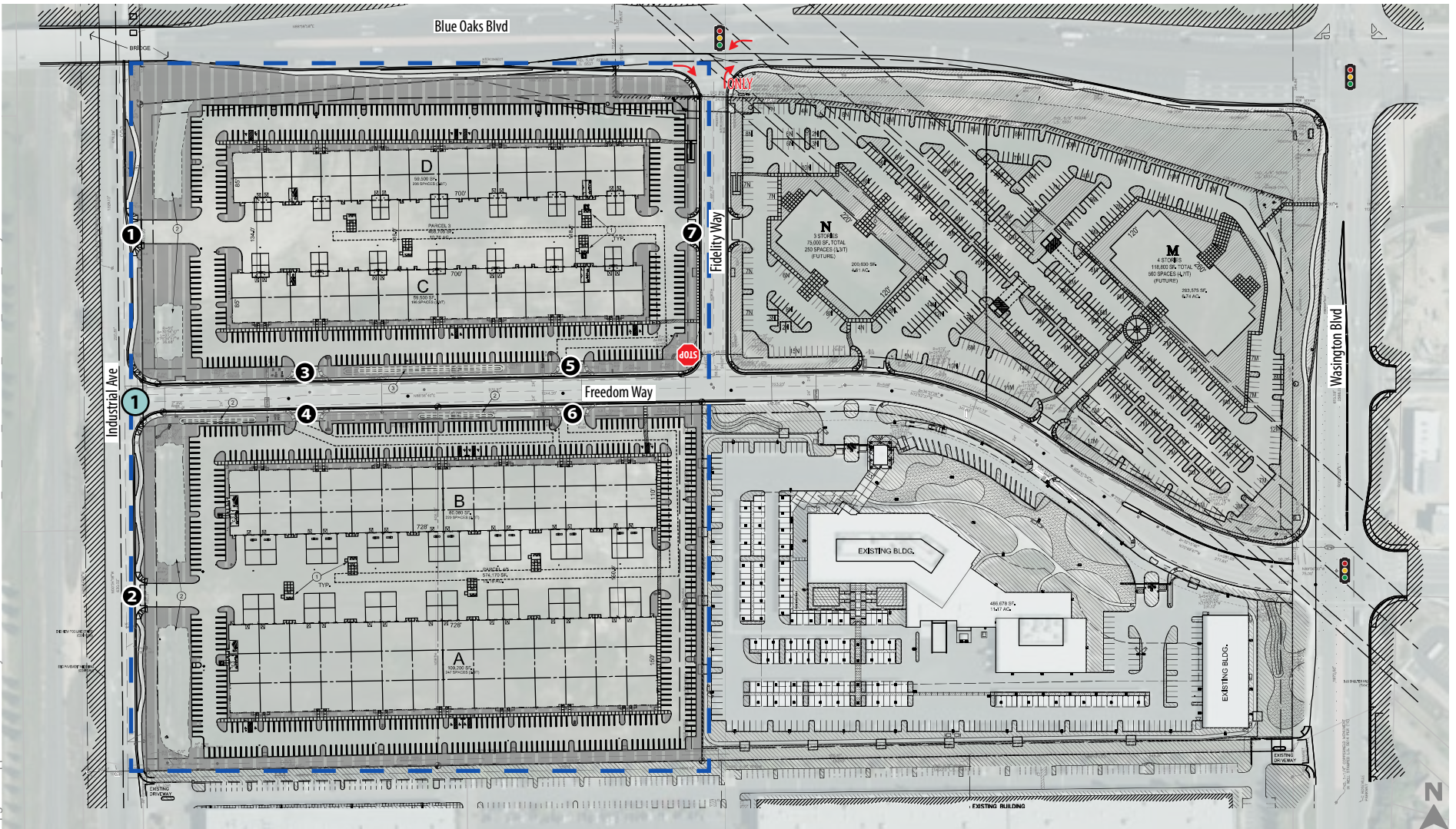
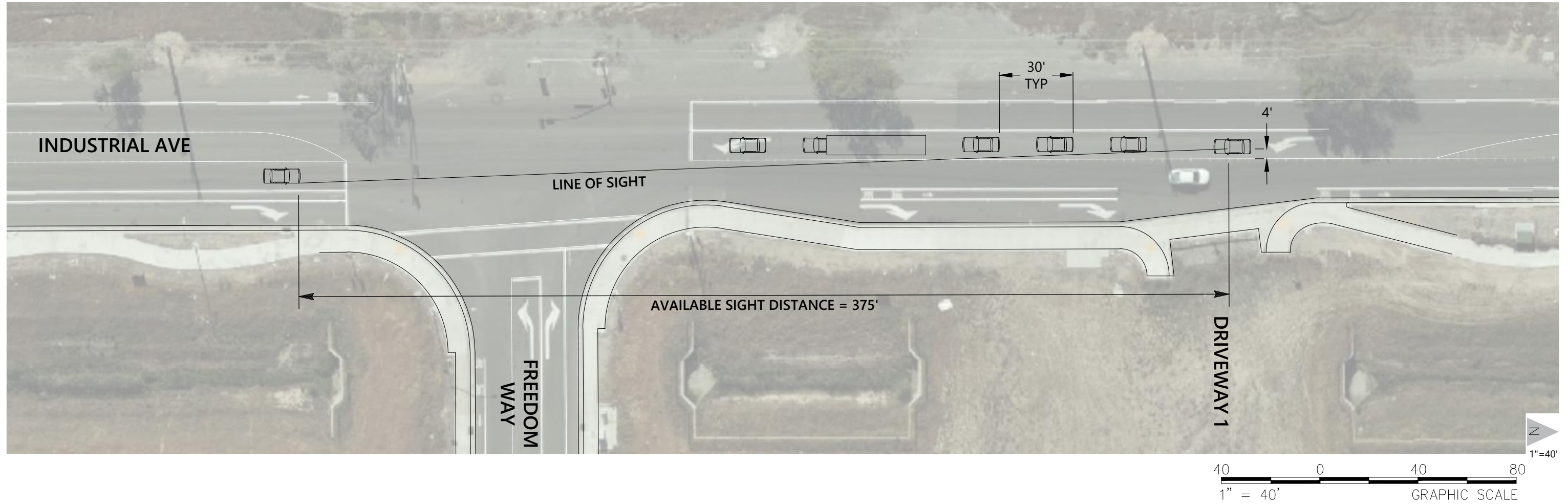


Figure 4  
Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Project Conditions



### DESIGN SPEED

INDUSTRIAL AVENUE IS A COLLECTOR STREET WITH A POSTED SPEED LIMIT OF 45 MPH. DESIGN SPEED OF 50 MPH (5 MPH ABOVE SPEED LIMIT) ASSUMED FOR ANALYSIS.

### LEFT TURN SIGHT DISTANCE

QUEUING OF VEHICLES SHOWN IS BASED ON POSITIONING AND VEHICLE TYPES OBSERVED IN THE FIELD (SEE IMAGE 2 OF TECHNICAL MEMORANDUM). NOTE THAT QUEUED VEHICLES ARE ASSUMED TO BE CENTERED IN LANE. LEFT-TURNING VEHICLE ASSUMED TO HAVE A 4-FOOT OFFSET FROM THE DRIVERS EYE TO THE LEFT STRIPE EDGE PER CITY OF ROSEVILLE DESIGN STANDARDS EXHIBIT 7-1.

REQUIRED LEFT TURN SIGHT DISTANCE = 440 FEET (CALCULATED PER 2018 AASHTO GEOMETRIC DESIGN OF HIGHWAYS AND STREETS CHAPTER 9.5.3.6 CASE F)



Figure 5  
Left Turn Sight Distance at Driveway 1