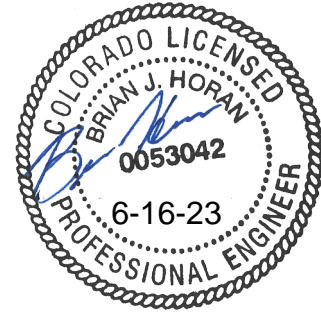


To: Alex Mestdagh  
Engineering Services

From: Brian Horan, P.E., PTOE

Date: June 16, 2023

Re: **SP21-126; Parker and Pine F1 L1 – In-N-Out Burger  
Traffic Analysis Memorandum**



### INTRODUCTION

This memorandum was conducted in support of a proposed In-N-Out (INO) on the southwest corner of South Parker Road and Pine Lane. The proposed development will be part of the larger Parker and Pine development, which was analyzed in the Parker and Pine Traffic Impact Study (TIS), conducted by Kimley Horn and dated April 2020. This memorandum serves to determine whether the proposed In-N-Out will change the trip generation assumptions made for the Parker and Pine overall development in the TIS and to provide an assessment of the existing and proposed improvements provided by the overall development would remain sufficient to support the proposed In-N-Out. Additional analysis has also been provided following comments and conversations with the Town of Parker.

The Parker and Pine Development is a large, multiuse development that was proposed to consist of the following uses:

- 13,000 square foot (SF) day care center
- 17,000 SF retail
- 175 multifamily residential units
- Two 3,000 SF fast-food restaurants
- 16 fueling position gas station with convenience store
- 5,400 SF automated car wash

The site boundaries are shown on Figure 1.

The In-N-Out will be located within the northeast corner of the larger Parker and Pine development. The location within the larger development is also shown on Figure 1. Access to the site will be provided by the already approved and constructed grid of internal streets. Access to the local network is provided via a right-in/right-out on Parker Road, a  $\frac{3}{4}$  access on Pine Lane, and a full movement access on Twenty Mile Road.

As shown on the site plan, provided as Figure 2, the approximately 3,900 SF In-N-Out would provide twenty-four (24) spaces for drive-through queueing. Consistent with other In-N-Out developments nationally and within the state these spaces are forecasted to be sufficient to accommodate anticipated queues. A queueing analysis is provided herein.



INO Traffic Analysis  
Parker, CO



Figure 1 – Study Area



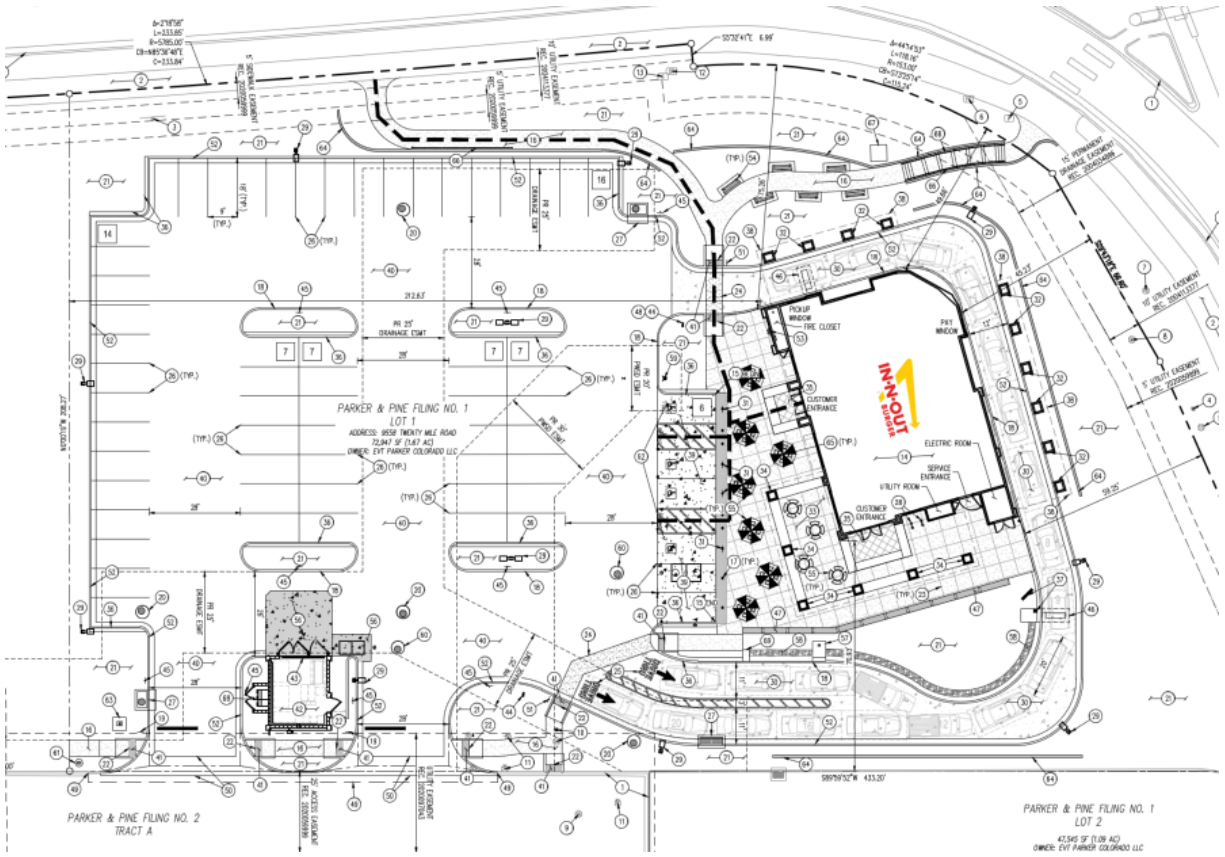


Figure 2– Site Plan

### TRIP GENERATION

The Parker and Pine Traffic Impact Study by Kimley Horn forecasted trip generation for the overall Parker and Pine development, detailed in Table 1. The forecasted trips followed appropriate guidelines and methodologies provided by the locality as well as the Institute of Transportation Engineers. This included reductions for internal capture (limited to 10% of total trips) and pass-by trips.



**Table 1 – Parker and Pine Traffic Generation**

Land Use	Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
<b>Total Trips</b>								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	952	15	44	59	46	30	76
Day Care Center (ITE 565)	13,000 SF	620	74	69	143	68	77	145
Shopping Center (ITE 820)	17,000 SF	642	10	6	16	31	34	65
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,414	62	59	121	51	47	98
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,414	62	59	121	51	47	98
Gas Station w/ Convenience (ITE 945)	16 Positions	3,286	102	98	200	114	110	224
Automated Car Wash (ITE 948)	5,400 SF	760	38	38	76	38	38	76
<b>Total</b>	-	<b>9,088</b>	<b>363</b>	<b>373</b>	<b>736</b>	<b>399</b>	<b>383</b>	<b>782</b>
<b>Total Trips After Internal Capture (ITE Methodology)</b>								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	857	14	40	53	41	27	68
Day Care Center (ITE 565)	13,000 SF	558	67	62	129	61	69	131
Shopping Center (ITE 820)	17,000 SF	642	10	6	16	31	34	65
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,273	56	53	109	46	42	88
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,273	56	53	109	46	42	88
Gas Station w/ Convenience (ITE 945)	16 Positions	2,957	92	88	180	103	99	202
Automated Car Wash (ITE 948)	5,400 SF	684	34	34	68	34	34	68
<b>Total</b>	-	<b>8,244</b>	<b>329</b>	<b>336</b>	<b>664</b>	<b>362</b>	<b>347</b>	<b>710</b>
<b>Non Pass-By Trips</b>								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	857	14	40	53	41	27	68
Day Care Center (ITE 565)	13,000 SF	558	67	62	129	61	69	131
Shopping Center (ITE 820)	17,000 SF	546	9	5	14	26	29	55
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,082	48	45	93	39	36	75
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,082	48	45	93	39	36	75
Gas Station w/ Convenience (ITE 945)	16 Positions	2,513	78	75	153	88	84	172
Automated Car Wash (ITE 948)	5,400 SF	684	34	34	68	34	34	68
<b>Total</b>	-	<b>7,322</b>	<b>298</b>	<b>306</b>	<b>603</b>	<b>328</b>	<b>315</b>	<b>644</b>
<b>Pass-By Trips</b>								
Shopping Center (ITE 820)	17,000 SF	96	0	0	0	5	5	10
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	191	8	8	16	7	6	13
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	191	8	8	16	7	6	13
Gas Station w/ Convenience (ITE 945)	16 Positions	444	14	13	27	15	15	30
<b>Total</b>	-	<b>922</b>	<b>30</b>	<b>29</b>	<b>59</b>	<b>34</b>	<b>32</b>	<b>66</b>

Note: ITE does not provide AM trip generation information for Automated Car Wash (ITE 948) although car washes are open in the morning. Therefore, the PM trip generation was duplicated for the AM trip generation.

*Table 1– TIS Trip Generation*

The TIS distributed these trips through the roadway network and proposed the roadway improvements necessary to accommodate the forecasted trips. As can be seen in the table, fast food with drive through use was assumed in the TIS. The proposed In-N-Out will take the place of the fast food with drive through use assumed in the TIS. The future roadway network was designed to be able to accommodate the trips generated from the fast food with drive through land use, as well as the trips generated by the other land uses. This comparison determines whether the forecasted trips generated by the In-N-Out are in general conformance with the TIS assumptions.



## PROPOSED SITE TRIP GENERATION

### Overview

The Applicant proposes to develop the site with an In-N-Out fast food with drive through use. It is understood that due to the popularity of In-N-Out, trip generation estimates may differ from the typically used ITE rates; therefore, rates specific to the operator were used for this study. The Applicant provided trip generation rates from historical data of 12 completed In-N-Out developments. This data was used to calculate the number of trips generated by the development during the weekday AM and PM peak hours, as well as the number of daily weekday generated trips. The trip generation analysis is presented in Table 2. It should be noted that In-N-Out does not have AM hours that would coincide with the morning peak hour. The AM information provided herein is for comparative use only and AM trip generation of the In-N-Out is experienced during the midday (MD) peak.

### Pass-by Trips

Pass-by-trips are defined as trips in which the development serves as an intermediate stop, and results in little to no out of direction travel for the drivers total route. Pass-by-trips will increase the volume turning into and out of a site but will likely not affect the overall traffic volume through the network, as the vehicle would have been passing through anyway. A gas station is a type of development that typically has a high proportion of pass-by-trips, as drivers often will wait for a gas station along their route rather than changing their route to find one. The following pass-by reductions were taken from the ITE guidelines and were applied to the trip generation analysis:

- Fast Food with Drive Through 50% AM/ 55% PM

As shown in Table 2, the site is anticipated to generate 143 weekday AM peak hour, 114 weekday PM peak hour, and 1,610 weekday daily pass-by trips.

### Net Site Trips

The net site trips are the number of additional trips that are expected to be generated by the proposed development, and do not include the pass-by trips. The site will generate 141 additional trips in the weekday AM peak hour, and 94 additional trips in the weekday PM peak hour. It is projected to generate a total of 1,317 additional daily weekday trips.

## SITE TRIP GENERATION COMPARISON

As can be seen in Table 2, a higher level of pass-by trips can be assumed than what was studied in the TIS. This is consistent with ITE and has been discussed with the Town. As such the proposed use is anticipated to generate similar net new trips to the network as compared to what was studied. Specifically, 48 additional AM peak hour, 19 additional PM peak hour and 235 additional daily weekday trips are forecasted for the proposed use.

These trips would be distributed to the local network via the three access locations as described previously. This would represent only a minor change to the analysis provided in the overall TIS. As such it is anticipated that the INO development would not significantly impact the results or conclusions of the TIS and the proposed development would be accommodated by the existing and proposed infrastructure in the area. To further analyze this, additional analysis has been undertaken to specifically quantify what the increase in trips would have to the network.

## ADDITIONAL TRIP ASSIGNMENT

In order to understand the impacts that the In-N-Out would have to the surrounding network, it was determined that the additional pass by and non-pass by trips should be assigned to the network consistent with the approved TIS and to analyze any intersections that would be significantly impacted by the development. In review of the approved TIS it was noted that the PM peak hour was the more



Table 2

In-N-Out: Parker, CO

Site Trip Generation Comparison

Land Use	Land Use Code	Amount	Units	AM/MD Peak Hour			PM Peak Hour			Average Daily Trips
				In	Out	Total	In	Out	Total	
<i>Approved Trip Generation</i> Fast Food Restaurant with Drive-Thru <sup>(1)</sup> <i>After Internal Capture (10%)</i> <i>Non-Pass By</i> <i>Pass-by</i>	934	3,000	SF	62	59	121	51	47	98	1,402
				56	53	109	46	42	88	1,273
				48	45	93	39	36	75	1,082
				8	8	16	7	6	13	191
<i>Proposed</i> In-n-Out Provided Data <sup>(2)</sup> <i>After Internal Capture (10%)</i> <i>Non-Pass By</i> <i>Pass-by (50% AM/ 55%PM/ 55% ADT)</i>	-	3,879	SF	159	157	316	115	115	230	3,252
				143	141	284	104	104	208	2,927
				71	70	141	47	47	94	1,317
				72	71	143	57	57	114	1,610
<b>Difference (proposed minus approved)</b>										
<i>Total Trips</i>				97	98	195	64	68	132	1,850
<i>After Internal Capture (10%)</i>				87	88	175	58	62	120	1,654
<b><i>Non-Pass By</i></b>				<b>23</b>	<b>25</b>	<b>48</b>	<b>8</b>	<b>11</b>	<b>19</b>	<b>235</b>
<i>Pass-by</i>				64	63	127	50	51	101	1,419

Note(s):

(1) Trip generation based on Parker and Pine TIS dated April 2020

(2) Based on rates/data provided by In-N-Out

traffic intense peak hour. Additionally, In-N-Out is not open during the typical AM commute period. For these reasons a PM updated analysis is provided herein to show the specific impact the increase in trips would have.

The approved TIS provides non-pass by trip distributions on Figure 6, PM Pass by trip distributions on Figure 8 and 2040 ultimate volumes on Figure 12. These Figures are included for reference in Attachment I. Utilizing the information in these Figures the additional trips anticipated by the In-N-Out, shown in Table 2, can be assigned to the network and added to the 2040 Total Volumes as provided in Figure 12 of the approved TIS.

The increase in non-pass by and pass by trips were assigned to the network utilizing the distributions provided in Figure 6 and Figure 8 of the approved TIS respectively. These trip assignments are provided on Figure 3 and Figure 4 provided herein. These trips were added to the total future volumes of the approved TIS (shown in Figure of 12 of the approved TIS) and provided herein as Figure 5.

### **ADDITIONAL TRIP ASSESSMENT**

After a review of the additional trips that would be expected by the In-N-Out, as shown on Figures 3 and 4, it was determined that the following intersections and movements should be further analyzed:

Intersection 3 (Pine Lane/Pine Lane Access)

- Northbound Right
- Westbound Left

Intersection 1 (Parker Road/Pine Lane)

- Eastbound Left
- Northbound Left

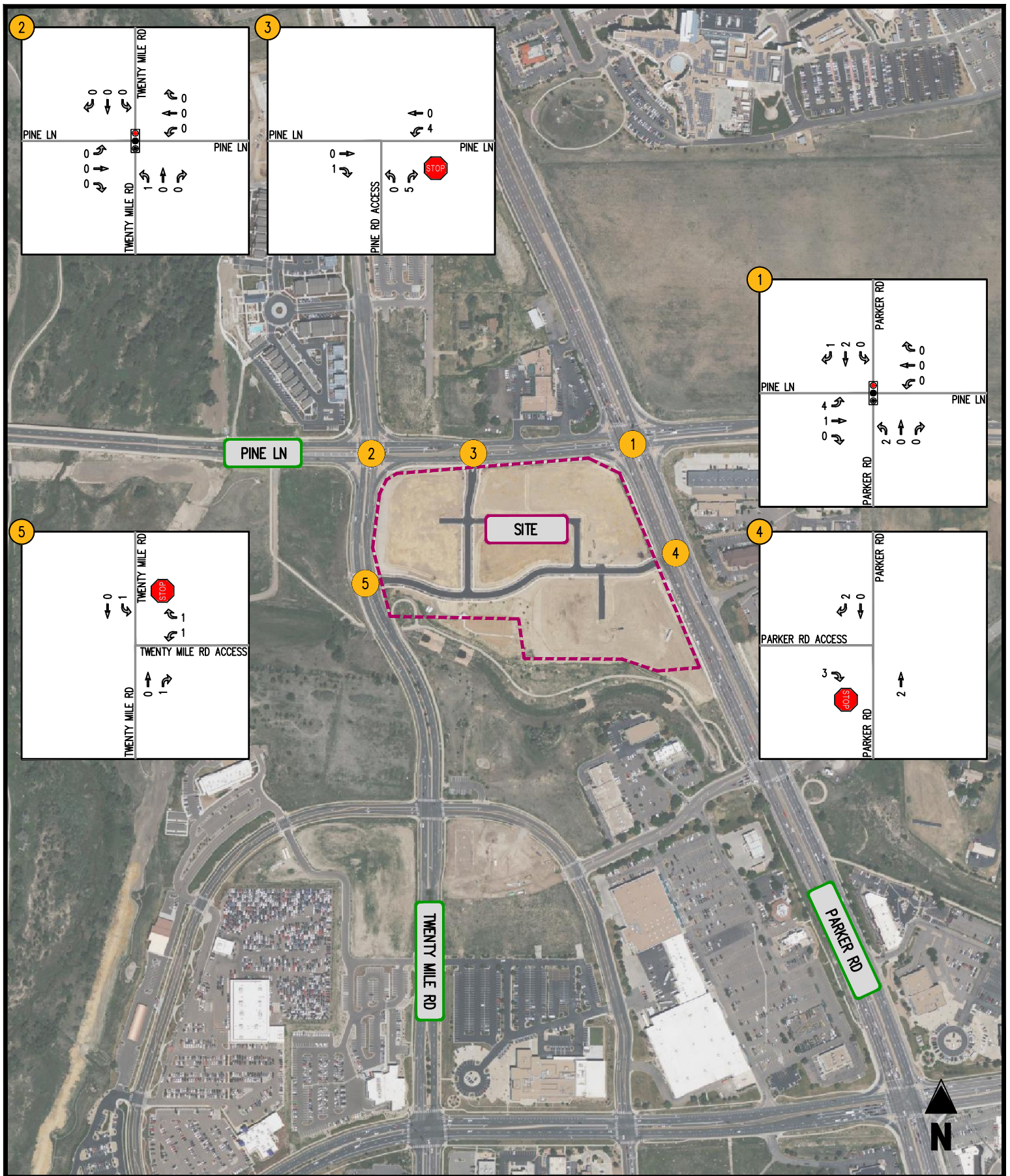
Intersection 4 (Parker Road/Parker Road Access)

- Southbound Right
- Eastbound Right

As such these intersections were analyzed in Synchro consistent with the outputs provided in the approved TIS. It should be noted that the approved TIS was completed in Synchro version 9 and the current version is 11. All efforts were made to replicate the approved TIS assumptions exactly. The outputs from the approved TIS are included as Attachment I. The volumes shown in Figure 5 were analyzed in Synchro and the comparative results are provided in Table 3. Outputs are provided in Attachment II.

As shown in Table 3, operations will be impacted slightly by the increase in volume to each movement. Additionally, queues will increase slightly but will remain contained within the effective storage area of the movement. As shown in Table 3, no movements were identified that would require additional improvements to accommodate the proposed development.





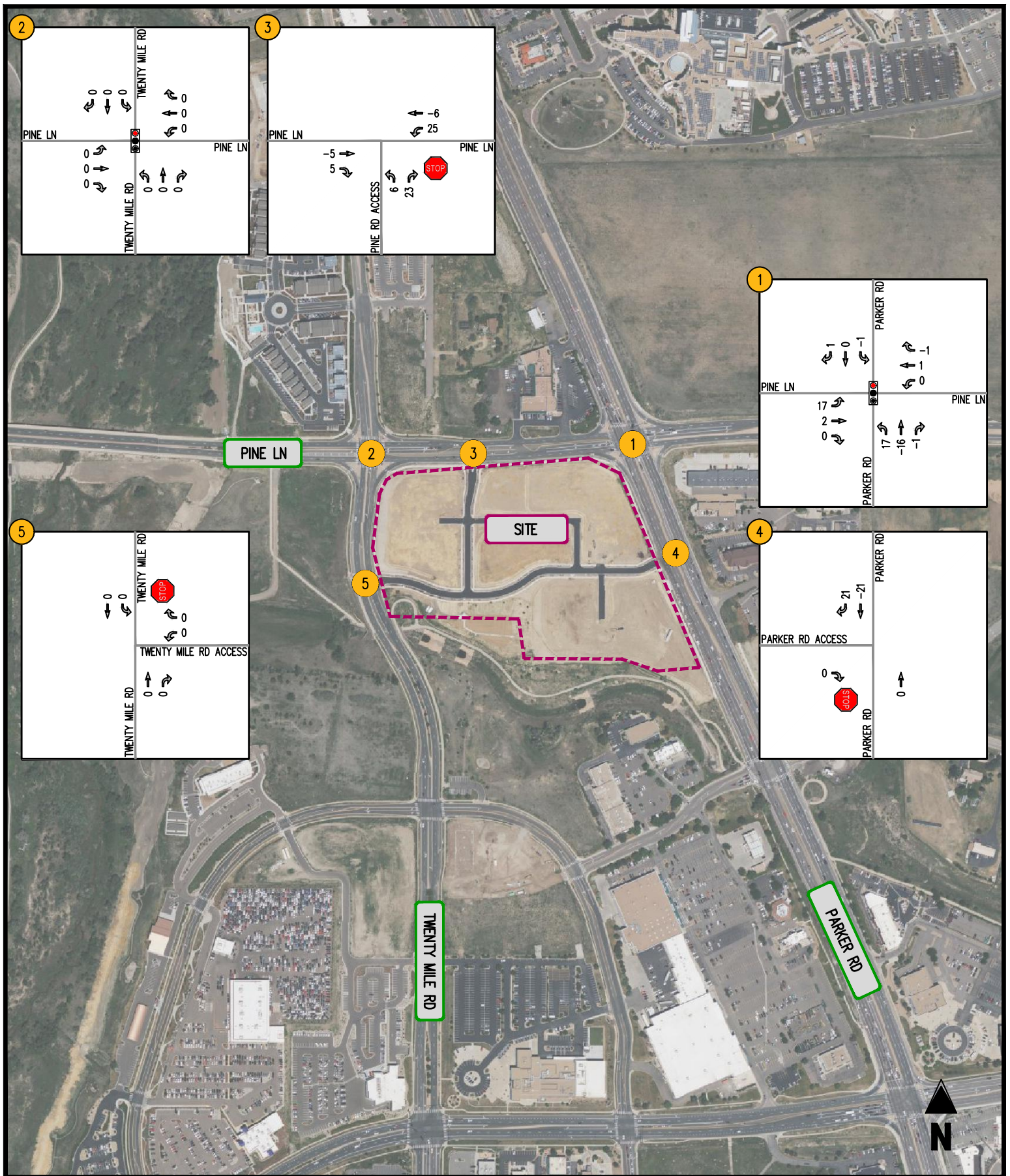
**FIGURE 3**  
**Additional Non Pass-by Trips**

In-N-Out Parker and Pine  
 Parker, CO

0000 (PM PEAK HOUR)

- MOVEMENT
- SIGNALIZED INTERSECTION
- STOP SIGN
- YIELD SIGN





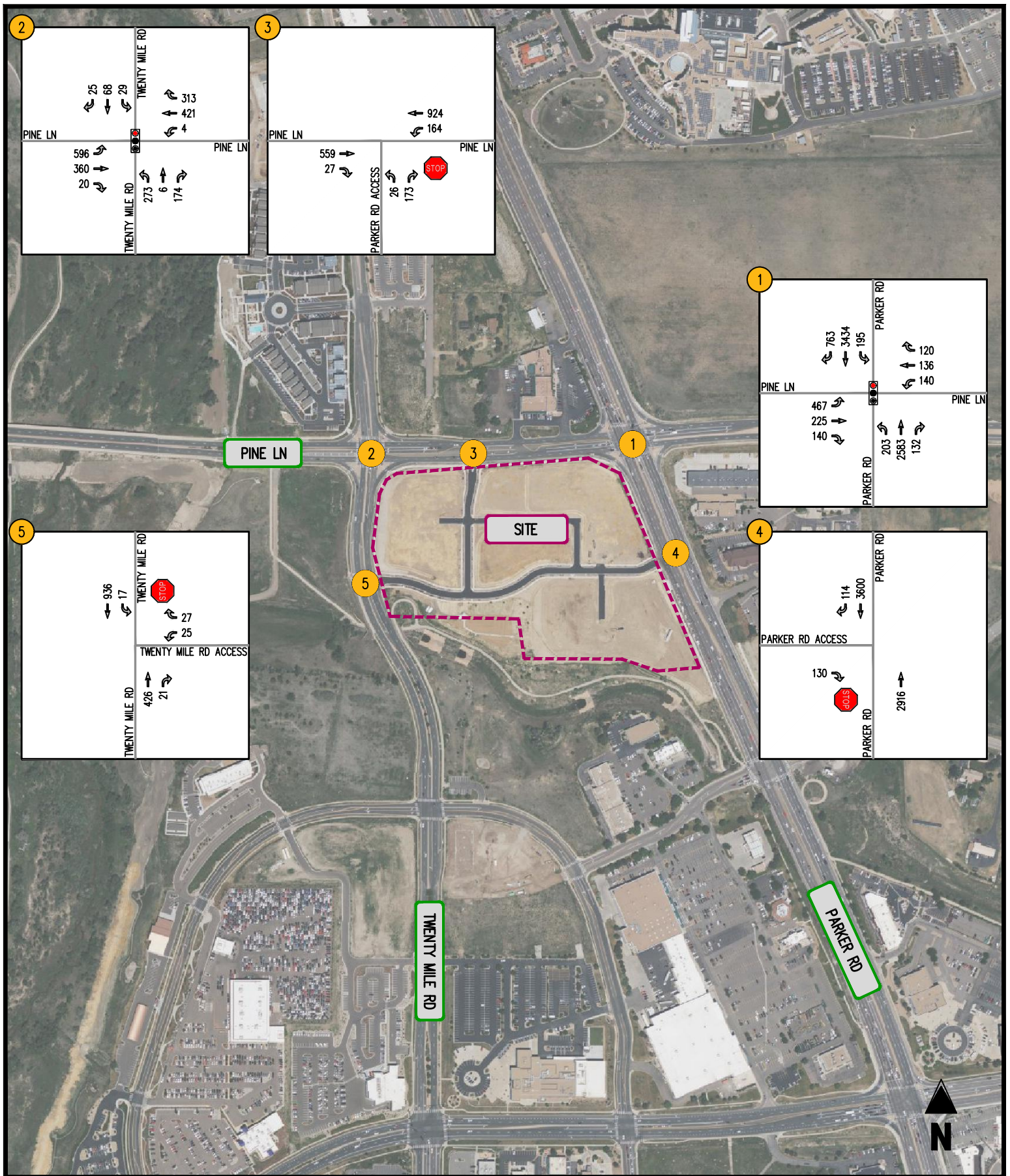
**FIGURE 4**  
**Additional Pass-by Trips**

In-N-Out Parker and Pine  
 Parker, CO

0000 (PM PEAK HOUR)

- MOVEMENT
- SIGNALIZED INTERSECTION
- STOP SIGN
- YIELD SIGN





**FIGURE 5**  
**New 2040 Plus Background Project Traffic Volumes**

In-N-Out Parker and Pine  
 Parker, CO

0000 (PM PEAK HOUR)

- ← MOVEMENT
- 🚦 SIGNALIZED INTERSECTION
- 🛑 STOP SIGN
- 🚧 YIELD SIGN



Table 3  
 INO Parker and Pine  
 2040 Intersection Level of Service and Queue Comparison (1) (2) (3)

Intersection	Operating Condition	Street Name	Approach/Movement	Approved TIS 2040 PM Peak Hour	In-N-Out Update 2040 PM Peak Hour	Available Storage	Approved TIS 2040 PM Queue (ft)	In-N-Out Update 2040 PM Queue (ft)
3 Pine Lane/Pine Lane Access	STOP	Access Pine Lane	NBR WBL	C [24.4] B [10.1]	D [27.0] A [9.7]	181 175	67.5 15	87.5 17.5
1 Parker Road/Pine Lane	SIGNAL	Pine Lane Parker Road	EBL NBL	F (234.1) F (218.2)	F (195.5) F (136.1)	270 dual 735	346 141	372 182
4 Parker Road/Parker Road Access	STOP	Parker Road Access	SBR EBR	A [0.0] B [14.4]	A [0.0] C [15.6]	- 195	0 22	0 30

Notes : (1) Numbers in brackets [] represent delay at unsignalized intersections in seconds per vehicle.  
 (2) Numbers in parenthesis () represent delay at signalized intersections in seconds per vehicle.  
 (3) Queue length is based on the 95th percentile queue as reported by Synchro.

## INTERNAL SITE QUEUEING

To determine the condition of the existing In-N-Out queuing operations, data was collected at the existing sites of Democracy Point and New Center Point in Colorado Springs. The queue data was collected in five-minute intervals from 11:00 AM to 11:00 PM on Saturday, August 27, 2022 and on Tuesday, August 30, 2022. The data provides the number of vehicles queued in the drive-thru lane every five minutes. The data was broken down into 5-minute increments to help illustrate the rate at which vehicles are processed through the drive-thru. The collected data is illustrated on Figure 6 for New Center Point and Figure 7 for Democracy Point, on the following two pages.

As shown in Figure 5, New Center Point generally has longer queues, with an average queue length of 16.60 vehicles during Tuesday and an average queue length of 23.87 vehicles on Saturday. As shown in Figure 6, Democracy Point had an average queue length of 13.74 vehicles during Tuesday and an average queue length of 17.87 vehicles on Saturday. The maximum observed queue at Democracy Point was 34 vehicles while the maximum queue at New Center Point was 39 vehicles. The total averages for both sites were as follows:

- Weekday: 15.17
- Weekend: 20.87

The service rate per vehicle is the estimated time for a guest (upon arriving at the drive-thru window) to receive their order and depart. Based on the operator's internal data and field measurements, the observed service rate is approximately 30 seconds per vehicle during periods of high volume (extra grill in operation and the drive-thru queue is above eight (8) vehicles where an associate with a handheld ordering tablet is deployed). This service rate can be witnessed in the Figure 6 and Figure 7. During spikes in queues the service rate increases and processes a significant portion of the queue within a short period of time.

The peak period of 39 cars on Saturday at 2:30pm in New Center Point is a significant outlier that is not indicative of typical operations. Based on the occurrence out of normal meal peak periods, this is believed to be due to an uncommonly large order placed between 2:15-2:20pm. The period between 2:30-2:35pm best exemplifies the associates' 30 second service rate, clearing 11 cars in a five-minute span.



Figure 6

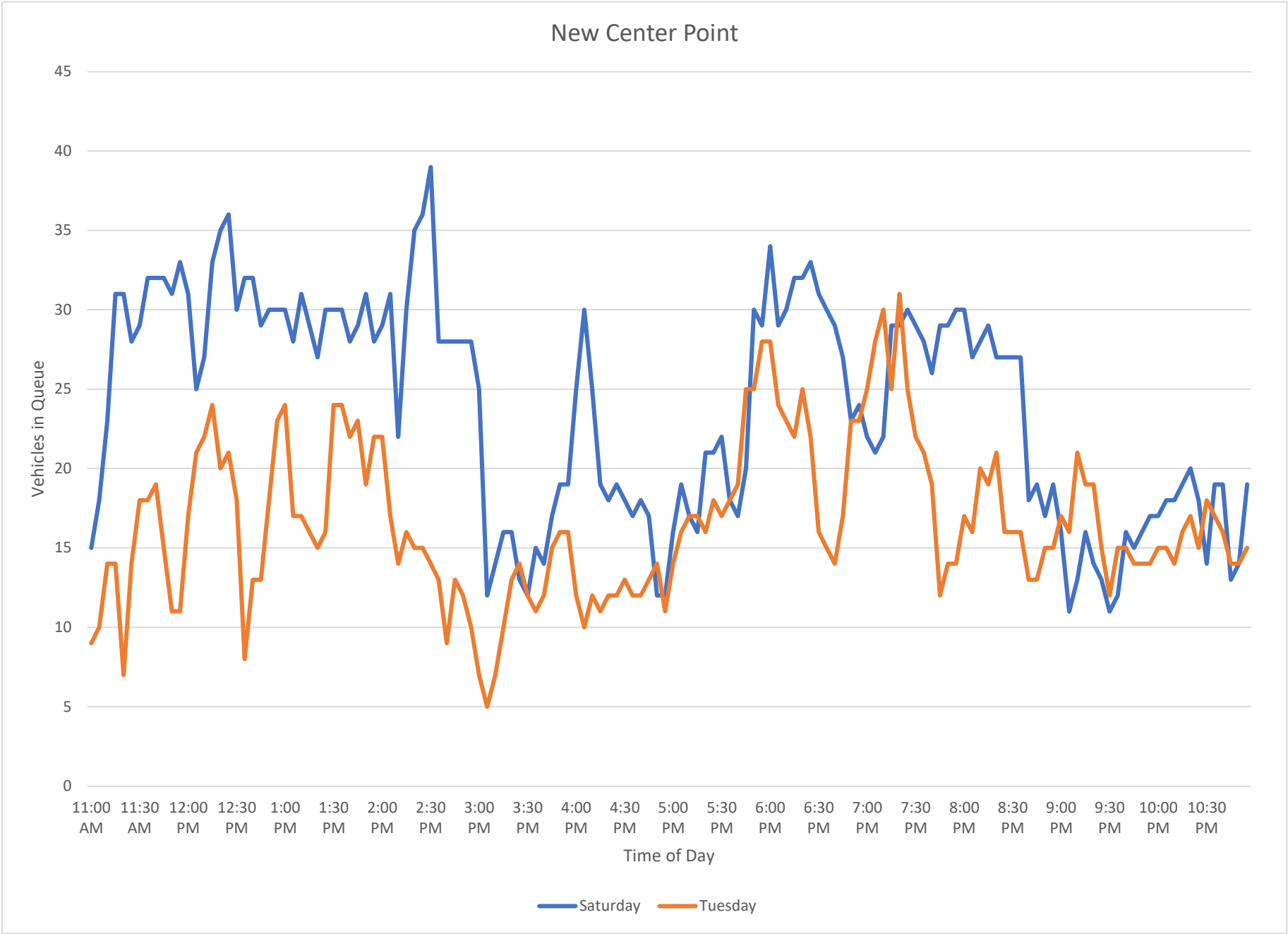
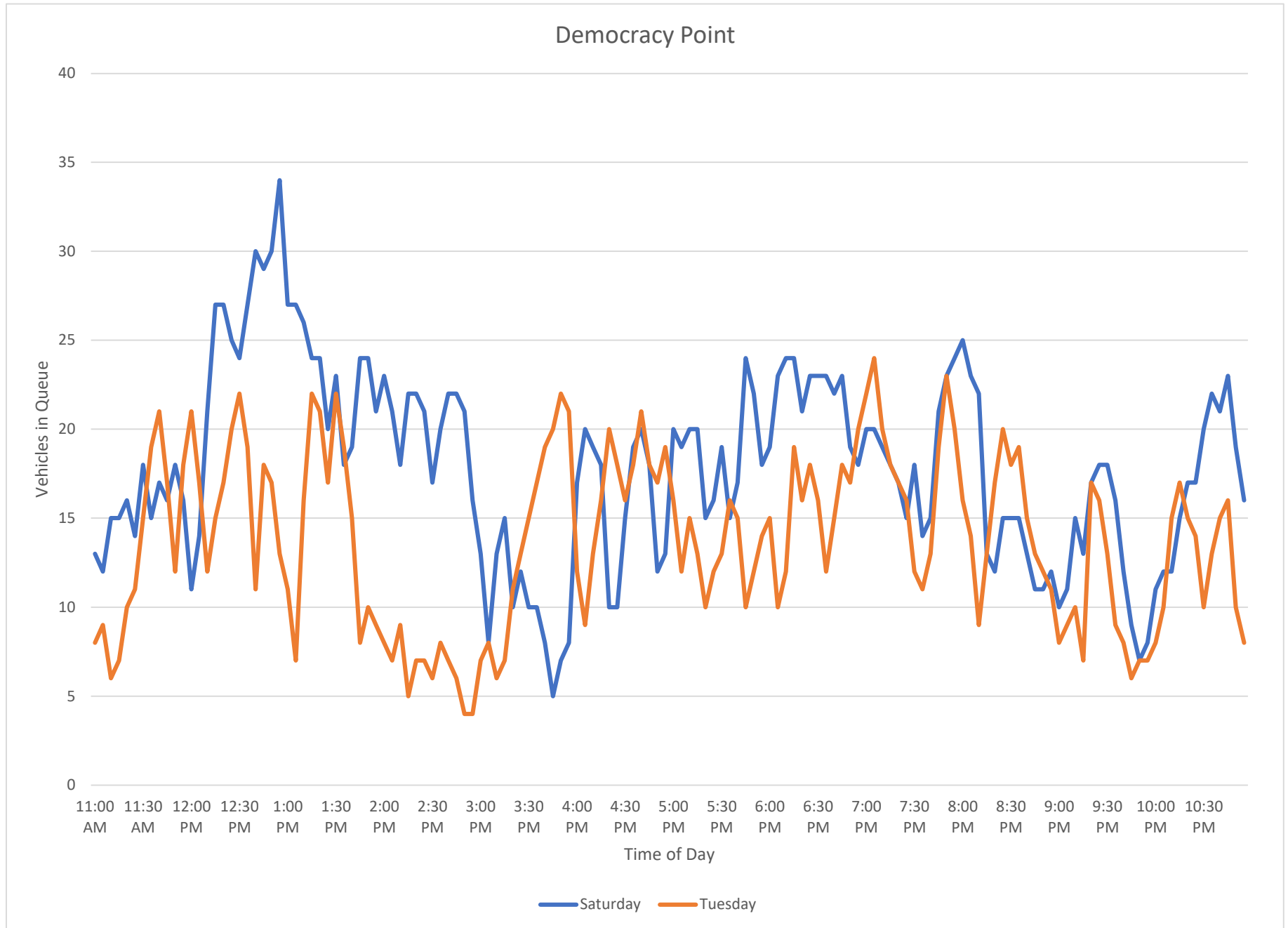


Figure 7



The proposed fast-food drive-thru facility will provide a stacking capacity of 21 vehicles. If the queue extends beyond the designated drive-thru lanes, at least an additional 10 vehicles will be able to stack through the In-N-Out parking lot prior to reaching the private internal drive, giving a total queuing capacity of 31 vehicles.

As can be seen in the queuing data summarized in Figure 6 and Figure 7, the spikes in queue length never last for an extended time. This is because as the queue grows, In-N-Out increases its processing speed via the operational methods mentioned previously. Neither site had queues of over 30 vehicles for an extended period, indicating that if the queue does extend into the parking lot of the proposed development, it is unlikely to remain that length for long. It is unlikely for a queue to extend into the internal driveway for any significant period. As such, the internal queuing generated by the proposed development is not expected to cause operational issues.

It should also be noted that as additional In-N-Out restaurants have opened in the state, the demand has been spread across the additional stores. Although this is difficult to quantify, it is anticipated that the proposed location will improve operations at existing stores and likely lower average queues for existing and proposed stores alike.

## CONCLUSIONS

1. The subject site was previously studied under a mixed use for the Parker and Pine development in Parker, CO.
2. According to the Parker and Pine TIS, the proposed roadway geometry through the study area was designed to be able to accommodate the trips generated by a fast food restaurant with drive through, in addition to the trips generated by the other proposed uses of the development.
3. The Applicant proposes to develop an In-N-Out fast food restaurant with drive through as a section of the larger Parker and Pine development consistent with the approved development program.
4. Upon completion, the gas station will generate 284 AM peak hour site trips, 230 PM peak hour site trips, and 2,927 daily site trips. It will also generate 143 AM peak hour pass-by trips, 94 PM peak hour pass-by trips, and 1,317 daily pass-by trips. This represents 48 additional AM, 19 additional PM, and 235 additional daily non pass-by trips.
5. The minor increase in net new trips over what was previously studied were analyzed and it was determined that they would not have a significant impact on the conclusions or recommendations of the approved TIS.
6. It is anticipated that the existing and proposed infrastructure would be sufficient to accommodate the proposed development.
7. The proposed development will have the capacity to stack 21 vehicles in the drive-thru lanes and has significant additional capacity for stacking vehicles prior to the queue extending out of the site parking lot.
8. Based on the queue data for two other similar In-N-Outs, the queue will be able to be contained within the drive thru lanes and is not expected to cause any operational issues. It will be In-N-Out's responsibility to mitigate any impacts that queuing from this restaurant may have on the adjacent roadways or properties.

We trust that the information contained herein satisfy the request of Staff. If you have any questions or need further information, please contact Brian Horan at [brianhoran@gallowayus.com](mailto:brianhoran@gallowayus.com) or 303-770-8884.



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NOT FOR BIDDING  
NOT FOR CONSTRUCTION

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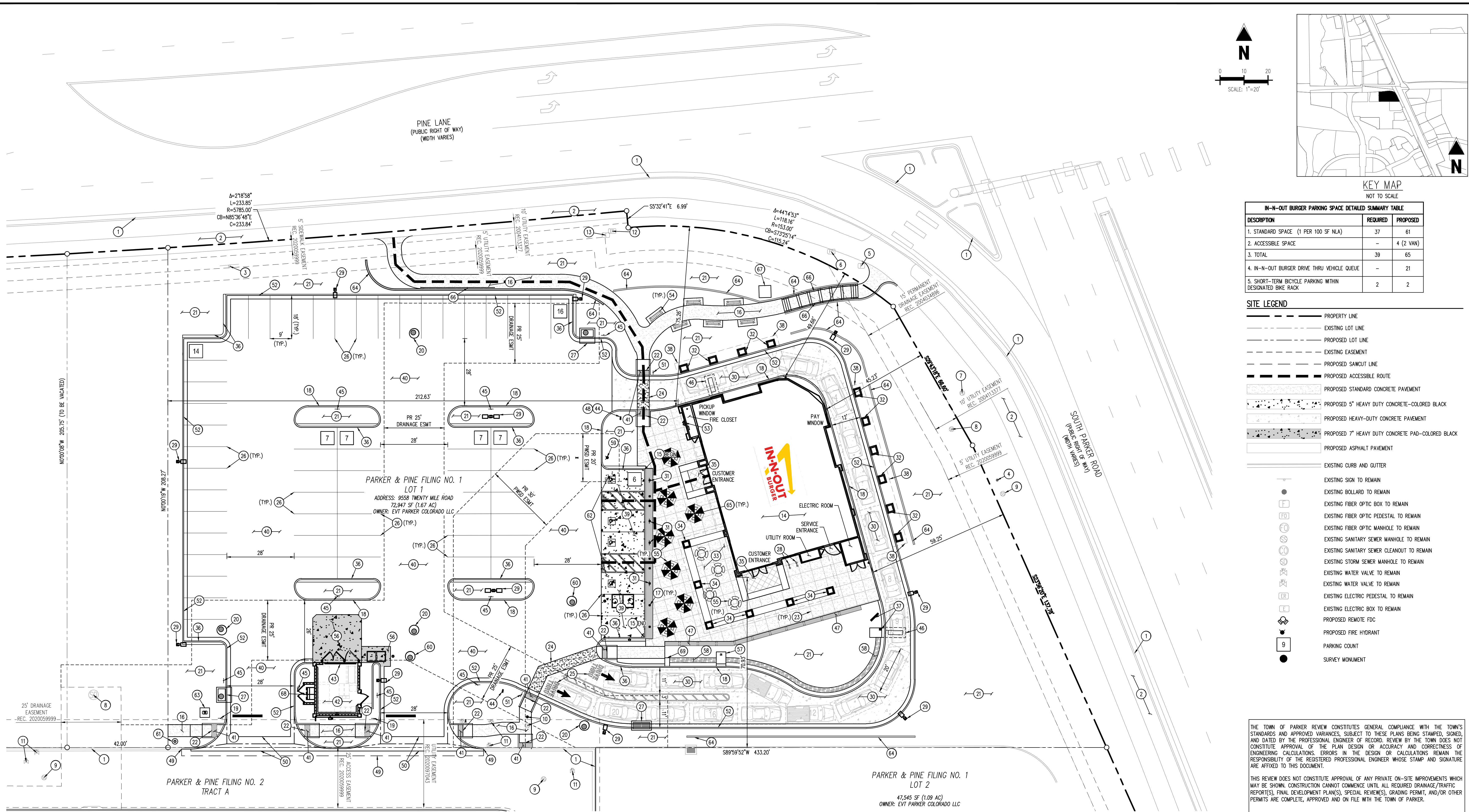
**IN-N-OUT BURGER**  
CONSTRUCTION DOCUMENTS  
PARKER & PINE FILING NO. 1, LOT 1  
PARKER, CO 80134

#	Date	Issue / Description	Init.
1	12/21/2022	1ST CD SUBMITTAL	PJD
2	03/17/2023	2ND CD SUBMITTAL	PJD
3	04/25/2023	3RD CD SUBMITTAL	PJD

Project No:	INC000014-20
Drawn By:	JNE
Checked By:	PJD
Date:	03/17/2023

**SITE PLAN**

**C1.0**  
Sheet 3 of 35



**IN-N-OUT BURGER PARKING SPACE DETAILED SUMMARY TABLE**

DESCRIPTION	REQUIRED	PROPOSED
1. STANDARD SPACE (1 PER 100 SF NLA)	37	61
2. ACCESSIBLE SPACE	-	4 (2 VAN)
3. TOTAL	39	65
4. IN-N-OUT BURGER DRIVE THRU VEHICLE QUEUE	-	21
5. SHORT-TERM BICYCLE PARKING WITHIN DESIGNATED BIKE RACK	2	2

**SITE LEGEND**

---	PROPERTY LINE
---	EXISTING LOT LINE
---	PROPOSED LOT LINE
---	EXISTING EASEMENT
---	PROPOSED SAWCUT LINE
---	PROPOSED ACCESSIBLE ROUTE
---	PROPOSED STANDARD CONCRETE PAVEMENT
---	PROPOSED 5" HEAVY DUTY CONCRETE-COLORED BLACK
---	PROPOSED HEAVY-DUTY CONCRETE PAVEMENT
---	PROPOSED 7" HEAVY DUTY CONCRETE PAD-COLORED BLACK
---	PROPOSED ASPHALT PAVEMENT
---	EXISTING CURB AND GUTTER
●	EXISTING SIGN TO REMAIN
○	EXISTING BOLLARD TO REMAIN
□	EXISTING FIBER OPTIC BOX TO REMAIN
□	EXISTING FIBER OPTIC PEDESTAL TO REMAIN
○	EXISTING FIBER OPTIC MANHOLE TO REMAIN
○	EXISTING SANITARY SEWER MANHOLE TO REMAIN
○	EXISTING SANITARY SEWER CLEANOUT TO REMAIN
○	EXISTING STORM SEWER MANHOLE TO REMAIN
○	EXISTING WATER VALVE TO REMAIN
○	EXISTING WATER PEDESTAL TO REMAIN
○	EXISTING ELECTRIC PEDESTAL TO REMAIN
○	EXISTING ELECTRIC BOX TO REMAIN
○	PROPOSED REMOTE FDC
○	PROPOSED FIRE HYDRANT
○	PARKING COUNT
●	SURVEY MONUMENT

THE TOWN OF PARKER REVIEW CONSTITUTES GENERAL COMPLIANCE WITH THE TOWN'S STANDARDS AND APPROVED VARIANCES. SUBJECT TO THESE PLANS BEING STAMPED, SIGNED, AND DATED BY THE PROFESSIONAL ENGINEER OF RECORD, REVIEW BY THE TOWN DOES NOT CONSTITUTE APPROVAL OF THE PLAN DESIGN OR ACCURACY AND CORRECTNESS OF ENGINEERING CALCULATIONS. ERRORS IN THE DESIGN OR CALCULATIONS REMAIN THE RESPONSIBILITY OF THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT.

THIS REVIEW DOES NOT CONSTITUTE APPROVAL OF ANY PRIVATE ON-SITE IMPROVEMENTS WHICH MAY BE SHOWN. CONSTRUCTION CANNOT UNTIL ALL REQUIRED DRAINAGE/TRAFFIC REPORT(S), FINAL DEVELOPMENT PLAN(S), SPECIAL REVIEW(S), GRADING PERMIT, AND/OR OTHER PERMITS ARE COMPLETE, APPROVED AND ON FILE WITH THE TOWN OF PARKER.

TOWN OF PARKER, DIRECTOR OF ENGINEERING DATE

**LEGAL DESCRIPTION**

LOT 1, PARKER & PINE FILING NO. 1, COUNTY OF DOUGLAS, STATE OF COLORADO  
**BENCHMARK**  
PUBLISHED BENCHMARK: ELEVATIONS ARE BASED ON A DOUGLAS COUNTY CONTROL MONUMENT, STATION NAME: CRAIN, BEING A BRASS DISK LOCATED AT 125 FEET NORTH OF THE CENTERLINE OF A DRIVEWAY, 84 FEET SOUTH OF A DOUBLE 36 IN CULVERT, 25 FEET WEST OF THE EDGE OF PARKER ROAD, AND 25 FEET EAST OF THE WEST RIGHT OF WAY FENCE.  
ELEVATION = 5734.25 FEET (NAV 88) PUBLISHED BY DOUGLAS COUNTY

**BASIS OF BEARING**  
BASIS OF BEARING: ALL BEARINGS ARE GRID BEARINGS OF THE COLORADO STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM 1983. THE WEST LINE OF THE SOUTHWEST QUARTER OF SECTION 10, TOWNSHIP 6 SOUTH, RANGE 66 WEST BEARS N001°7'51"E, MONUMENTED BY THE SOUTHWEST CORNER OF SAID SECTION 10, BEING A 3-1/4" INCH ALUMINUM CAP STAMPED "LS 19003", AND MONUMENTED BY THE WEST QUARTER CORNER OF SAID SECTION 10, BEING A 3-1/4" ALUMINUM CAP STAMPED "PLS 22561", AS SHOWN HEREON.

**CAUTION - NOTICE TO CONTRACTOR**  
1. ALL UTILITY LOCATIONS SHOWN ARE BASED ON MAPS PROVIDED BY THE APPROPRIATE UTILITY COMPANY AND FIELD SURFACE EVIDENCE AT THE TIME OF SURVEY AND IS TO BE CONSIDERED AN APPROXIMATE LOCATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION OF ALL UTILITIES, PUBLIC OR PRIVATE, WHETHER SHOWN ON THE PLANS OR NOT, PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.  
2. WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POT-Holing OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.



- SCHEDULE**
- 1 EXISTING CURB AND GUTTER TO REMAIN
  - 2 EXISTING SIDEWALK TO REMAIN
  - 3 EXISTING SIGN TO REMAIN
  - 4 EXISTING BOLLARD TO REMAIN
  - 5 EXISTING FIBER OPTIC BOX TO REMAIN
  - 6 EXISTING FIBER OPTIC PEDESTAL TO REMAIN
  - 7 EXISTING FIBER OPTIC MANHOLE TO REMAIN
  - 8 EXISTING STORM DRAIN MANHOLE TO REMAIN
  - 9 EXISTING SANITARY SEWER MANHOLE TO REMAIN
  - 10 EXISTING SANITARY SEWER CLEANOUT TO BE REMOVED AND REPLACED
  - 11 EXISTING WATER VALVE TO REMAIN
  - 12 EXISTING ELECTRIC PEDESTAL TO REMAIN
  - 13 EXISTING ELECTRIC BOX TO REMAIN
  - 14 PROPOSED 3879 SF IN-N-OUT BURGER RESTAURANT, REF BUILDING PLANS
  - 15 PROPOSED 0" CONCRETE CURB (REF DET 24, SHT C1.4)
  - 16 PROPOSED 6" THICK 4,000 PSI REINFORCED ON-SITE CONCRETE SIDEWALK OVER 6" MINIMUM THICK 95% COMPACTED CLASS 2 AGGREGATE BASE OVER 12" MINIMUM THICK SUBGRADE SOIL MOISTURE CONDITIONED TO AT LEAST OPTIMUM MOISTURE CONTENT COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DENSITY. REINFORCEMENT TO CONSIST OF NO. 3 REBAR AT 18" O.C. EACH WAY AT MID-HEIGHT OF SLAB

- 17 PROPOSED WHITE DECORATIVE BOLLARD (REF DET 2, SHT C1.3)
- 18 PROPOSED PRIVATE 6" PLANTER CURB (REF DET 24, SHT C1.4)
- 19 PROPOSED "STOP" SIGN, MUTCD R1-1
- 20 PROPOSED STORM SEWER MANHOLE (REF STORM SEWER PLANS)
- 21 PROPOSED LANDSCAPED AREA (REF LANDSCAPE PLAN)
- 22 PROPOSED ADA RAMP WITH DETECTABLE WARNING
- 23 PROPOSED CONCRETE SAWCUT JOINT (REF DET 9, SHT C1.3)
- 24 PROPOSED COLORED CONCRETE CROSSWALK (REF DET 27, SHT C1.5)
- 25 PROPOSED DIRECTIONAL MARKING (REF DET 5, SHT C1.3)
- 26 PROPOSED 9'X18" STANDARD PARKING STALL W/4" SOLID WHITE STRIPING (REF DET 26, SHT C1.4)
- 27 PROPOSED STORM SEWER INLET; REF STORM SEWER PLANS
- 28 PROPOSED BICYCLE RACK
- 29 PROPOSED SITE LIGHTS (REF PHOTOMETRIC PLAN SHT ####)
- 30 PROPOSED MIN 6" THICK 4,000 PSI REINFORCED HEAVY-DUTY CONCRETE OVER 6" MINIMUM THICK 95% COMPACTED CLASS 2 AGGREGATE BASE OVER 12" MINIMUM THICK SUBGRADE SOIL MOISTURE CONDITIONED TO AT LEAST OPTIMUM MOISTURE CONTENT COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DENSITY. REINFORCEMENT TO CONSIST OF NO. 3 REBAR AT 18" O.C. EACH WAY AT MID-HEIGHT OF SLAB (REF DET 16, SHT C1.4) REFER TO GEOTECHNICAL REPORT FOR PAVEMENT SPECIFICATIONS
- 31 PROPOSED ADA SIGNAGE W/ PAINTED WHITE POLE (REF DET 3, SHT C1.3)
- 32 PROPOSED DRIVE THRU CANOPY COLUMN (REF ARCHITECTURAL PLANS)

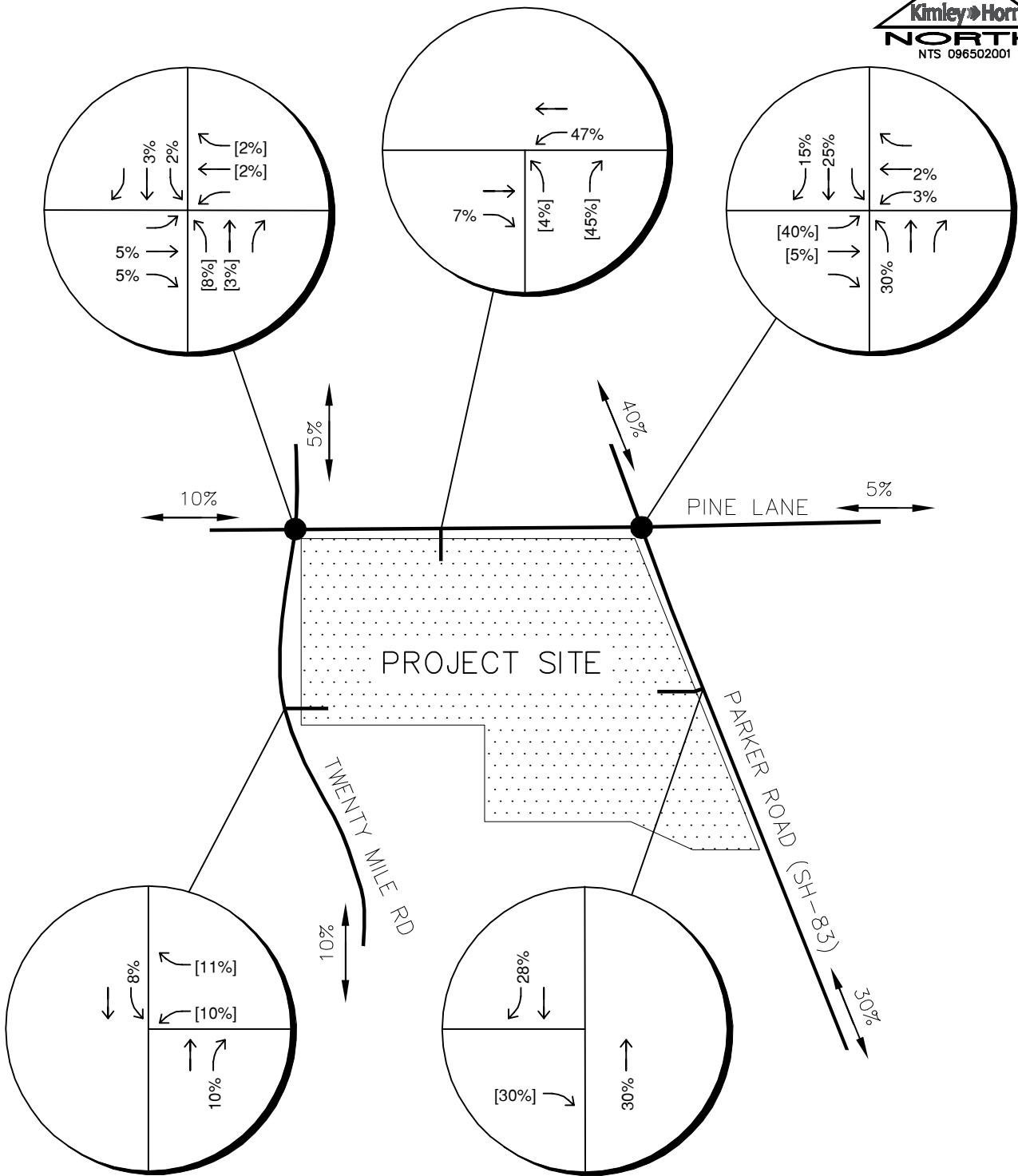
- 33 PROPOSED OUTDOOR SEATING AREA (REF ARCHITECTURAL PLANS)
- 34 PROPOSED OUTDOOR SEATING CANOPY COLUMN (REF ARCHITECTURAL PLANS)
- 35 PROPOSED DECORATIVE CONCRETE JOINT PATTERN AT CUSTOMER ENTRY (REF DET 18 & 19, SHT C1.4)
- 36 PROPOSED 6" PLANTER CURB W/ 12" SIDEWALK (REF DET 25, SHT C1.4)
- 37 PROPOSED IN-N-OUT MENU BOARD AND SPEAKER BOX
- 38 PROPOSED IN-N-OUT DRIVE THRU CANOPY (REF ARCHITECTURAL PLANS)
- 39 PROPOSED HEAVY-DUTY CONCRETE PAVED COLORED JET BLACK PER DAVIS COLORS #860 (LIQUID DOSE RATE: 9 LBS PER 94 LB SACK OF CEMENT) FOR PARKING LOT - MIN 4" THICK 4,000 PSI REINFORCED HEAVY-DUTY CONCRETE OVER 6" MINIMUM THICK 95% COMPACTED CLASS 2 AGGREGATE BASE OVER 12" MINIMUM THICK SUBGRADE SOIL MOISTURE CONDITIONED TO AT LEAST OPTIMUM MOISTURE CONTENT COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DENSITY. REINFORCEMENT TO CONSIST OF NO. 3 REBAR AT 18" O.C. EACH WAY AT MID-HEIGHT OF SLAB (REF GEOTECHNICAL REPORT FOR SPECIFICATIONS) (REF DET 16, SHT C1.4)
- 40 PROPOSED ASPHALT PAVEMENT - 4.5" THICK OVER 6" MINIMUM THICK 95% COMPACTED CLASS 2 AGGREGATE BASE OVER 12" MINIMUM THICK SUBGRADE SOIL MOISTURE CONDITIONED TO AT LEAST 95% OF ITS MAXIMUM DENSITY. REINFORCEMENT TO CONSIST OF NO. 3 REBAR AT 18" O.C. EACH WAY AT MID-HEIGHT OF SLAB (REF GEOTECHNICAL REPORT FOR SPECIFICATIONS) (REF DET 22, SHT C1.4)
- 41 INSTALL 3" WIDE ADA ACCESSIBLE TRUNCATED DOMES DETECTABLE WARNING STRIP. CONTRACTOR TO PROVIDE SAMPLE TO BUILDING INSPECTOR FOR APPROVAL PRIOR TO INSTALLATION. (REF DET 15, SHT C1.4)
- 42 PROPOSED CONCRETE BLOCK TRASH ENCLOSURE, ROOF COVERED TRASH, RECYCLE BIN, TRASH COMPACTOR AND STORAGE CONTAINER ENCLOSURE, NOT SUBJECT TO STORM WATER RUNOFF, PER DETS SHOWN ON THE ARCHITECTURAL BUILDING PLANS.
- 43 PROPOSED 12" WIDE BY 13" LONG CONCRETE TRENCH DRAIN AT THE SPECIFIED ELEVATIONS SHOWN ON SHT C2.1. INSTALL TRAFFIC RATED GRATE SECURED TO PROTECT AGAINST THEFT PER PLUMBING PLANS. TRENCH DRAIN NOT SUBJECT TO STORM WATER RUN-OFF.
- 44 PROPOSED IN-N-OUT DRIVE THRU SIGNAGE

- 45 PROPOSED FIRE LANE SIGN (REF DET 7, SHT C1.3)
- 46 PROPOSED VEHICLE DETECTOR LOOP. INSTALL (2) LOOPS, 12" FROM FACE OF CURB; FIRST LOOP TO BE 2" BELOW TOP OF PAVEMENT, SECOND LOOP TO BE 1" BELOW THE FIRST. NO REBAR WITHIN 12" OF LOOPS
- 47 PROPOSED SEAT WALL (REF DET 12, SHT C1.3)
- 48 PROPOSED "THANK YOU" SIGN
- 49 PROPOSED SAWCUT EXISTING ASPHALT PAVEMENT
- 50 PROPOSED 6" CONCRETE CROSSSPAN (REF DET 17, SHT C1.4)
- 51 PROPOSED "PEDESTRIAN CROSSING" SIGN
- 52 PROPOSED PRIVATE 6" CURB W/ 18" GUTTER (REF DET 20, SHT C1.4)
- 53 PROPOSED FIRE DEPARTMENT CONNECTION
- 54 PROPOSED BENCH SEATING (REF LANDSCAPE ARCHITECTURAL PLANS)
- 55 PROPOSED COVERED SEATING TABLE (REF ARCHITECTURAL PLANS)
- 56 PROPOSED HEAVY-DUTY CONCRETE PAD COLORED JET BLACK PER DAVIS COLORS #860 (LIQUID DOSE RATE: 9 LBS PER 94 LB SACK OF CEMENT) IN FRONT OF TRASH ENCLOSURE - MIN 7" THICK 4,000 PSI REINFORCED HEAVY-DUTY CONCRETE OVER 6" MINIMUM THICK 95% COMPACTED CLASS 2 AGGREGATE BASE OVER 12" MINIMUM THICK SUBGRADE SOIL MOISTURE CONDITIONED TO AT LEAST OPTIMUM MOISTURE CONTENT COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DENSITY. REINFORCEMENT TO CONSIST OF NO. 3 REBAR AT 18" O.C. EACH WAY AT MID-HEIGHT OF SLAB (PER GEOTECHNICAL RECOMMENDATIONS. REFER TO GEOTECHNICAL REPORT FOR FURTHER PAVEMENT SPECIFICATIONS)
- 57 PROPOSED CONCRETE PAD WITH UMBRELLA
- 58 PROPOSED ASSOCIATE WALKWAY (REF DET 14, SHT C1.3)
- 59 PROPOSED FIRE HYDRANT

- 60 NOT USED
- 61 PROPOSED 1" IRRIGATION TAP & METER
- 62 PROPOSED 9'X18" ADA PARKING STALL AND PAINTED ACCESS AISLE WITH 4" SOLID BLUE STRIPING 2" O.C. @ 45° ANGLE (REF DET 6, SHT C1.3 AND DET 26, SHT C1.4)
- 63 EXISTING ELECTRIC TRANSFORMER ON CONCRETE PAD TO REMAIN
- 64 PROPOSED RETAINING WALL
- 65 PROPOSED SEATING TABLE WITH UMBRELLA
- 66 PROPOSED HANDRAILS
- 67 PROPOSED PUBLIC ART AREA
- 68 PROPOSED ELUSIVE CABINET
- 69 PROPOSED SANITARY MANHOLE

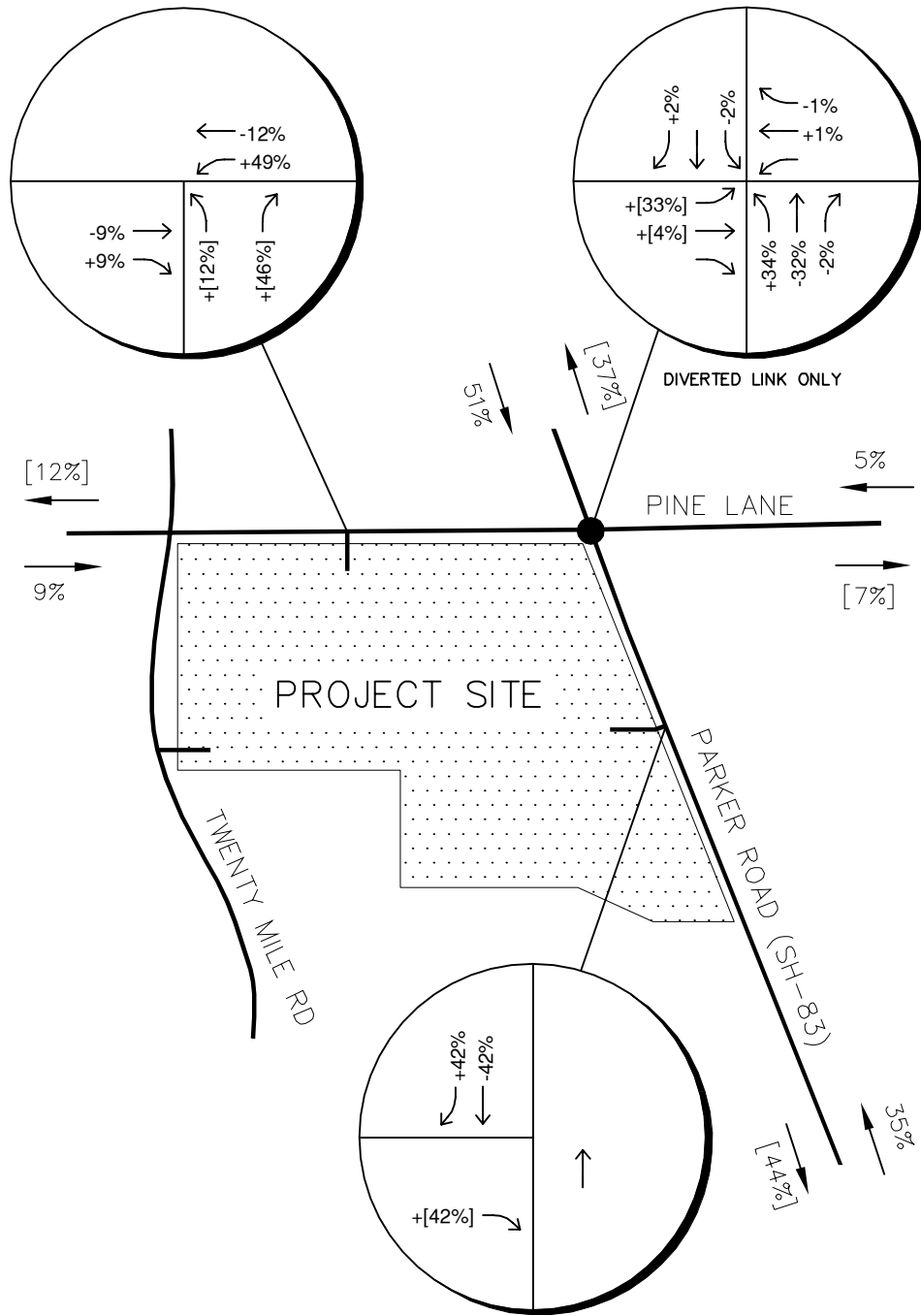
**ATTACHMENT I**  
**Kimley Horn Approved TIS Figures and Outputs**





PARKER AND PINE  
 PARKER ROAD & PINE LANE  
 PROJECT TRIP DISTRIBUTION

FIGURE 6



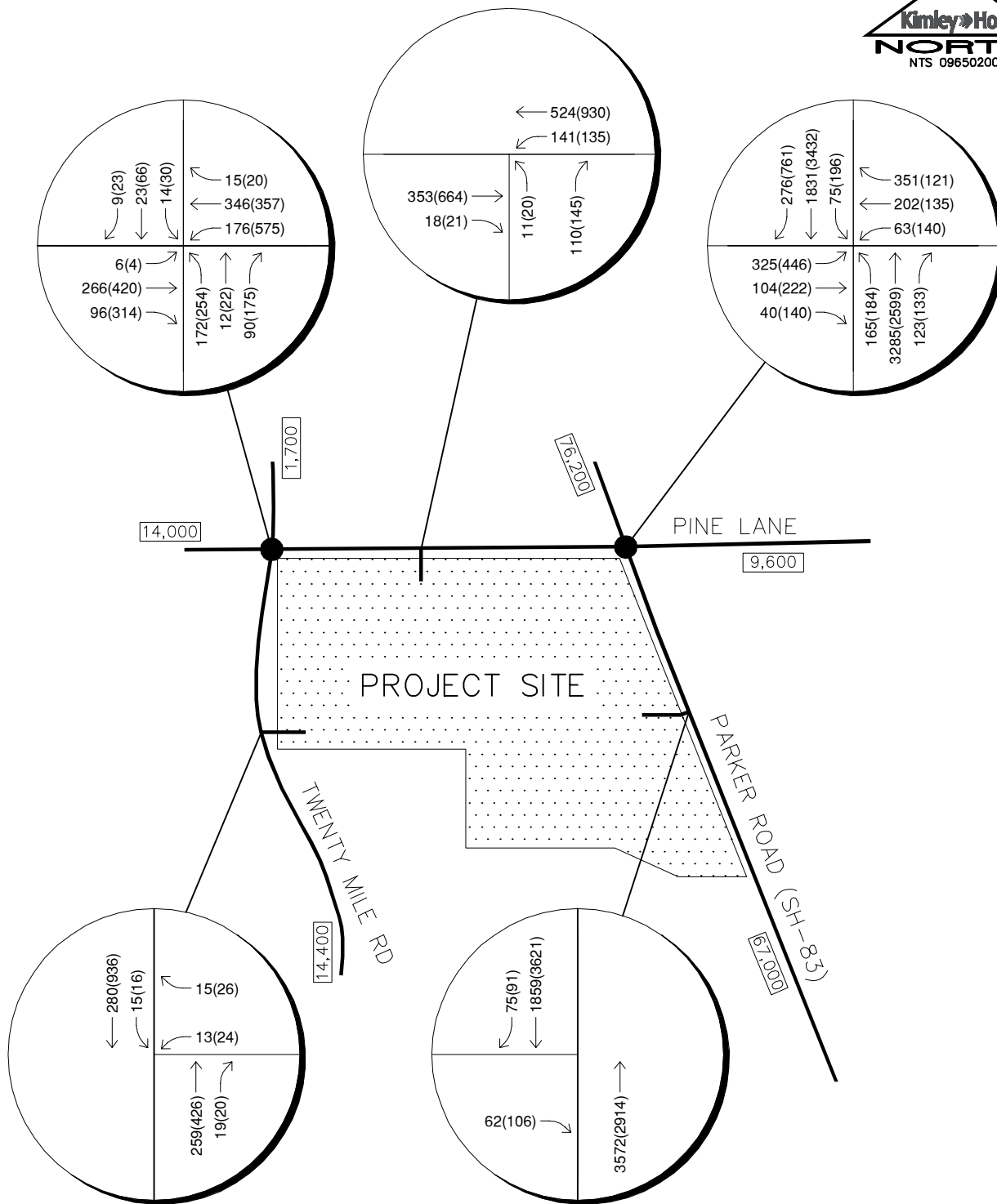
LEGEND

● Study Area Key Intersection

XX%[XX%] Entering[Exiting] Trip Distribution Percentage

PARKER AND PINE  
 PARKER ROAD & PINE LANE  
 PM PEAK PASS-BY TRIP DISTRIBUTION

FIGURE 8



**LEGEND**

























- Study Area Key Intersection
- XX(XX) Weekday AM(PM) Peak Hour Traffic Volumes
- XX,X00 Estimated Daily Traffic Volume

PARKER AND PINE  
 PARKER ROAD & PINE LANE  
 2040 BACKGROUND  
 PLUS PROJECT TRAFFIC VOLUMES

FIGURE 12

HCM 2010 Signalized Intersection Summary  
 1: Parker Road & Pine Lane

2040 Total PM.syn  
 08/14/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	446	222	140	140	135	121	184	2599	133	196	3432	761
Future Volume (veh/h)	446	222	140	140	135	121	184	2599	133	196	3432	761
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	485	241	0	152	147	0	200	2825	0	213	3730	0
Adj No. of Lanes	2	2	1	2	2	1	2	3	1	2	3	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	359	406	181	209	252	113	158	3156	1079	186	3198	1161
Arrive On Green	0.03	0.04	0.00	0.06	0.07	0.00	0.05	0.62	0.00	0.05	0.63	0.00
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	485	241	0	152	147	0	200	2825	0	213	3730	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1695	1583	1721	1695	1583
Q Serve(g_s), s	12.5	8.0	0.0	5.2	4.8	0.0	5.5	56.9	0.0	6.5	75.5	0.0
Cycle Q Clear(g_c), s	12.5	8.0	0.0	5.2	4.8	0.0	5.5	56.9	0.0	6.5	75.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	359	406	181	209	252	113	158	3156	1079	186	3198	1161
V/C Ratio(X)	1.35	0.59	0.00	0.73	0.58	0.00	1.27	0.90	0.00	1.14	1.17	0.00
Avail Cap(c_a), veh/h	359	602	269	290	531	237	158	3156	1079	186	3198	1161
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	57.9	55.0	0.0	55.4	54.0	0.0	57.3	19.4	0.0	56.8	22.3	0.0
Incr Delay (d2), s/veh	176.1	1.4	0.0	5.6	2.1	0.0	161.0	4.4	0.0	109.5	78.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.7	4.0	0.0	2.6	2.4	0.0	6.1	27.7	0.0	5.9	58.2	0.0
LnGrp Delay(d),s/veh	234.1	56.4	0.0	61.0	56.2	0.0	218.2	23.9	0.0	166.2	100.8	0.0
LnGrp LOS	F	E		E	E		F	C		F	F	
Approach Vol, veh/h		726			299			3025			3943	
Approach Delay, s/veh		175.1			58.6			36.7			104.4	
Approach LOS		F			E			D			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.0	79.0	11.8	18.3	10.0	80.0	17.0	13.0				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	6.5	65.0	10.1	20.4	5.5	66.0	12.5	18.0				
Max Q Clear Time (g_c+I1), s	8.5	58.9	7.2	10.0	7.5	77.5	14.5	6.8				
Green Ext Time (p_c), s	0.0	6.1	0.1	1.6	0.0	0.0	0.0	1.7				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			83.5									
HCM 2010 LOS			F									

**Intersection**

Int Delay, s/veh 2.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑↑	↑	
Traffic Vol, veh/h	664	21	135	930	20	145
Future Vol, veh/h	664	21	135	930	20	145
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	722	23	147	1011	22	158

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	745
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.22
Pot Cap-1 Maneuver	-	-	859
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	859
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	24.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	361	-	-	859	-
HCM Lane V/C Ratio	0.497	-	-	0.171	-
HCM Control Delay (s)	24.4	-	-	10.1	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	2.7	-	-	0.6	-



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑↑	↑↑↑	↗
Traffic Volume (veh/h)	0	106	0	2914	3621	91
Future Volume (Veh/h)	0	106	0	2914	3621	91
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	115	0	3167	3936	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)					470	
pX, platoon unblocked	0.46	0.46	0.46			
vC, conflicting volume	4728	1312	4035			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4998	0	3482			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	77	100			
cM capacity (veh/h)	0	496	33			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	115	792	792	792	792	1312	1312	1312	99
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	115	0	0	0	0	0	0	0	99
cSH	496	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.23	0.47	0.47	0.47	0.47	0.77	0.77	0.77	0.06
Queue Length 95th (ft)	22	0	0	0	0	0	0	0	0
Control Delay (s)	14.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B								
Approach Delay (s)	14.4	0.0				0.0			
Approach LOS	B								

Intersection Summary		
Average Delay		0.2
Intersection Capacity Utilization	83.2%	ICU Level of Service
Analysis Period (min)	15	E

## Queues

2040 Total PM.syn

## 1: Parker Road &amp; Pine Lane

08/10/2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	484	241	152	152	147	132	201	2821	145	213	3727	825
v/c Ratio	1.36	0.58	0.10	0.56	0.45	0.08	0.56	1.02	0.13	0.57	1.33	0.71
Control Delay	212.9	36.0	0.1	61.5	55.5	0.1	58.7	49.5	1.9	57.8	178.8	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	212.9	36.0	0.1	61.5	55.5	0.1	58.7	49.5	1.9	57.8	178.8	11.5
Queue Length 50th (ft)	~232	93	0	59	57	0	77	~860	3	81	~1374	246
Queue Length 95th (ft)	#346	110	0	94	89	0	#141	#947	25	#134	#1446	392
Internal Link Dist (ft)		525			849			390			780	
Turn Bay Length (ft)	175		50	325		50	625			550		
Base Capacity (vph)	357	601	1583	288	530	1583	356	2771	1098	374	2796	1167
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.36	0.40	0.10	0.53	0.28	0.08	0.56	1.02	0.13	0.57	1.33	0.71

## Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

INO Traffic Analysis  
Parker, CO

# ATTACHMENT II Updated Synchro Outputs



Queues

1: Parker Road & Pine Lane

03/24/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	508	245	152	152	148	130	221	2808	143	212	3733	829
v/c Ratio	1.34	0.55	0.53	0.54	0.43	0.54	1.12	0.96	0.15	1.08	1.28	0.76
Control Delay	209.1	51.6	25.2	57.6	51.8	24.9	148.9	33.1	4.6	136.1	151.8	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	209.1	51.6	25.2	57.6	51.8	24.9	148.9	33.1	4.6	136.1	151.8	13.4
Queue Length 50th (ft)	~246	90	36	55	54	24	~94	661	13	~87	~1250	199
Queue Length 95th (ft)	#372	132	101	92	87	85	#182	#895	44	#175	#1413	415
Internal Link Dist (ft)		398			4680			693			1174	
Turn Bay Length (ft)	175		50	325		50	625			550		
Base Capacity (vph)	379	642	368	304	564	332	197	2926	953	197	2926	1096
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.34	0.38	0.41	0.50	0.26	0.39	1.12	0.96	0.15	1.08	1.28	0.76

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM 2010 Signalized Intersection Summary

## 1: Parker Road & Pine Lane

03/24/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	467	225	140	140	136	120	203	2583	132	195	3434	763
Future Volume (veh/h)	467	225	140	140	136	120	203	2583	132	195	3434	763
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	508	245	0	152	148	0	221	2808	0	212	3733	0
Adj No. of Lanes	2	2	1	2	2	1	2	3	1	2	3	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	395	414	185	214	228	102	205	3032	944	205	3032	944
Arrive On Green	0.11	0.12	0.00	0.06	0.06	0.00	0.06	0.60	0.00	0.06	0.60	0.00
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	508	245	0	152	148	0	221	2808	0	212	3733	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1695	1583	1721	1695	1583
Q Serve(g_s), s	12.5	7.2	0.0	4.7	4.5	0.0	6.5	54.3	0.0	6.5	65.0	0.0
Cycle Q Clear(g_c), s	12.5	7.2	0.0	4.7	4.5	0.0	6.5	54.3	0.0	6.5	65.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	395	414	185	214	228	102	205	3032	944	205	3032	944
V/C Ratio(X)	1.29	0.59	0.00	0.71	0.65	0.00	1.08	0.93	0.00	1.03	1.23	0.00
Avail Cap(c_a), veh/h	395	665	298	316	584	261	205	3032	944	205	3032	944
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	48.3	45.7	0.0	50.2	49.8	0.0	51.3	19.9	0.0	51.3	22.0	0.0
Incr Delay (d2), s/veh	147.3	1.4	0.0	4.3	3.1	0.0	84.8	6.3	0.0	71.8	107.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.0	3.6	0.0	2.4	2.3	0.0	5.5	27.0	0.0	5.1	60.1	0.0
LnGrp Delay(d),s/veh	195.5	47.0	0.0	54.5	52.9	0.0	136.1	26.1	0.0	123.1	129.2	0.0
LnGrp LOS	F	D		D	D		F	C		F	F	
Approach Vol, veh/h		753			300			3029			3945	
Approach Delay, s/veh		147.2			53.7			34.1			128.8	
Approach LOS		F			D			C			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.0	69.5	11.3	17.2	11.0	69.5	17.0	11.5				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	6.5	65.0	10.0	20.5	6.5	65.0	12.5	18.0				
Max Q Clear Time (g_c+I1), s	8.5	56.3	6.7	9.2	8.5	67.0	14.5	6.5				
Green Ext Time (p_c), s	0.0	8.4	0.1	1.1	0.0	0.0	0.0	0.6				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			92.0									
HCM 2010 LOS			F									

Intersection						
Int Delay, s/veh	3.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑↑	↘	
Traffic Vol, veh/h	559	27	164	924	26	173
Future Vol, veh/h	559	27	164	924	26	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	125	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	608	29	178	1004	28	188

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	637	0	1481 319
Stage 1	-	-	-	-	623 -
Stage 2	-	-	-	-	858 -
Critical Hdwy	-	-	4.14	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.22	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	943	-	116 677
Stage 1	-	-	-	-	497 -
Stage 2	-	-	-	-	376 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	943	-	94 677
Mov Cap-2 Maneuver	-	-	-	-	94 -
Stage 1	-	-	-	-	497 -
Stage 2	-	-	-	-	305 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	27
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	374	-	-	943	-
HCM Lane V/C Ratio	0.578	-	-	0.189	-
HCM Control Delay (s)	27	-	-	9.7	-
HCM Lane LOS	D	-	-	A	-
HCM 95th %tile Q(veh)	3.5	-	-	0.7	-

# HCM Unsignalized Intersection Capacity Analysis

## 4: Parker Road & Parker Access

03/24/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR				
Lane Configurations		↗		↑↑↑	↑↑↑	↗				
Traffic Volume (veh/h)	0	130	0	2916	3600	114				
Future Volume (Veh/h)	0	130	0	2916	3600	114				
Sign Control	Stop			Free		Free				
Grade	0%			0%	0%					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Hourly flow rate (vph)	0	141	0	3170	3913	124				
<b>Pedestrians</b>										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None	None					
Median storage (veh)										
Upstream signal (ft)						773				
pX, platoon unblocked	0.44	0.44	0.44							
vC, conflicting volume	4706	1304	4037							
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	4966	0	3450							
tC, single (s)	6.8	6.9	4.1							
tC, 2 stage (s)										
tF (s)	3.5	3.3	2.2							
p0 queue free %	100	71	100							
cM capacity (veh/h)	0	478	33							
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4	
Volume Total	141	792	792	792	792	1304	1304	1304	124	
Volume Left	0	0	0	0	0	0	0	0	0	
Volume Right	141	0	0	0	0	0	0	0	124	
cSH	478	1700	1700	1700	1700	1700	1700	1700	1700	
Volume to Capacity	0.29	0.47	0.47	0.47	0.47	0.77	0.77	0.77	0.07	
Queue Length 95th (ft)	30	0	0	0	0	0	0	0	0	
Control Delay (s)	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Lane LOS	C									
Approach Delay (s)	15.6	0.0					0.0			
Approach LOS	C									
<b>Intersection Summary</b>										
Average Delay	0.3									
Intersection Capacity Utilization	84.3%			ICU Level of Service				E		
Analysis Period (min)	15									