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# Barajas Traffic Impact Analysis

Jurisdiction: City of Monroe

November 2018



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## 1. DEVELOPMENT IDENTIFICATION

Gibson Traffic Consultants, Inc. (GTC) has been retained to provide a traffic impact analysis for the proposed Barajas development to address the City of Monroe, Snohomish County and Washington State Department of Transportation (WSDOT) traffic impacts. Brad Lincoln, responsible for this report and traffic analysis, is a licensed professional engineer (Civil) in the State of Washington and member of the Washington State section of ITE.

The Barajas development is proposed to consist of a total of 19 single-family residential units that will be constructed in one phase. There is 1 existing single-family residential unit that will be removed and will be credited to the development. The analysis in this report has therefore been performed for 18 new single-family residential units. The development site is located along the south side of 134<sup>th</sup> Street SE, west of 191<sup>st</sup> Avenue SE. A site vicinity map has been included in Figure 1.

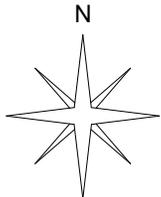
## 2. METHODOLOGY

Trip generation calculations for the Barajas development have been performed utilizing average trip generation data contained in the Institute of Transportation Engineers' (ITE) *Trip Generation, 10<sup>th</sup> Edition (2017)*. The distribution of trips generated by the site is based on approved distributions for developments in the site vicinity.

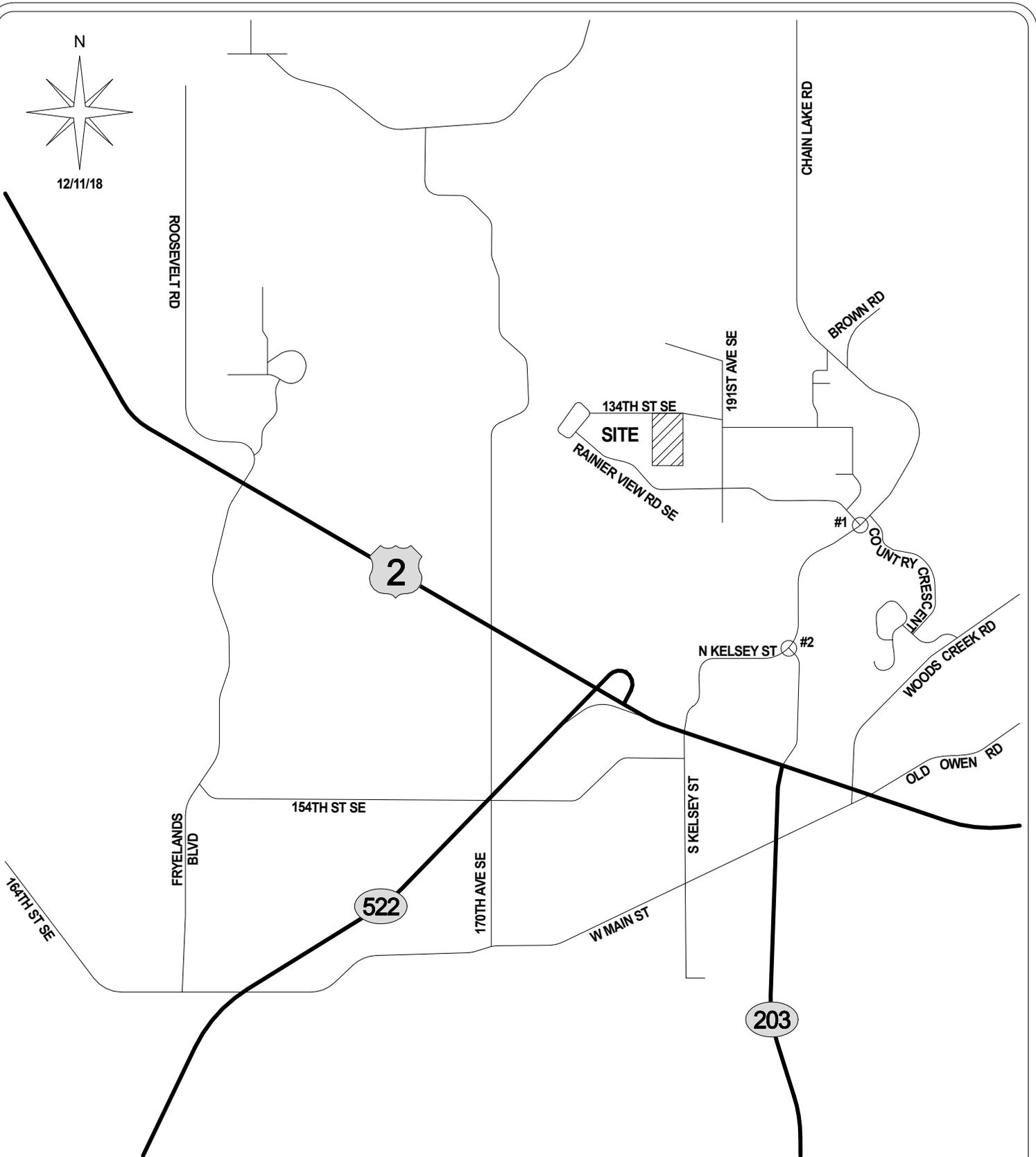
Intersection level of service analysis has been performed based on typical City of Monroe requirements and previous scoping conversations with City of Monroe staff. Level of service analysis has been performed for the following City of Monroe intersections:

1. Chain Lake Road at Rainier View Road SE
2. Chain Lake Road at Kelsey Street

Congestion at intersections is generally measured in terms of level of service (LOS). In accordance with *Highway Capacity Manual: 6<sup>th</sup> Edition (HCM)* by the Transportation Research Board, road facilities and intersections are rated between LOS A and LOS F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions. The level of service at signalized, roundabout and all-way stop-controlled intersections is based on the average delay of all approaches. The level of service for two-way stop-controlled intersections is based on average delays for the stopped approach with the highest delay. Geometric characteristics and conflicting traffic movements are taken into consideration when determining level of service values. A summary of the intersection level of service criteria is included in Table 1.



12/11/18



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GTC #18-319**

**BARAJAS DEVELOPMENT  
18 NET NEW SINGLE FAMILY  
DWELLINGS**

**LEGEND**



DEVELOPMENT SITE



STUDY INTERSECTION

**FIGURE 1  
SITE VICINITY  
MAP**

**CITY OF MONROE**

**Table 1: Level of Service Criteria for Intersections**

Level of <sup>1</sup> Service	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	Signalized Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delays	>35 and ≤50	>55 and ≤80
F	Extreme Delays <sup>2</sup>	>50	>80

The City of Monroe has a level of service threshold of LOS D for arterial road intersections, which includes both of the City of Monroe study intersections. The level of service analysis has been performed utilizing the *Synchro 10.2 Build 0* software for the intersection of Chain Lake Road at (intersection 1). The *Sidra 8.0* software has been utilized for the intersection of Chain Lake Road at Kelsey Street (intersection 2), which is a roundabout.

The City of Monroe also has an interlocal agreement with Snohomish County to provide turning movements at Snohomish County key intersections impacted with 3 or more directional peak-hour trips on any approach or departure and for traffic mitigation fees.

<sup>1</sup> **Source:** *Highway Capacity Manual 6<sup>th</sup> Edition*.

LOS A: Free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).

LOS B: Generally stable traffic flow conditions.

LOS C: Occasional back-ups may develop, but delay to vehicles is short term and still tolerable.

LOS D: During short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).

LOS E: Intersections operate at or near capacity, with long queues developing on all approaches and long delays.

LOS F: Jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

<sup>2</sup> When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

### 3. TRIP GENERATION

The trip generation calculations for the Barajas development are based on the average trip generation rates for ITE Land Use Code 210, Single-Family Detached Housing. The trip generation calculations are based on the 30 new units of the Barajas development, which includes credit for the existing unit on the site and are summarized in Table 2.

**Table 2: Trip Generation Summary**

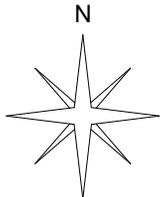
18 New Single-Family Residential Units	Average Daily Trips			AM Peak-Hour Trips			PM Peak-Hour Trips		
	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Generation Rate	9.44 trips per unit			0.74 trips per unit			0.99 trips per unit		
Splits	50%	50%	100%	25%	75%	100%	63%	37%	100%
Trips	84.96	84.96	169.92	3.33	9.99	13.32	11.23	6.59	17.82

The 18 new units are anticipated to generate approximately 169.92 average daily trips with approximately 13.32 AM peak-hour trips and 17.82 PM peak-hour trips.

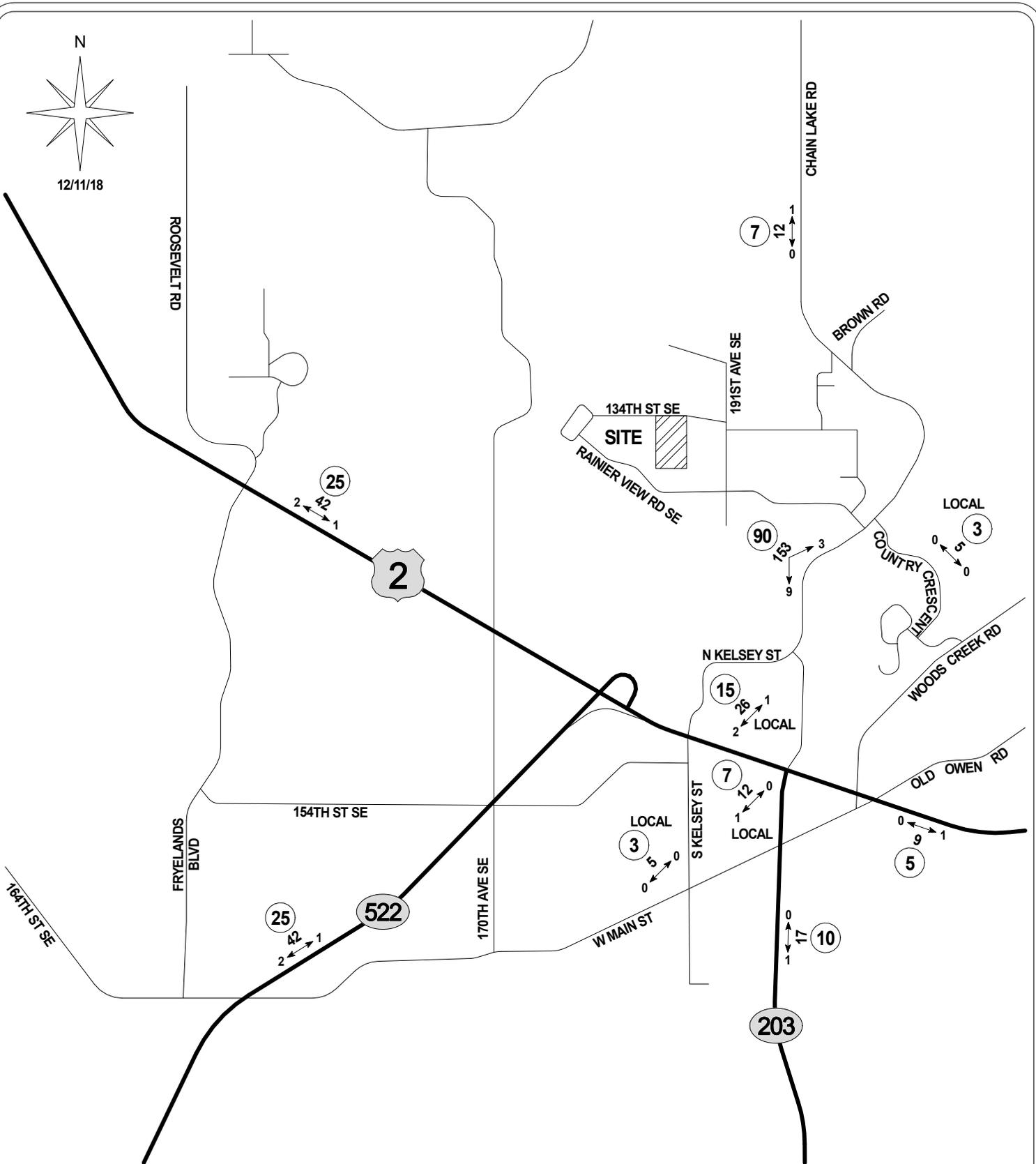
### 4. TRIP DISTRIBUTION

The distribution of trips generated by the Barajas development is based on approved distributions for developments in the site vicinity. It is anticipated that 25% of the development's trips will travel to and from the west along US-2. Approximately 35% of the development's trips will travel to and from the south, twenty-five percent along SR-522 and ten percent along SR-203. It is estimated that 28% of the development's trips will travel to and from local areas in the vicinity of the development, ten percent south of US-2, fifteen percent north of US-2, and three percent to the east. The remaining 12% of the development's trips are anticipated to travel to and from the north and east, seven percent to and from the north along Chain Lake Road and five percent to and from the east along US-2. Detailed distributions are included in Figure 2 for the AM peak-hour and Figure 3 for the PM peak-hour.

The interlocal agreement with Snohomish County requires key intersections impacted with 3 or more directional peak-hour trips on any approach or departure to be shown. The Barajas development will impact 3 key intersections during the PM peak-hour. The key intersection impacts are shown in detail in the attachments of this report. Snohomish County's trip distribution policy states that trips along US-2 do not need to be distributed west of 88<sup>th</sup> Street SE. Trips traveling to and from the south along SR-522 and SR-203 are anticipated to travel to and from King County.



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**BARAJAS DEVELOPMENT**  
18 NET NEW SINGLE FAMILY DWELLINGS

LEGEND

AWDT  
AM ↔ PEAK

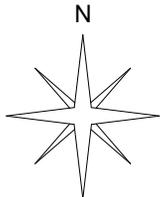
NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)



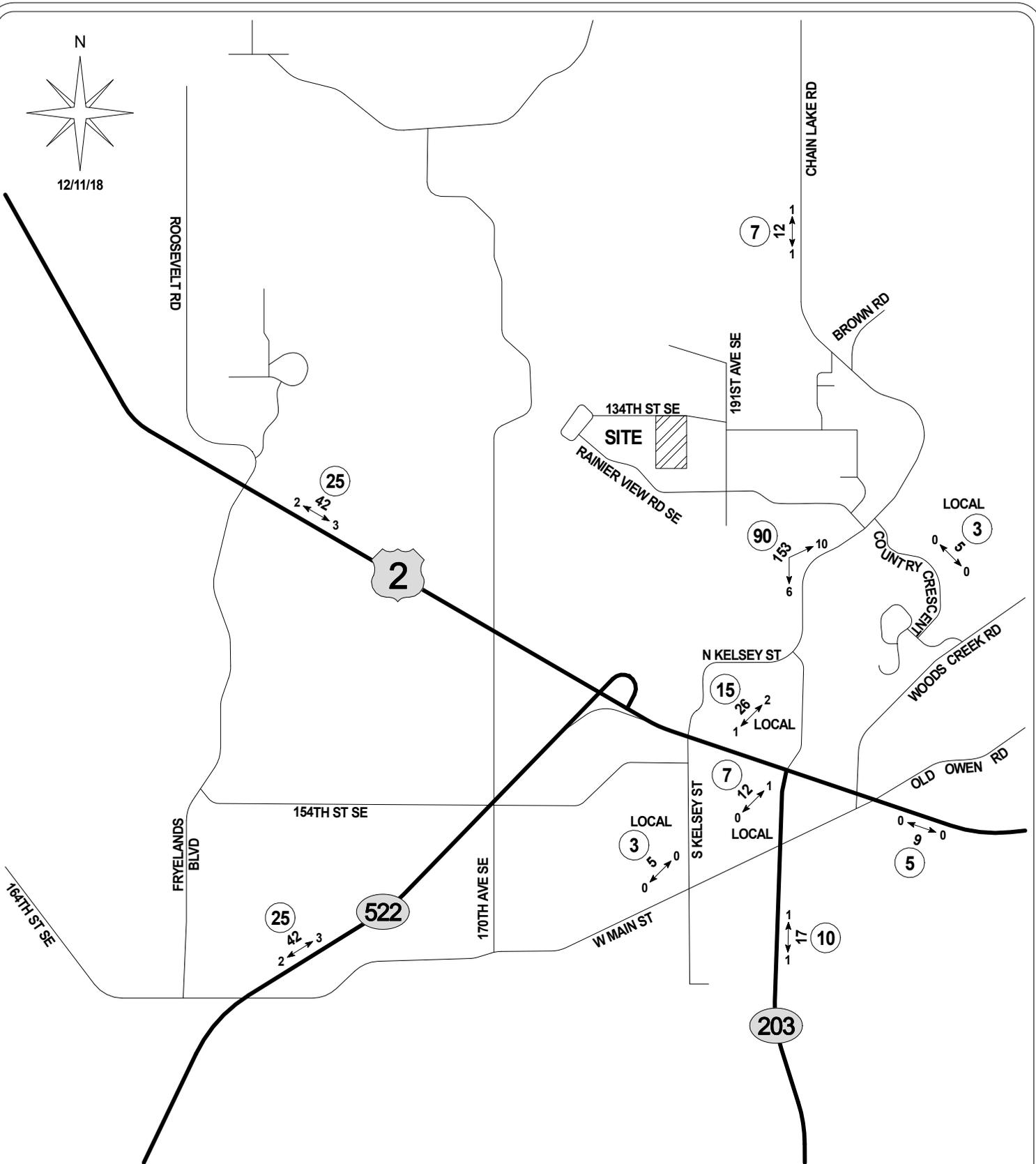
TRIP DISTRIBUTION %

**FIGURE 2**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**AM PEAK-HOUR**

**CITY OF MONROE**



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**BARAJAS DEVELOPMENT**  
18 NET NEW SINGLE FAMILY DWELLINGS

**LEGEND**  
AWDT  
PM ↔ PEAK  
**XX**

NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)

TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

**CITY OF MONROE**

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## 5. INTERSECTION LEVEL OF SERVICE ANALYSIS

The intersections that have been analyzed as part of this report are based on the typical City of Monroe requirements and previous scoping discussions with City of Monroe staff. Level of service analysis has been performed for the following intersections for the weekday PM peak-hour:

1. Chain Lake Road at Rainier View Road SE
2. Chain Lake Road at Kelsey Street

The analysis has been completed for the existing, 2028 baseline and 2028 future with development conditions.

### 5.1 Turning Movement Volumes

The existing turning movements at the study intersections are based on data collected by the independent count firm, Traffic Data Gathering (TDG), in January 2018. The existing turning movements at the study intersections are shown in Figure 4.

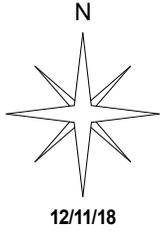
The 2028 baseline volumes have been calculated using a 10-year horizon period and applying a 2% annually compounding growth rate with the following pipeline developments:

- Eaglemont I-III (F.K.A. Eaglemont) – 15 unconstructed new single-family units
- Eaglemont IV (F.K.A. Eaglemont IV-VIII) – 117 new single-family units
- Eaglemont V – 15 new single-family units
- Eaglemont VI (F.K.A. Sky View Ridge) – 44 new single-family units
- Eaglemont VII – 41 new single-family units
- Easton Cove (F.K.A. Klier Property) – 88 new single-family units
- Worthington Heights – 100 new single-family units
- Raspberry Hill – 25 new single-family units
- Clothier Short Plat – 6 new single-family units
- 2 Short Plats north of Easton Cove – 10 new single-family units
- Kestrel Ridge – 30 new single-family units

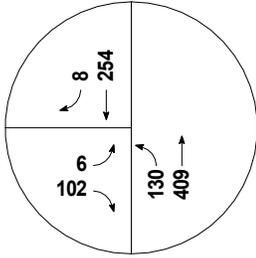
The approved PM peak-hour trip distributions for the pipeline developments are included in the attachments. For the pipeline projects where a trip distribution was not available, the pipeline's trips were distributed in accordance with the Barajas distribution. The Eaglemont I-III development is anticipated to have a total of 149 units, however, GTC staff surveyed the area and found 134 completed and lived in houses, resulting in 15 unconstructed houses for the Eaglemont I-III development. The 2028 baseline turning movements at the study intersections are shown in Figure 5.

The 2028 future with development turning movements were calculated by adding the development's turning movements to the 2028 baseline turning movements. The 2028 future with development turning movements are shown in Figure 6.

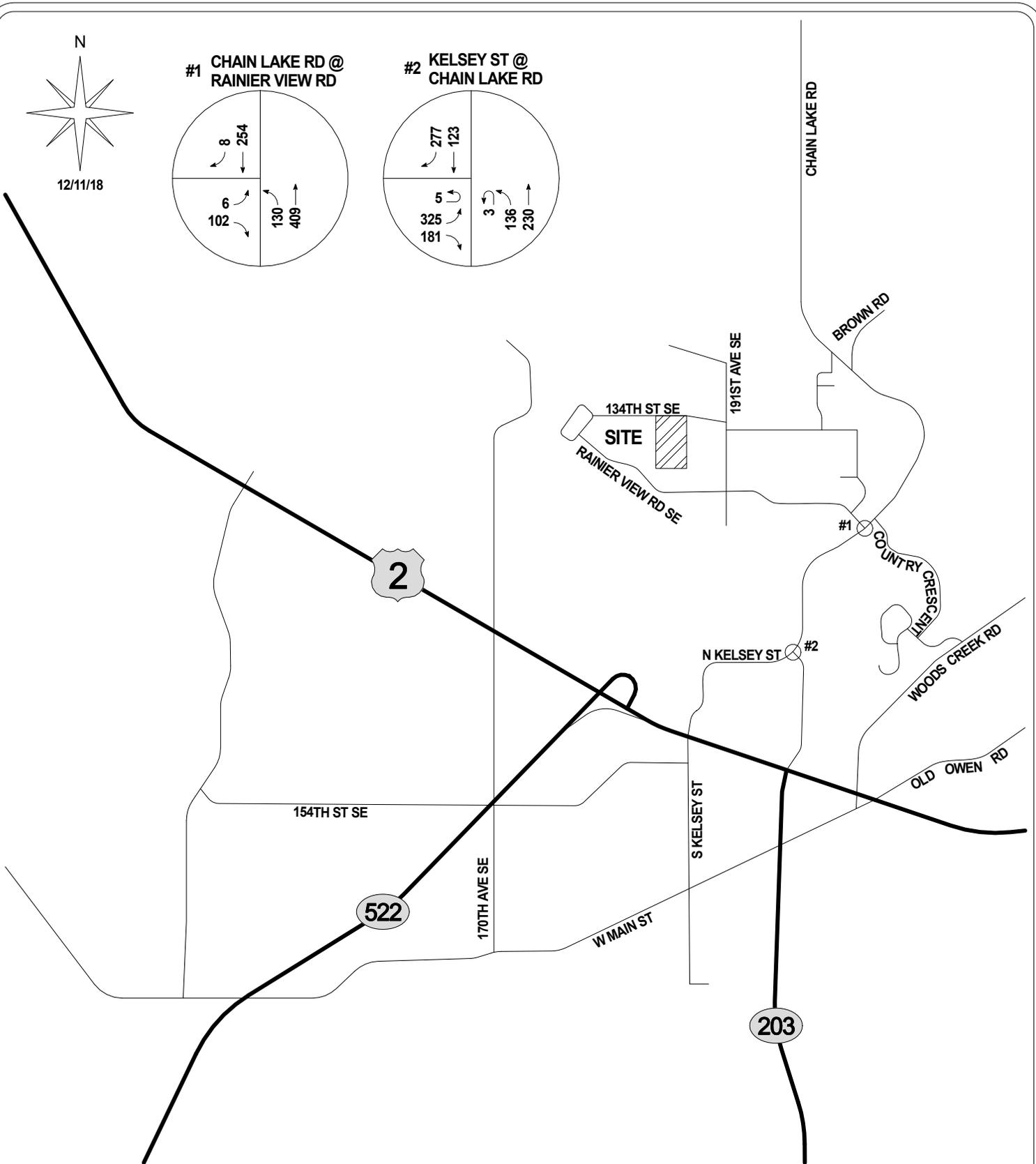
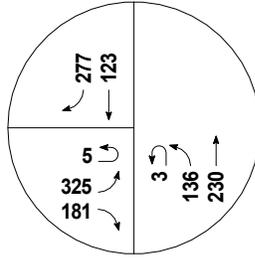
The existing turning movement counts and turning movement calculations are included in the attachments.



#1 CHAIN LAKE RD @ RAINIER VIEW RD



#2 KELSEY ST @ CHAIN LAKE RD



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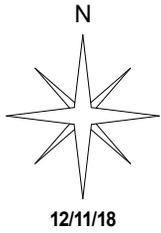
**BARAJAS DEVELOPMENT  
18 NET NEW SINGLE FAMILY  
DWELLINGS**

LEGEND

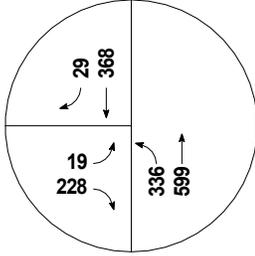
XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

**FIGURE 4  
EXISTING  
TURNING MOVEMENTS**

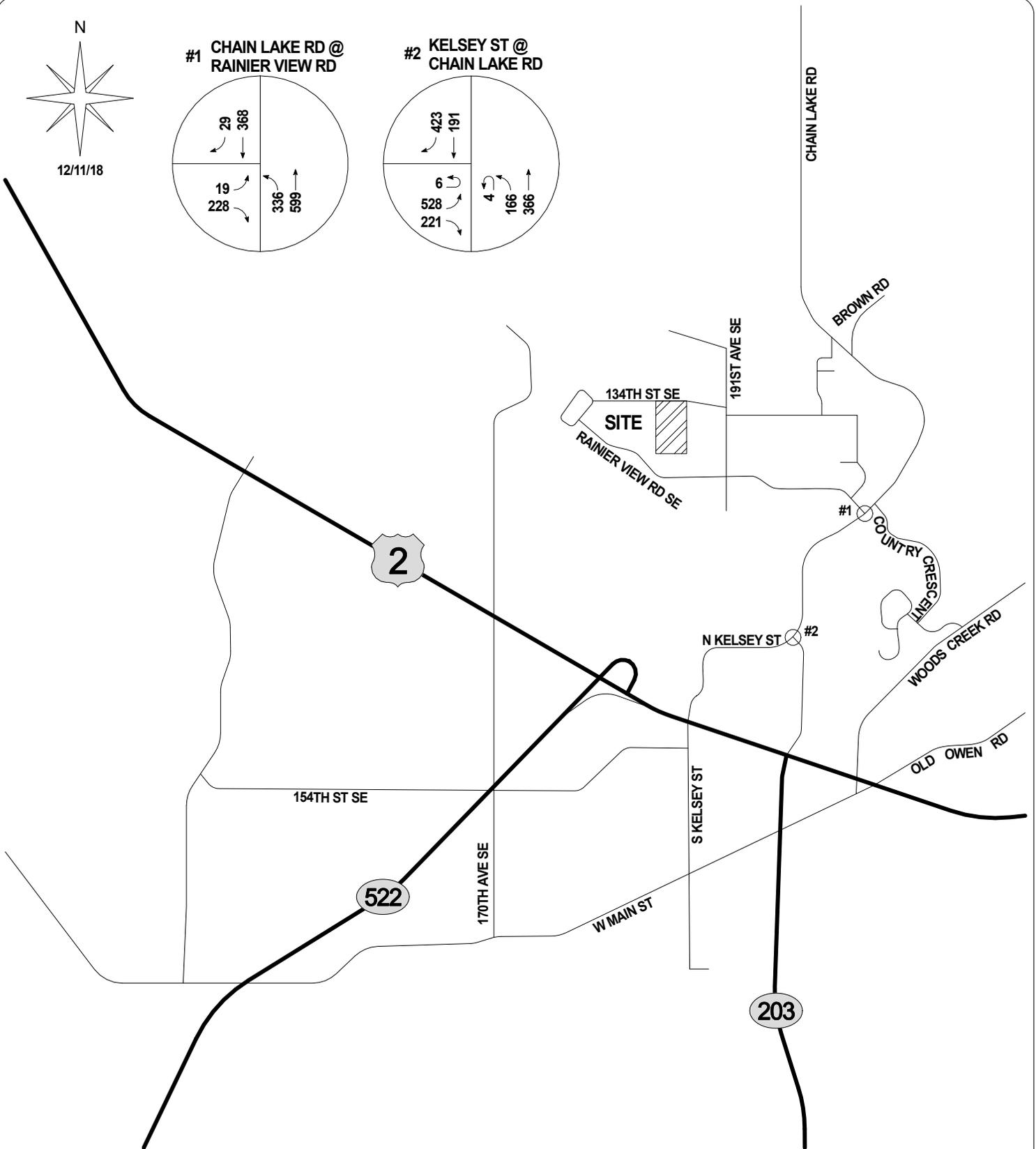
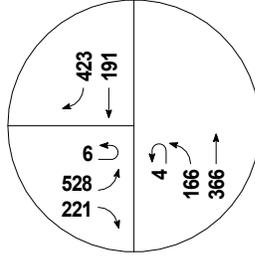
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#1 CHAIN LAKE RD @ RAINIER VIEW RD



#2 KELSEY ST @ CHAIN LAKE RD



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GTC #18-319**

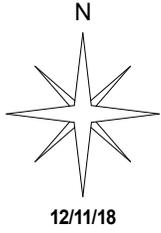
**BARAJAS DEVELOPMENT  
18 NET NEW SINGLE FAMILY  
DWELLINGS**

LEGEND

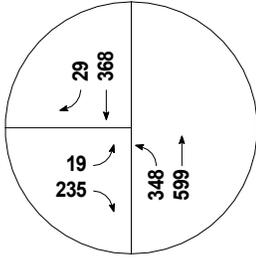
XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

**FIGURE 5  
2028 BASELINE  
TURNING MOVEMENTS**

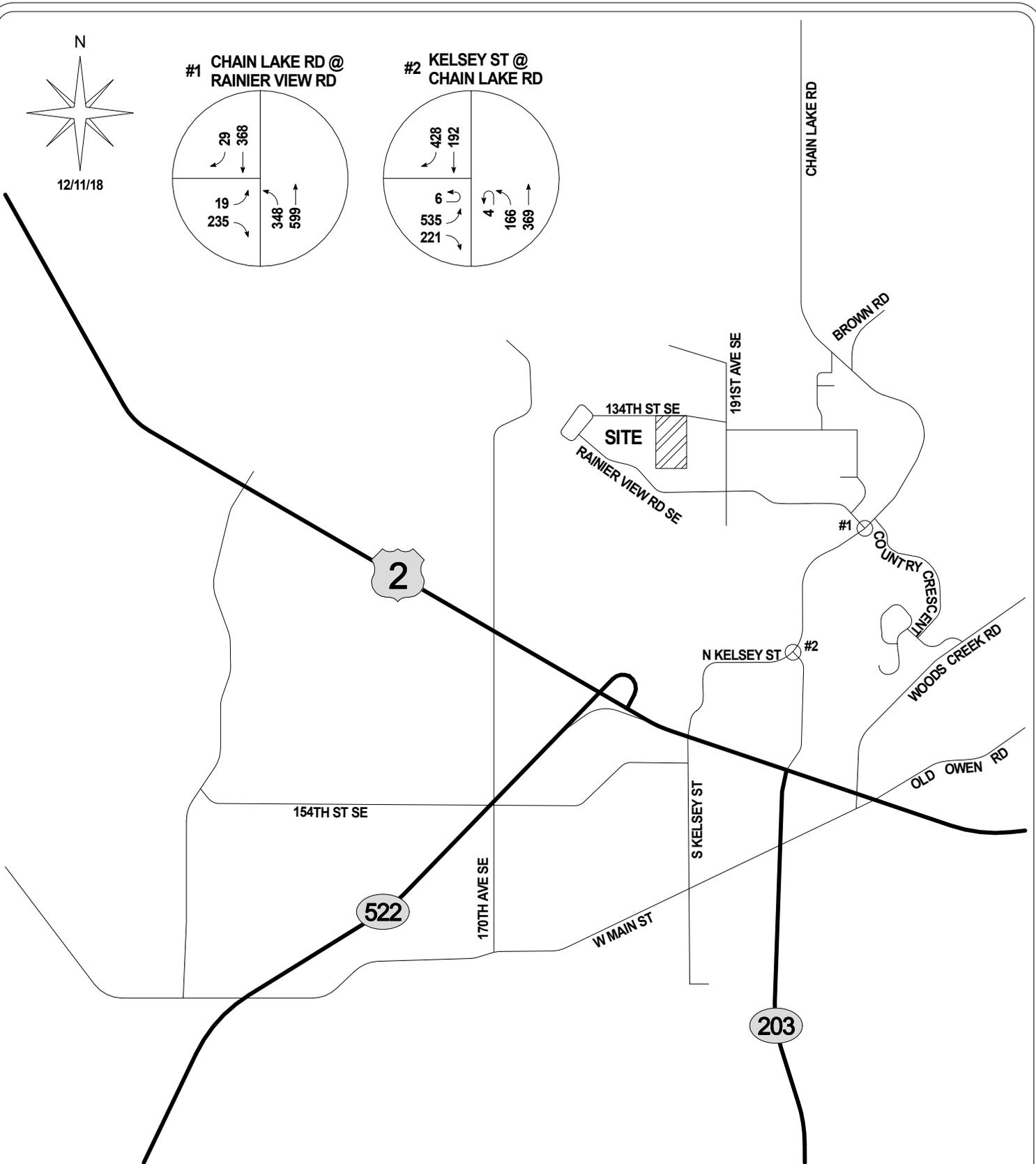
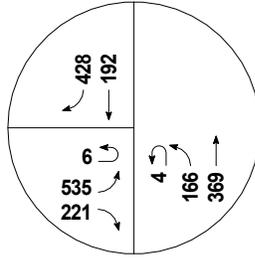
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#1 CHAIN LAKE RD @ RAINIER VIEW RD



#2 KELSEY ST @ CHAIN LAKE RD



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**TRAFFIC IMPACT STUDY  
GTC #18-319**

**BARAJAS DEVELOPMENT  
18 NET NEW SINGLE FAMILY  
DWELLINGS**

LEGEND

XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

**CITY OF MONROE**

**FIGURE 6  
2028 FUTURE  
WITH DEVELOPMENT  
TURNING MOVEMENTS**

## 5.2 Intersection Level of Service Results

The level of service analysis has been performed utilizing the existing control, channelization, peak-hour factors and heavy-vehicle factors from the 2018 counts.

The level of service analysis shows that the development will not cause any intersection to operate at LOS F and will not cause the level of service to change from the 2028 baseline conditions. However, the intersection of Chain Lake Road at Rainier View Road SW is anticipated to operate at LOS E under the 2028 baseline and 2028 future with development conditions. The level of service results for the study intersections are summarized in Table 3.

**Table 3: Intersection Level of Service Summary**

Intersection	Intersection Type	2018 Existing Conditions		2028 Baseline Conditions		2028 Future Conditions with Development	
		LOS	Delay	LOS	Delay	LOS	Delay
1. Chain Lake Road at Rainier View Road SW	Two-Way Stop-Control	B	11.6 sec	E	45.9 sec	E	49.2 sec
2. Chain Lake Road at Kelsey Street	Roundabout	A	7.3 sec	A	9.8 sec	B	10.0 sec

The level of service calculations are included in the attachments.

### 5.2.1. Chain Lake Road at Rainier View Road

Improvements to the Chain Lake Road corridor have been analyzed as part of the updated City of Monroe Comprehensive Plan. Improvements to Chain Lake Road to increase vehicle capacity are included in the Comprehensive Plan and show the intersection of Chain Lake Road at Rainier View Road operating at LOS C. The City of Monroe traffic mitigation fees, which are discussed later in this report, will help fund these improvements.

## 6. TRAFFIC MITIGATION FEES

The Washington Growth Management Act and Revised Code of Washington 82.02.050(2) authorize local jurisdictions to establish proportionate share traffic mitigation fees in order to fund capital facilities, such as roads and intersections. The Barajas development is located within the City of Monroe, which has established traffic mitigation fees. The City of Monroe also has interlocal agreements with Snohomish County and WSDOT for traffic mitigation fees.

### **6.1 City of Monroe**

The City of Monroe has established a traffic mitigation fee schedule. The fee for single-family residential units is \$3,475 per unit. The 18 new units of the Barajas development will result in City of Monroe traffic mitigation fees of \$62,550. It should be noted that these fees may not vest and may be higher when the building applications are pulled.

### **6.2 Snohomish County**

The City of Monroe and Snohomish County have an interlocal agreement that provides for the payment of traffic mitigation for impacts to Snohomish County roadways by City of Monroe developments. Traffic mitigation fees are based on predetermined area impacts or impacts to actual improvement projects. The trip distribution shows that the Barajas development will not impact any Snohomish County improvement projects in the Transportation Needs Report with three directional PM peak-hour trips. According to Section 3(a)2 of the *Snohomish County Traffic Worksheet and Traffic Study Requirements for Developments in the City of Monroe*, City of Monroe developments are only required to pay traffic mitigation fees for improvements in the Transportation Needs Report impacted with three directional peak-hour trips. Snohomish County traffic mitigation fees should therefore not be required for the Barajas development.

### **6.3 WSDOT**

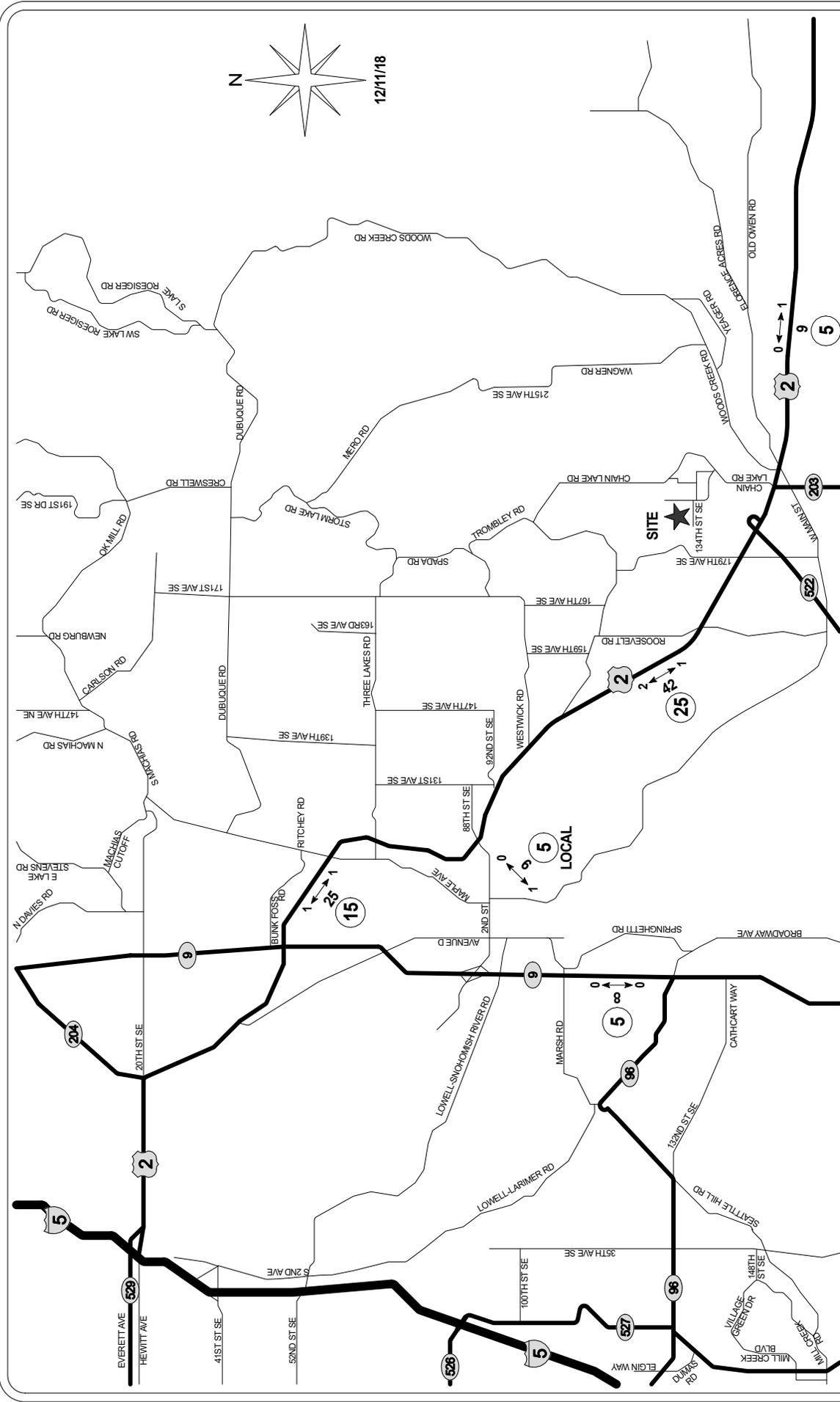
The City of Monroe and WSDOT have an interlocal agreement that provides for the payment of traffic mitigation fees. The interlocal agreement states that a development only has a “significant adverse impact” if the development contributes 25 or more trips to a WSDOT intersection. The Barajas development is not anticipated to impact any WSDOT intersections with 25 PM peak-hour trips and is therefore not anticipated to have a “significant adverse impact” on WSDOT intersections. WSDOT does not have a collection project for any of the intersections near the Barajas development and therefore WSDOT traffic mitigation fees should not be assessed for the Barajas development.

## **7. CONCLUSIONS**

The Barajas development is proposed to consist of 19 single-family residential units with 1 existing unit being removed. The 18 new units of the Barajas development are anticipated to generate approximately 169.92 average daily trips with approximately 13.32 AM peak-hour trips and 17.82 PM peak-hour trips. The level of service analysis shows that all the study intersections are anticipated to operate at acceptable levels of service except for Chain Lake Road at Rainier View Road SW, which will operate at LOS E in the 2028 baseline and future with development conditions. The intersection is planned for capacity improvements identified in the latest Comprehensive Plan. The Barajas development will have City of Monroe traffic mitigation fees of \$62,550. The development’s impacts will not meet the thresholds for paying traffic mitigation fees to Snohomish County or WSDOT.

# **Snohomish County Key Intersection Impacts**





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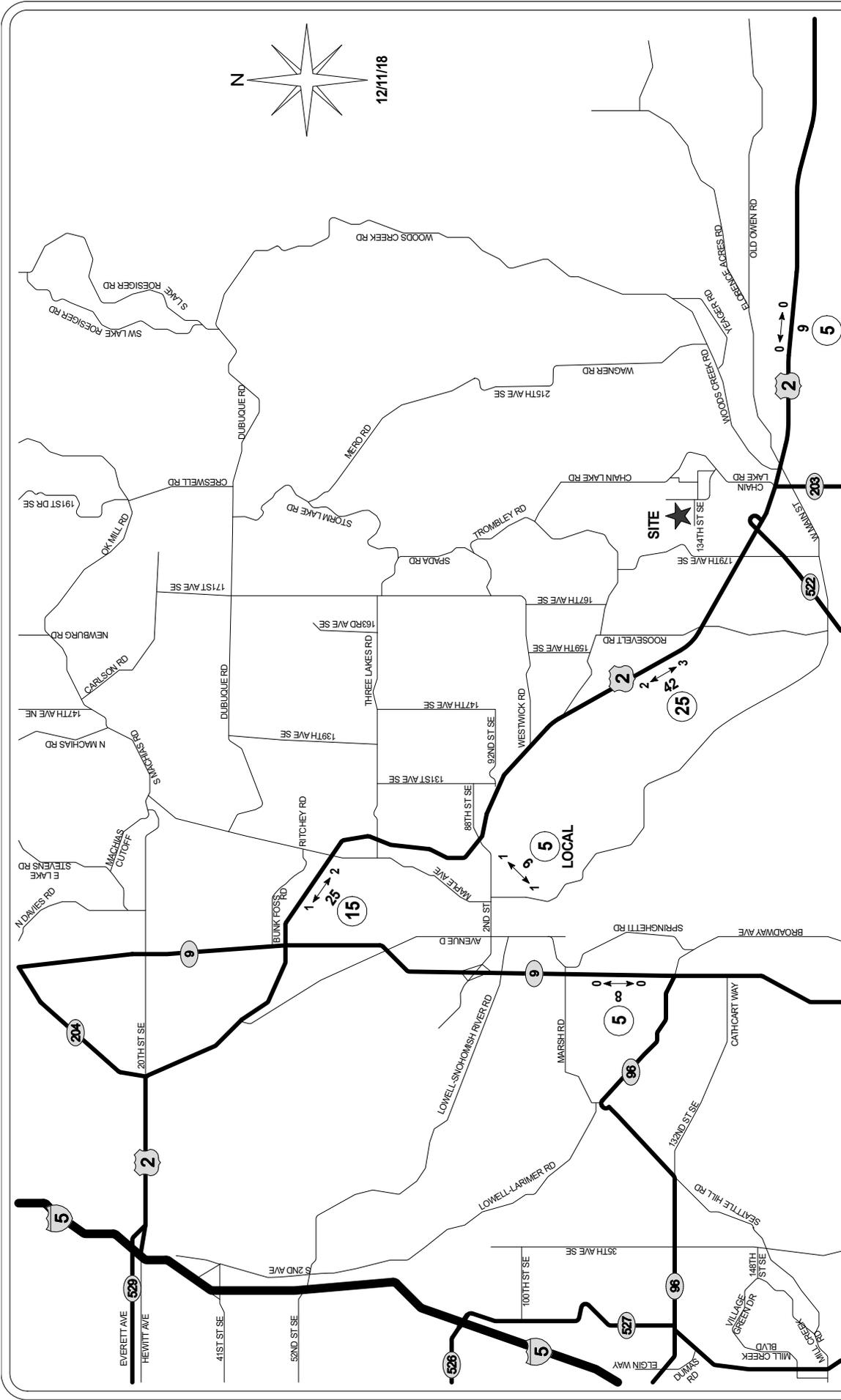
**FIGURE A2**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**AM PEAK-HOUR**

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**LEGEND**  
 NEW SITE TRAFFIC  
 DAILY AND AM PEAK-HOUR  
 AM ← PEAK  
 AWD T →  
 (XX) TRIP DISTRIBUTION %

**BARAJAS DEVELOPMENT**  
**21 NET NEW SINGLE FAMILY**  
**DWELLINGS**

**CITY OF MONROE**



**TRAFFIC IMPACT STUDY**  
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**FIGURE A3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

**GIBSON TRAFFIC CONSULTANTS**

**LEGEND**  
 NEW SITE TRAFFIC  
 DAILY AND PM PEAK-HOUR  
 AWD T → PEAK  
 PM ←  
 (XX) TRIP DISTRIBUTION %

**BARAJAS DEVELOPMENT**  
**21 NET NEW SINGLE FAMILY DWELLINGS**

**CITY OF MONROE**

PM  
PEAK-HOUR

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TRAFFIC IMPACT STUDY  
GTC #18-319

BARAJAS DEVELOPMENT  
21 NET NEW SINGLE FAMILY  
DWELLINGS

LEGEND

XXX →

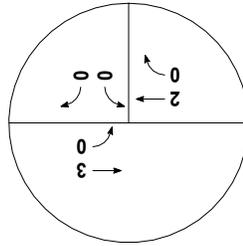
PEAK HOUR  
TURNING MOVEMENT VOLUME

CITY OF MONROE

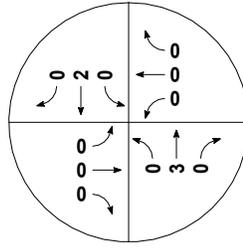
FIGURE A4

DEVELOPMENT  
KEY INTERSECTION VOLUMES  
PM PEAK-HOURS

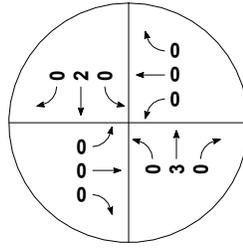
SR-2 @  
#162 WESTWICK RD



SR-2 @  
#469 ROOSEVELT RD



SR-2 @  
#496 179TH AVE SE



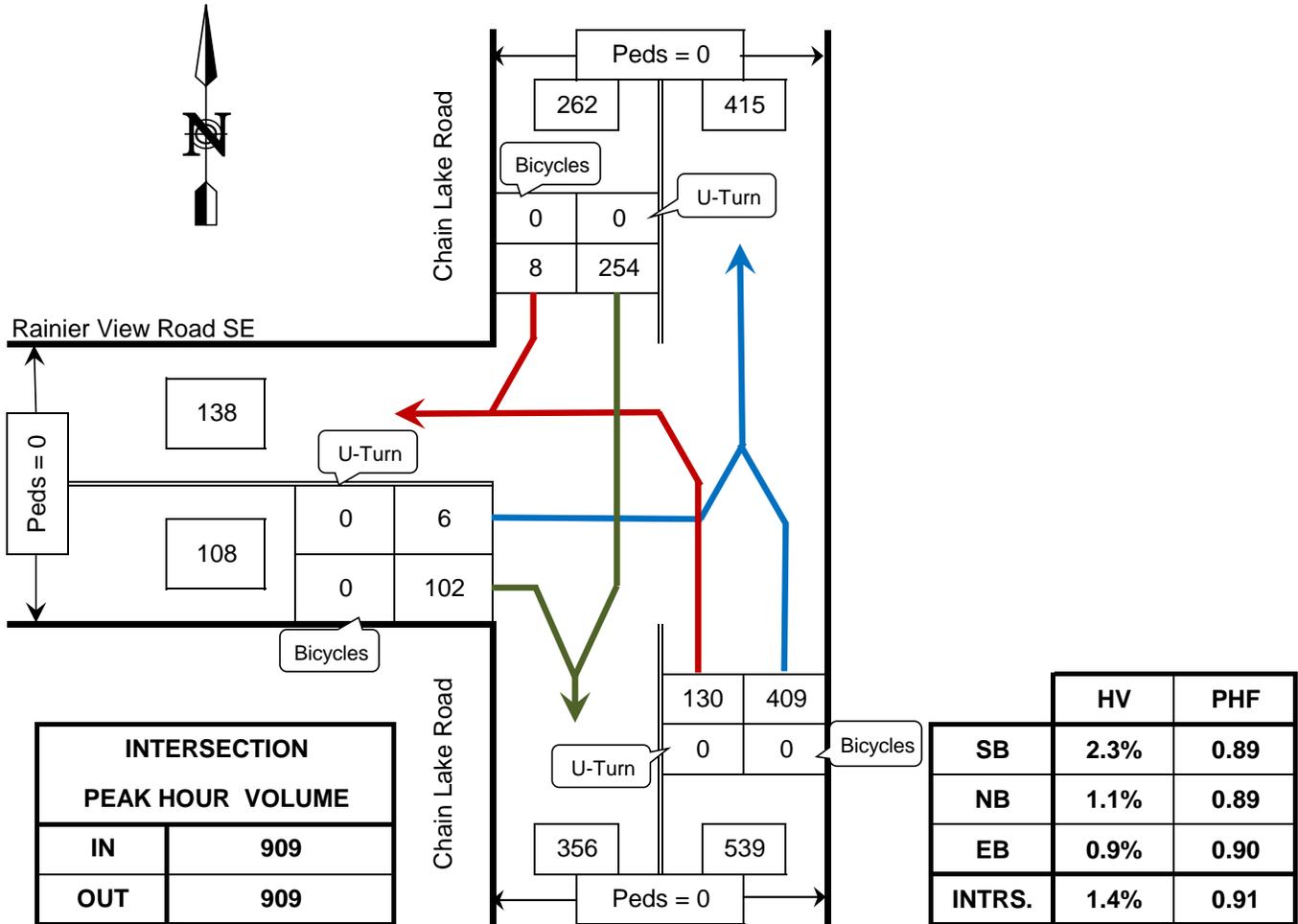
### PM Peak-Hour Key Intersection Volumes

<b>Intersection</b>	<b>EBL</b>	<b>EBT</b>	<b>EBR</b>	<b>WBL</b>	<b>WBT</b>	<b>WBR</b>	<b>NBL</b>	<b>NBT</b>	<b>NBR</b>	<b>SBL</b>	<b>SBT</b>	<b>SBR</b>
#162: SR-2 at Westwick Rd	N/A	N/A	N/A	0	N/A	0	N/A	2	0	0	3	N/A
#469: SR-2 at Roosevelt Rd	0	3	0	0	2	0	0	0	0	0	0	0
#496: SR-2 at 179 <sup>th</sup> Ave SE	0	3	0	0	2	0	0	0	0	0	0	0

# **Turning Movement Calculations and Counts**

**TURNING MOVEMENTS DIAGRAM**

**4:00 PM - 6:00 PM PEAK HOUR: 4:00 PM TO 5:00 PM**



HV = Heavy Vehicles  
PHF = Peak Hour Factor

**Chain Lake Road @ Rainier View Road SE**

**Monroe, WA**

COUNTED BY: VT/CN

DATE OF COUNT: Wed. 1/31/18

REDUCED BY: CN

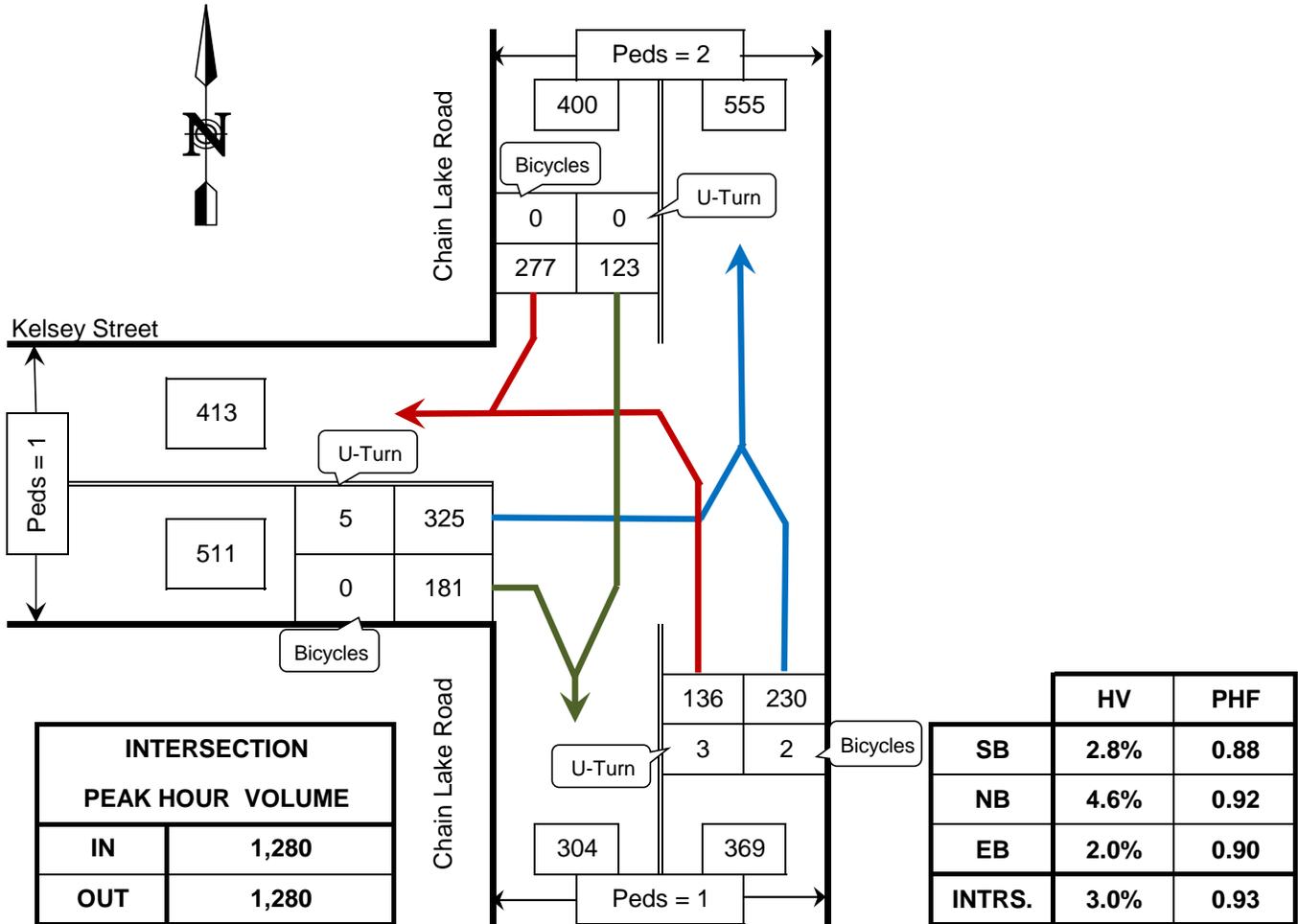
TIME OF COUNT: 4:00 PM - 6:00 PM

REDUCTION DATE: Tue. 2/6/18

WEATHER: Rainy

**TURNING MOVEMENTS DIAGRAM**

**4:00 PM - 6:00 PM PEAK HOUR: 4:00 PM TO 5:00 PM**



HV = Heavy Vehicles  
PHF = Peak Hour Factor

**Chain Lake Road @ Kelsey Street**

**Monroe, WA**

COUNTED BY: VT

DATE OF COUNT: Wed. 3/7/18

REDUCED BY: CN

TIME OF COUNT: 4:00 PM - 6:00 PM

REDUCTION DATE: Fri. 3/9/18

WEATHER: Overcast

1 Rainier View @ Chain Lake Rd

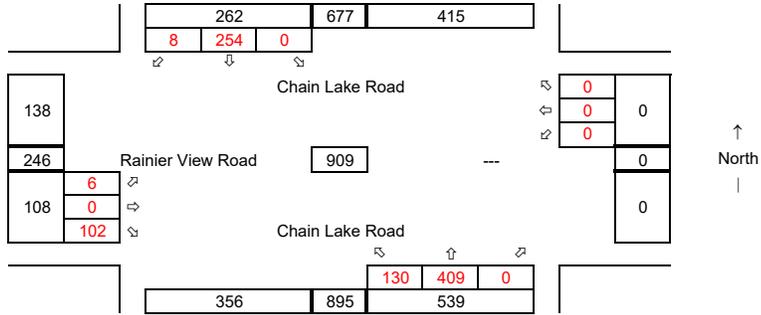
Synchro ID: 1

**Existing**

Average Weekday  
PM Peak Hour

Year: 1/31/18

Data Source: TDG



**Future without Project**

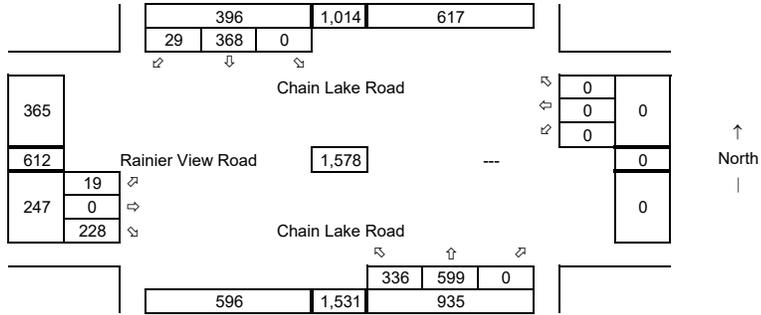
Average Weekday  
PM Peak Hour

Year: 2028

Growth Rate = 2.0%

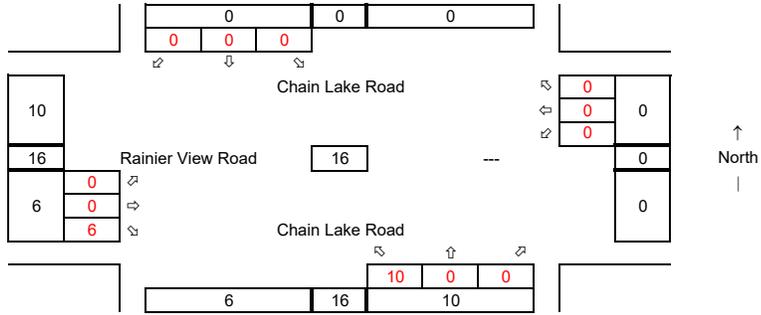
Years of Growth = 10

Total Growth = 1.2190



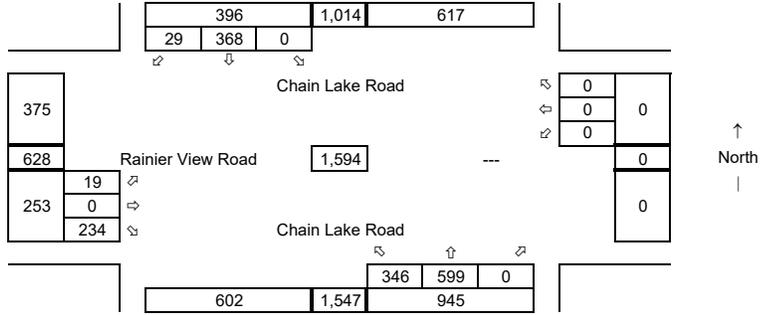
**Total Project Trips**

Average Weekday  
PM Peak Hour



**Future with Project**

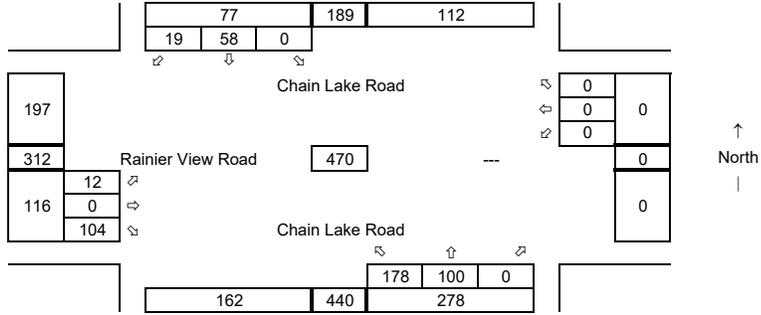
Average Weekday  
PM Peak Hour



**Pipeline Trips**

Average Weekday  
PM Peak Hour

Eaglemont 1-7  
Easton Cove  
Worthington Heights  
Raspberry Hill  
Clothier Short Plat  
2 Short Plats  
Kestrel Ridge



2 Kelsey St @ Chain Lake Rd

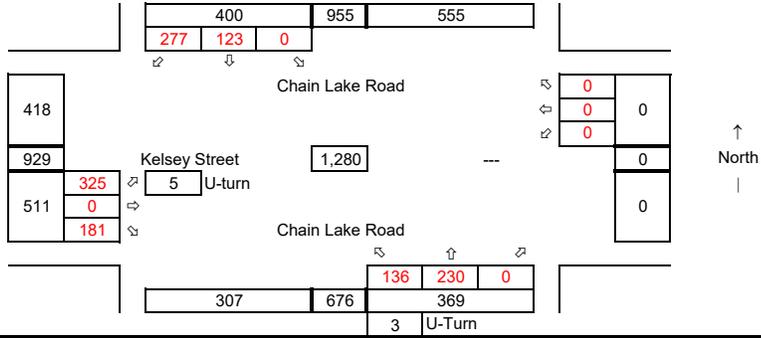
Synchro ID: 2

**Existing**

Average Weekday  
PM Peak Hour

Year: 1/31/18

Data Source: TDG

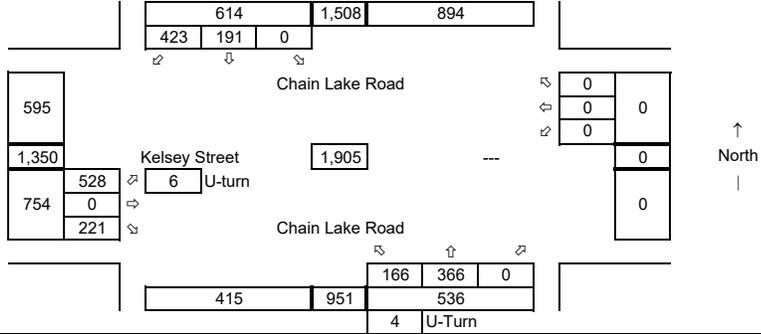


**Future without Project**

Average Weekday  
PM Peak Hour

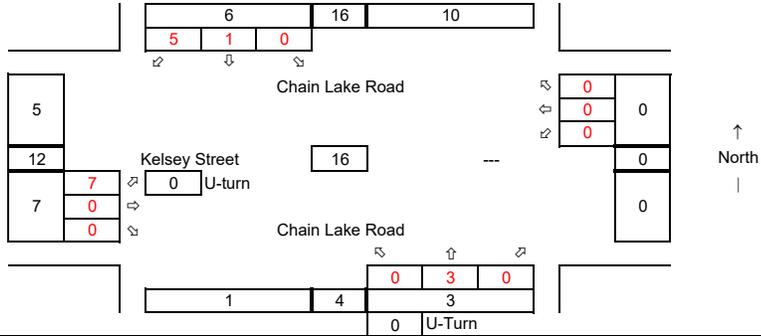
Year: 2028

Growth Rate = 2.0%  
Years of Growth = 10  
Total Growth = 1.218994



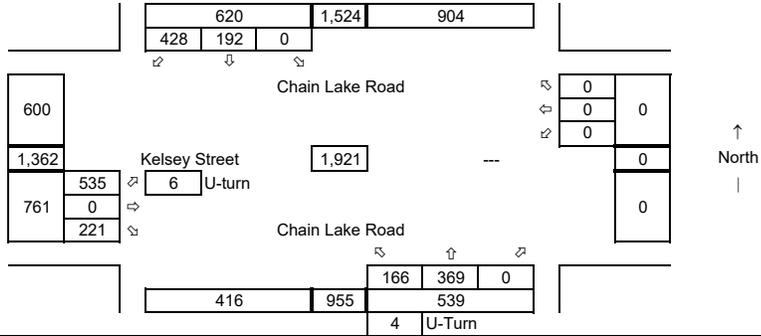
**Total Project Trips**

Average Weekday  
PM Peak Hour



**Future with Project**

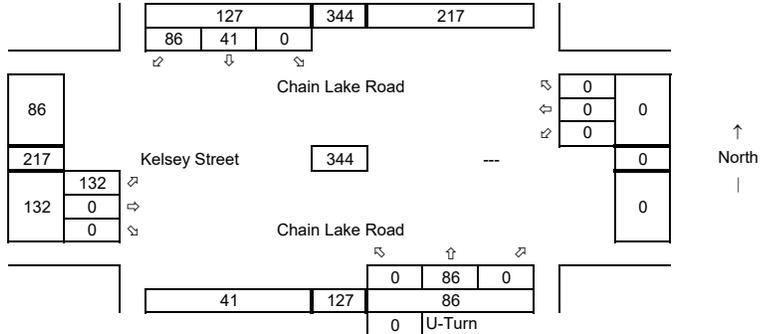
Average Weekday  
PM Peak Hour



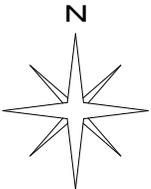
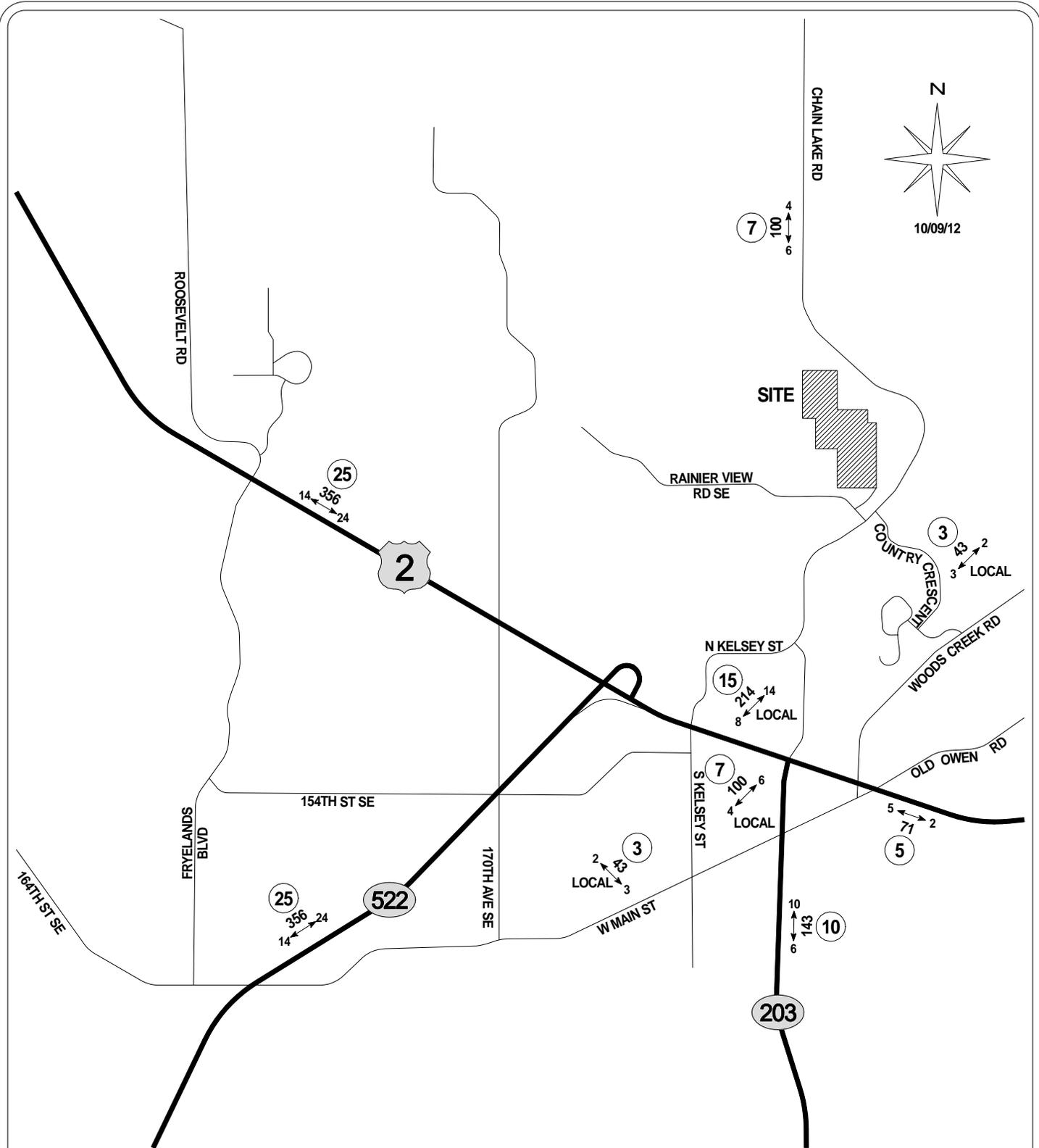
**Pipeline Trips**

Average Weekday  
PM Peak Hour

Eaglemont 1-7  
Easton Cove  
Worthington Heights  
Raspberry Hill  
Clothier Short Plat  
2 Short Plats  
Kestrel Ridge



# **Pipeline Information**



10/09/12

GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #12-087

EAGLEMONT  
149 SINGLE-FAMILY UNITS

**LEGEND**

AWDT  
PM ↔ PEAK

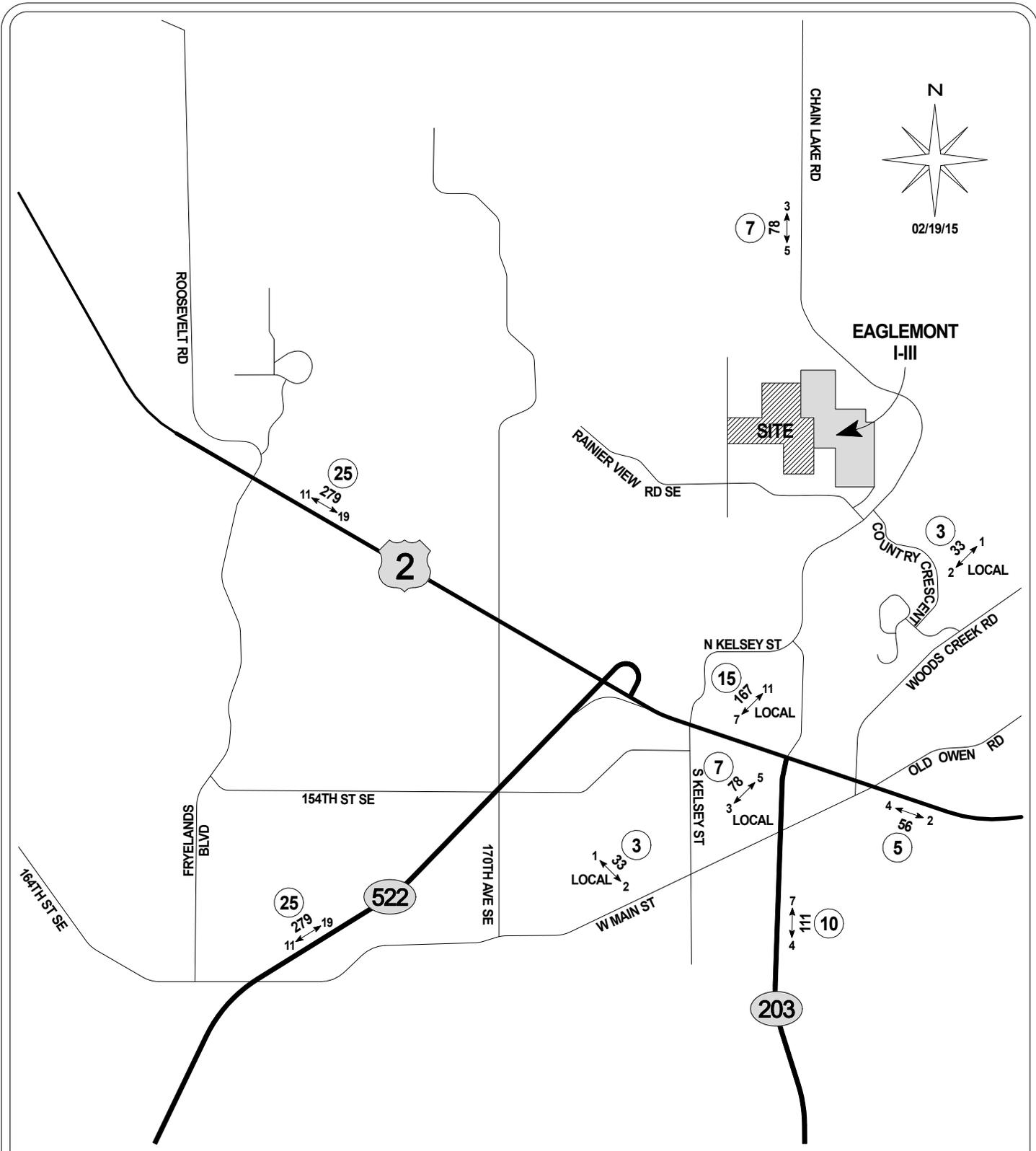
NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

CITY OF MONROE



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #15-045

EAGLEMONT IV-VIII  
117 NEW SINGLE-FAMILY UNITS

CITY OF MONROE

**LEGEND**

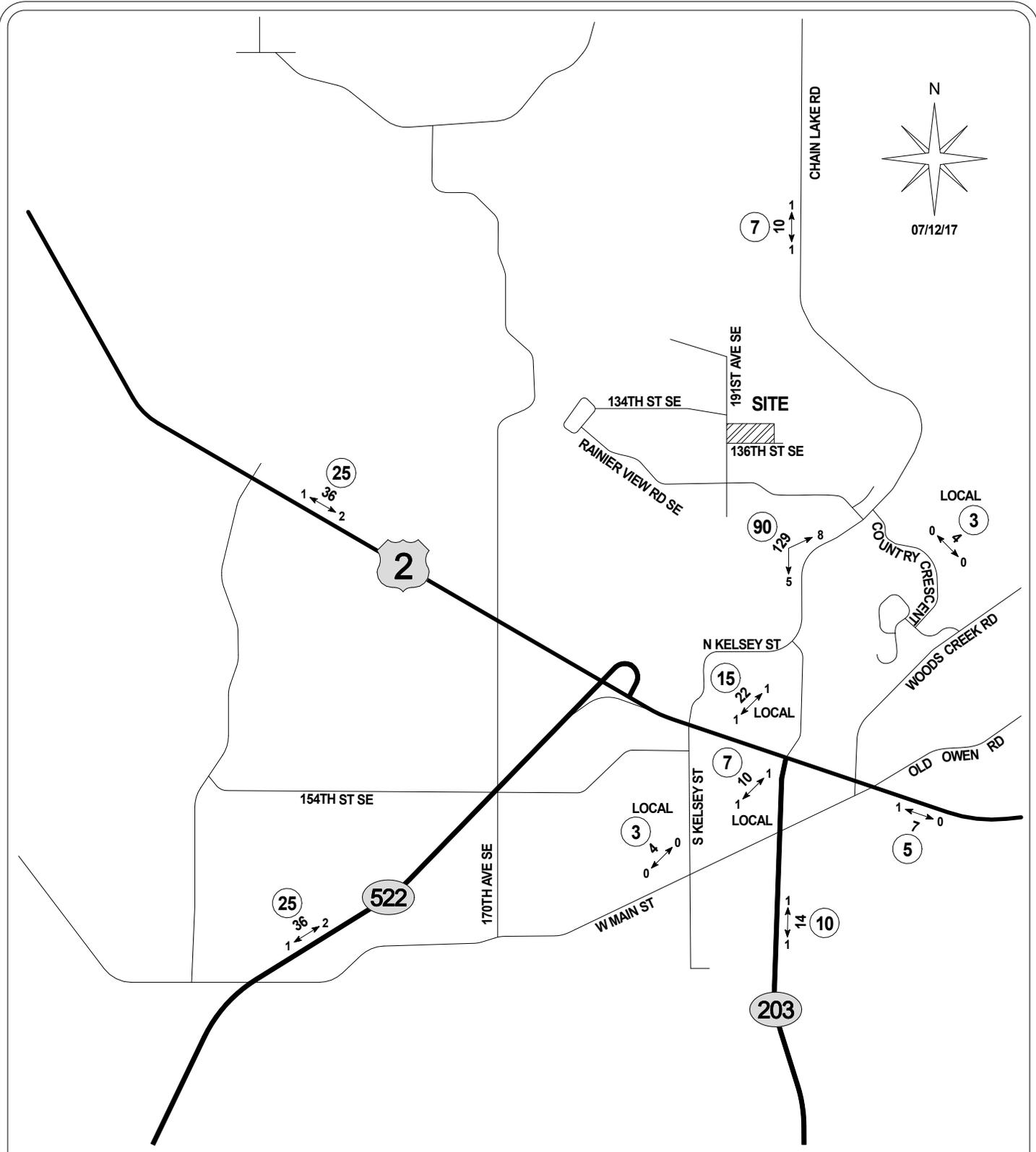
AWDT  
PM ↔ PEAK

NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)

XX

TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #17-130

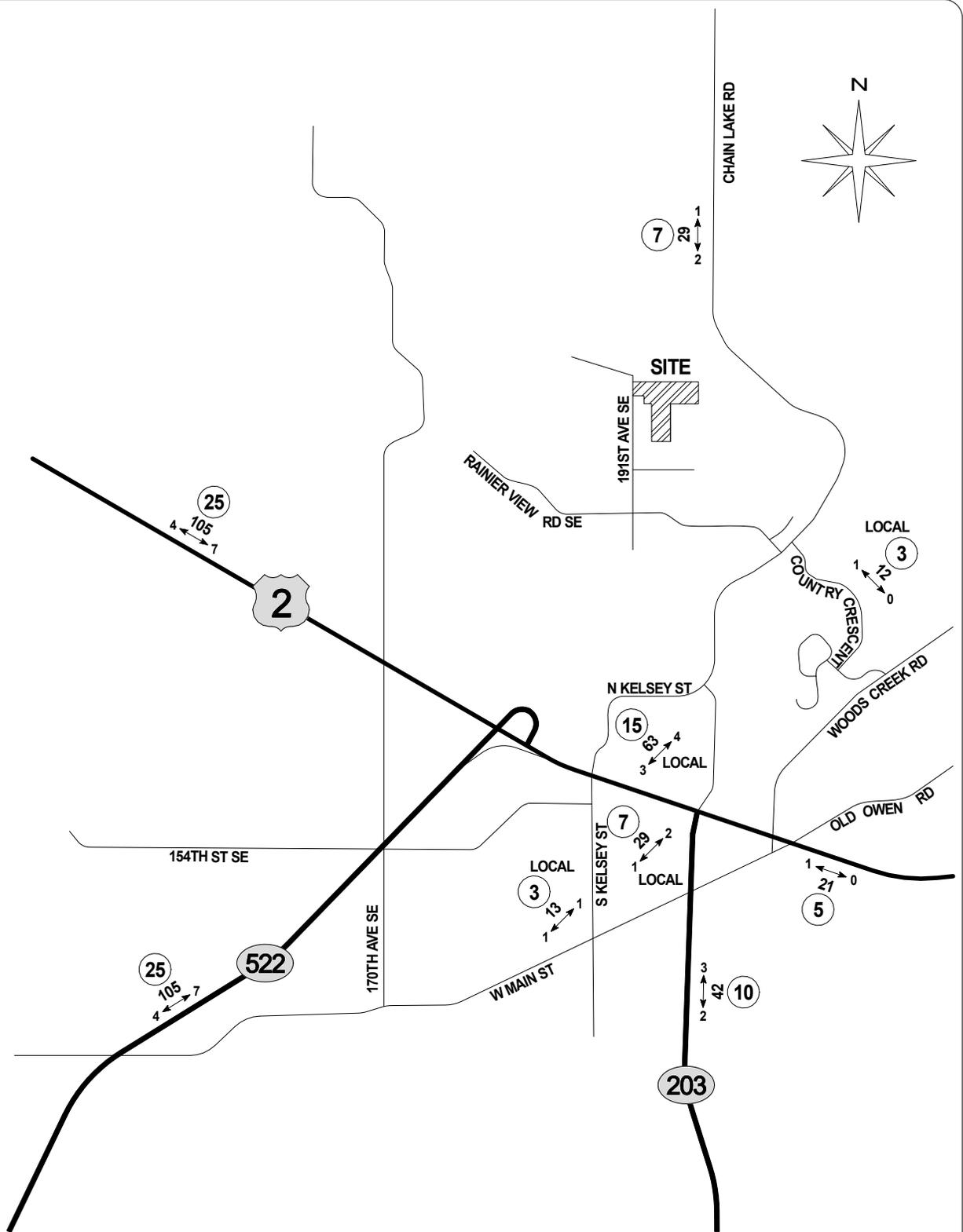
EAGLEMONT 5  
15 NEW SINGLE FAMILY  
DWELLINGS

CITY OF MONROE

**LEGEND**  
AWDT  
PM ↔ PEAK  
**XX**  
NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)  
TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**





GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #15-244

SKY VIEW RIDGE  
44 NEW SINGLE-FAMILY UNITS

**LEGEND**

AWDT  
PM ↔ PEAK

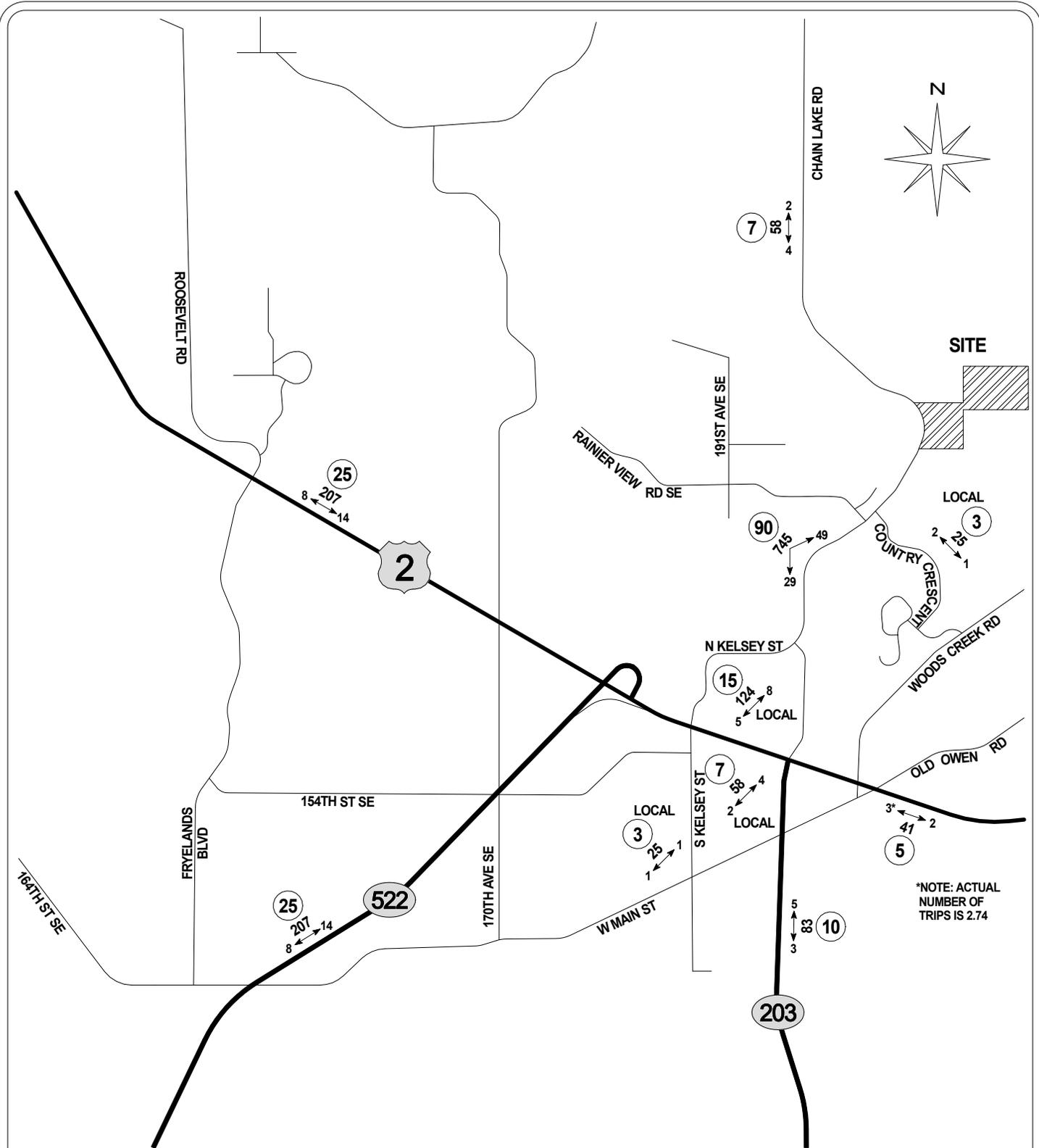
NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

**FIGURE 2**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

CITY OF MONROE



\*NOTE: ACTUAL NUMBER OF TRIPS IS 2.74

GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #16-030

KLIER DEVELOPMENT  
87 NEW SINGLE FAMILY  
DWELLINGS

**LEGEND**

AWDT  
PM ↔ PEAK

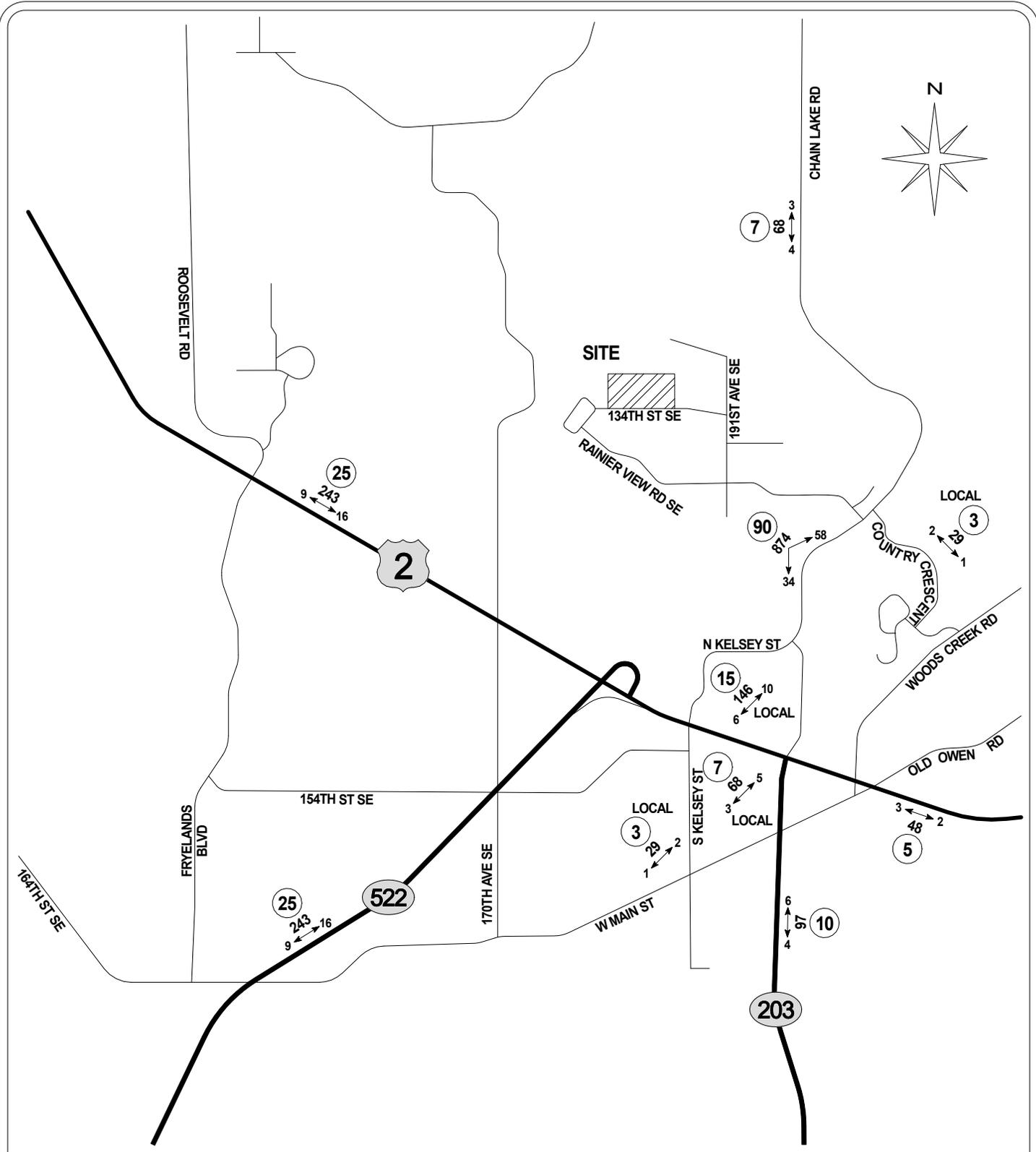
NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

CITY OF MONROE



**GIBSON TRAFFIC CONSULTANTS**

**TRAFFIC IMPACT STUDY  
GTC #16-171**

**WORTHINGTON HEIGHTS  
106 SINGLE FAMILY  
DWELLINGS**

**LEGEND**

AWDT  
PM ↔ PEAK

NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)

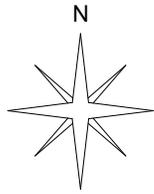
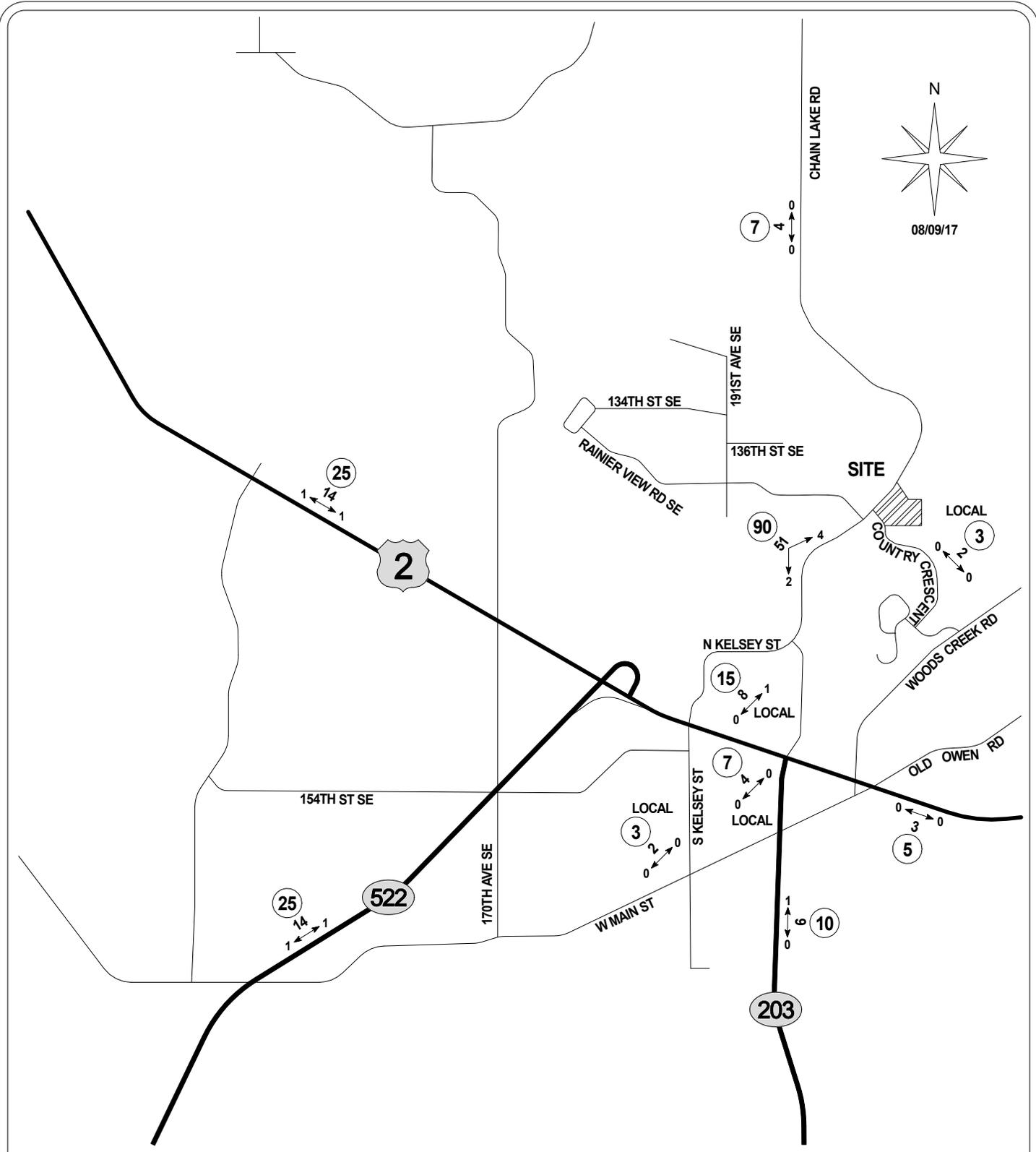


TRIP DISTRIBUTION %

**FIGURE 3  
DEVELOPMENT  
TRIP DISTRIBUTION  
PM PEAK-HOUR**

**CITY OF MONROE**





08/09/17

**GIBSON TRAFFIC CONSULTANTS**

**TRAFFIC IMPACT STUDY  
GTC #17-167**

**CLOTHIER SHORT PLAT  
6 NEW SINGLE FAMILY  
DWELLINGS**

**LEGEND**

AWDT  
PM ↔ PEAK

NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

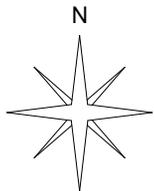
**FIGURE 3  
DEVELOPMENT  
TRIP DISTRIBUTION  
PM PEAK-HOUR**

**CITY OF MONROE**

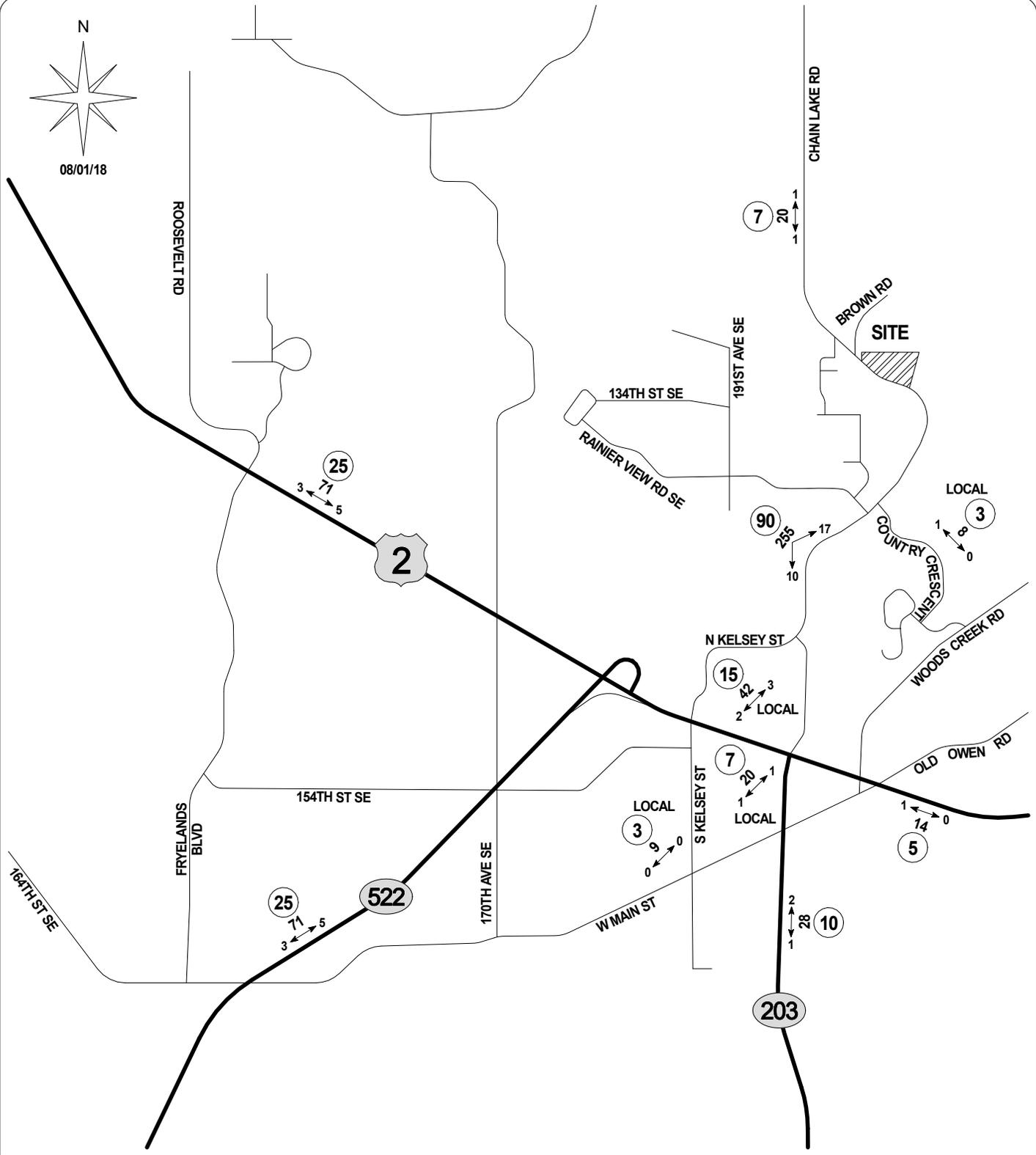
PM Peak-Hour

%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	94	6	4	9.90
1%	0.94	0.06	0.04	0.10
2%	1.89	0.12	0.07	0.20
3%	2.83	0.19	0.11	0.30
4%	3.78	0.25	0.15	0.40
<b>5%</b>	<b>4.72</b>	<b>0.31</b>	<b>0.18</b>	<b>0.50</b>
6%	5.66	0.37	0.22	0.59
7%	6.61	0.44	0.26	0.69
8%	7.55	0.50	0.29	0.79
9%	8.50	0.56	0.33	0.89
<b>10%</b>	<b>9.44</b>	<b>0.62</b>	<b>0.37</b>	<b>0.99</b>
11%	10.38	0.69	0.40	1.09
12%	11.33	0.75	0.44	1.19
13%	12.27	0.81	0.48	1.29
14%	13.22	0.87	0.51	1.39
<b>15%</b>	<b>14.16</b>	<b>0.94</b>	<b>0.55</b>	<b>1.49</b>
16%	15.10	1.00	0.59	1.58
17%	16.05	1.06	0.62	1.68
18%	16.99	1.12	0.66	1.78
19%	17.94	1.19	0.70	1.88
<b>20%</b>	<b>18.88</b>	<b>1.25</b>	<b>0.73</b>	<b>1.98</b>
21%	19.82	1.31	0.77	2.08
22%	20.77	1.37	0.81	2.18
23%	21.71	1.44	0.84	2.28
24%	22.66	1.50	0.88	2.38
<b>25%</b>	<b>23.60</b>	<b>1.56</b>	<b>0.92</b>	<b>2.48</b>
26%	24.54	1.62	0.95	2.57
27%	25.49	1.68	0.99	2.67
28%	26.43	1.75	1.02	2.77
29%	27.38	1.81	1.06	2.87
<b>30%</b>	<b>28.32</b>	<b>1.87</b>	<b>1.10</b>	<b>2.97</b>
31%	29.26	1.93	1.13	3.07
32%	30.21	2.00	1.17	3.17
33%	31.15	2.06	1.21	3.27
34%	32.10	2.12	1.24	3.37
<b>35%</b>	<b>33.04</b>	<b>2.18</b>	<b>1.28</b>	<b>3.47</b>
36%	33.98	2.25	1.32	3.56
37%	34.93	2.31	1.35	3.66
38%	35.87	2.37	1.39	3.76
39%	36.82	2.43	1.43	3.86
<b>40%</b>	<b>37.76</b>	<b>2.50</b>	<b>1.46</b>	<b>3.96</b>
41%	38.70	2.56	1.50	4.06
42%	39.65	2.62	1.54	4.16
43%	40.59	2.68	1.57	4.26
44%	41.54	2.75	1.61	4.36
<b>45%</b>	<b>42.48</b>	<b>2.81</b>	<b>1.65</b>	<b>4.46</b>
46%	43.42	2.87	1.68	4.55
47%	44.37	2.93	1.72	4.65
48%	45.31	3.00	1.76	4.75
49%	46.26	3.06	1.79	4.85
<b>50%</b>	<b>47.20</b>	<b>3.12</b>	<b>1.83</b>	<b>4.95</b>

%	New ADT	New PM Peak Hour Trips		
		In	Out	Total
100%	94	6	4	10
51%	48.14	3.18	1.87	5.05
52%	49.09	3.24	1.90	5.15
53%	50.03	3.31	1.94	5.25
54%	50.98	3.37	1.98	5.35
<b>55%</b>	<b>51.92</b>	<b>3.43</b>	<b>2.01</b>	<b>5.45</b>
56%	52.86	3.49	2.05	5.54
57%	53.81	3.56	2.09	5.64
58%	54.75	3.62	2.12	5.74
59%	55.70	3.68	2.16	5.84
<b>60%</b>	<b>56.64</b>	<b>3.74</b>	<b>2.20</b>	<b>5.94</b>
61%	57.58	3.81	2.23	6.04
62%	58.53	3.87	2.27	6.14
63%	59.47	3.93	2.31	6.24
64%	60.42	3.99	2.34	6.34
<b>65%</b>	<b>61.36</b>	<b>4.06</b>	<b>2.38</b>	<b>6.44</b>
66%	62.30	4.12	2.42	6.53
67%	63.25	4.18	2.45	6.63
68%	64.19	4.24	2.49	6.73
69%	65.14	4.31	2.53	6.83
<b>70%</b>	<b>66.08</b>	<b>4.37</b>	<b>2.56</b>	<b>6.93</b>
71%	67.02	4.43	2.60	7.03
72%	67.97	4.49	2.64	7.13
73%	68.91	4.56	2.67	7.23
74%	69.86	4.62	2.71	7.33
<b>75%</b>	<b>70.80</b>	<b>4.68</b>	<b>2.75</b>	<b>7.43</b>
76%	71.74	4.74	2.78	7.52
77%	72.69	4.80	2.82	7.62
78%	73.63	4.87	2.85	7.72
79%	74.58	4.93	2.89	7.82
<b>80%</b>	<b>75.52</b>	<b>4.99</b>	<b>2.93</b>	<b>7.92</b>
81%	76.46	5.05	2.96	8.02
82%	77.41	5.12	3.00	8.12
83%	78.35	5.18	3.04	8.22
84%	79.30	5.24	3.07	8.32
<b>85%</b>	<b>80.24</b>	<b>5.30</b>	<b>3.11</b>	<b>8.42</b>
86%	81.18	5.37	3.15	8.51
87%	82.13	5.43	3.18	8.61
88%	83.07	5.49	3.22	8.71
89%	84.02	5.55	3.26	8.81
<b>90%</b>	<b>84.96</b>	<b>5.62</b>	<b>3.29</b>	<b>8.91</b>
91%	85.90	5.68	3.33	9.01
92%	86.85	5.74	3.37	9.11
93%	87.79	5.80	3.40	9.21
94%	88.74	5.87	3.44	9.31
<b>95%</b>	<b>89.68</b>	<b>5.93</b>	<b>3.48</b>	<b>9.41</b>
96%	90.62	5.99	3.51	9.50
97%	91.57	6.05	3.55	9.60
98%	92.51	6.12	3.59	9.70
99%	93.46	6.18	3.62	9.80
<b>100%</b>	<b>94.40</b>	<b>6.24</b>	<b>3.66</b>	<b>9.90</b>



08/01/18



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY  
GTC #18-042

KESTREL RIDGE  
30 NEW SINGLE FAMILY  
DWELLINGS

CITY OF MONROE

**LEGEND**

AWDT  
PM ↔ PEAK



NEW SITE TRAFFIC  
(DAILY/PEAK-HOUR)

TRIP DISTRIBUTION %

**FIGURE 3**  
**DEVELOPMENT**  
**TRIP DISTRIBUTION**  
**PM PEAK-HOUR**

# **Level of Service Calculations**

Barajas Development (18-319)  
 1: Chain Lake Road & Rainier View Road SE

Existing Conditions  
 PM Peak-Hour

Intersection

Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	102	130	409	254	8
Future Vol, veh/h	6	102	130	409	254	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	89	89	89	89
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	7	113	146	460	285	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1042	290	294	0	-	0
Stage 1	290	-	-	-	-	-
Stage 2	752	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-	-
Pot Cap-1 Maneuver	256	752	1273	-	-	-
Stage 1	762	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	227	752	1273	-	-	-
Mov Cap-2 Maneuver	227	-	-	-	-	-
Stage 1	674	-	-	-	-	-
Stage 2	468	-	-	-	-	-

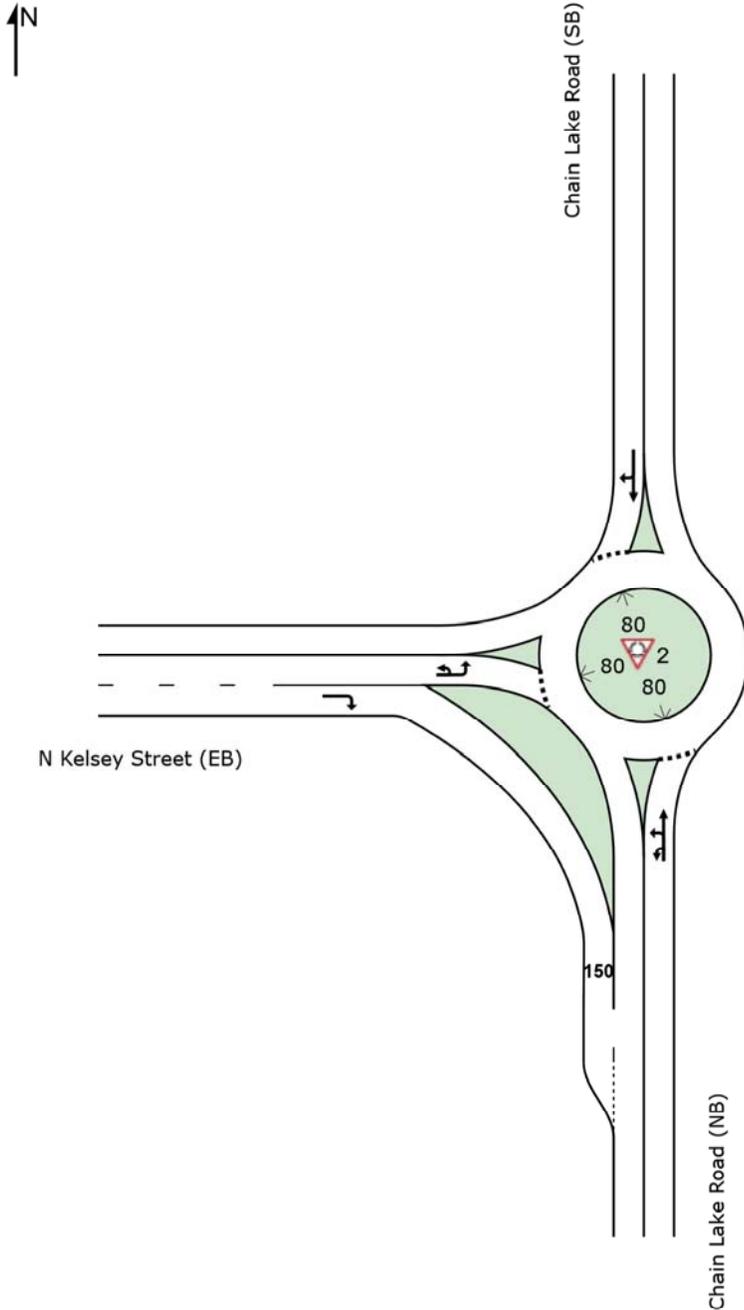
Approach	EB	NB	SB
HCM Control Delay, s	11.6	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1273	-	666	-	-
HCM Lane V/C Ratio	0.115	-	0.18	-	-
HCM Control Delay (s)	8.2	-	11.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.7	-	-

# SITE LAYOUT

## Site: 2 [2018 Existing Conditions]

Chain Lake Road at N Kelsey Street  
Site Category: (None)  
Roundabout



# MOVEMENT SUMMARY

## Site: 2 [2018 Existing Conditions]

Chain Lake Road at N Kelsey Street  
 Site Category: (None)  
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	3	3.0	0.397	14.2	LOS B	2.7	68.8	0.63	0.71	0.63	35.2
3	L2	146	3.0	0.397	12.0	LOS B	2.7	68.8	0.63	0.71	0.63	34.5
8	T1	247	3.0	0.397	6.7	LOS A	2.7	68.8	0.63	0.71	0.63	34.6
Approach		397	3.0	0.397	8.7	LOS A	2.7	68.8	0.63	0.71	0.63	34.5
North: Chain Lake Road (SB)												
4	T1	132	3.0	0.369	5.3	LOS A	2.7	68.1	0.46	0.54	0.46	36.2
14	R2	298	3.0	0.369	5.2	LOS A	2.7	68.1	0.46	0.54	0.46	35.2
Approach		430	3.0	0.369	5.2	LOS A	2.7	68.1	0.46	0.54	0.46	35.5
West: N Kelsey Street (EB)												
5u	U	5	3.0	0.248	12.3	LOS B	1.6	40.7	0.35	0.62	0.35	34.4
5	L2	349	3.0	0.248	10.1	LOS B	1.6	40.7	0.35	0.62	0.35	33.8
12	R2	195	3.0	0.120	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		549	3.0	0.248	7.9	LOS A	1.6	40.7	0.23	0.57	0.23	34.8
All Vehicles		1376	3.0	0.397	7.3	LOS A	2.7	68.8	0.42	0.60	0.42	34.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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 Organisation: GIBSON TRAFFIC CONSULTANTS | Processed: Wednesday, December 12, 2018 10:47:47 AM  
 Project: H:\2018\18-319\Sidra\Chain Lake Rd at Kelsey St.sip8

Barajas Development (18-319)  
 1: Chain Lake Road & Rainier View Road SE

2028 Baseline Conditions  
 PM Peak-Hour

Intersection

Int Delay, s/veh	9.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	
Traffic Vol, veh/h	19	228	336	599	368	29
Future Vol, veh/h	19	228	336	599	368	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	89	89	89	89
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	21	253	378	673	413	33

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	1859	430	446	0	0
Stage 1	430	-	-	-	-
Stage 2	1429	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-
Pot Cap-1 Maneuver	81	627	1120	-	-
Stage 1	658	-	-	-	-
Stage 2	222	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	54	627	1120	-	-
Mov Cap-2 Maneuver	54	-	-	-	-
Stage 1	436	-	-	-	-
Stage 2	222	-	-	-	-

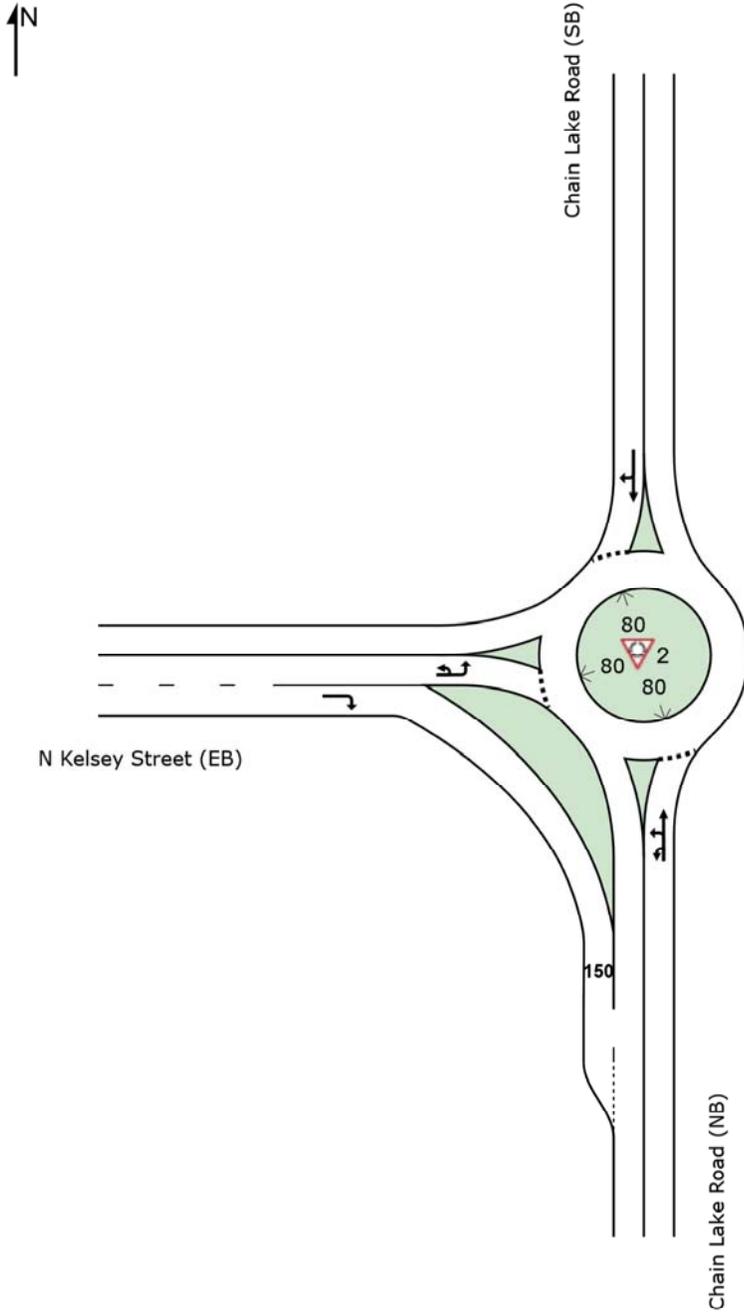
Approach	EB	NB	SB
HCM Control Delay, s	45.9	3.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1120	-	345	-	-
HCM Lane V/C Ratio	0.337	-	0.795	-	-
HCM Control Delay (s)	9.8	-	45.9	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	1.5	-	6.7	-	-

# SITE LAYOUT

## Site: 2 [2028 Baseline Conditions]

Chain Lake Road at N Kelsey Street  
Site Category: (None)  
Roundabout



# MOVEMENT SUMMARY

## Site: 2 [2028 Baseline Conditions]

Chain Lake Road at N Kelsey Street  
 Site Category: (None)  
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	4	3.0	0.722	21.9	LOS C	9.0	231.5	0.96	1.10	1.36	32.0
3	L2	178	3.0	0.722	19.6	LOS B	9.0	231.5	0.96	1.10	1.36	31.4
8	T1	394	3.0	0.722	14.4	LOS B	9.0	231.5	0.96	1.10	1.36	31.4
Approach		576	3.0	0.722	16.0	LOS B	9.0	231.5	0.96	1.10	1.36	31.4
North: Chain Lake Road (SB)												
4	T1	205	3.0	0.597	6.0	LOS A	5.8	148.5	0.68	0.61	0.68	35.6
14	R2	455	3.0	0.597	5.9	LOS A	5.8	148.5	0.68	0.61	0.68	34.7
Approach		660	3.0	0.597	5.9	LOS A	5.8	148.5	0.68	0.61	0.68	35.0
West: N Kelsey Street (EB)												
5u	U	6	3.0	0.432	12.9	LOS B	3.4	87.6	0.54	0.66	0.54	34.0
5	L2	568	3.0	0.432	10.6	LOS B	3.4	87.6	0.54	0.66	0.54	33.4
12	R2	238	3.0	0.146	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		812	3.0	0.432	8.7	LOS A	3.4	87.6	0.38	0.61	0.38	34.3
All Vehicles		2048	3.0	0.722	9.8	LOS A	9.0	231.5	0.64	0.75	0.75	33.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Barajas Development (18-319)  
 1: Chain Lake Road & Rainier View Road SE

2028 Future with Development Conditions  
 PM Peak-Hour

Intersection

Int Delay, s/veh	9.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	234	346	599	368	29
Future Vol, veh/h	19	234	346	599	368	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	89	89	89	89
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	21	260	389	673	413	33

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	1881	430	446	0	0
Stage 1	430	-	-	-	-
Stage 2	1451	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-
Pot Cap-1 Maneuver	79	627	1120	-	-
Stage 1	658	-	-	-	-
Stage 2	217	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	52	627	1120	-	-
Mov Cap-2 Maneuver	52	-	-	-	-
Stage 1	430	-	-	-	-
Stage 2	217	-	-	-	-

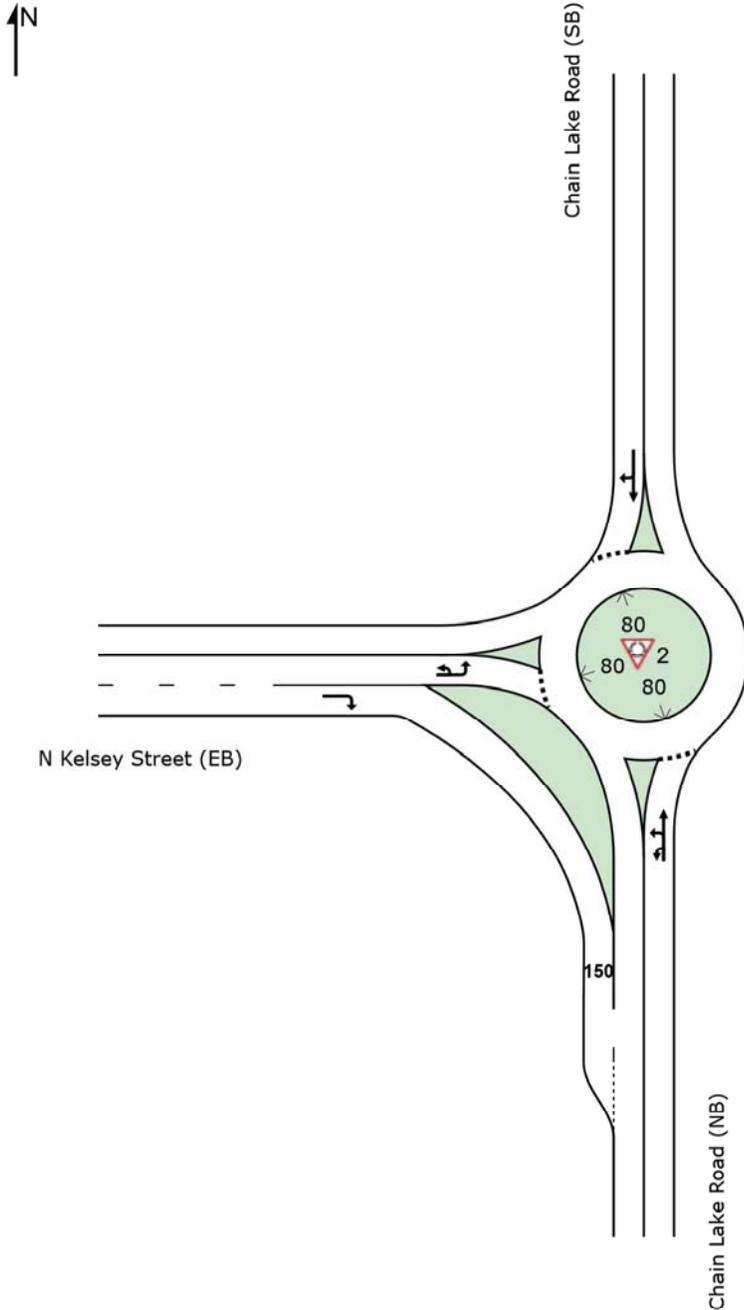
Approach	EB	NB	SB
HCM Control Delay, s	49.2	3.6	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1120	-	343	-	-
HCM Lane V/C Ratio	0.347	-	0.82	-	-
HCM Control Delay (s)	9.9	-	49.2	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	1.6	-	7.1	-	-

# SITE LAYOUT

## Site: 2 [2028 Future Conditions w Development]

Chain Lake Road at N Kelsey Street  
Site Category: (None)  
Roundabout



# MOVEMENT SUMMARY

## Site: 2 [2028 Future Conditions w Development]

Chain Lake Road at N Kelsey Street  
 Site Category: (None)  
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	4	3.0	0.732	22.4	LOS C	9.4	240.0	0.97	1.12	1.39	31.7
3	L2	178	3.0	0.732	20.1	LOS C	9.4	240.0	0.97	1.12	1.39	31.2
8	T1	397	3.0	0.732	14.8	LOS B	9.4	240.0	0.97	1.12	1.39	31.2
Approach		580	3.0	0.732	16.5	LOS B	9.4	240.0	0.97	1.12	1.39	31.2
North: Chain Lake Road (SB)												
4	T1	206	3.0	0.603	6.0	LOS A	5.9	151.5	0.69	0.62	0.69	35.6
14	R2	460	3.0	0.603	5.9	LOS A	5.9	151.5	0.69	0.62	0.69	34.7
Approach		667	3.0	0.603	5.9	LOS A	5.9	151.5	0.69	0.62	0.69	34.9
West: N Kelsey Street (EB)												
5u	U	6	3.0	0.438	12.9	LOS B	3.5	89.6	0.54	0.66	0.54	34.0
5	L2	575	3.0	0.438	10.7	LOS B	3.5	89.6	0.54	0.66	0.54	33.3
12	R2	238	3.0	0.146	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		819	3.0	0.438	8.7	LOS A	3.5	89.6	0.38	0.61	0.38	34.3
All Vehicles		2066	3.0	0.732	10.0	LOS A	9.4	240.0	0.65	0.75	0.77	33.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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