



HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

Olympia, WA



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HARRISON AVENUE MIXED-USE TRAFFIC IMPACT ANALYSIS

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HARRISON AVENUE MIXED-USE TRAFFIC IMPACT ANALYSIS

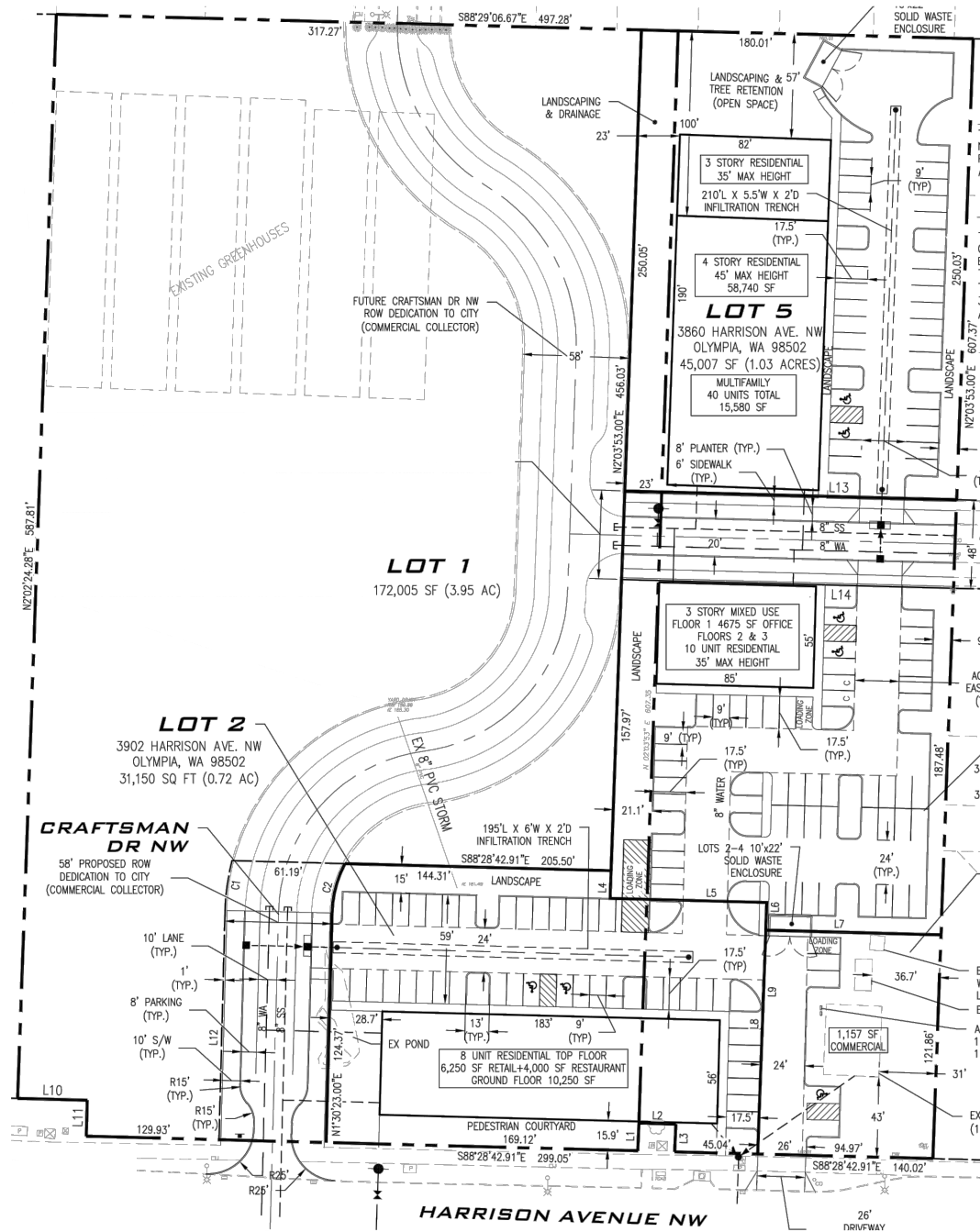
1. INTRODUCTION

The main goals of this study focus on the assessment of existing roadway conditions and forecasts of newly generated project traffic. The first task includes the review of general roadway information on the adjacent street system serving the subject site and gathering existing vehicular volumes within a defined study area. Forecasts of future traffic and dispersion patterns on the street system are then determined using established trip generation and distribution techniques. As a final step, appropriate conclusions and mitigation measures are defined.

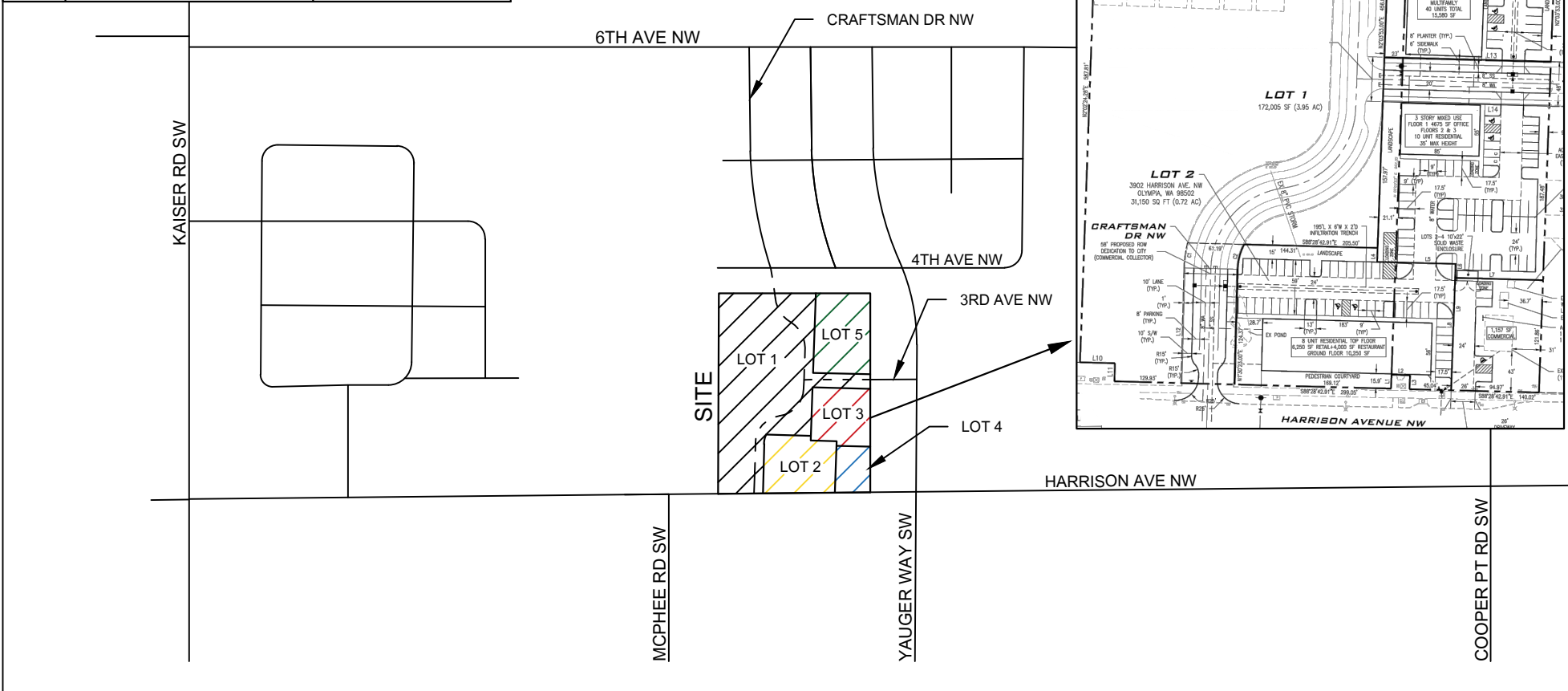
2. PROJECT DESCRIPTION

Harrison Avenue Mixed-Use is a mixed-use project consisting of residential, commercial and office space. The subject site is located on the north side of Harrison Avenue NW and west of Yaeger Way NW on tax parcels #'s: 1281714-0800; -0900. Upon full buildout of the site, a total of 61 multi-family units, 10,222 sq. ft. of retail space, 4,675 sq. ft. office space and a 4,000 sq. ft. restaurant is proposed. Three points of access are proposed to and from the site: a westerly extension of 3rd Avenue NW roughly midpoint of the subject property; a single right-in/right-out driveway to Harrison Avenue NW on the southeast corner; and a shared driveway currently serving the Bark & Garden Center. This driveway is to be a future Craftsman Drive connection and would extend from Harrison Avenue NW to 4th Avenue NW. However, this full extension is not planned at this time. The roadway would terminate just after the limits of LOT 2 in the provided site plan. A conceptual site plan illustrating the proposed site layout is presented in Figure 1. Figure 2 shows the vicinity map and adjacent street system as well as a use breakdown by LOT number.





LAND USE BY LOT		
LOT	LAND USE	SIZE
1	ROADWAY EXTENSIONS	-
2	MULTI-FAMILY LOW-RISE	8 DWELLING UNITS
	RETAIL	6,250 SQ. FT.
	RESTAURANT	4,000 SQ. FT.
3	COMMERCIAL	1,160 SQ. FT.
4	OFFICE	4,675 SQ. FT.
5	MULTI-FAMILY LOW-RISE	10 DWELLING UNITS
	MULTI-FAMILY LOW-RISE	40 DWELLING UNITS



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HARRISON AVENUE MIXED-USE
VICINITY MAP & ROADWAY SYSTEM
FIGURE 2

3. EXISTING CONDITIONS

3.1 Existing Street System

The primary roadways serving the site are described below.

Harrison Avenue NW: is an east-west, 4- to 5-lane arterial bordering the south side of the subject property. The roadway cross-section adjacent to the subject site consists of two travel lanes, a 5-foot bicycle lane in either direction and a center two-way left-turn lane (TWLTL). Travel lanes are approximately 10- to 11-feet in width. Raised center pedestrian refuge islands (within the TWLTL) and marked crosswalks are available intermittently within the City limits. Curb, gutter, intermittent bus pull-outs/vegetative buffers and paved sidewalk are available. The posted speed limit is 35 mph.

Yauger Way NW: is a north-south, 2- to 3-lane roadway located east of the subject property. South of Harrison Avenue NW, the roadway is a classified major collector with a cross-section primarily consisting of one travel lane and a 5-foot bicycle lane in either direction and a center TWLTL. North of Harrison Avenue NW, the roadway is classified as a local roadway and a TWLTL with raised vegetated medians are present until 4th Avenue NW. The posted speed limit is 25 mph.

3rd Avenue NW: is an east-west, two-lane local access roadway proposed for a westerly extension to a future Craftsman Drive NW that will bisect the subject site. Total roadway width is approximately 18-feet. Vertical curb and detached sidewalks are present.

Craftsman Drive NW: is a north-south, two-lane local roadway that would eventually extend south and connect to Harrison Avenue NW. Total roadway width is approximately 18-feet. Vertical curb and detached sidewalks are present.

3.2 Existing Peak Hour Volumes and Travel Patterns

Field data was collected and/or obtained from the City to determine baseline vehicular volumes in the study area. During the scoping process with the city of Olympia, the following intersections were selected for evaluation:

1. 3rd Avenue NW / Yauger Way NW – *Stop Control*
2. Harrison Avenue NW / Bark & Garden Center Driveway (Future Proj. Ent.) – *Stop*
3. Harrison Avenue NW / Yauger Way NE – *Signal*
4. Harrison Avenue NW / Cooper Point Road NW – *Signal*

Counts were performed between the PM peak period of 4:00-6:00 PM, which generally represents peak roadway conditions during a typical 24-hour period. The single hour exhibiting highest overall intersection volumes is then derived (peak hour) and is used for analysis for each respective location. Intersection volumes have been derived from the City's 2018 Synchro Network. All volumes have been adjusted via a two percent annual growth rate through 2020 to reflect baseline conditions. As no data were available for the Bark & Garden Center, turning movement counts were taken in October of 2020. In addition, volumes along 3rd Avenue NW were estimated based on the six existing residential units. Baseline 2020 PM peak hour volumes are illustrated in Figure 3. Full count data are available in the appendix.

3.3 Non-Motorist Inventory

The surrounding area roadways have complete sidewalk and bicycle lanes to facilitate and encourage multi-modal transport. During field observations approximately 5 pedestrians and 10 cyclists were observed traveling along Harrison Avenue NW and two pedestrians along Yaeger Way NW. Additional non-motorist transport can be expected as a result of the proposed development due to the complete surrounding infrastructure and proximity to local transit.

3.4 Transit Service

A review of the Intercity Transit and Grays Harbor Transit bus schedules indicates that transit is provided directly south of the subject site at Harrison Avenue NW & Yaeger Way NW. Intercity Transit Route 47, traveling from the Olympia Transit Center to Capital Medical Center, provides weekday and weekend service from 9:00 AM – 7:55 PM with 60-minute headways. Grays Harbor Transit Route 40, traveling from Olympia to Hoquiam, provides weekday service from 5:10 AM – 9:50 PM. No weekend service is provided at this time. Refer to the Intercity and Grays Harbor Transit Guides for further route information. Some transit activity can be expected from the residential component of the Harrison Avenue Mixed-Use site given the proximity and available walking connectivity.

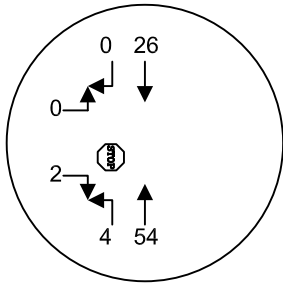
3.5 Roadway Improvements

A review of the current City of Olympia 2021-2026 Preliminary Capital Facilities Plan¹ indicates that no improvement projects are planned in the vicinity of the subject site within the next 6 years.

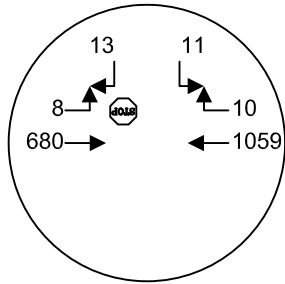
¹ City of Olympia 2021-2026 Preliminary Capital Facilities Plan: Transportation



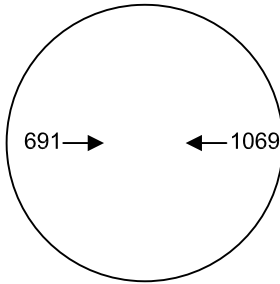
① 3RD AVE NW
& YAUGER WAY NW



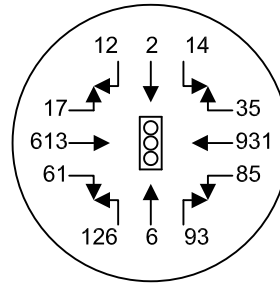
② HARRISON AVE NW
& W DRIVEWAY



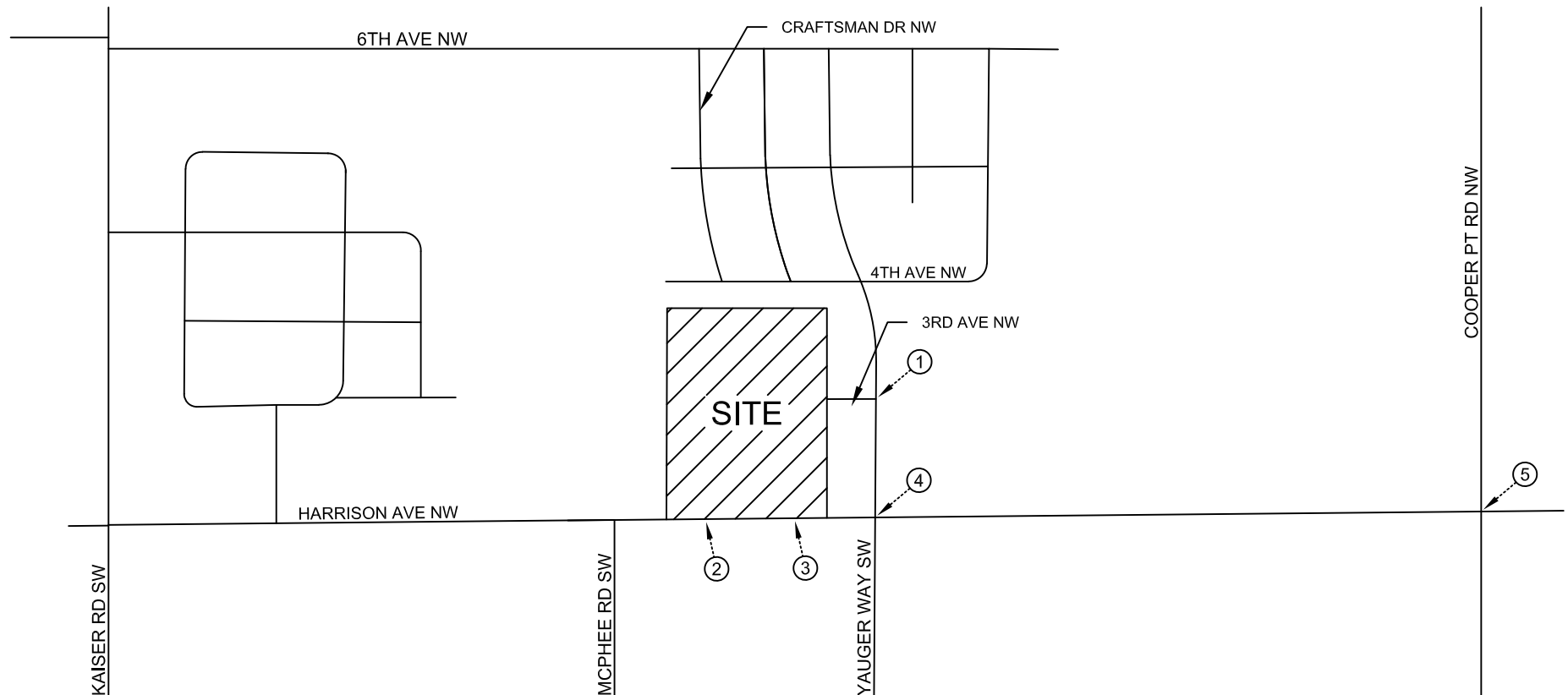
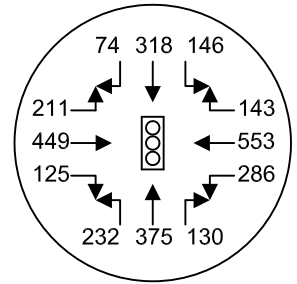
③ HARRISON AVE NW
& E DRIVEWAY



④ HARRISON AVE NW
& YAUGER WAY N/SW



⑤ HARRISON AVE NW
& COOPER PT RD N/SW



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HARRISON AVENUE MIXED-USE
BASELINE 2020 PM PEAK HOUR VOLUMES
FIGURE 3

3.6 Existing Level of Service

Peak hour delays were determined through the use of the *Highway Capacity Manual* 6th Edition. Capacity analysis is used to determine level of service (LOS) which is an established measure of congestion for transportation facilities. The range² for intersection level of service is LOS A to LOS F with the former indicating the best operating conditions with low control delays and the latter indicating saturated conditions with heavy control delays. Detailed descriptions of intersection LOS are given in the *2016 Highway Capacity Manual*. Level of service calculations were made through the use of the *Synchro 10* analysis program using the City of Olympia's Network Model. Table 1 below summarizes baseline 2020 PM peak hour LOS delays for the intersections of study.

Table 1: Baseline 2020 PM Peak Hour Level of Service

Delays given in seconds per vehicle

ID	Intersection	Control	Critical Approach	LOS	Delay
1	3rd Avenue NW / Yauger Way	Stop	Overall	A	0.5
			EB	A	8.4
2	Harrison Avenue / Bark & Garden	Stop	Overall	A	0.3
			SB	C	18.6
3	Harrison Avenue / Proj. Driveway	Stop	--	--	--
4	Harrison Avenue / Yauger Way	Signal	Overall	C	21.2
5	Harrison Avenue / Cooper Point Rd	Signal	Overall	D	43.1

City Level of Service Standards: Level of Service E generally applies on arterials and major collectors whereas Level of Service D generally applies to local roadways³.

Existing Weekday PM Peak Hour: The study intersections are shown to meet City standards operating at LOS D or better under PM peak hour conditions. Harrison Avenue is also a City Strategy Corridor where LOS may fall below adopted LOS E standards.

² *Signalized Intersections - Level of Service*

Level of Service	Control Delay per Vehicle (sec)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Stop Controlled Intersections – Level of Service

Level of Service	Control Delay per Vehicle (sec)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Highway Capacity Manual, 6th Edition

³ City of Olympia Comprehensive Plan, *Transportation*, Section PT8.6

3.6 Project Access

Three access points are proposed to serve the subject property. Each location is summarized below.

3rd Avenue NW: A westerly extension spanning approximately 165 feet from its current location to the edge of the property limits is proposed. At a future date, this roadway would connect and tie into a Craftsman Drive extension. However, until such time, 3rd Avenue NW would be blocked off at the western edge to prohibit external movements through the roadway. Access would be provided for the Harrison Avenue Mixed-Use site and local residents by way of Yaeger Way NW. 3rd Avenue NW is a City designated local access and can serve up to 500 average daily trips. Sight lines from 3rd Avenue at Yaeger Way NW appear to meet City standards.

Harrison Avenue NW: Two access points are proposed along Harrison Avenue NW. The east driveway currently serves an 1,160 sq. ft. commercial facility that would initially remain but would subsequently be redeveloped into a larger commercial building. The driveway would allow right-turn movements into and out of the site only due to the raised center median along Harrison Avenue NW.

The second access currently serves the Bark & Garden Center which is proposed to remain in operation during the three-year horizon period of this analysis. This driveway will eventually become Craftsman Drive NW via a southerly extension from 4th Avenue NW to Harrison Avenue NW. Right-of-way dedication of 58 feet is required per the future Commercial Collector classification. For this analysis, the roadway would terminate just past the LOT 2 limits identified in the site plan. Actual construction of the future roadway is to be determined.

In the vicinity, Harrison Avenue is relatively flat in grade and has no horizontal curvature. Based on the 35-mph posted speed limit and roadway geometrics on Harrison Avenue, City of Olympia's Engineering Design and Development Standards requires 415 feet of intersection sight distance. Preliminary examinations of the proposed access points along Harrison Avenue indicate sight lines to exceed 450 feet in either direction.

3.7 Accident History

A list of the recorded accident history for the most recent six full years (beginning of 2014 through end of 2019) for the intersections of study nearest the subject site was requested from WSDOT. Table 2 below provides a summary of the collisions recorded per year for each study location.

Table 2: Accident History

Intersection	2014	2015	2016	2017	2018	2019	Avg/Yr
Harrison Ave / Yauger Way	4	4	2	1	4	1	2.67
Harrison Ave / Bark & Garden	0	0	1	1	0	0	0.33
Harrison Ave Corridor							
from Yauger to Bark & Garden	1	0	1	0	0	0	0.33

WSDOT data indicate a total of 20 recorded collisions at the study intersections of interest and adjacent roadway segment. Collision type and contributing factor breakdowns for each intersection/segment are provided below.

- 1. Harrison Avenue NW & Yauger Way:** a total of 16 accidents were recorded, resulting in approximately 2.67 collisions per year. The most common occurrence listed was “from opposite direction – one left turn, one straight” (5/16), followed by “rear-end” (4/16) followed by “entering at an angle” (4/16). Other notable occurrences include “vehicle strikes pedalcyclist” (2/16) and “vehicle hits object” (1/16).
- 2. Harrison Avenue NW & W Project Driveway:** a total of 2 accidents were recorded, resulting in approximately 0.33 collisions per year. The common occurrence listed was “entering at angle” (2/2).
- 3. Harrison Avenue corridor segment:** a total of 2 accidents were recorded on Harrison Avenue NW between Yauger Road NW/SW and the existing westerly project driveway, resulting in approximately 0.33 collisions per year. Occurrences were listed as “vehicle hits object” (1/2) and “from same direction” (1/2).

Most contributing collision circumstances were associated with driver inattention and no identifiable trend related to roadway geometric deficiencies is noted. Out of all 20 crashes, 12 collisions resulted in no apparent injury while 6 collisions resulted in possible injury. No fatalities were recorded. The two collisions involving pedalcyclists resulted in possible injury (occurring at Harrison & Yauger). Contributing factors listed for these two crashes are “driver inattention” and “none”, with both occurring under dry conditions during daylight.

4. FORECAST TRAFFIC DEMAND AND ANALYSIS

4.1 Project Trip Generation

Trip generation is defined by the number of vehicular movements that enter or exit a site during a particular timeframe such as a specific hour or an entire day. To establish estimated trip generation demand as a result of the proposed development, data have been derived from the Institute of Transportation Engineers' publication *Trip Generation*, 10th Edition. Applicable Land Use Codes (LUCs) and average rates have been applied for each respective use. An aggregate trip generation summary is provided in Table 3 below. Available in the appendix is a use-specific breakdown including rates used for calculations.

Table 3: Project Trip Generation

Trip Type	AWDT	AM Peak-Hour Trips			PM Peak-Hour Trips		
		In	Out	Total	In	Out	Total
Primary	815	15	20	35	41	34	75
Pass-by	283	2	3	5	14	14	28
Total	1,098	17	23	40	55	48	103

As shown in the table above, trips to and from the site are broken into primary and pass-by. Primary trips are considered new trips to the adjacent street network whereas pass-by trips are already passing the site along Harrison Avenue NW and make an intermediate stop on their way to a primary destination. Commercial uses along an arterial generally attract some passerby traffic. These trips are not considered new to the City system but will increase turning movements at the project's driveways. Pass-by rates have been derived from the ITE manual and through City scoping.

In total, 1,098 trips per day are expected as a result from the proposed development with 40 trips occurring in the AM peak hour and 103 trips in the PM peak hour. This trip generation summary includes activity from all proposed on-site uses (i.e., residential, office and commercial).

4.2 Distribution & Assignment

Trip distribution describes the process by which project generated trips are dispersed on the roadway network surrounding the site. Trip distribution percentages were derived through a site-specific Transportation Analysis Zone (TAZ) model as prepared by Thurston Regional Planning Council (TRPC). The in-depth model took into consideration the proposed land uses, roadway geometrics, speeds and other variables to determine expected trip routes to and from the site.

As requested by the City, two separate model scenarios were prepared. The first model reflects trip distribution based on the project with no Craftsman Drive extension, consistent with the basis of this study. The second model includes the complete Craftsman Drive extension from 4th Avenue to Harrison Avenue and future potential development within LOT 1 of the site plan. This model was prepared for illustrative purposes at this time as the extension and LOT 1 development is not included in this project scope. TRPC models were derived for each LOT and can be found in the appendix. Using the models' assumptions, Figure 4a reflects the project's primary trip distribution and assignment. Figure 4b illustrates pass-by trips which would originate and depart via Harrison Avenue NW.

Based on the TAZ modeling, approximately 23 PM peak hour trips are expected to access the site by way of 3rd Avenue NW (~30 percent of site-generated traffic). These trips are primarily expected from the proposed residential components from LOTS 4 & 5. While not shown in the model, a few of these trips may be from local residents residing within the Grass Lake Community to visit the commercial offerings. However, the majority of commercial activity is expected to arrive and depart via Harrison Avenue. Further, any truck traffic would enter the site via the Craftsman Drive access, which would be designed with appropriate turning radii to accommodate larger vehicles.

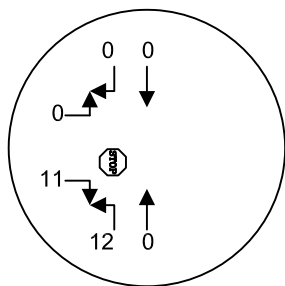
The 3rd Avenue NW access and roadway extension, as required by the City, is to enhance interconnectivity and would benefit both the proposed project and local neighborhood. See appendix for an excerpt from the City's Connectivity Goals and Policies as obtained within the Transportation Element of the Comprehensive Plan. It should also be noted that 3rd Avenue NW is to remain closed at the west end until such time that Craftsman Drive is fully constructed.

4.3 Future Peak Hour Volumes

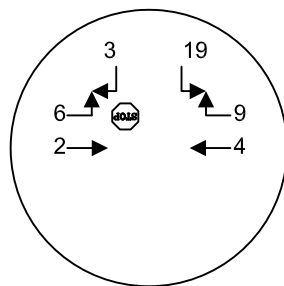
A 3-year horizon of 2023 was used for future traffic delay analysis. Forecast 2023 background traffic volumes were derived by applying a 2.0 percent compound annual growth rate to the existing volumes shown in Figure 3. In addition, pipelines volumes from the nearby planned Woodbury Crossing project have been included in the background forecast. An exhibit is available in the appendix illustrating pipeline volumes. Forecast 2023 background peak hour volumes and volumes with the addition of project-generated traffic are presented in Figures 5 and 6, respectively.



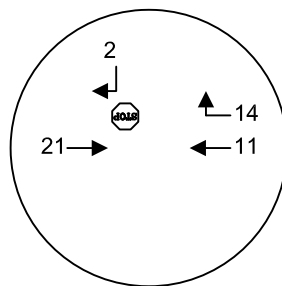
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& YAUGER WAY NW



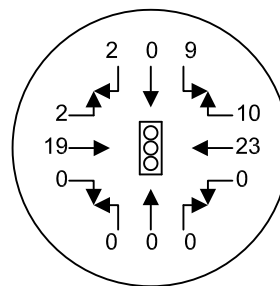
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& W DRIVEWAY



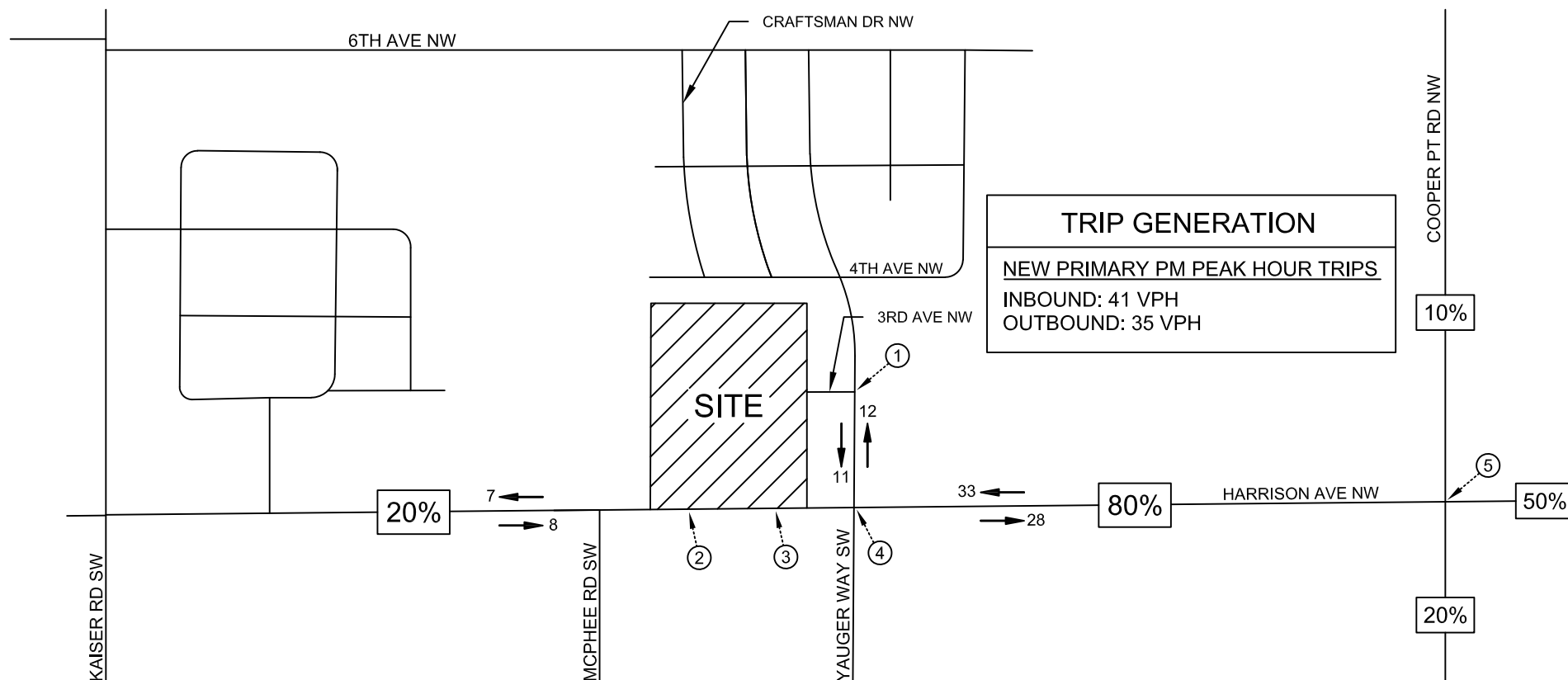
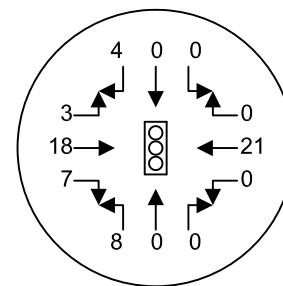
③ HARRISON AVE NW
& E DRIVEWAY



④ HARRISON AVE NW
& YAUGER WAY N/SW



⑤ HARRISON AVE NW
& COOPER PT RD N/SW

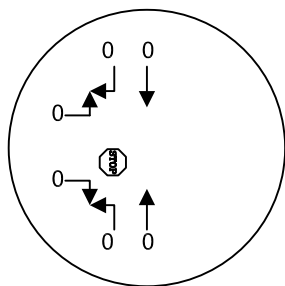


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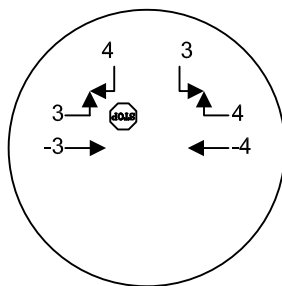
HARRISON AVENUE MIXED-USE
TRIP DISTRIBUTION & ASSIGNMENT - PRIMARY TRIPS
FIGURE 4a



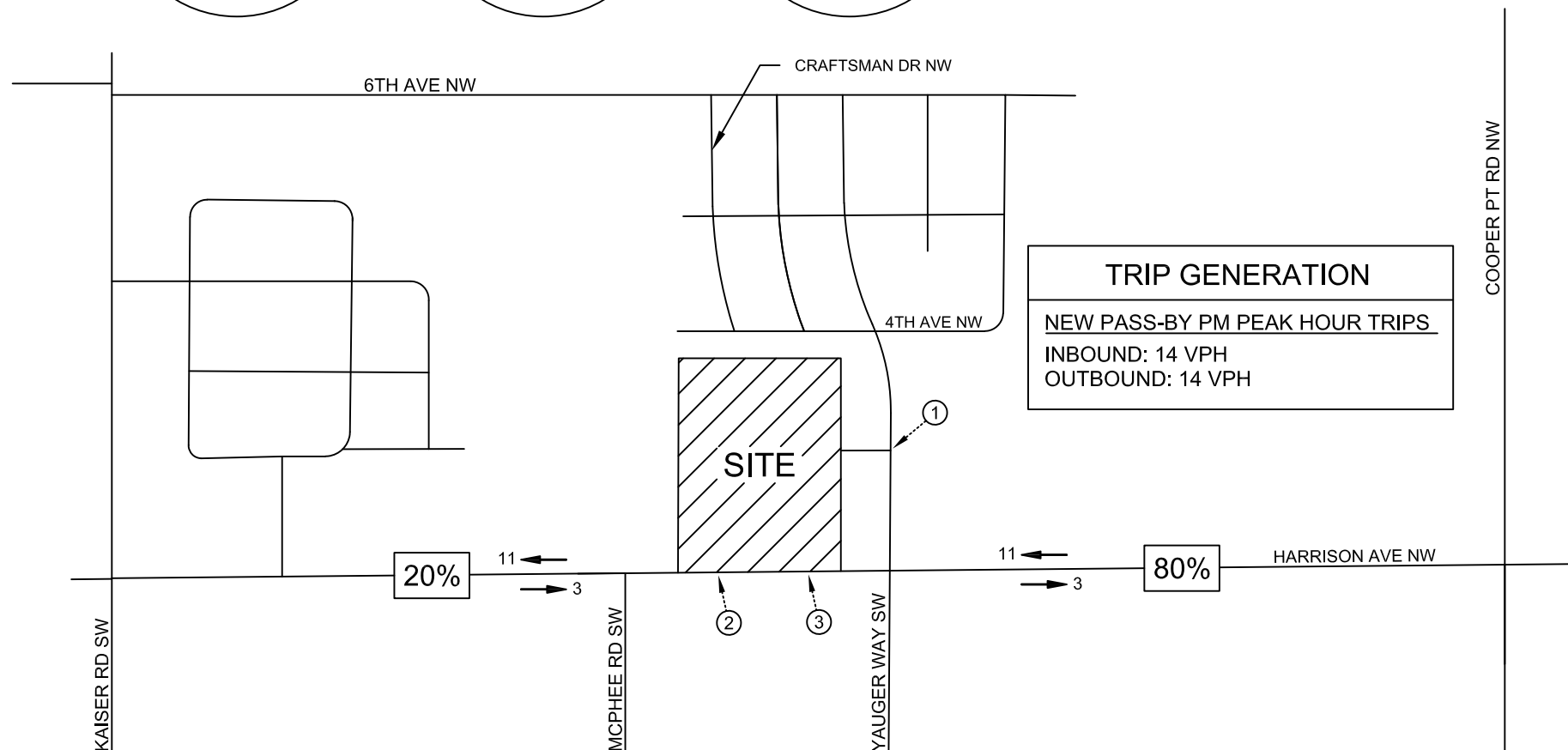
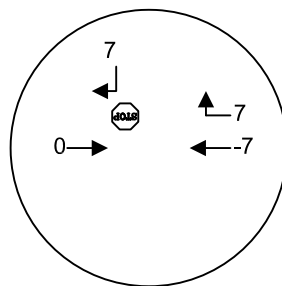
① 3RD AVE NW
& YAUGER WAY NW



② HARRISON AVE NW
& W DRIVEWAY



③ HARRISON AVE NW
& E DRIVEWAY

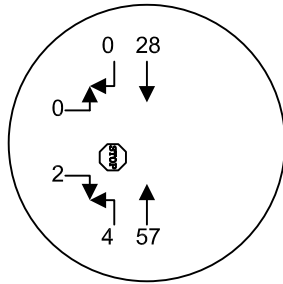


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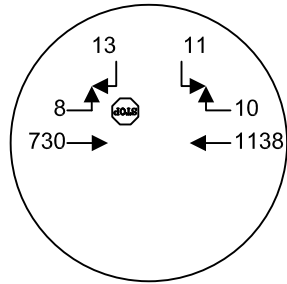
HARRISON AVENUE MIXED-USE
TRIP DISTRIBUTION & ASSIGNMENT - PASS-BY TRIPS
FIGURE 4b



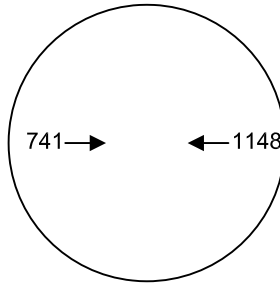
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& YAUGER WAY NW



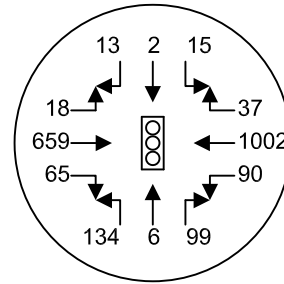
② HARRISON AVE NW
& W DRIVEWAY



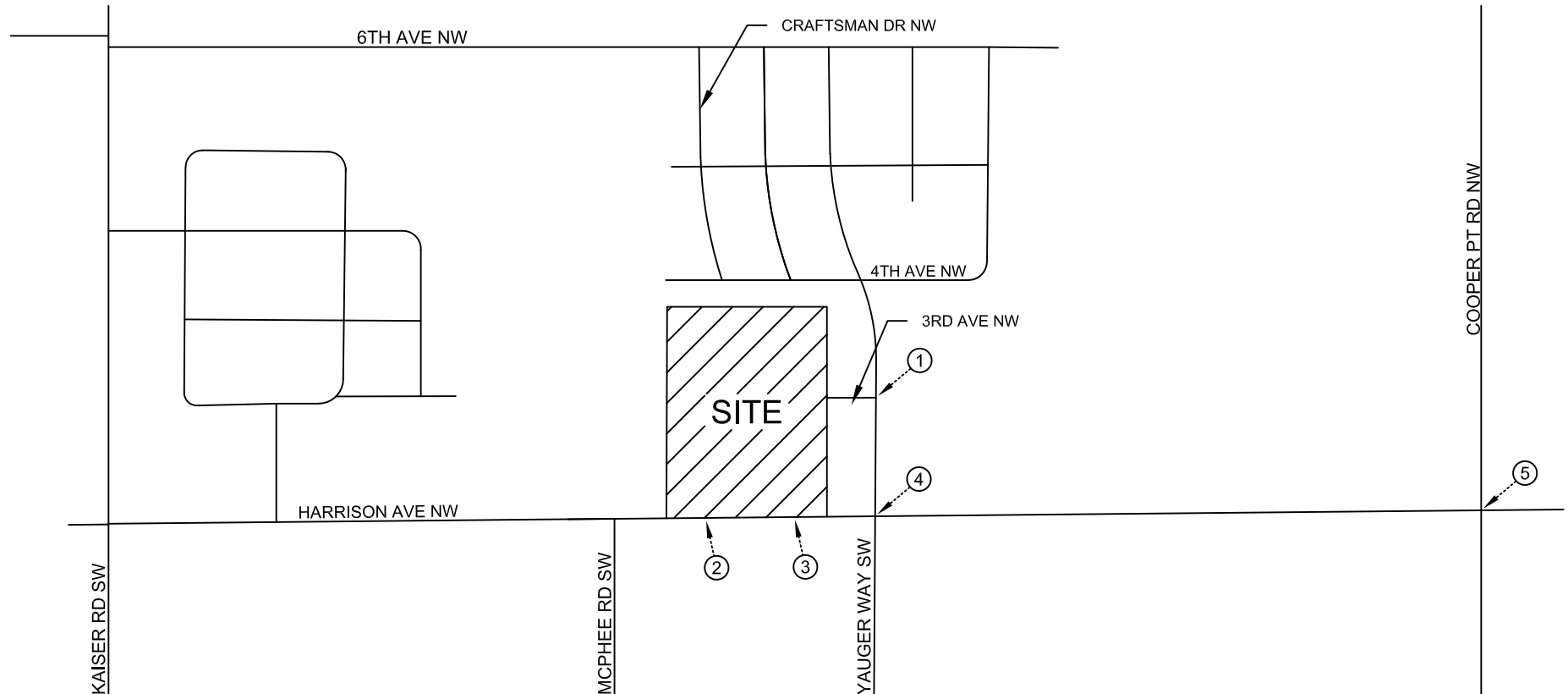
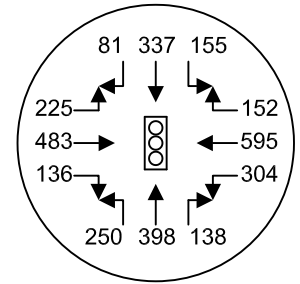
③ HARRISON AVE NW
& E DRIVEWAY



④ HARRISON AVE NW
& YAUGER WAY N/SW



⑤ HARRISON AVE NW
& COOPER PT RD N/SW

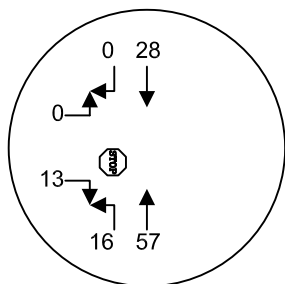


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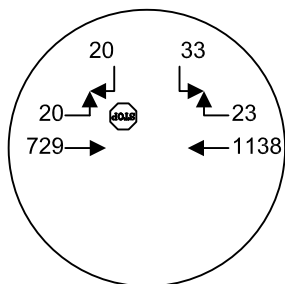
HARRISON AVENUE MIXED-USE
FORECAST 2023 PM PEAK HOUR VOLUMES WITHOUT PROJECT
FIGURE 5



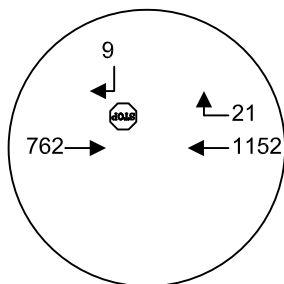
① 3RD AVE NW
& YAUGER WAY NW



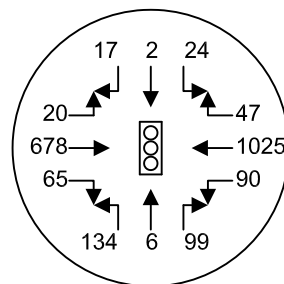
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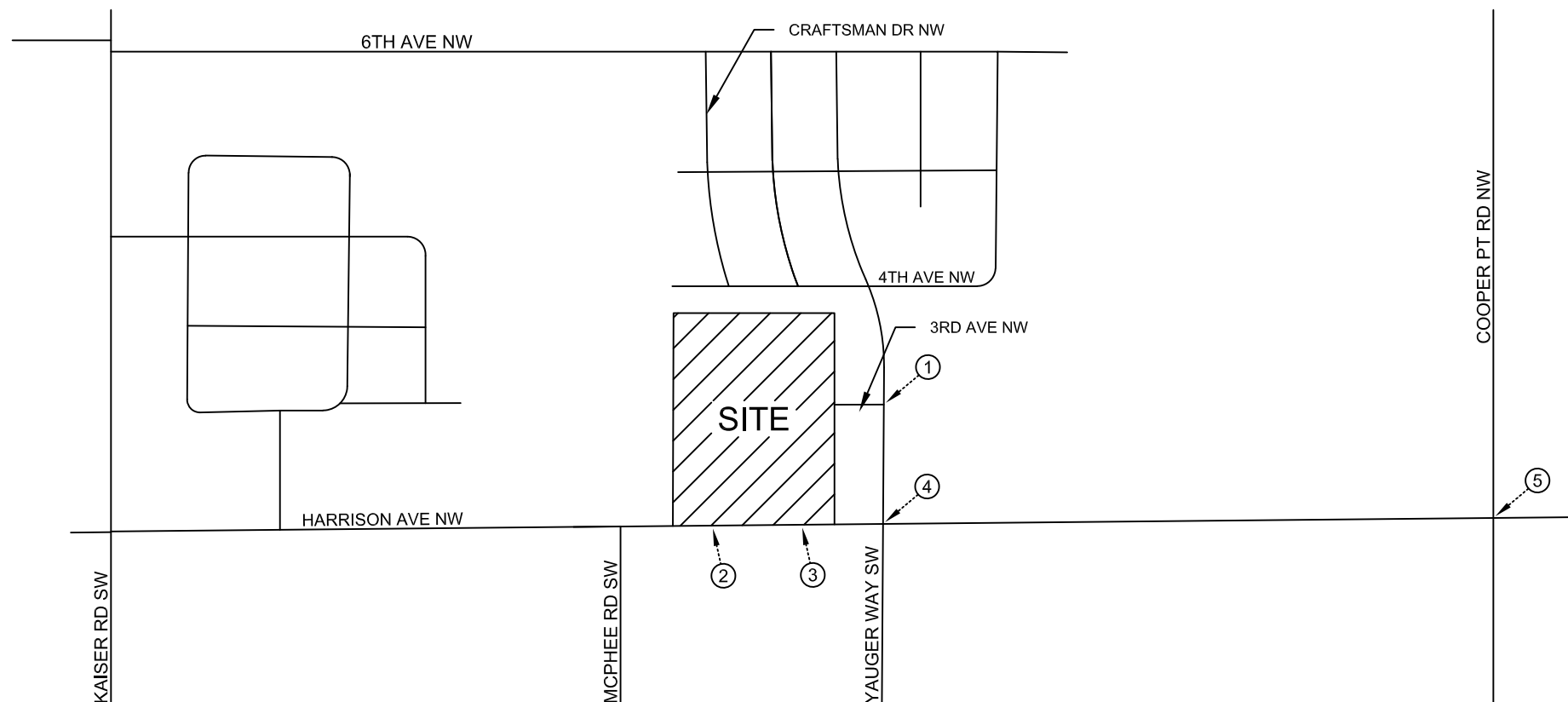
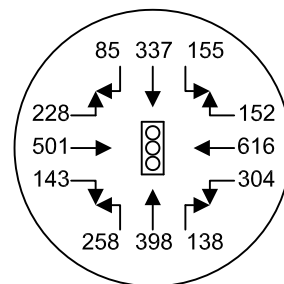
③ HARRISON AVE NW
& E DRIVEWAY



④ HARRISON AVE NW
& YAUGER WAY N/SW



⑤ HARRISON AVE NW
& COOPER PT RD N/SW



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HARRISON AVENUE MIXED-USE
FORECAST 2023 PM PEAK HOUR VOLUMES WITH PROJECT
FIGURE 6

4.4 Future Level of Service

Level of service analyses were made of the future PM peak hour volumes without (background) and with project related trips added to the key roadways and intersections. This analysis once again involved the use of the *Synchro 10* analysis programs. Delays for the study intersections under future conditions are shown below in Table 4.

Table 4: Forecast 2023 PM Peak Hour Level of Service

Delays Given in Seconds per Vehicle

ID	Intersection	Control	Critical Approach	Without Project		With Project	
				LOS	Delay	LOS	Delay
1	3 rd Avenue NW / Yauger Way	Stop	Overall	A	0.5	A	2.0
			EB	A	8.5	A	8.5
2	Harrison Avenue / Craftsman Drive	Stop	Overall	A	0.3	A	0.8
			SB	C	20.0	D	26.2
3	Harrison Avenue / Proj. Driveway	Stop RIRO	Overall	--	--	A	0.1
			SB	--	--	B	13.8
4	Harrison Avenue / Yauger Way	Signal	Overall	C	25.7	C	28.4
5	Harrison Avenue / Cooper Point Rd	Signal	Overall	D	46.0	D	47.0

RIRO: Right-in/Right-out

Forecast 2023 PM peak hour with project development is shown to continuing operating with acceptable LOS D or better conditions meeting City standards. No operational deficiencies are identified as a result of the proposed development. Performance descriptions of the two most impacted intersections are discussed as follows:

3rd Avenue NW / Yauger Way: is shown to operate with acceptable LOS A conditions with or without the proposed project. 3rd Avenue NW is a City classified local access roadway with a daily trip threshold of 500 trips. Currently six residences exist along 3rd Avenue NW, which generally translates into 10 trips/day for each unit, or 60 existing trips per day. As identified in the model, roughly 30 percent of primary trip traffic is expected to use 3rd Avenue, which accounts for 245 trips (815 daily trips x 30%). In total, approximately 305 daily trips are expected which remains below the 500-trip threshold. However, given the increase in traffic, the City may require traffic calming devices based on the local access classification.

Harrison Avenue / Craftsman Drive: is shown to operate at LOS D with project traffic. Calculations assumed a single departing lane from Craftsman Drive. Adding a second lane to separate left- and right-turn movements to Harrison Avenue would improve conditions to LOS C (24.2 sec). The two-lane channelization would also improve future conditions subsequent to the full extension of Craftsman Drive as more vehicles would utilize the intersection.

5. CONCLUSIONS & MITIGATION

Harrison Avenue Mixed-Use proposes for the construction of 61 multi-family units, 10,222 sq. ft. of retail space, 4,675 sq. ft. office space and a 4,000 sq. ft. restaurant in the city of Olympia. The subject site is situated on the north side of Harrison Avenue NW and west of Yaeger Way NW. A conceptual site plan illustrating the overall configuration of the project is provided in Figure 1, showing the proposed 3rd Avenue NW and Craftsman Drive NW roadway extensions providing access to the site. For this analysis and development proposal, Craftsman Drive would terminate just beyond LOT 2 of the provided site plan and 3rd Avenue would be closed off at the west end.

Existing level of service (LOS) at the study intersections are shown to operate at LOS D or better meeting City standards. The project is anticipated to generate approximately 1,098 daily trips, 40 AM peak hour trips and 103 PM peak hour trips based on ITE data. As shown in Table 3, a portion of these trips are anticipated to be in the form of pass-by. Under a three-year horizon forecast, LOS is shown to continue operating with LOS D or better conditions. The surrounding roadways were found to have sufficient capacity to support the project's demands.

Based on this analysis, a recommended mitigation is as follows:

1. Pay traffic impact fees as required by the city of Olympia. Exact fees and calculations will be determined by the City at the time of building permit issuance.
2. Traffic calming devices may be required along 3rd Avenue NW. Additional discussion and coordination with the City is recommended to discuss potential mitigation measures.
3. Based on City review and decision, additional right-of-way and/or construction of a three-lane Craftsman Drive section at the newly created intersection of Craftsman Drive / Harrison Avenue may be needed.

No other mitigation is identified at this time.

HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

APPENDIX
COUNTS

Heath & Associates

2214 Tacoma Rd E
Puyallup, WA 98371

File Name : 4413b
Site Code : 00004413
Start Date : 10/22/2020
Page No : 1

Groups Printed- Passenger + - Trucks

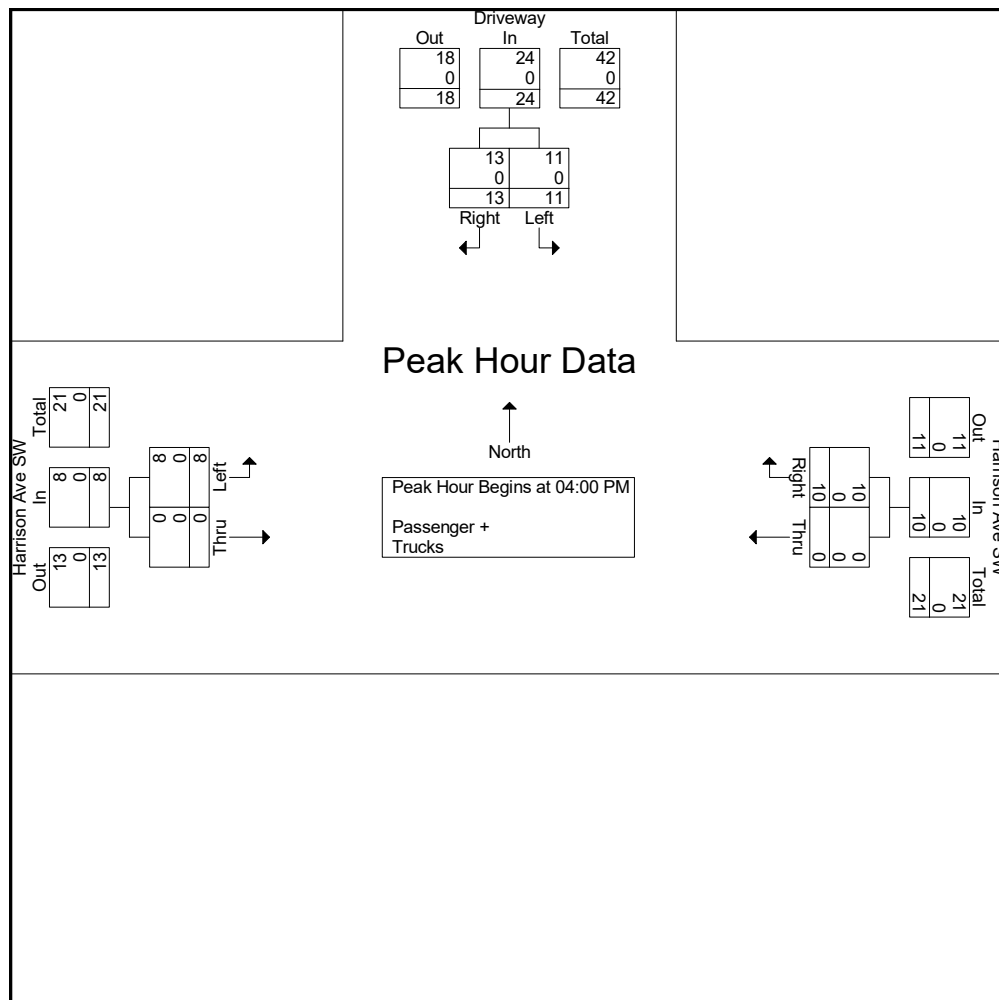
Start Time	Driveway Southbound			Harrison Ave SW Westbound			Harrison Ave SW Eastbound			Int. Total
	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	
04:00 PM	4	3	7	4	0	4	0	2	2	13
04:15 PM	1	3	4	3	0	3	0	1	1	8
04:30 PM	3	2	5	0	0	0	0	3	3	8
04:45 PM	5	3	8	3	0	3	0	2	2	13
Total	13	11	24	10	0	10	0	8	8	42
05:00 PM	3	3	6	0	0	0	0	0	0	6
05:15 PM	1	1	2	0	0	0	0	1	1	3
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	4	4	8	0	0	0	0	1	1	9
Grand Total	17	15	32	10	0	10	0	9	9	51
Apprch %	53.1	46.9		100	0		0	100		
Total %	33.3	29.4	62.7	19.6	0	19.6	0	17.6	17.6	
Passenger +	17	15	32	10	0	10	0	9	9	51
% Passenger +	100	100	100	100	0	100	0	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0

Heath & Associates

2214 Tacoma Rd E
Puyallup, WA 98371

File Name : 4413b
Site Code : 00004413
Start Date : 10/22/2020
Page No : 2

	Driveway Southbound			Harrison Ave SW Westbound			Harrison Ave SW Eastbound			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	4	3	7	4	0	4	0	2	2	13
04:15 PM	1	3	4	3	0	3	0	1	1	8
04:30 PM	3	2	5	0	0	0	0	3	3	8
04:45 PM	5	3	8	3	0	3	0	2	2	13
Total Volume	13	11	24	10	0	10	0	8	8	42
% App. Total	54.2	45.8		100	0		0	100		
PHF	.650	.917	.750	.625	.000	.625	.000	.667	.667	.808
Passenger +	13	11	24	10	0	10	0	8	8	42
% Passenger +	100	100	100	100	0	100	0	100	100	100
Trucks	0	0	0	0	0	0	0	0	0	0
% Trucks	0	0	0	0	0	0	0	0	0	0



HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

APPENDIX
TRIP GENERATION

Harrison Avenue Mixed-Use - Trip Generation Summary

Average Weekday Trips																	
Development	Land Use	LUC	Variable	Value	Rate	Distribution		Total Trips			Internal Capture		Pass-by Trips		Primary Trips		
						In	Out	In	Out	Total	%	Total	%	Total	In	Out	Total
Previous	N/A	--	--	0	0	0%	0%	0.0	0.0	0.0	0%	0	0%	0.0	0.0	0.0	0.0
Proposed	Multi-Family (Mid-Rise)	#221	Dwelling Units	61	5.44	50%	50%	165.9	165.9	331.8	0%	0.0	0%	0.0	165.9	165.9	331.8
	Office	#710	1000 sqft	4.7	9.74	50%	50%	22.9	22.9	45.8	0%	0.0	10%	4.6	20.6	20.6	41.2
	Retail	#820	1000 sqft	10.2	37.75	50%	50%	192.5	192.5	385.1	0%	0.0	34%	130.9	127.1	127.1	254.1
	Restaurant	#931	1000 sqft	4	83.84	50%	50%	167.7	167.7	335.4	0%	0.0	44%	147.6	93.9	93.9	187.8
Totals														283.1	407.5	407.5	815.0

Weekday AM Peak Hour																	
Development	Land Use	LUC	Variable	Value	Rate	Distribution		Total Trips			Internal Capture		Pass-by Trips		Primary Trips		
						In	Out	In	Out	Total	%	Total	%	Total	In	Out	Total
Previous	N/A	--	--	0	0	0%	0%	0.0	0.0	0.0	0%	0	0%	0.0	0.0	0.0	0.0
Proposed	Multi-Family (Mid-Rise)	#221	Dwelling Units	61	0.36	26%	74%	5.7	16.3	22.0	0%	0.0	0%	0.0	5.7	16.3	22.0
	Office	#710	1000 sqft	4.7	1.16	86%	14%	4.7	0.8	5.5	0%	0.0	10%	0.5	4.2	0.7	4.9
	Retail	#820	1000 sqft	10.2	0.94	62%	38%	5.9	3.6	9.6	0%	0.0	34%	3.3	3.9	2.4	6.3
	Restaurant	#931	1000 sqft	4	0.73	90%	10%	2.6	0.3	2.9	0%	0.0	44%	1.3	1.5	0.2	1.6
Totals														5.1	15.3	19.5	34.8

Weekday PM Peak Hour																	
Development	Land Use	LUC	Variable	Value	Rate	Distribution		Total Trips			Internal Capture		Pass-by Trips		Primary Trips		
						In	Out	In	Out	Total	%	Total	%	Total	In	Out	Total
Previous	N/A	--	--	0	0	0%	0%	0.0	0.0	0.0	0%	0	0%	0.0	0.0	0.0	0.0
Proposed	Multi-Family (Mid-Rise)	#221	Dwelling Units	61	0.44	61%	39%	16.4	10.5	26.8	0%	0.0	0%	0.0	16.4	10.5	26.8
	Office	#710	1000 sqft	4.7	1.15	16%	84%	0.9	4.5	5.4	0%	0.0	10%	0.5	0.8	4.1	4.9
	Retail	#820	1000 sqft	10.2	3.81	48%	52%	18.7	20.2	38.9	0%	0.0	34%	13.2	12.3	13.3	25.6
	Restaurant	#931	1000 sqft	4	7.8	67%	33%	20.9	10.3	31.2	0%	0.0	44%	13.7	11.7	5.8	17.5
Totals														27.5	41.2	33.7	74.8

Sources:

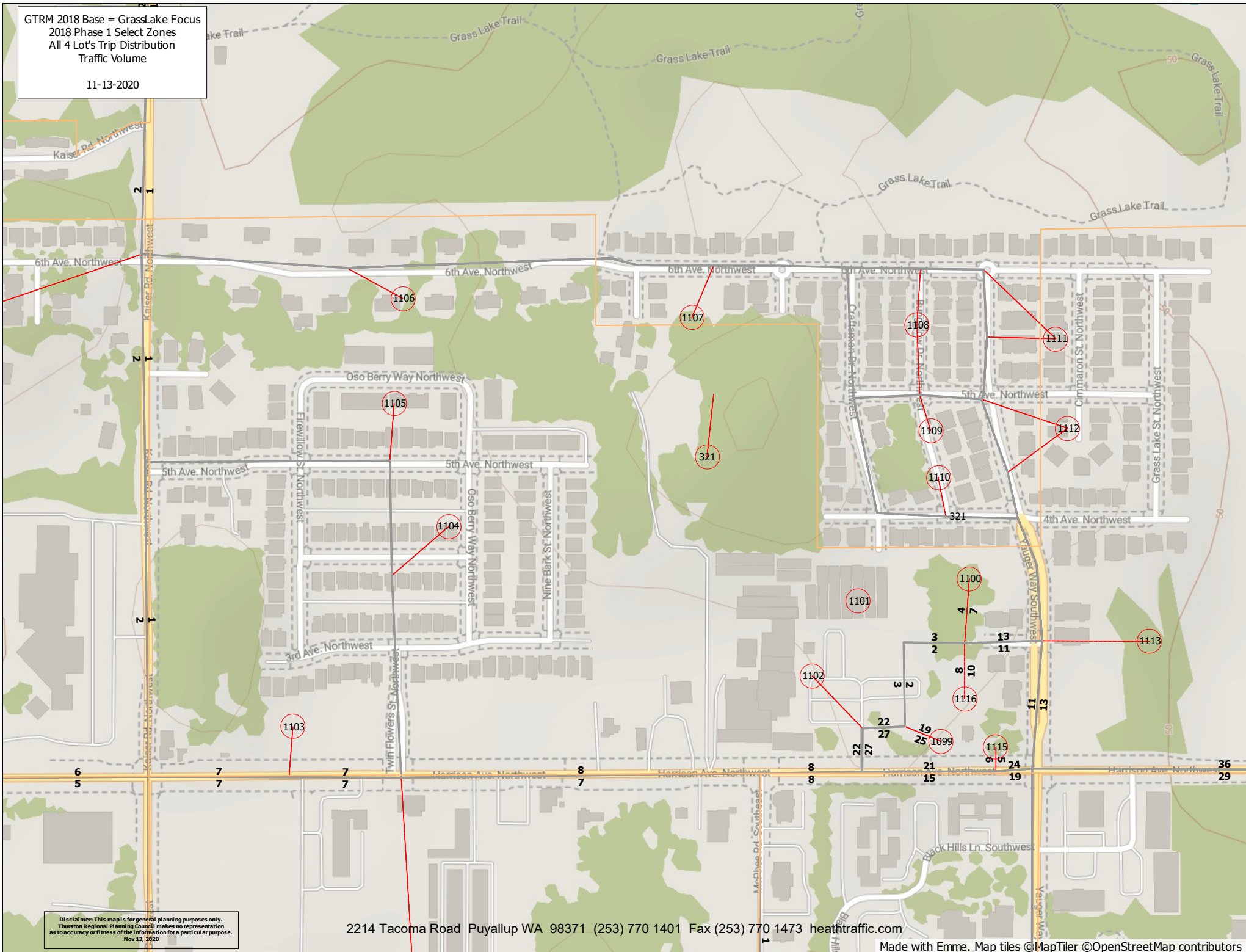
Institute of Transportation Engineers, *Trip Generation Manual*, 10th Edition, (2017).
 Institute of Transportation Engineers, *Trip Generation Handbook*, 3rd Edition, (2017).
 City of Olympia Scoping Trip Generation Rates

HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

APPENDIX
TRPC MODELS

GTRM 2018 Base = GrassLake Focus
2018 Phase 1 Select Zones
All 4 Lot's Trip Distribution
Traffic Volume

11-13-2020



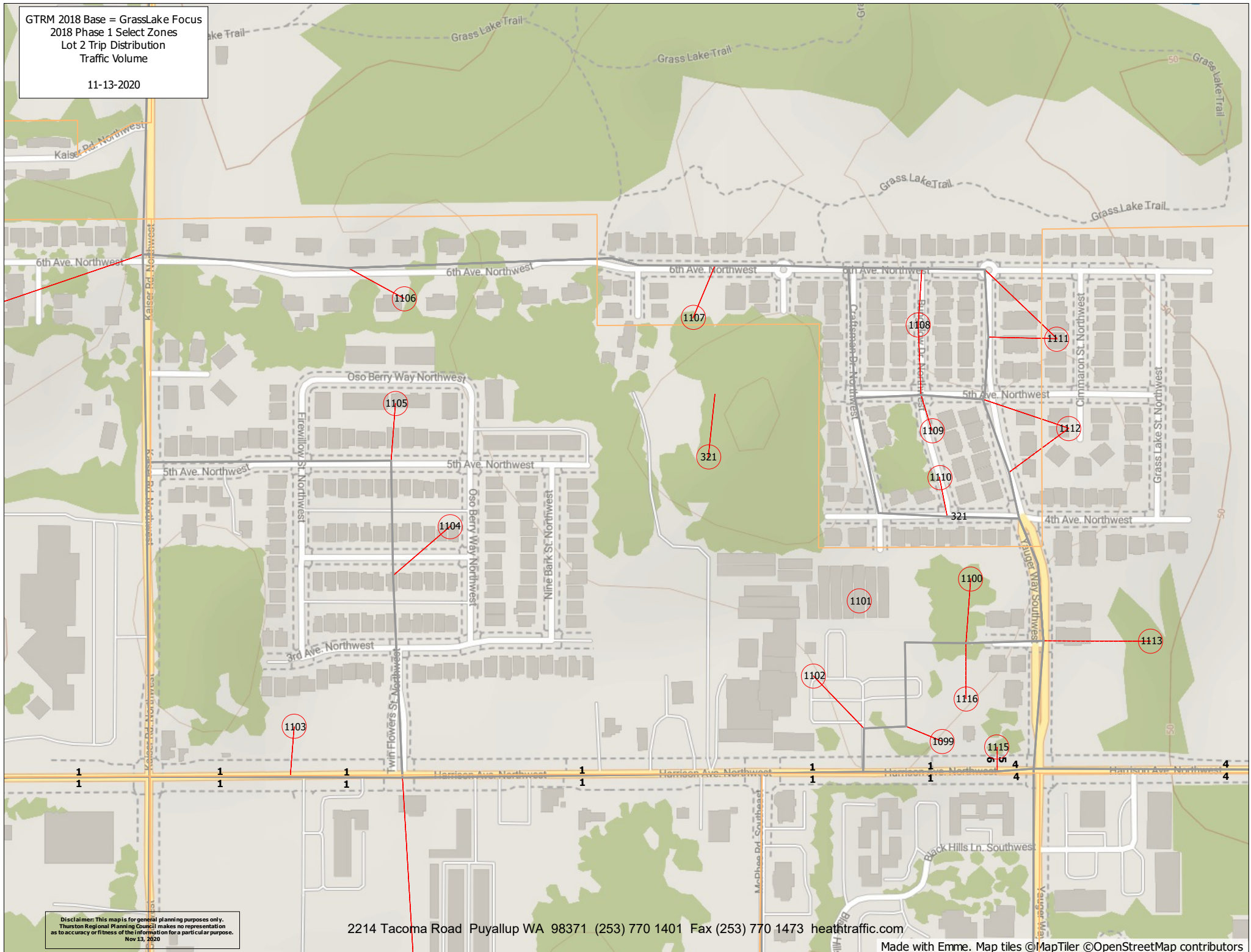
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GTRM 2018 Base = GrassLake Focus
2018 Phase 1 Select Zones
Lot 2 Trip Distribution
Traffic Volume

11-13-2020

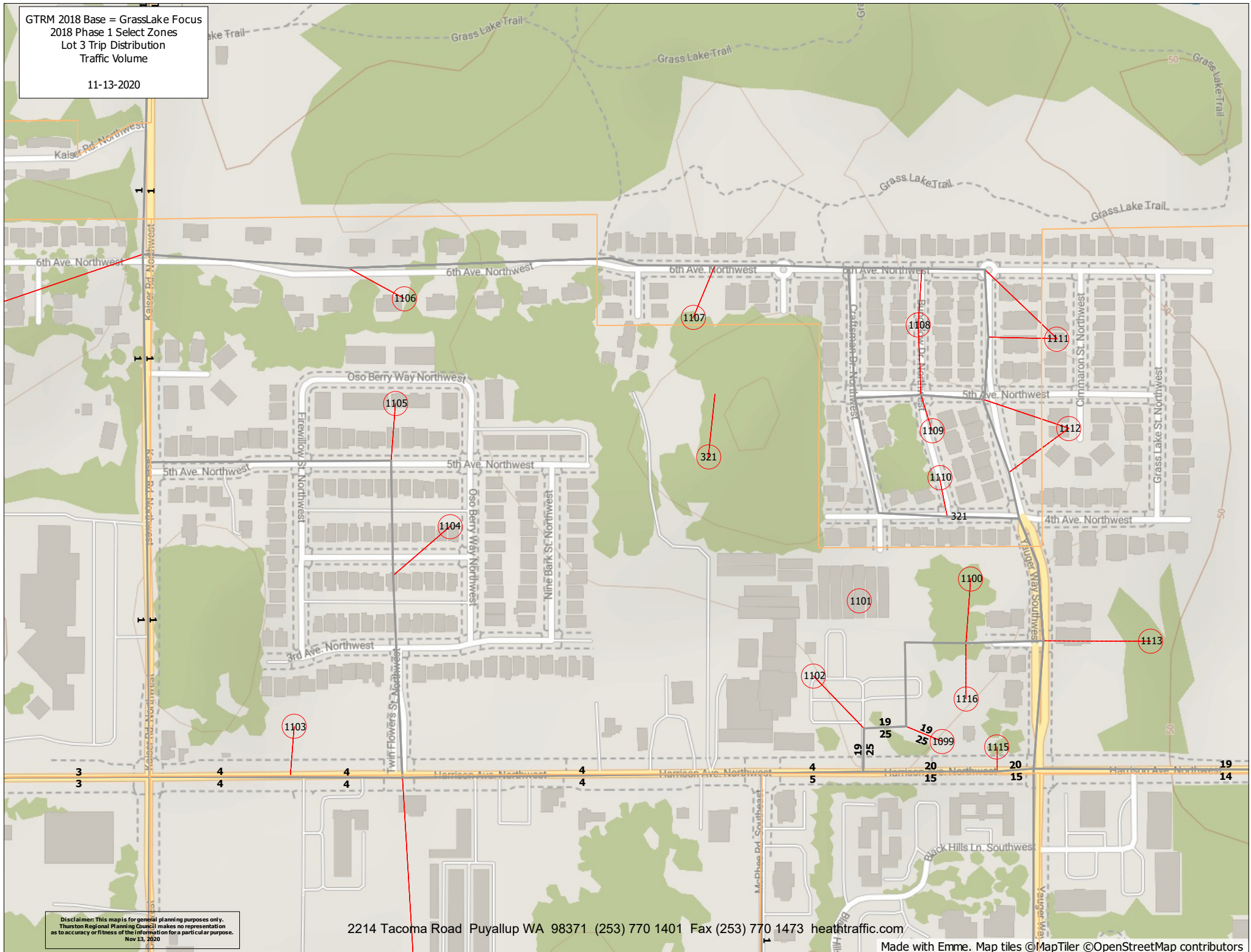


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 2018 Phase 1 Select Zones
 Lot 3 Trip Distribution
 Traffic Volume
 11-13-2020



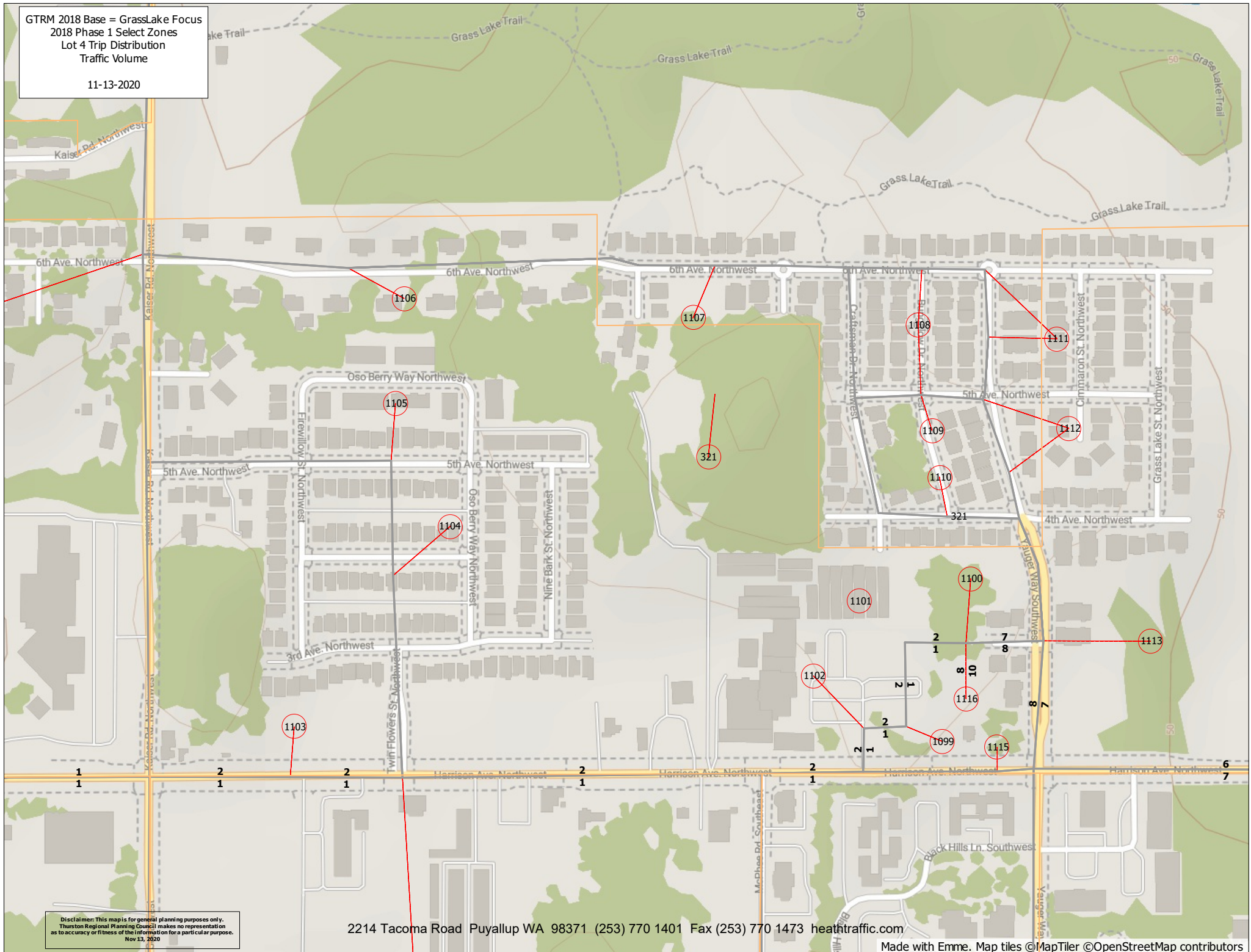
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2018 Phase 1 Select Zones
Lot 4 Trip Distribution
Traffic Volume

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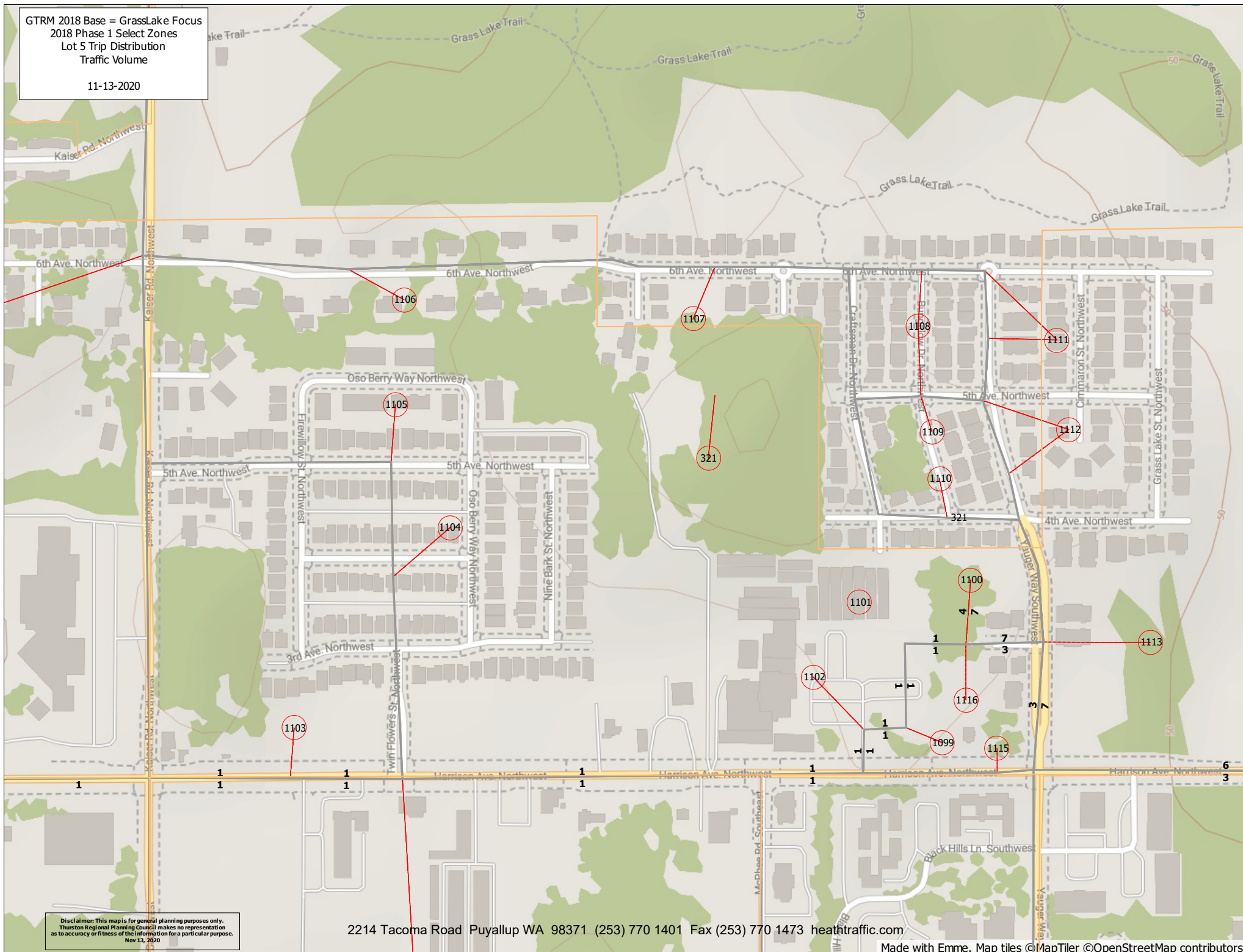


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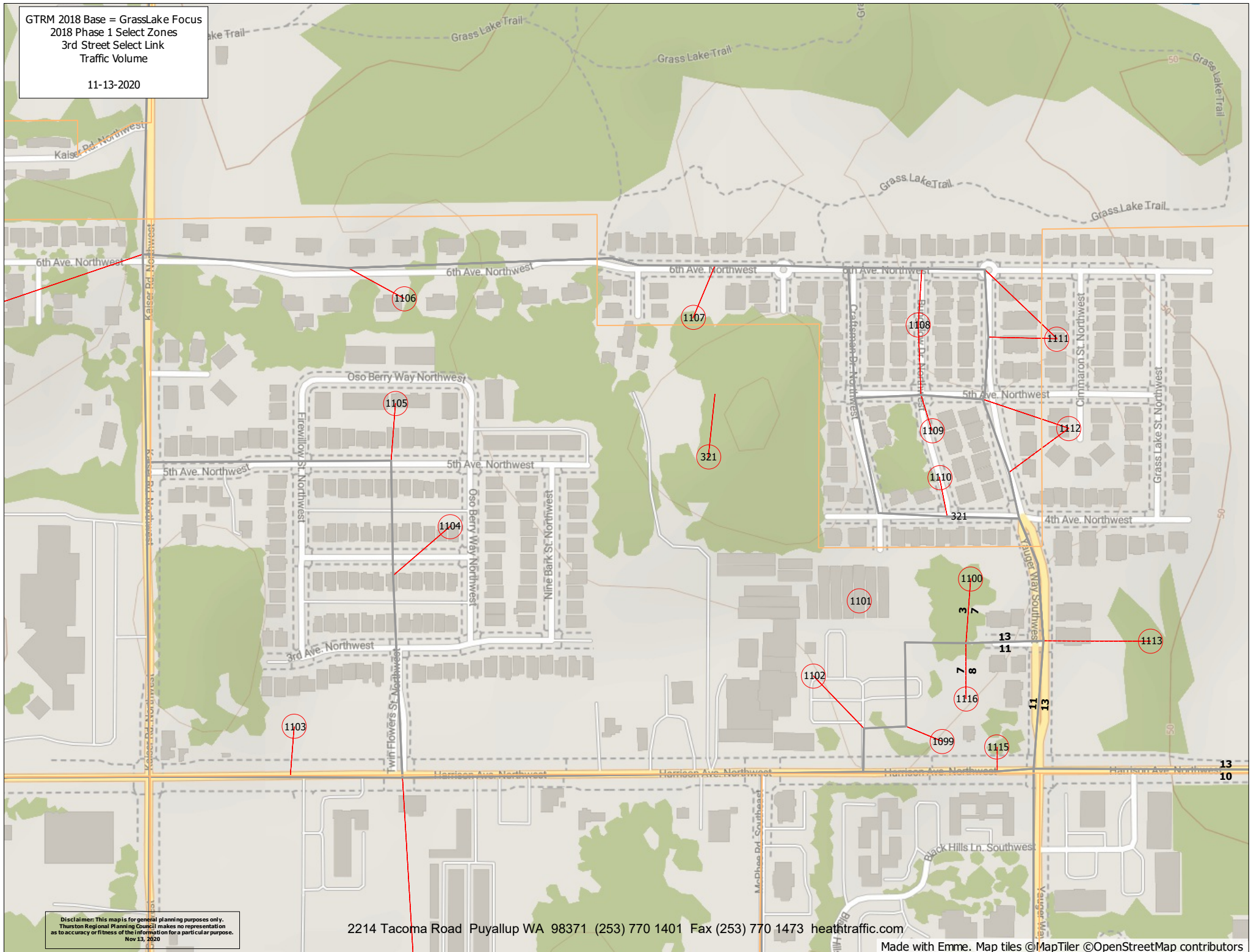
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 2018 Phase 1 Select Zones
 3rd Street Select Link
 Traffic Volume
 11-13-2020

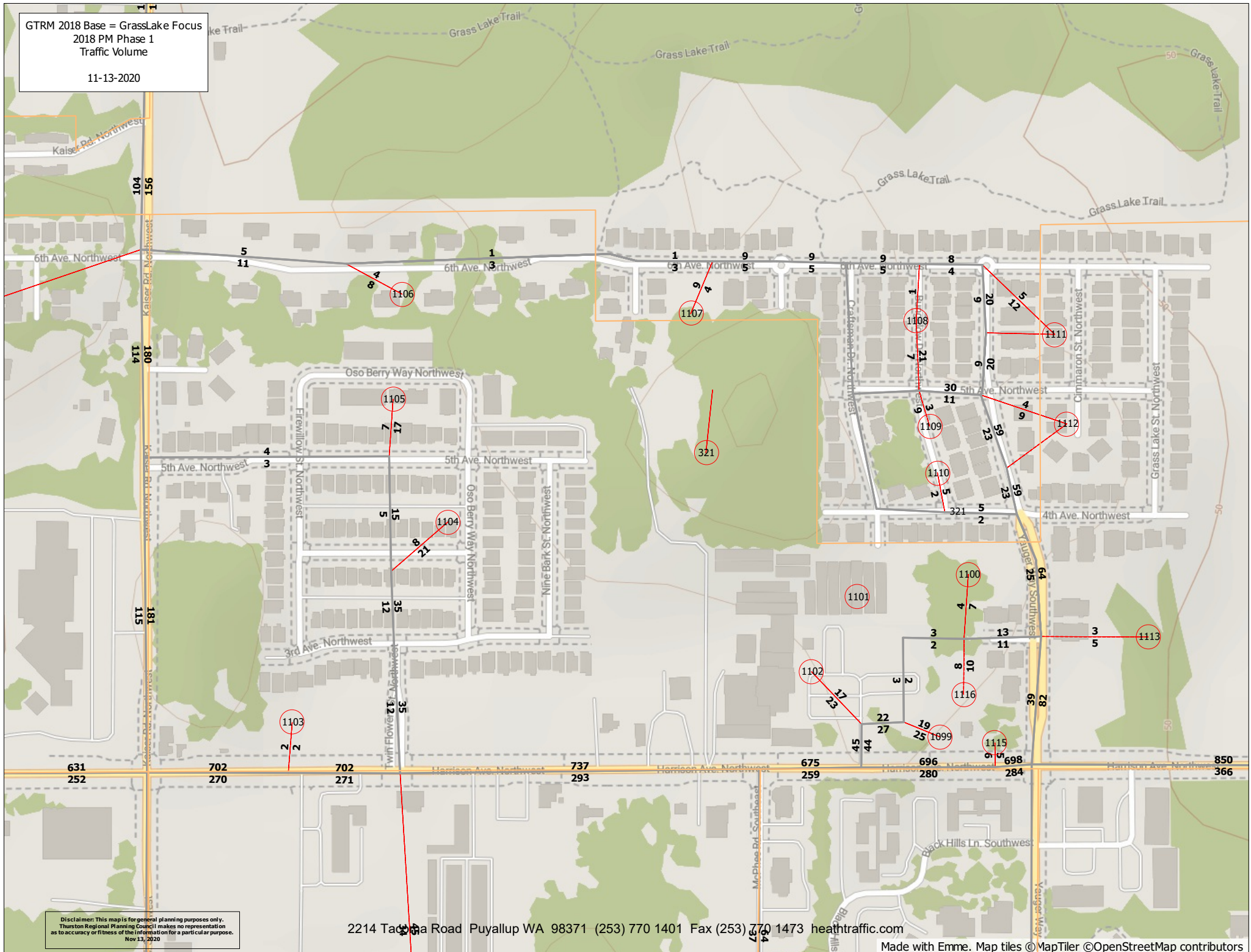


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 2018 PM Phase 1
 Traffic Volume
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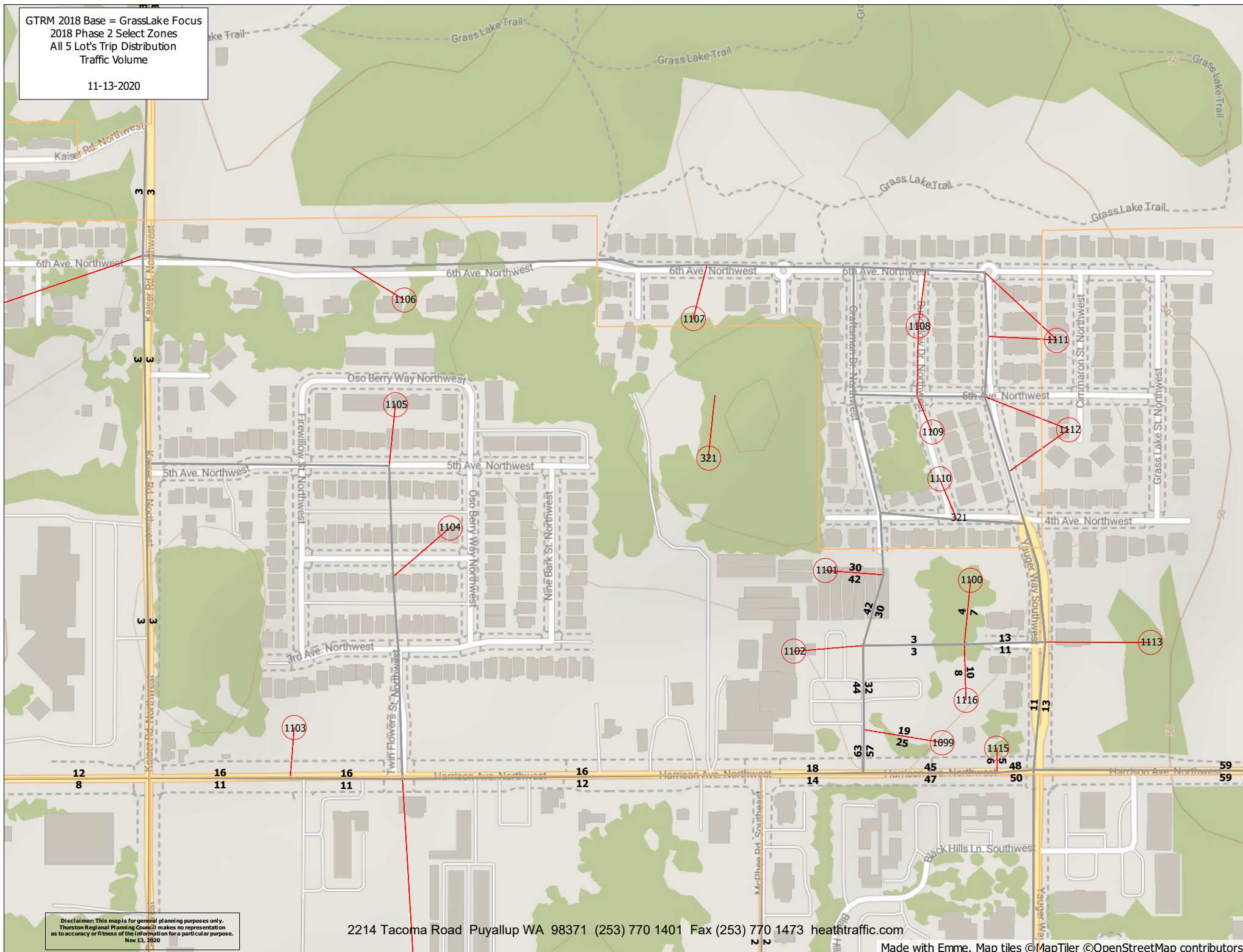


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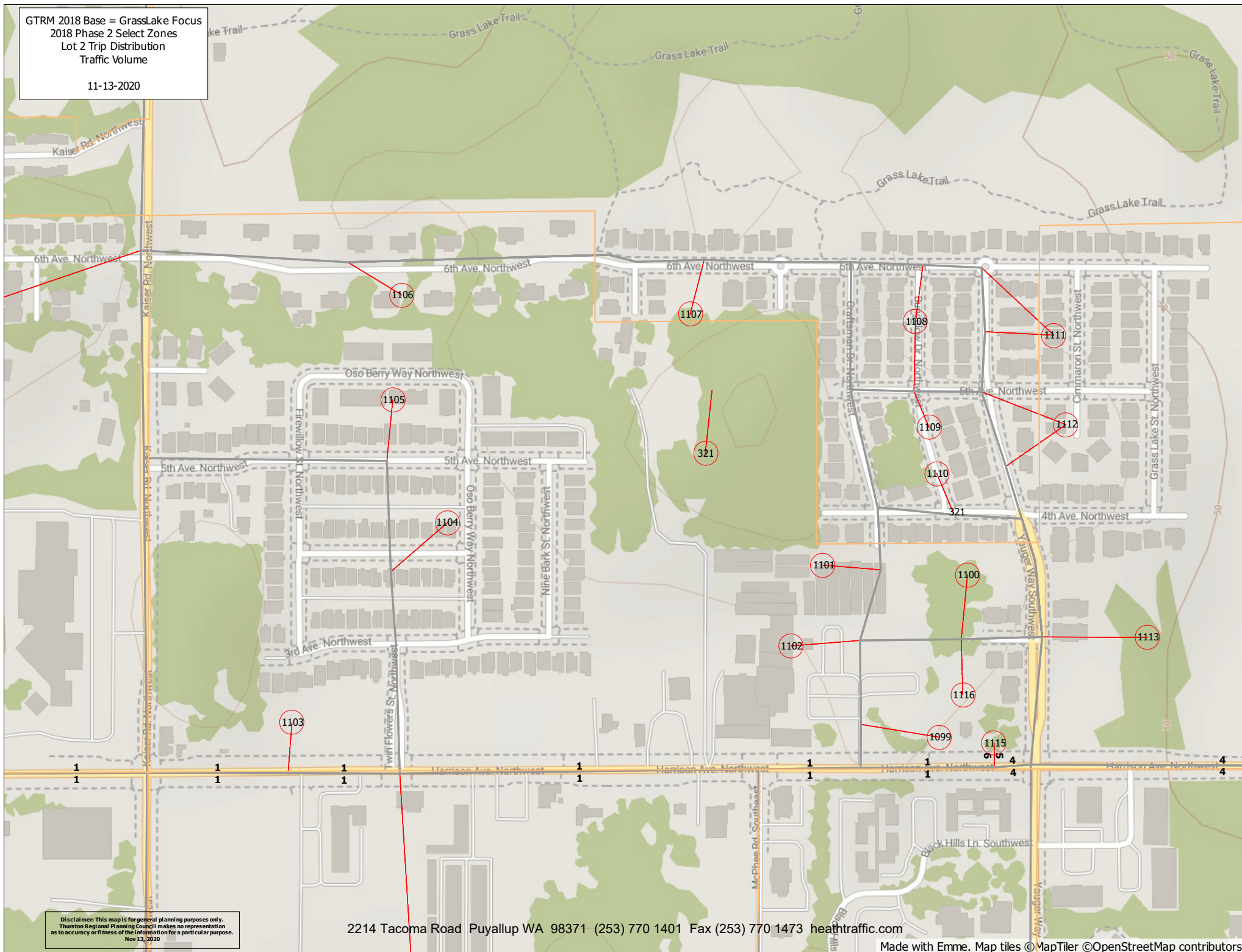
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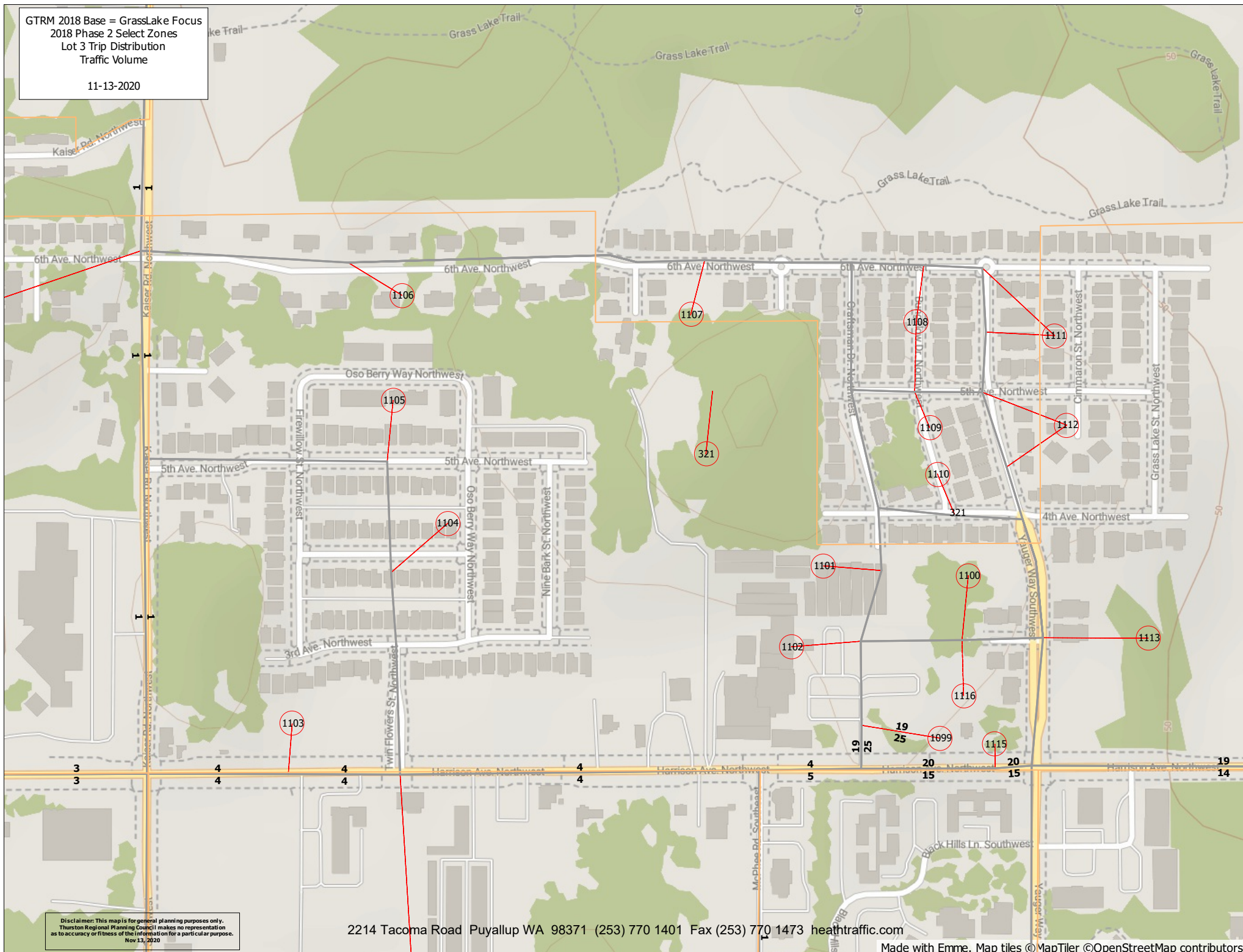
11-13-2020



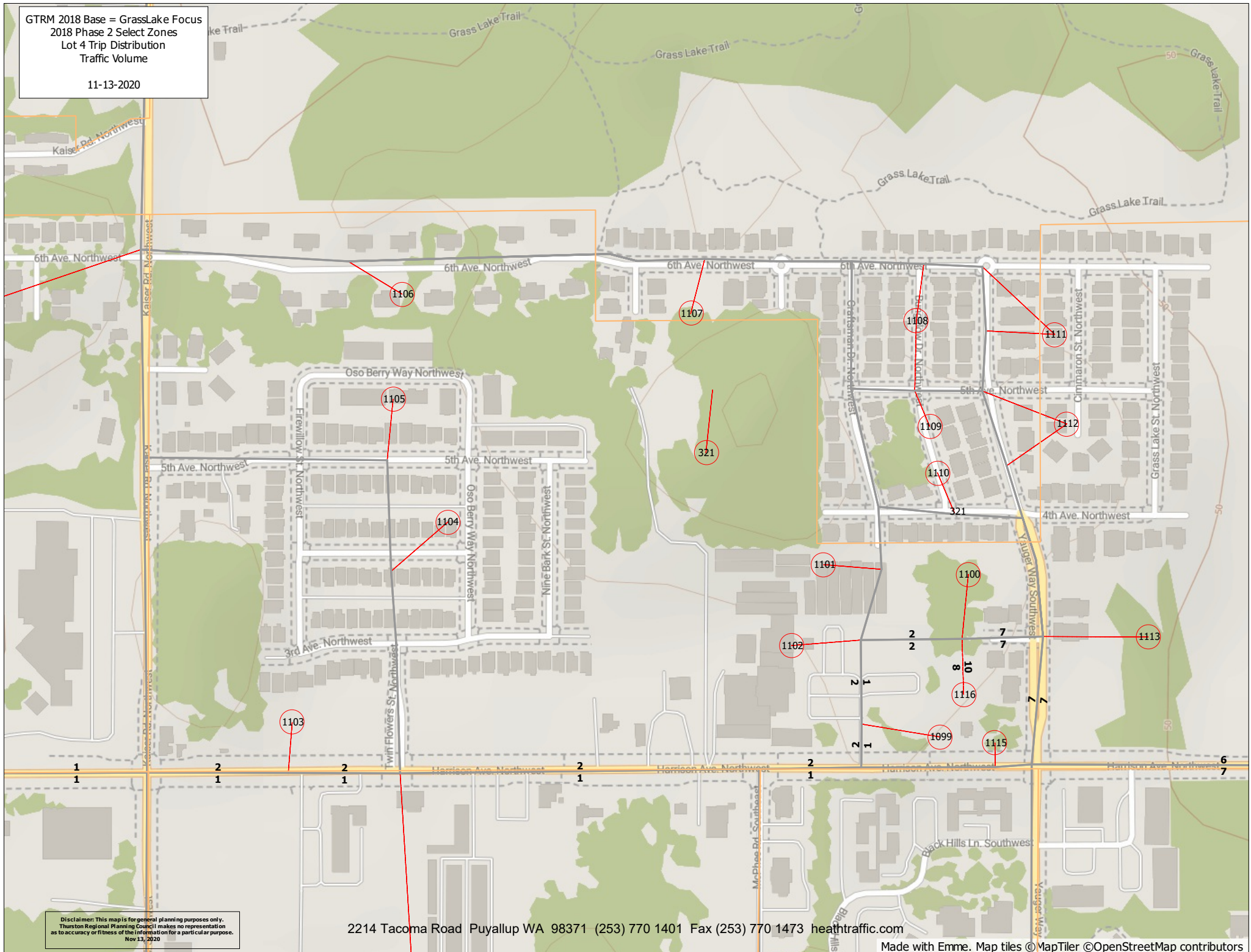
11-13-2020



11-13-2020



GTRM 2018 Base = GrassLake Focus
 2018 Phase 2 Select Zones
 Lot 4 Trip Distribution
 Traffic Volume
 11-13-2020



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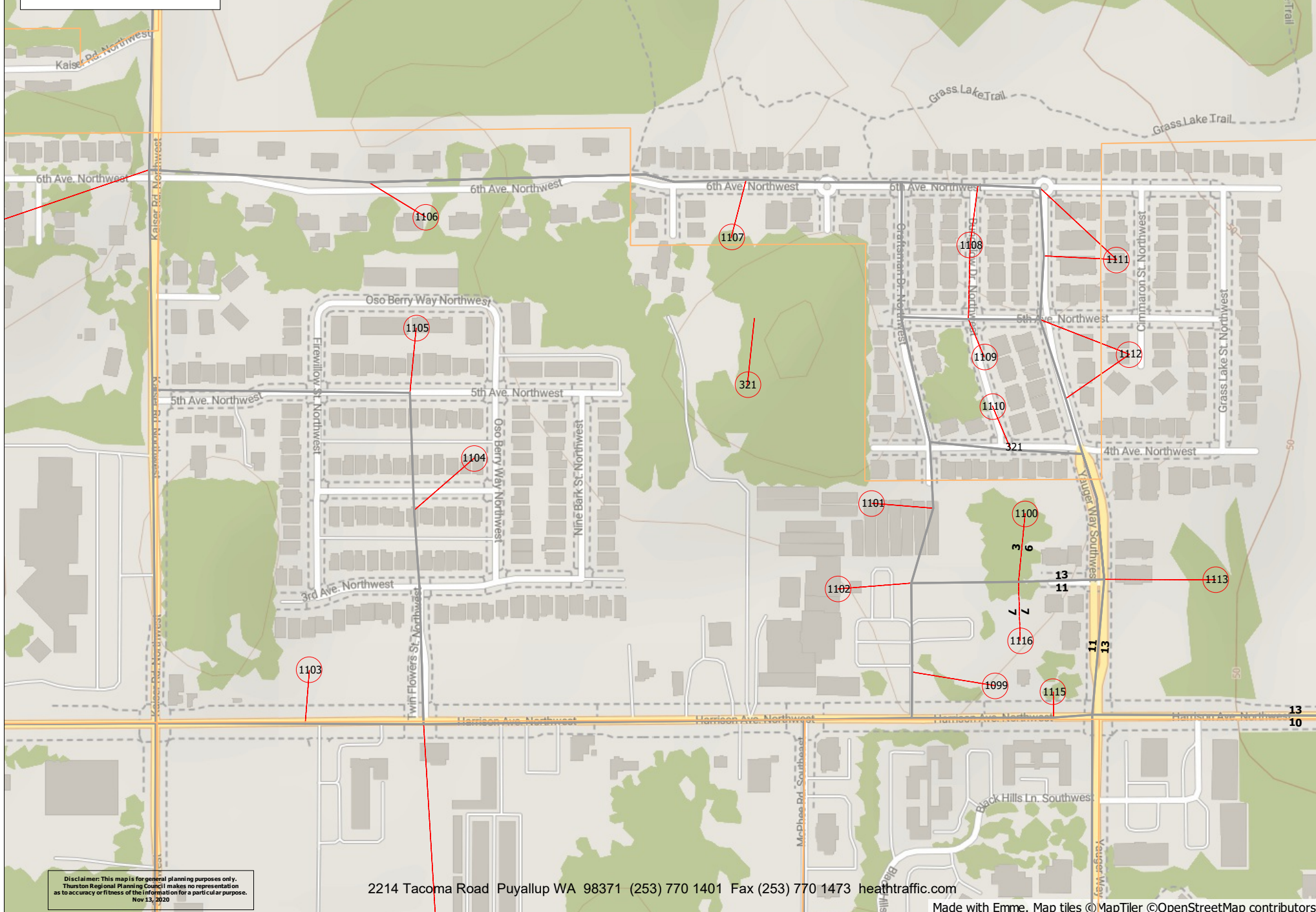
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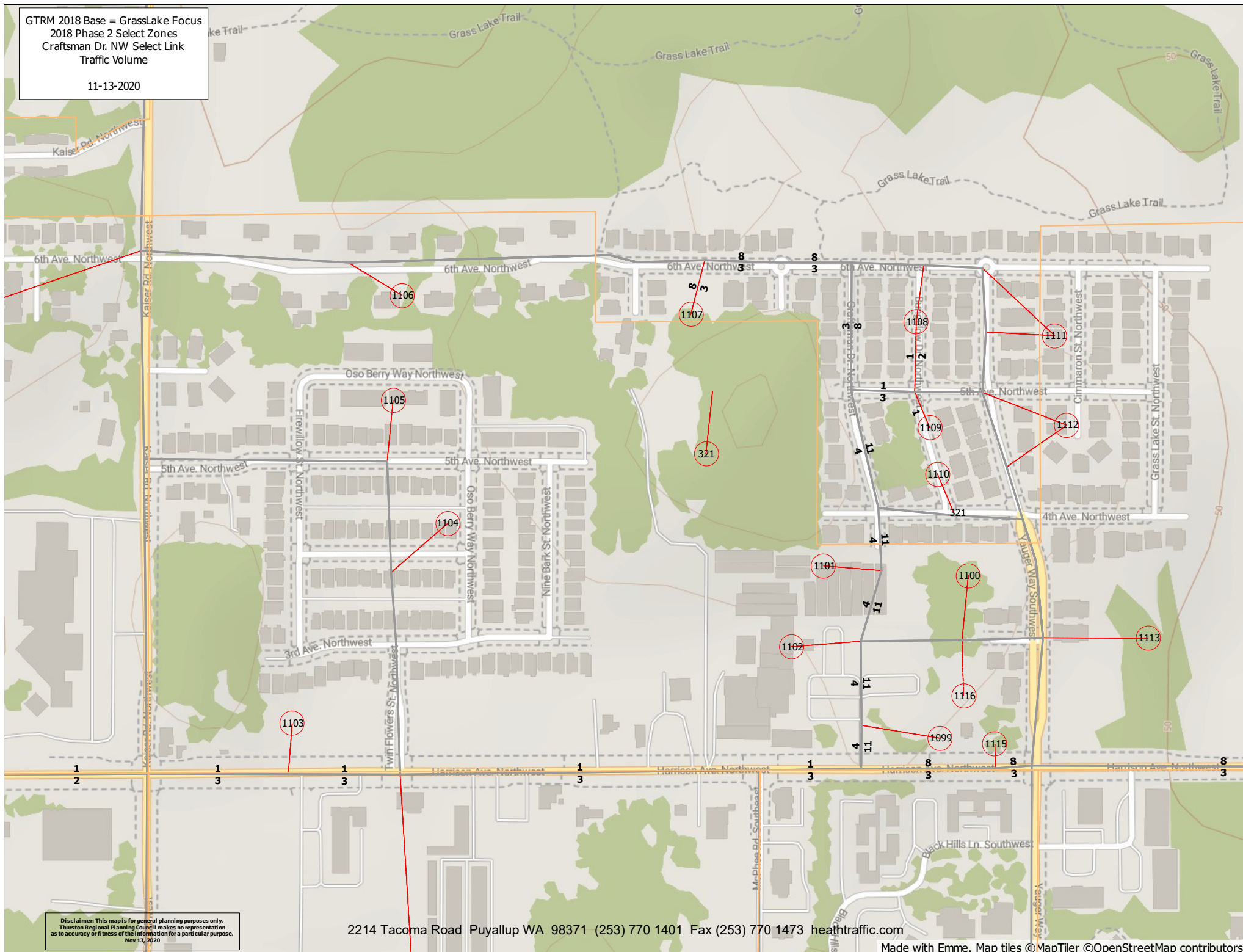
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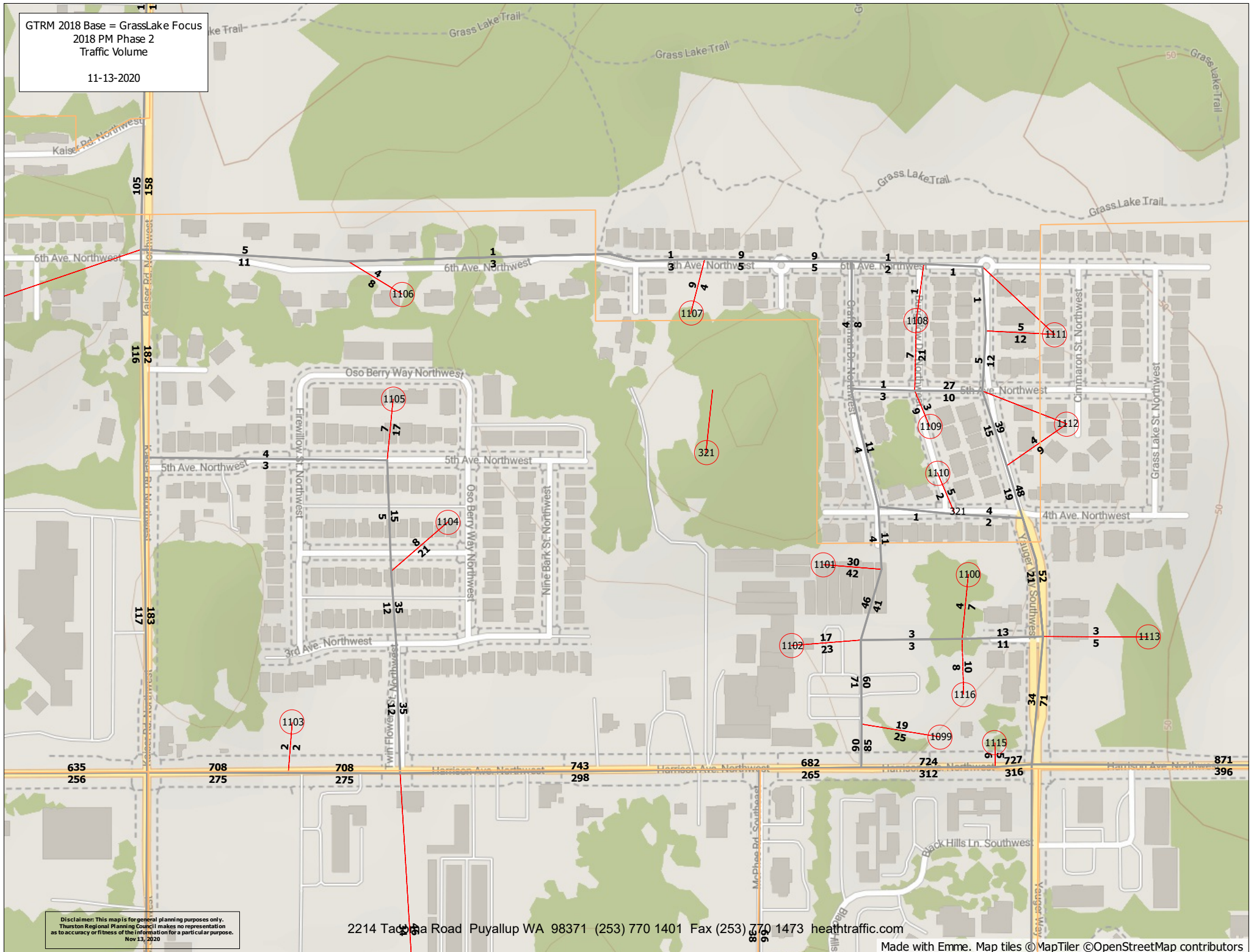


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GTRM 2018 Base = GrassLake Focus
2018 PM Phase 2
Traffic Volume

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HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

APPENDIX

CITY OF OLYMPIA COMPREHENSIVE PLAN – STREET CONNECTIVITY

A city with a well-connected network of smaller streets helps create a better city for walking, biking, riding the bus and driving. This “connectivity” creates a human-scale environment. Whether people are walking, biking, or driving, their routes are shorter. Transit riders can get to their stops more easily. A well-connected street grid provides direct and efficient access for all types of service vehicles including transit buses, delivery trucks, and emergency vehicles.



A street connection extends Olympia Avenue to the downtown.

A 1994 planning study conducted by the City led to the fully-connected street network we are now building. The study determined that instead of continuing to widen our major roads, we should build a connected grid of smaller streets. This study became the basis for our vision of a modified street grid and planned street connections. (See maps in Appendix B and the Transportation Planning History in Appendix A for additional information.)

Because well-connected streets create more direct routes, fewer miles are driven, saving fuel and reducing pollution. During emergencies and major construction, the grid provides options: if one route is blocked, other direct routes are available. A grid also provides more opportunities to turn left, reducing traffic back-ups.

There can be challenges with making street connections. Topography and environmentally sensitive areas can make certain street connections infeasible. Some street connections and the resulting changes to traffic patterns have the potential to affect neighborhood character or disproportionately impact some residents. The City will balance decisions about the value of a street connection with potential impacts to the unique geography, character or historical context of a residential neighborhood. In these cases, policies help guide the analysis of a street connection. When street connections are not made for motor vehicle access, priority will be given to making a connection for bicyclists, pedestrians, emergency vehicles and transit.

Pathways and trails provide connectivity for bicyclists and pedestrians. Pathways are shortcuts in neighborhoods that provide connections to parks, schools, trails and streets. Trails allow travel off the street system, benefitting bicyclists and pedestrians for transportation and recreation.



The gridded street network in an older neighborhood.

Goals and Policies [+](#) SHARE [✉](#)

GT4

The street network is a well-connected system of small blocks, allowing short, direct trips for pedestrians, bicyclists, transit users, motorists, and service vehicles. [+](#) SHARE [✉](#)

PT4.1 Connect streets in a grid-like pattern of smaller blocks. Block sizes should range from 250 feet to 350 feet in residential areas and up to a maximum of 500 feet along arterials.


PT4.2 Build new street connections to reduce travel time and distances for all users of the street system.


PT4.3 Build new street and pathway connections so that people walking, biking, or accessing bus stops have direct route options, making these modes more inviting.

PT4.4 Build new street connections so that motor-vehicle trips are shorter, to save fuel, cut travel time, and reduce pollution.

PT4.5 Build new street connections so the grid provides other routes if an emergency or major construction blocks travel.

PT4.6 Build new street connections so that emergency vehicles, transit, and other service vehicles have direct and efficient access.

PT4.7 Build a human-scale street grid of small blocks by defining required dimensions in the [Engineering Design and Development Standards](#) . Use street-spacing criteria to define the frequency of different types of streets in the grid, and define block sizes on each type of street to keep blocks small.

PT4.8 Build new arterials, major collectors and neighborhood collectors based on the general location defined on the Transportation Maps in Appendix B. Require the use of the [Engineering Design and Development Standards](#) .

PT4.9 Seek public and private funding to construct street connections in the network.

PT4.10 Require new developments to connect to the existing street network and provide for future street connections to ensure the gridded street system is built concurrent with development.

PT4.11 Retrofit existing development into a pattern of short blocks.

PT4.12 Build bike and pedestrian pathways for safe and direct non-motorized access. Where street connections are not possible, build pathways based on block sizes defined in the Engineering Design and Development Standards.

PT4.13 Build an adequate network of arterials and collectors to discourage heavy traffic volumes on local access streets. (See maps and lists in Appendix B.)

PT4.14 Build a dense grid of local access and collector streets to provide motorists with multiple ways to enter and exit neighborhoods instead of using arterial streets for trips within the neighborhood.

PT4.15 Allow cul-de-sacs only when topographic and environmental constraints permit no other option. Cul-de-sacs that are built should have a maximum length of 300 feet and be built with pedestrian and bike connections to adjacent streets, or to destinations such as schools, parks and trails wherever possible.

PT4.16 Use signs to identify planned but still unbuilt street connections or "stub outs" and to indicate the type of street that is planned. This information should also be shown on maps of newly platted areas.

PT4.17 Create public bicycle and pedestrian connections for interim use when street connections are not completed with new development.



PT4.18 Plan and identify street connections in undeveloped areas to ensure they are eventually connected.

PT4.19 Plan for adequate rights-of-way for future streets.

PT4.20 Use traffic-calming devices to slow vehicles, where necessary, especially when new streets are connected to existing neighborhoods.

PT4.21 Develop measures to demonstrate the connectedness of an area and to help explain the value of new street or pathway connections. Measures may include intersection density, centerline miles per square mile, and a route directness index.

GT5

Street connections to existing residential areas and in environmentally sensitive areas will be carefully examined before a decision is made to create a connection for motor vehicle traffic.  [SHARE](#) 

PT5.1 Seek to avoid street connections through wetlands or other critical areas by examining alternative street alignments. Fully mitigate impacts when a street connection in an environmentally sensitive area is determined to be the preferred option.

PT5.2 Carefully examine proposed street connections to existing residential neighborhoods. The developer, City, or County will analyze the street connection with the involvement of affected neighborhoods and stakeholders. Consideration will be given to the unique neighborhood character and context, particularly any direct impacts of a street connection on established neighborhoods. This analysis will determine whether or not to construct the street connection for motor vehicle traffic. Affected neighborhoods and other stakeholders will be consulted before a final decision is made and be involved in identification of any potential mitigation measures. As appropriate, this evaluation will include:

- Effects on the overall city transportation system
- Effects on reduced vehicle miles travelled and associated greenhouse gases
- Opportunities for making additional connections that would reduce neighborhood impacts of the connection being evaluated
- Impacts on directness of travel for pedestrians, bicyclists, transit users, and motorists
- Impacts on directness of travel for emergency-, public-, and commercial-service vehicles
- An assessment of travel patterns of the larger neighborhood area and volumes at nearby major intersections
- An assessment of traffic volumes at the connection and whether projected volumes are expected to exceed the typical range for that classification of street

- Bicycle and pedestrian safety
- Noise impacts and air pollution
- Social justice issues and any impacts on the unique character of a neighborhood or effects on affordability of housing
- Likelihood of diverting significant cross-town arterial traffic on to local neighborhood streets
- Effectiveness of proposed traffic-calming measures
- The cost of a street connection and the cost of any alternative approach to meeting transportation needs if a street connection is not made
- Consideration of the information in Appendix A of this chapter

PT5.3 In the event that a street connection is not made for motor vehicles, priority will be given to pedestrian, bicycle, transit and emergency vehicle access.

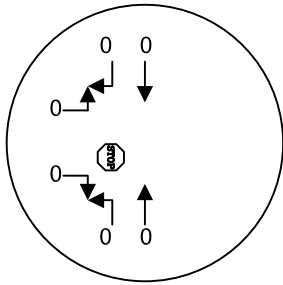
PT5.4 Address safety concerns on newly connected streets and build any needed improvements at the time when street connections are made. Define what constitutes safety improvements in the Engineering Design and Development Standards.

HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS

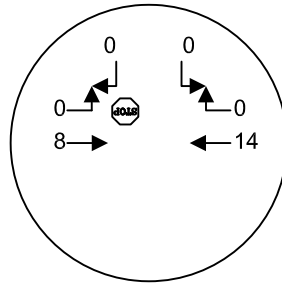
APPENDIX
PIPELINE VOLUMES



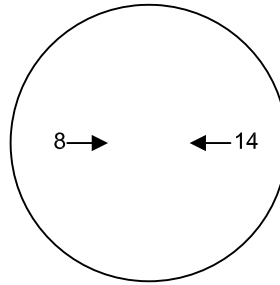
① 3RD AVE NW
& YAUGER WAY NW



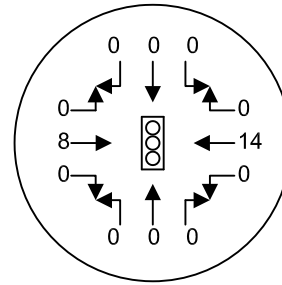
② HARRISON AVE NW
& W DRIVEWAY



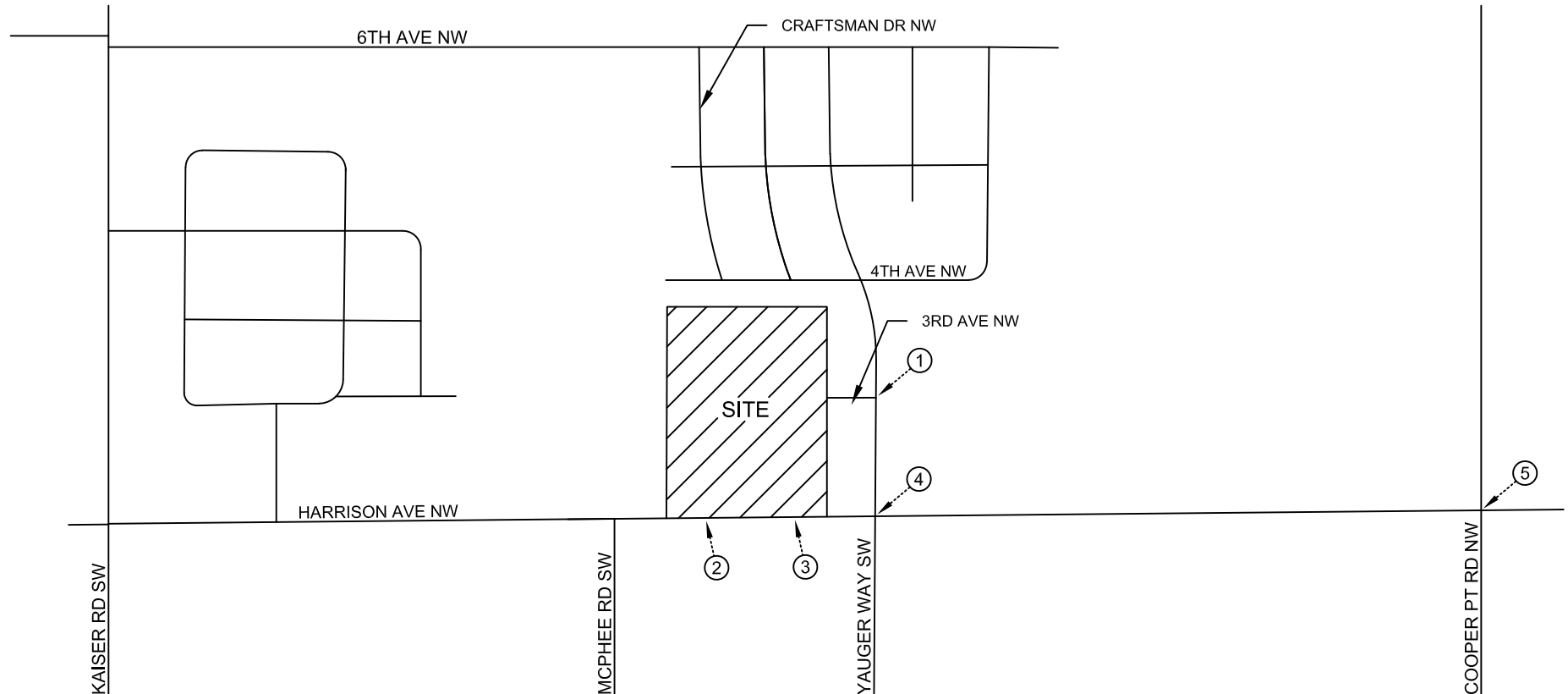
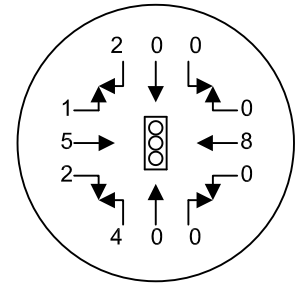
③ HARRISON AVE NW
& E DRIVEWAY



④ HARRISON AVE NW
& YAUGER WAY N/SW



⑤ HARRISON AVE NW
& COOPER PT RD N/SW






HEATH & ASSOCIATES
TRAFFIC AND CIVIL ENGINEERING

HARRISON AVENUE MIXED-USE
PIPELINE VOLUMES
FIGURE A1

HARRISON AVENUE MIXED-USE
TRAFFIC IMPACT ANALYSIS





APPENDIX
LEVEL OF SERVICE

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	4	54	26	0
Future Vol, veh/h	0	2	4	54	26	0
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	-	-	-	-	-
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	0	2	4	59	28	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	95	28	28	0	0
Stage 1	28	-	-	-	-
Stage 2	67	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	905	1047	1585	-	0
Stage 1	995	-	-	-	0
Stage 2	956	-	-	-	0
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	902	1047	1585	-	-
Mov Cap-2 Maneuver	854	-	-	-	-
Stage 1	992	-	-	-	-
Stage 2	956	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	1585	-	1047	-
HCM Lane V/C Ratio	0.003	-	0.002	-
HCM Control Delay (s)	7.3	0	8.4	-
HCM Lane LOS	A	A	A	-
HCM 95th %tile Q(veh)	0	-	0	-

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	680	1059	10	11	13
Future Vol, veh/h	8	680	1059	10	11	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	739	1151	11	12	14

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1162	0	0 1545 581
Stage 1	-	-	- 1157 -
Stage 2	-	-	- 388 -
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	597	-	- 105 457
Stage 1	-	-	- 261 -
Stage 2	-	-	- 655 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	597	-	- 103 457
Mov Cap-2 Maneuver	-	-	- 204 -
Stage 1	-	-	- 257 -
Stage 2	-	-	- 655 -






















Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	18.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	597	-	-	-	291
HCM Lane V/C Ratio	0.015	-	-	-	0.09
HCM Control Delay (s)	11.1	-	-	-	18.6
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lanes, Volumes, Timings
4: Yauger Way & Harrison Ave.

Baseline 2020 PM Peak Hour

12/01/2020













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	589	59	82	895	35	121	6	89	14	2	12
Future Volume (vph)	17	589	59	82	895	35	121	6	89	14	2	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	75		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.994			0.860			0.870	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3257	0	1652	3283	0	1652	1495	0	1652	1513	0
Flt Permitted	0.190			0.295			0.748			0.690		
Satd. Flow (perm)	330	3257	0	513	3283	0	1300	1495	0	1200	1513	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			7			97			13	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1075			2132			2366			330	
Travel Time (s)		20.9			41.5			64.5			9.0	
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
Adj. Flow (vph)	18	640	64	89	973	38	132	7	97	15	2	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	704	0	89	1011	0	132	104	0	15	15	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane		Yes										
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	55.0%		55.0%	55.0%	
Maximum Green (s)	22.0	22.0		22.0	22.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	

2018 4:00 pm 05/23/2017 2018 Existing - PM Peak TP2
DSS

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
93: Yaeger Way & Harrison Ave.

Baseline 2020 PM Peak Hour
12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)	21.0	21.0		21.0	21.0		28.0	28.0		28.0	28.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.47	0.47		0.47	0.47	
v/c Ratio	0.15	0.60		0.49	0.86		0.21	0.14		0.03	0.02	
Control Delay	16.8	17.6		25.5	27.0		10.7	3.2		8.9	5.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.8	17.6		25.5	27.0		10.7	3.2		8.9	5.4	
LOS	B	B		C	C		B	A		A	A	
Approach Delay		17.6			26.8			7.4			7.1	
Approach LOS		B			C			A			A	
Queue Length 50th (ft)	4	101		24	169		27	1		3	0	
Queue Length 95th (ft)	18	150		66	#274		56	22		11	8	
Internal Link Dist (ft)		995			2052			2286			250	
Turn Bay Length (ft)										75		
Base Capacity (vph)	123	1226		191	1228		616	760		569	725	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.57		0.47	0.82		0.21	0.14		0.03	0.02	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 59.1

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 55.1%

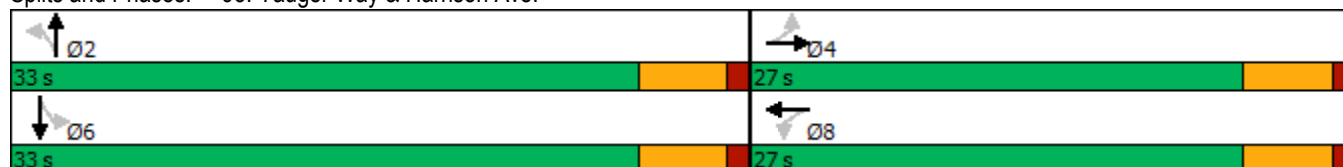
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.






















Queue shown is maximum after two cycles.

Splits and Phases: 93: Yaeger Way & Harrison Ave.



Lanes, Volumes, Timings
5: Cooper Point Rd & Harrison Ave.

Baseline 2020 PM Peak Hour
12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	211	449	125	286	553	143	232	375	130	146	318	74
Future Volume (vph)	211	449	125	286	553	143	232	375	130	146	318	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	200		0	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.967				0.850		0.961			0.972	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3211	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3211	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28				155		43			22	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		2132			1782			1321			1612	
Travel Time (s)		58.1			48.6			25.7			31.4	
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
Adj. Flow (vph)	229	488	136	311	601	155	252	408	141	159	346	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	229	624	0	311	601	155	252	549	0	159	426	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						2						
Detector Phase	1	6		5	2	2	7	4		3	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	12.0	32.0		12.0	32.0	32.0	12.0	34.0		12.0	30.0	
Total Split (s)	21.0	32.0		30.0	41.0	41.0	28.0	43.0		15.0	30.0	
Total Split (%)	17.5%	26.7%		25.0%	34.2%	34.2%	23.3%	35.8%		12.5%	25.0%	
Maximum Green (s)	16.0	27.0		25.0	36.0	36.0	23.0	38.0		10.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0	-2.0	-2.0	-3.0		-2.0	-3.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	2.0		3.0	2.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.5		2.0	2.5	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Walk Time (s)		5.0			5.0	5.0		5.0			5.0	













2018 4:00 pm 05/23/2017 2018 Existing - PM Peak TP2
DSS

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
4: Cooper Point Rd & Harrison Ave.

Baseline 2020 PM Peak Hour

12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)		22.0			22.0	22.0		24.0			20.0	
Pedestrian Calls (#/hr)		0			0	0		0			0	
Act Effect Green (s)	18.0	25.0		24.2	31.1	31.1	21.2	30.2		12.4	21.5	
Actuated g/C Ratio	0.17	0.24		0.23	0.30	0.30	0.21	0.29		0.12	0.21	
v/c Ratio	0.80	0.79		0.80	0.60	0.28	0.75	0.57		0.80	0.62	
Control Delay	65.3	44.4		56.3	34.1	6.1	55.2	31.1		77.4	41.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	65.3	44.4		56.3	34.1	6.1	55.2	31.1		77.4	41.0	
LOS	E	D		E	C	A	E	C		E	D	
Approach Delay		50.0			36.5			38.7			50.9	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	161	210		207	184	0	168	158		114	141	
Queue Length 95th (ft)	#331	299		#382	264	48	#296	216		#263	200	
Internal Link Dist (ft)		2052			1702			1241			1532	
Turn Bay Length (ft)	150			200			200			200		
Base Capacity (vph)	297	947		446	1256	658	413	1328		198	916	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.77	0.66		0.70	0.48	0.24	0.61	0.41		0.80	0.47	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 103.2

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 43.1

Intersection LOS: D

Intersection Capacity Utilization 69.6%

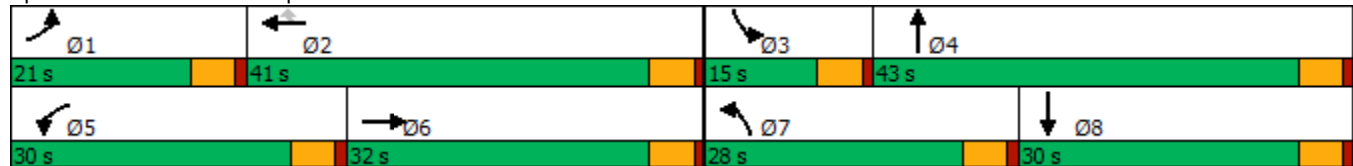
ICU Level of Service C




Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Cooper Point Rd & Harrison Ave.







Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	2	4	57	28	0
Future Vol, veh/h	0	2	4	57	28	0
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	-	-	-	-	-
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	0	2	4	62	30	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	100	30	30	0	0
Stage 1	30	-	-	-	-
Stage 2	70	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	899	1044	1583	-	0
Stage 1	993	-	-	-	0
Stage 2	953	-	-	-	0
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	896	1044	1583	-	-
Mov Cap-2 Maneuver	850	-	-	-	-
Stage 1	990	-	-	-	-
Stage 2	953	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.5	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	1583	-	1044	-
HCM Lane V/C Ratio	0.003	-	0.002	-
HCM Control Delay (s)	7.3	0	8.5	-
HCM Lane LOS	A	A	A	-
HCM 95th %tile Q(veh)	0	-	0	-

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	730	1138	10	11	13
Future Vol, veh/h	8	730	1138	10	11	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	793	1237	11	12	14

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1248	0	0 1658 624
Stage 1	-	-	- 1243 -
Stage 2	-	-	- 415 -
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	553	-	- 89 428
Stage 1	-	-	- 235 -
Stage 2	-	-	- 635 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	553	-	- 88 428
Mov Cap-2 Maneuver	-	-	- 184 -
Stage 1	-	-	- 231 -
Stage 2	-	-	- 635 -





















Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	20
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	553	-	-	-	266
HCM Lane V/C Ratio	0.016	-	-	-	0.098
HCM Control Delay (s)	11.6	-	-	-	20
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lanes, Volumes, Timings
4: Yauger Way & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes without Project

12/01/2020













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	659	65	90	1002	37	134	6	99	15	2	13
Future Volume (vph)	18	659	65	90	1002	37	134	6	99	15	2	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	75		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.995			0.859			0.869	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3257	0	1652	3287	0	1652	1493	0	1652	1511	0
Flt Permitted	0.182			0.252			0.747			0.683		
Satd. Flow (perm)	316	3257	0	438	3287	0	1299	1493	0	1187	1511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			7			81			14	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		1075			2132			2366			330	
Travel Time (s)		20.9			41.5			64.5			9.0	
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
Adj. Flow (vph)	20	716	71	98	1089	40	146	7	108	16	2	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	787	0	98	1129	0	146	115	0	16	16	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane		Yes										
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	55.0%		55.0%	55.0%	
Maximum Green (s)	22.0	22.0		22.0	22.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	

2018 4:00 pm 05/23/2017 2018 Existing - PM Peak TP2
DSS

Synchro 10 Report
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Lanes, Volumes, Timings
93: Yauger Way & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes without Project
12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	22.0	22.0		22.0	22.0		28.0	28.0		28.0	28.0	
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.47	0.47		0.47	0.47	
v/c Ratio	0.17	0.65		0.61	0.93		0.24	0.16		0.03	0.02	
Control Delay	17.5	18.5		36.5	34.4		11.0	4.5		8.9	5.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.5	18.5		36.5	34.4		11.0	4.5		8.9	5.3	
LOS	B	B		D	C		B	A		A	A	
Approach Delay		18.5			34.6			8.1			7.1	
Approach LOS		B			C			A			A	
Queue Length 50th (ft)	5	117		28	200		30	6		3	0	
Queue Length 95th (ft)	20	172		#95	#327		62	29		11	9	
Internal Link Dist (ft)		995			2052			2286			250	
Turn Bay Length (ft)										75		
Base Capacity (vph)	115	1206		160	1209		606	739		553	712	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.65		0.61	0.93		0.24	0.16		0.03	0.02	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 25.7

Intersection LOS: C

Intersection Capacity Utilization 58.8%





ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.






















Splits and Phases: 93: Yauger Way & Harrison Ave.

 Ø2	 Ø4
33 s	27 s
 Ø6	 Ø8
33 s	27 s

Lanes, Volumes, Timings
5: Cooper Point Rd & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes without Project

12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	483	136	304	595	152	250	398	138	155	337	81
Future Volume (vph)	225	483	136	304	595	152	250	398	138	155	337	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	200		0	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.967				0.850		0.961			0.971	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3207	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3207	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29				165		40			23	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		2132			1782			1321			1612	
Travel Time (s)		58.1			48.6			25.7			31.4	
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
Adj. Flow (vph)	245	525	148	330	647	165	272	433	150	168	366	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	673	0	330	647	165	272	583	0	168	454	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						2						
Detector Phase	1	6		5	2	2	7	4		3	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	12.0	32.0		12.0	32.0	32.0	12.0	34.0		12.0	30.0	
Total Split (s)	25.0	33.0		31.0	39.0	39.0	26.0	37.0		19.0	30.0	
Total Split (%)	20.8%	27.5%		25.8%	32.5%	32.5%	21.7%	30.8%		15.8%	25.0%	
Maximum Green (s)	20.0	28.0		26.0	34.0	34.0	21.0	32.0		14.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0	-2.0	-2.0	-3.0		-2.0	-3.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	2.0		3.0	2.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.5		2.0	2.5	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Walk Time (s)		5.0			5.0	5.0		5.0			5.0	













2018 4:00 pm 05/23/2017 2018 Existing - PM Peak TP2
DSS

Synchro 10 Report
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Lanes, Volumes, Timings
4: Cooper Point Rd & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes without Project

12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)		22.0			22.0	22.0		24.0			20.0	
Pedestrian Calls (#/hr)		0			0	0		0			0	
Act Effct Green (s)	20.2	27.0		25.8	32.5	32.5	21.8	29.2		15.0	22.5	
Actuated g/C Ratio	0.19	0.25		0.24	0.30	0.30	0.20	0.27		0.14	0.21	
v/c Ratio	0.80	0.82		0.84	0.65	0.30	0.82	0.66		0.73	0.66	
Control Delay	63.6	47.2		60.6	37.4	6.2	63.9	37.3		66.7	43.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	63.6	47.2		60.6	37.4	6.2	63.9	37.3		66.7	43.4	
LOS	E	D		E	D	A	E	D		E	D	
Approach Delay		51.5			39.6			45.7			49.7	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	174	235		232	215	0	194	190		121	156	
Queue Length 95th (ft)	#315	323		#407	295	51	#356	253		#237	213	
Internal Link Dist (ft)		2052			1702			1241			1532	
Turn Bay Length (ft)	150			200			200			200		
Base Capacity (vph)	342	924		436	1121	610	358	1074		249	863	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.72	0.73		0.76	0.58	0.27	0.76	0.54		0.67	0.53	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 108.2

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 46.0

Intersection LOS: D

Intersection Capacity Utilization 73.6%

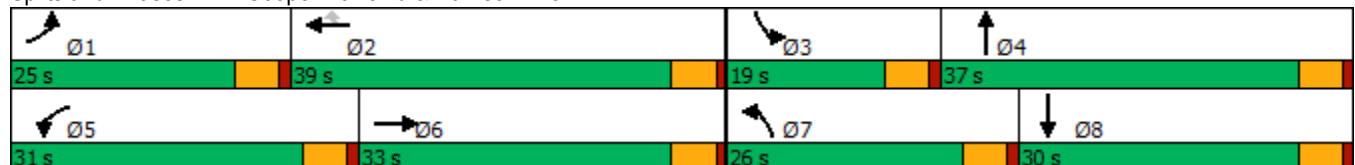
ICU Level of Service D




Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Cooper Point Rd & Harrison Ave.







Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	13	16	57	28	0
Future Vol, veh/h	0	13	16	57	28	0
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	-	-	-	-	-
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	0	14	17	62	30	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	126	30	30	0	0
Stage 1	30	-	-	-	-
Stage 2	96	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	869	1044	1583	-	0
Stage 1	993	-	-	-	0
Stage 2	928	-	-	-	0
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	859	1044	1583	-	-
Mov Cap-2 Maneuver	824	-	-	-	-
Stage 1	982	-	-	-	-
Stage 2	928	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.5	1.6	0
HCM LOS	A		






Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	1583	-	1044	-
HCM Lane V/C Ratio	0.011	-	0.014	-
HCM Control Delay (s)	7.3	0	8.5	-
HCM Lane LOS	A	A	A	-
HCM 95th %tile Q(veh)	0	-	0	-

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	729	1138	23	33	20
Future Vol, veh/h	20	729	1138	23	33	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	792	1237	25	36	22

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1262	0	0 1690 631
Stage 1	-	-	- 1250 -
Stage 2	-	-	- 440 -
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	547	-	- 84 424
Stage 1	-	-	- 233 -
Stage 2	-	-	- 616 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	547	-	- 81 424
Mov Cap-2 Maneuver	-	-	- 177 -
Stage 1	-	-	- 224 -
Stage 2	-	-	- 616 -

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	26.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	547	-	-	-	227
HCM Lane V/C Ratio	0.04	-	-	-	0.254
HCM Control Delay (s)	11.9	-	-	-	26.2
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	729	1138	23	33	20
Future Vol, veh/h	20	729	1138	23	33	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	792	1237	25	36	22

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1262	0	0 1690 631
Stage 1	-	-	- 1250 -
Stage 2	-	-	- 440 -
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	547	-	- 84 424
Stage 1	-	-	- 233 -
Stage 2	-	-	- 616 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	547	-	- 81 424
Mov Cap-2 Maneuver	-	-	- 177 -
Stage 1	-	-	- 224 -
Stage 2	-	-	- 616 -

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	24.2
HCM LOS			C





















Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	547	-	-	-	177	424
HCM Lane V/C Ratio	0.04	-	-	-	0.203	0.051
HCM Control Delay (s)	11.9	-	-	-	30.4	13.9
HCM Lane LOS	B	-	-	-	D	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7	0.2

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	762	1152	21	0	9
Future Vol, veh/h	0	762	1152	21	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	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	0	828	1252	23	0	10
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	-	0	-	0	-	638
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	419
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	419
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		13.8		
HCM LOS	B					
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	419		
HCM Lane V/C Ratio	-	-	-	0.023		
HCM Control Delay (s)	-	-	-	13.8		
HCM Lane LOS	-	-	-	B		
HCM 95th %tile Q(veh)	-	-	-	0.1		

Lanes, Volumes, Timings
4: Yauger Way & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes with Project

12/01/2020













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	678	65	90	1025	47	134	6	99	24	2	17
Future Volume (vph)	20	678	65	90	1025	47	134	6	99	24	2	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	75		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.993			0.859			0.865	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3260	0	1652	3280	0	1652	1493	0	1652	1504	0
Flt Permitted	0.182			0.240			0.744			0.683		
Satd. Flow (perm)	316	3260	0	417	3280	0	1293	1493	0	1187	1504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			9			75			17	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		525			2132			2366			330	
Travel Time (s)		10.2			41.5			64.5			9.0	
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
Adj. Flow (vph)	22	737	71	98	1114	51	146	7	108	26	2	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	808	0	98	1165	0	146	115	0	26	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane		Yes										
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	55.0%		55.0%	55.0%	
Maximum Green (s)	22.0	22.0		22.0	22.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	

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Lanes, Volumes, Timings
93: Yauger Way & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes with Project
12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	22.0	22.0		22.0	22.0		28.0	28.0		28.0	28.0	
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.47	0.47		0.47	0.47	
v/c Ratio	0.19	0.67		0.64	0.96		0.24	0.16		0.05	0.03	
Control Delay	18.1	18.9		40.3	39.5		11.0	4.8		9.1	5.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.1	18.9		40.3	39.5		11.0	4.8		9.1	5.1	
LOS	B	B		D	D		B	A		A	A	
Approach Delay		18.9			39.5			8.3			7.4	
Approach LOS		B			D			A			A	
Queue Length 50th (ft)	5	122		29	209		30	7		5	1	
Queue Length 95th (ft)	22	178		#98	#344		62	31		16	10	
Internal Link Dist (ft)		445			2052			2286			250	
Turn Bay Length (ft)										75		
Base Capacity (vph)	115	1207		152	1208		603	736		553	710	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.67		0.64	0.96		0.24	0.16		0.05	0.03	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 59.8%





ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.






















Splits and Phases: 93: Yauger Way & Harrison Ave.

 Ø2	 Ø4
33 s	27 s
 Ø6	 Ø8
33 s	27 s

Lanes, Volumes, Timings
5: Cooper Point Rd & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes with Project

12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	228	501	143	304	616	152	258	398	138	155	337	85
Future Volume (vph)	228	501	143	304	616	152	258	398	138	155	337	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	200		0	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.967				0.850		0.961			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3204	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1652	3194	0	1652	3303	1478	1652	3174	0	1652	3204	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29				165		40			24	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		2132			1782			1321			1612	
Travel Time (s)		58.1			48.6			25.7			31.4	
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
Adj. Flow (vph)	248	545	155	330	670	165	280	433	150	168	366	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	248	700	0	330	670	165	280	583	0	168	458	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			10			10	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						2						
Detector Phase	1	6		5	2	2	7	4		3	8	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	12.0	32.0		12.0	32.0	32.0	12.0	34.0		12.0	30.0	
Total Split (s)	25.0	33.0		31.0	39.0	39.0	26.0	37.0		19.0	30.0	
Total Split (%)	20.8%	27.5%		25.8%	32.5%	32.5%	21.7%	30.8%		15.8%	25.0%	
Maximum Green (s)	20.0	28.0		26.0	34.0	34.0	21.0	32.0		14.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0	-2.0	-2.0	-3.0		-2.0	-3.0	
Total Lost Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	2.0		3.0	2.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.5		2.0	2.5	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Walk Time (s)		5.0			5.0	5.0		5.0			5.0	













2018 4:00 pm 05/23/2017 2018 Existing - PM Peak TP2
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Lanes, Volumes, Timings
4: Cooper Point Rd & Harrison Ave.

Forecast 2023 PM Peak Hour Volumes with Project

12/01/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)		22.0			22.0	22.0		24.0			20.0	
Pedestrian Calls (#/hr)		0			0	0		0			0	
Act Effct Green (s)	20.4	27.6		25.9	33.1	33.1	22.0	29.6		15.1	22.7	
Actuated g/C Ratio	0.19	0.25		0.24	0.30	0.30	0.20	0.27		0.14	0.21	
v/c Ratio	0.81	0.85		0.85	0.67	0.29	0.84	0.66		0.74	0.67	
Control Delay	64.8	48.9		61.6	38.1	6.2	66.9	37.5		67.5	43.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	64.8	48.9		61.6	38.1	6.2	66.9	37.5		67.5	43.8	
LOS	E	D		E	D	A	E	D		E	D	
Approach Delay		53.0			40.2			47.0			50.2	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	177	248		233	225	0	202	191		121	158	
Queue Length 95th (ft)	#322	#358		#407	307	51	#370	253		#237	215	
Internal Link Dist (ft)		2052			1702			1241			1532	
Turn Bay Length (ft)	150			200			200			200		
Base Capacity (vph)	337	912		430	1105	604	353	1060		246	852	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.74	0.77		0.77	0.61	0.27	0.79	0.55		0.68	0.54	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 109.3

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 47.0

Intersection LOS: D

Intersection Capacity Utilization 74.9%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Cooper Point Rd & Harrison Ave.

