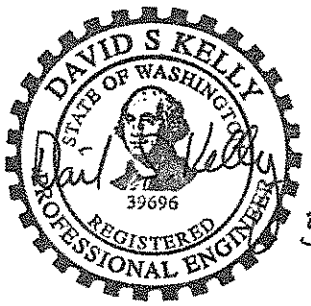
TRANSPORTATION IMPACT STUDY

FOR

SUNSET LANDING SUBDIVISION

OLD PACIFIC HIGHWAY S NORTH OF TODD ROAD

CITY OF KALAMA, WASHINGTON



5/14/2018

PREPARED BY

KELLY ENGINEERING

May 2018

TRANSPORTATION IMPACT STUDY

Sunset Landing Subdivision

City of Kalama, Washington

May 14, 2018

Prepared for:

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TRANSPORTATION IMPACT STUDY

Sunset Landing Subdivision

May 14, 2018

INTRODUCTION

A transportation impact study (TIS) for a 66-lot single-family residential subdivision was conducted to determine the potential traffic related impacts of the development to the surrounding roadway system. The TIS for the Sunset Landing Subdivision was based on correspondence with representatives from the City of Kalama and Gray & Osborne, Inc. Gray & Osborne, Inc. are transportation engineering consultants for the City of Kalama.

The site is located on the west side of Old Pacific Highway S and approximately ¼ mile south of the Cloverdale Road/Old Pacific Highway S intersection in the City of Kalama. The tax lot is 411460100. The property is undeveloped with no existing buildings or structures. The vegetation is grass and scattered trees.

Land uses in the vicinity of the site consist of single-family homes and vacant land. The future Cedar Springs Subdivision will be constructed on the opposite side of Old Pacific Highway S. A vicinity map, aerial photograph and feasibility layout are shown in Figures 1a, 1b and 1c.

Roadway Characteristics

The site will have two accesses onto Old Pacific Highway S. Old Pacific Highway S is a two lane paved arterial roadway with intermittent gravel/grass shoulders. The posted speed limit along the site frontage is 35 mph.

The Elm Street/1st Street and Todd Road/Robb Road/Old Pacific Highway S intersections were analyzed in this report. The Elm Street/1st Street intersection is controlled by stop signs on all approaches. The Todd Road/Robb Road/Old Pacific Highway S intersection is controlled by stop signs on the northbound, southbound and westbound approaches. The lane configurations for the intersections are shown in Figure 2.

Traffic Volumes

The traffic counts in this report were conducted from 7:00 to 9:00 am and 4:00 to 6:00 pm during March 2018. The AM peak hour occurred between approximately 7:30 to 8:30 am and the PM peak hour occurred between approximately 4:40 to 5:40 pm at the Elm Street/1st Street intersection and 4:00 to 5:00 at the Todd Road/Robb Road/Old Pacific Highway S intersection. The peak hour is the one-hour time period when traffic volumes are the highest and congestion is most likely to occur. The existing traffic volumes are shown in Figure 3. The raw traffic count data is shown in Appendix A.

Trip Generation/Distribution

The Sunset Landing Subdivision will generate approximately 554 trips per day, ITE Trip Generation Manual, 10th edition. A trip is a one-directional vehicle movement. Thirty-nine trips will occur during the AM peak hour and 51 trips will occur during the PM peak hour. The trip generation rates are shown in Table 1.

Table 1
Site Traffic Generation

Land Use	ITE code	Trip Generation	Units	Trips/ Day	Trips/ AM Peak	Trips/ PM Peak
Single-family Detached Housing	210	9.44 trips/d.u.-Day 0.74 trips/d.u.-AM peak hour 0.99 trips/d.u.-PM peak hour	33	312	24 (in-6, out-18)	33 (in-21, out-12)
Multifamily Housing (Low-Rise)	220	7.32 trips/d.u.-Day 0.46 trips/d.u.-AM peak hour 0.56 trips/d.u.-PM peak hour	33	242	15 (in-3, out-12)	18 (in-12, out-6)
Overall			**66**	**554**	**39 (in-9, out-30)**	**51 (in-33, out-18)**

The directional distribution of traffic generated by the development was assigned to the study area intersections and site access. The distribution was based on the existing traffic counts and a survey conducted within the vicinity of the site. The site traffic distribution and assignment diagrams are shown in Figures 6a and 6b.

Year 2023 Traffic Volumes

The year 2023 traffic volumes at the study area intersections included a 2.0 percent per year compounded growth rate. The growth rate was based on discussions with representatives from Gray & Osborne, Inc. The year 2023 traffic volumes also included traffic from the future Cedar Springs Subdivision. The growth rate and in-process traffic from the Cedar Springs Subdivision was included to provide an analysis of the intersections for build-out of the Sunset Landing Subdivision, forecast year 2023 traffic conditions.

Peak Hour Traffic Operations

The scope of the transportation impact study was based on discussions with representatives from Gray & Osborne, Inc. Based on the discussions the following intersections were analyzed in this report:

(1) 1st Street & Elm Street.
(2) Todd Road/Robb Road & Old Pacific Highway S.
(3) Old Pacific Highway S & site access (future)

The intersections were analyzed to determine existing, year 2023 without project and year 2023 with project conditions. The site access onto Old Pacific Highway S was analyzed for the year 2023 with project conditions. The assumption was made that site build out will occur within a five year time period. The year 2023 traffic volumes without the project are shown in Figure 5. The year 2023 traffic volumes with the project are shown in Figure 7.

The HCS + software was used to determine the level of service at the study area intersections. The software program is based on the Highway Capacity Manual methodology.

The Highway Capacity Manual procedures describe the operation of an intersection in terms of its level of service (LOS). The LOS criteria ranges from "A", which indicates little, if any, delay to "F", which indicates that vehicles experience very long delays. The LOS criteria with the corresponding delay in seconds per vehicle and capacity analysis summary are shown in Tables 2 and 3 on page 4.

Table 2
Level of Service Criteria

Level of Service (LOS)	A	B	C	D	E	F
Signalized Intersections Average Delay (seconds per vehicle)	≤10	>10-20	>20-35	>35-55	>55-80	>80
Unsignalized Intersections Average Delay (seconds per vehicle)	≤10	>10-15	>15-25	>25-35	>35-50	>50

Table 3
Capacity Analysis Summary

	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
1st Street & Elm Street				
Existing	B	11.1	A	9.9
Year 2023 w/o project	B	12.7	B	10.8
Year 2023 with project	B	13.0	B	11.0
Todd Road/Robb Road & Old Pacific Highway S				
Existing	B	11.4	B	11.5
Year 2023 w/o project	B	11.9	B	12.1
Year 2023 with project	B	12.2	B	12.8
Old Pacific Highway S & site access				
Year 2023 with project	A	9.1	A	9.4

LOS = Level of Service
Delay = Approach Delay in seconds per vehicle

Based on the findings of this transportation impact study the study area intersections will operate at LOS "B" or better with build-out of the Sunset Landing Subdivision during the AM and PM peak hours. The LOS computer printouts are included in Appendix D.

Turn Lanes

The requirement for turn lanes was not conducted at the site access due to low traffic volumes on S Pacific Highway and a very acceptable projected level of service with build out of the development.

Sight Distance

Sight distance was measured at the location of the future access onto Old Pacific Highway S. The measured corner sight distance was over 400 feet when looking towards the north and south. A distance of 390 feet is required as based on the posted speed limit of 35 mph on Old Pacific Highway S and the criteria in AASHTO, A Policy on Geometric Design of Highways and Streets, 2010. Therefore, the sight distance requirement is met.

Pedestrian/Bicycle/Transit Considerations

No pedestrian or bicycle activities were observed within the vicinity of the site. Sidewalks and bike lanes will be provided for along the site frontage of Old Pacific Highway S. The site is not served by public transit service.

Collision Records

Collision records were obtained from the Washington State Department of Transportation for the three year time period between January 1, 2015 and December 31, 2017. During the three year time period four accidents occurred at the Elm Street/1st Street intersection and no accidents occurred at the Old Pacific Highway S/Todd Road/Robb Road intersection. The calculated accident rate at the Elm Street/1st Street intersection (0.56) is below the threshold of 1.0 accidents per million entering vehicles which usually identifies an intersection with a high rate. The collision data is shown in Table 4 and Appendix B.

Table 4
Collision Data

Intersection	Number of Collisions	Collision Type		Rate *
		One Parked-One Moving	Vehicle Overturned	
Elm St./ 1st St.	4	2	2	0.56
Old Pacific Hwy S/Todd Rd./Robb Rd.	0			

* Accident rate per million entering vehicles

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this transportation impact study the surrounding roadway system can adequately accommodate traffic from the Sunset Landing Subdivision. The study area intersections will operate at LOS "B" or better with build-out of the development.

Adequate sight distance should be maintained at the site access onto Old Pacific Highway S. Obstructions by landscaping, signs, parked vehicles or other objects should not be allowed.

No additional off-site traffic control devices were identified to accommodate the development.

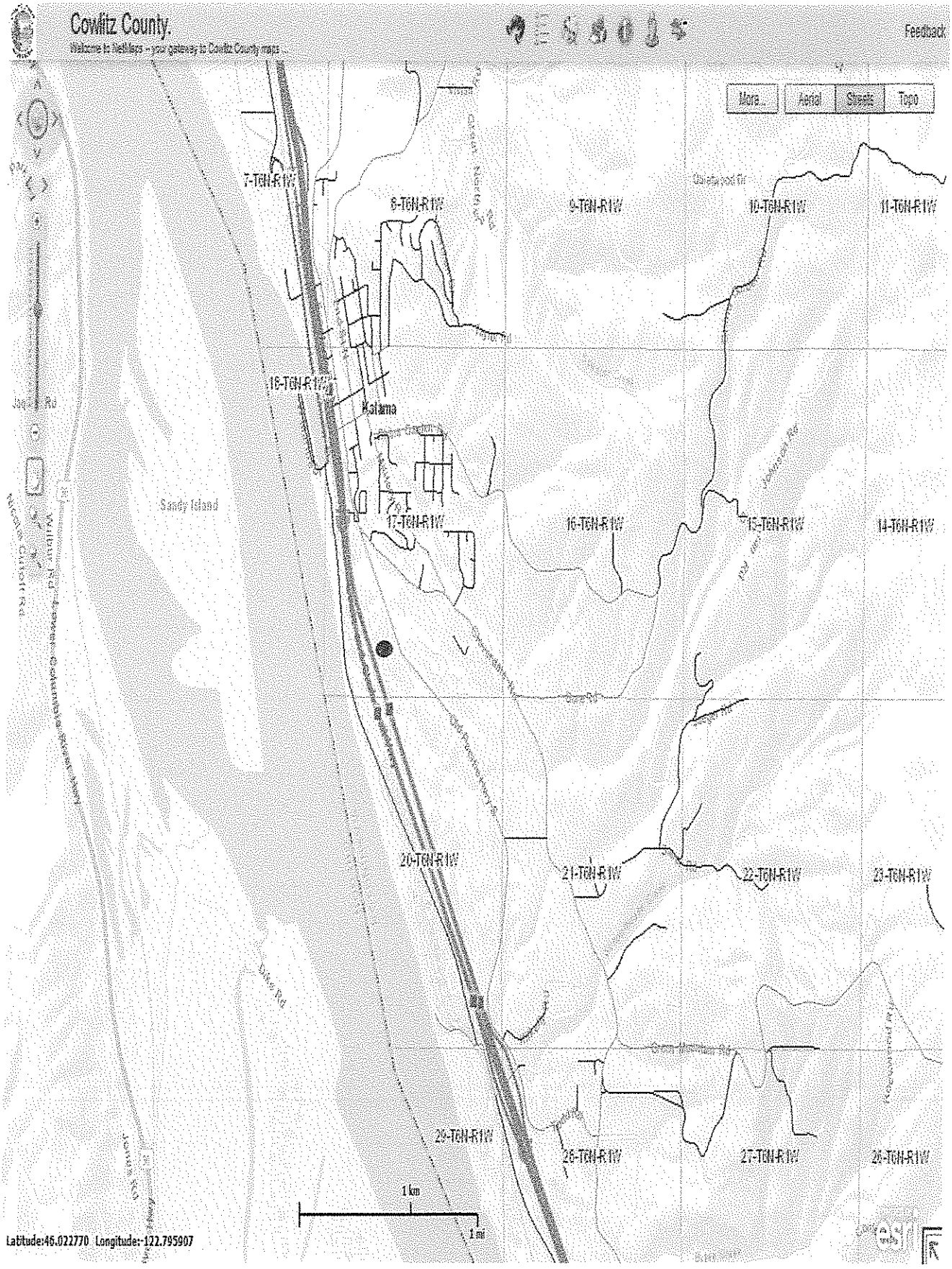


FIGURE 1a

3/24/2018

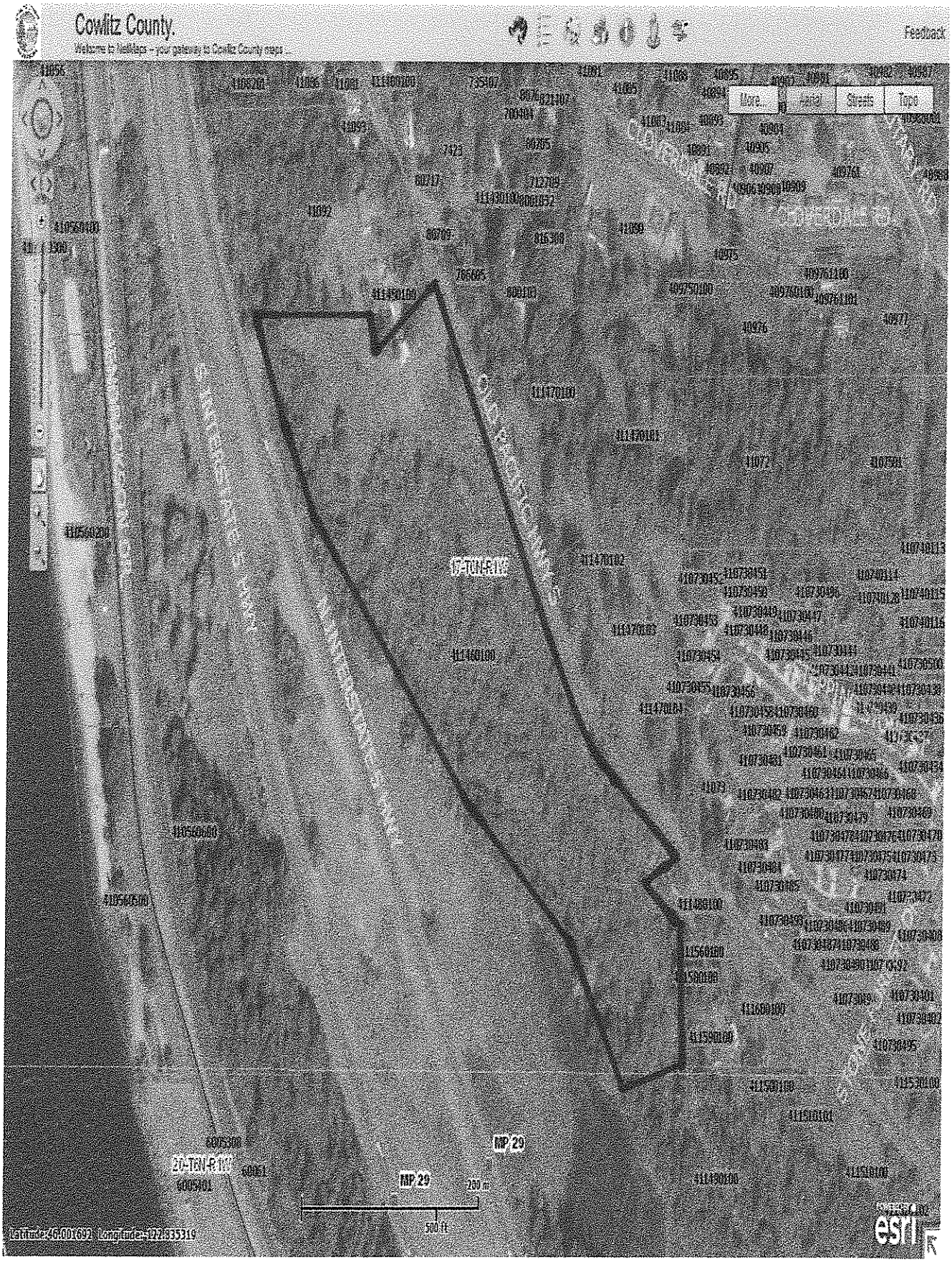


FIGURE 1b

3/21/2018

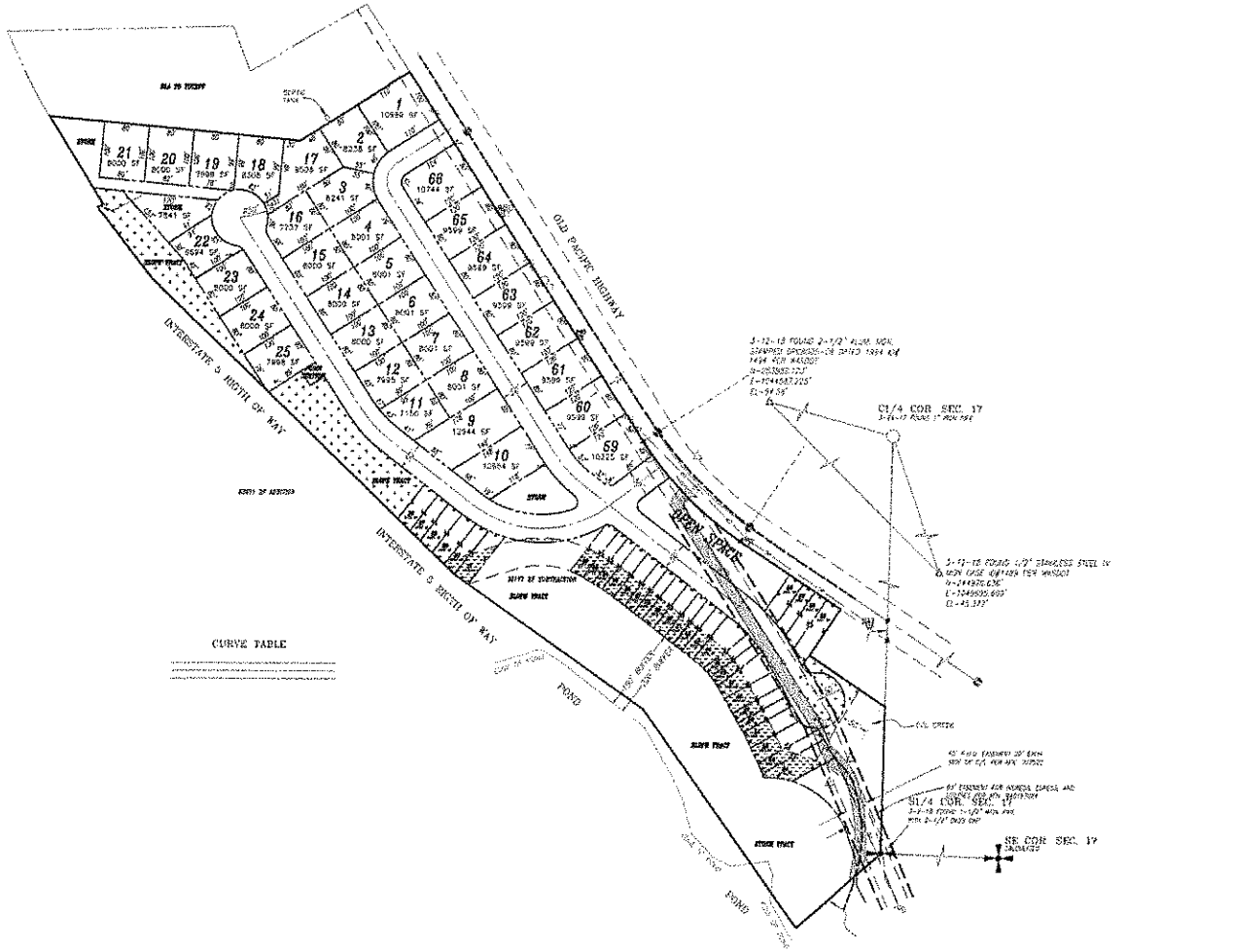
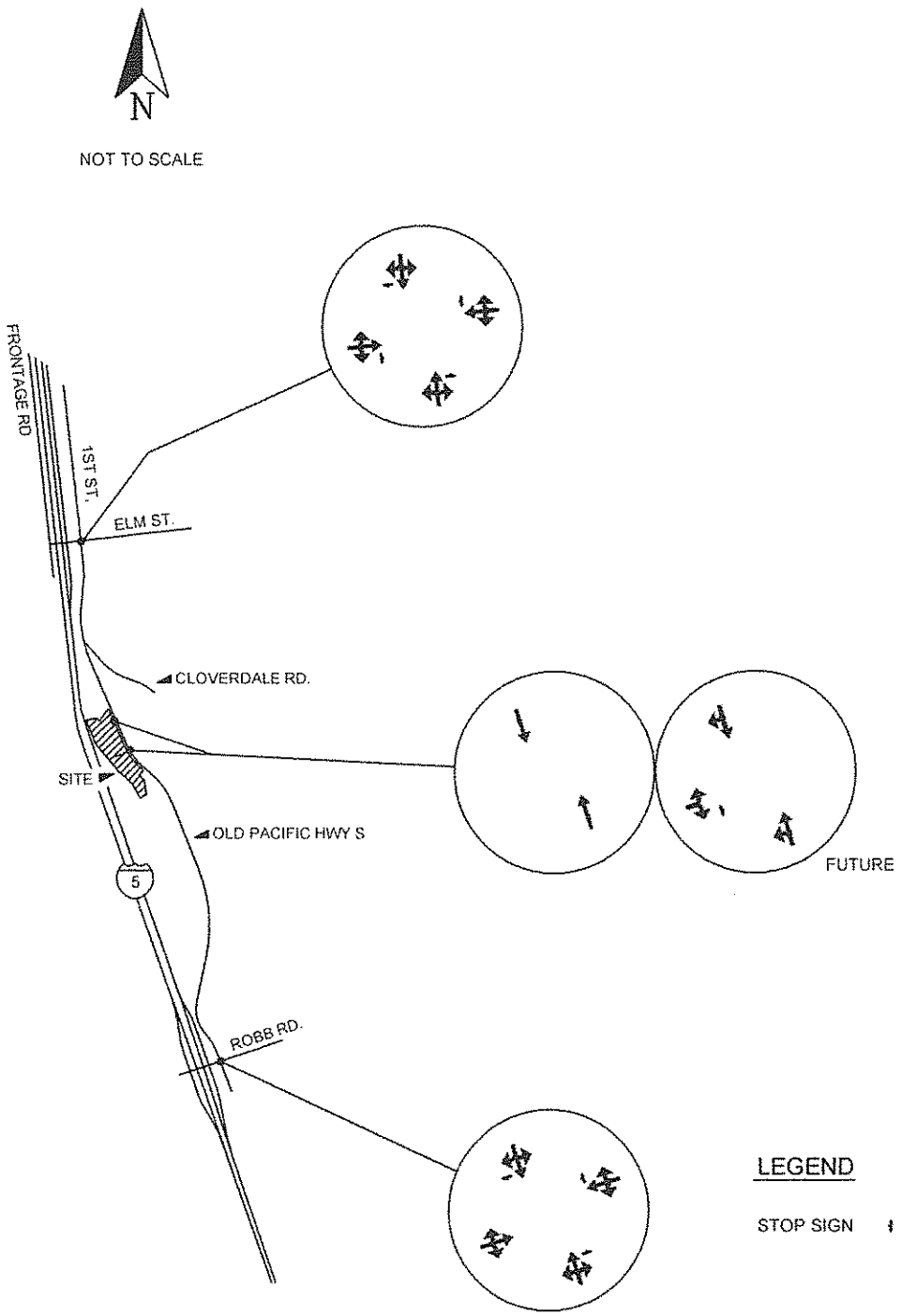

OLD PACIFIC HIGHWAY
INTERSTATE 5 SOUTH OR WAY
INTERSTATE 5 SOUTH OR WAY
CURVE TABLE
C1/4 COR SEC. 17
SE COR SEC. 17
SCALE 1" = 100'

FIGURE 1c



EXISTING CONDITIONS UNLESS NOTED

SUNSET LANDING SUBDIVISION

FIGURE 2
LANE CONFIGURATIONS

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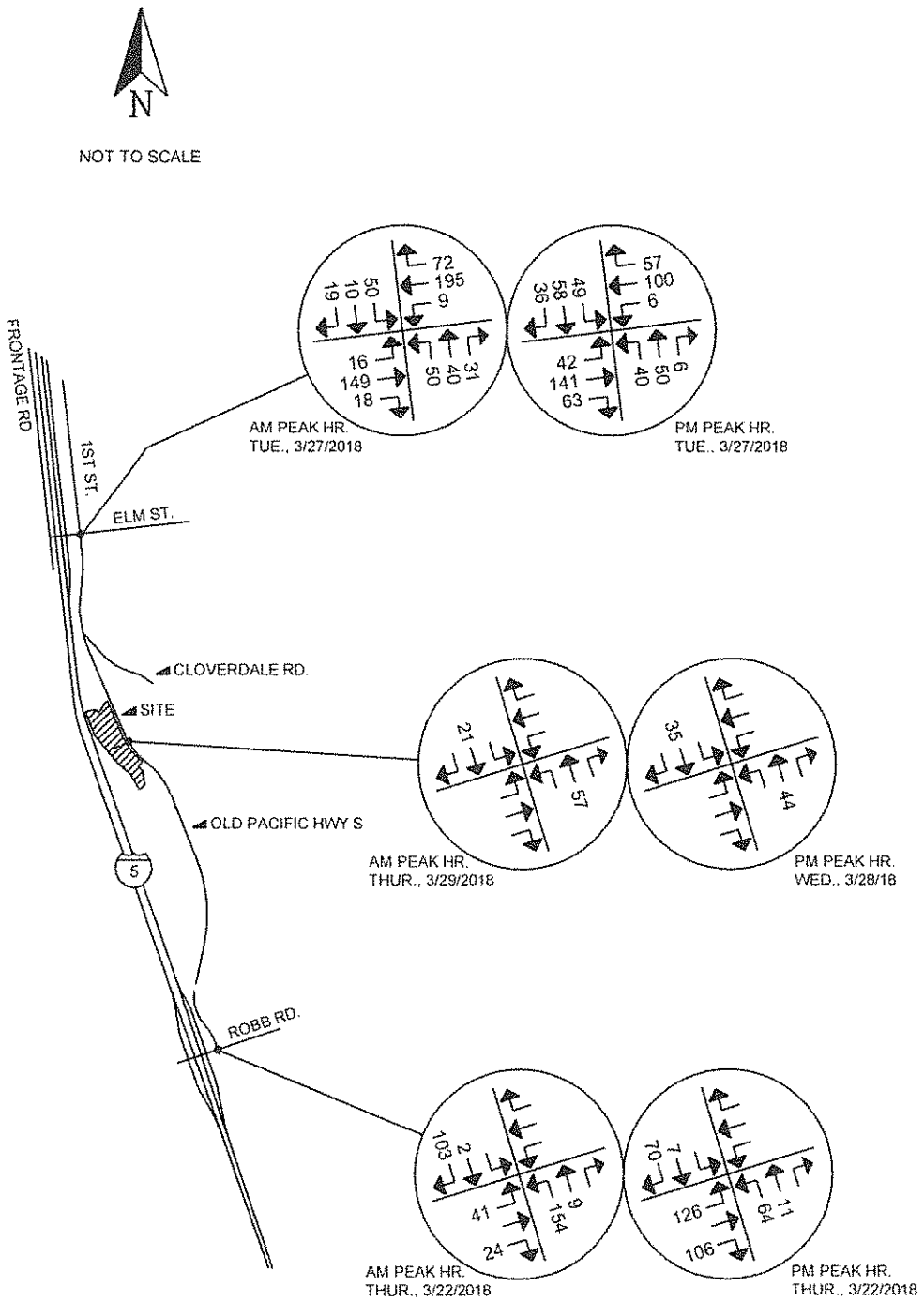

SUNSET LANDING SUBDIVISION

FIGURE 3
EXISTING TRAFFIC VOLUMES

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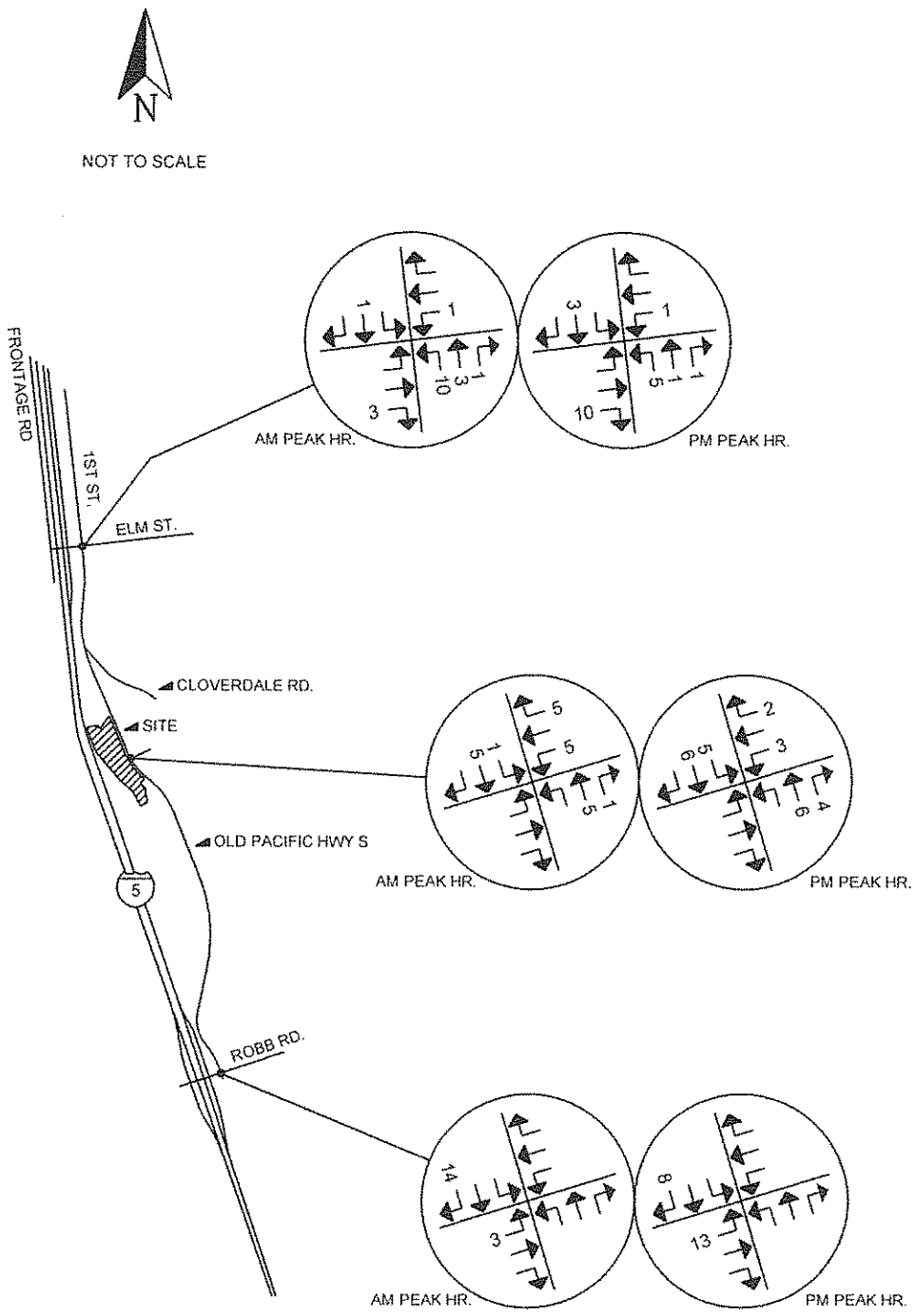

SUNSET LANDING SUBDIVISION

FIGURE 4
IN-PROCESS TRAFFIC

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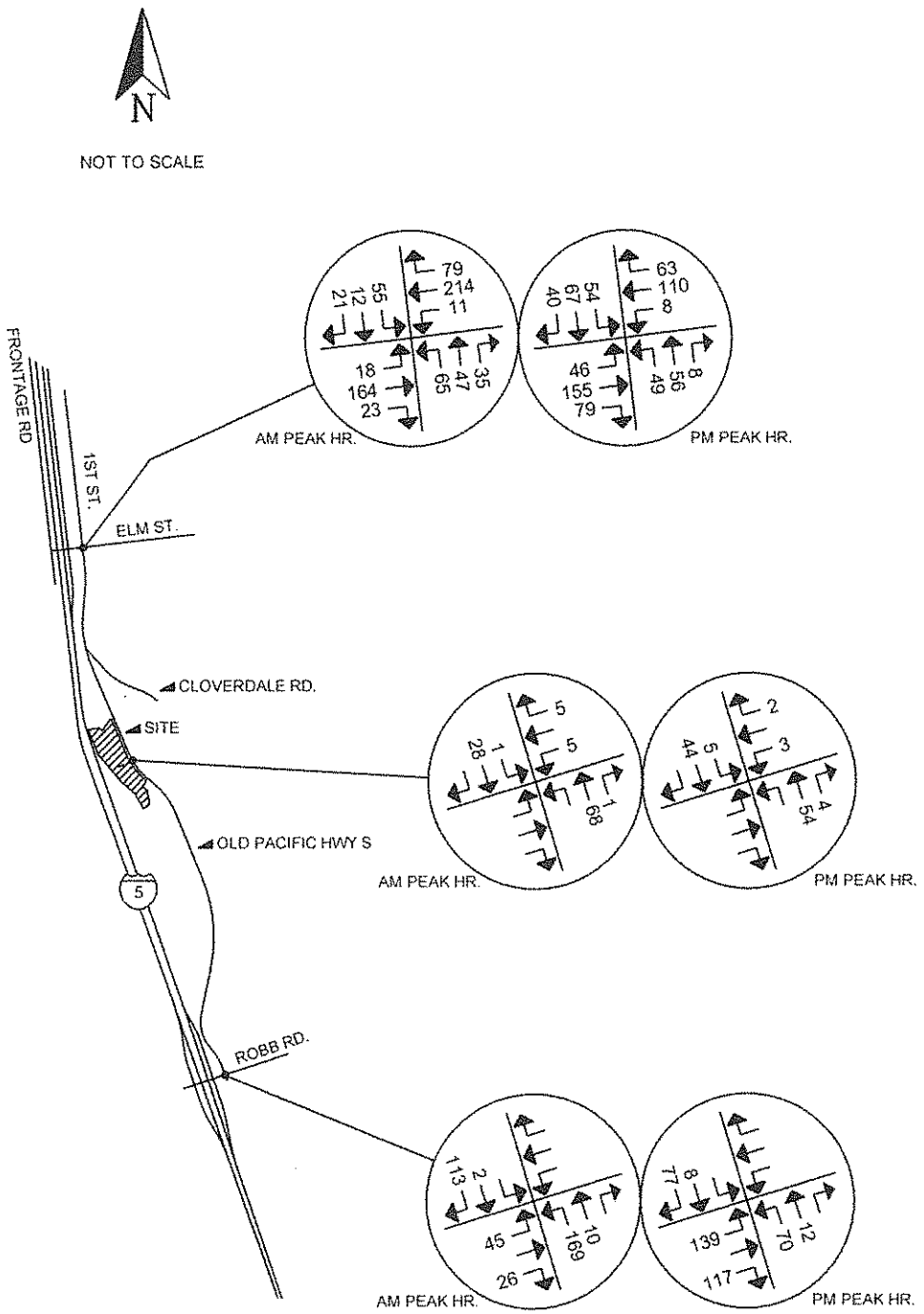

SUNSET LANDING SUBDIVISION

FIGURE 5
YEAR 2023 TRAFFIC VOLUMES
W/O PROJECT

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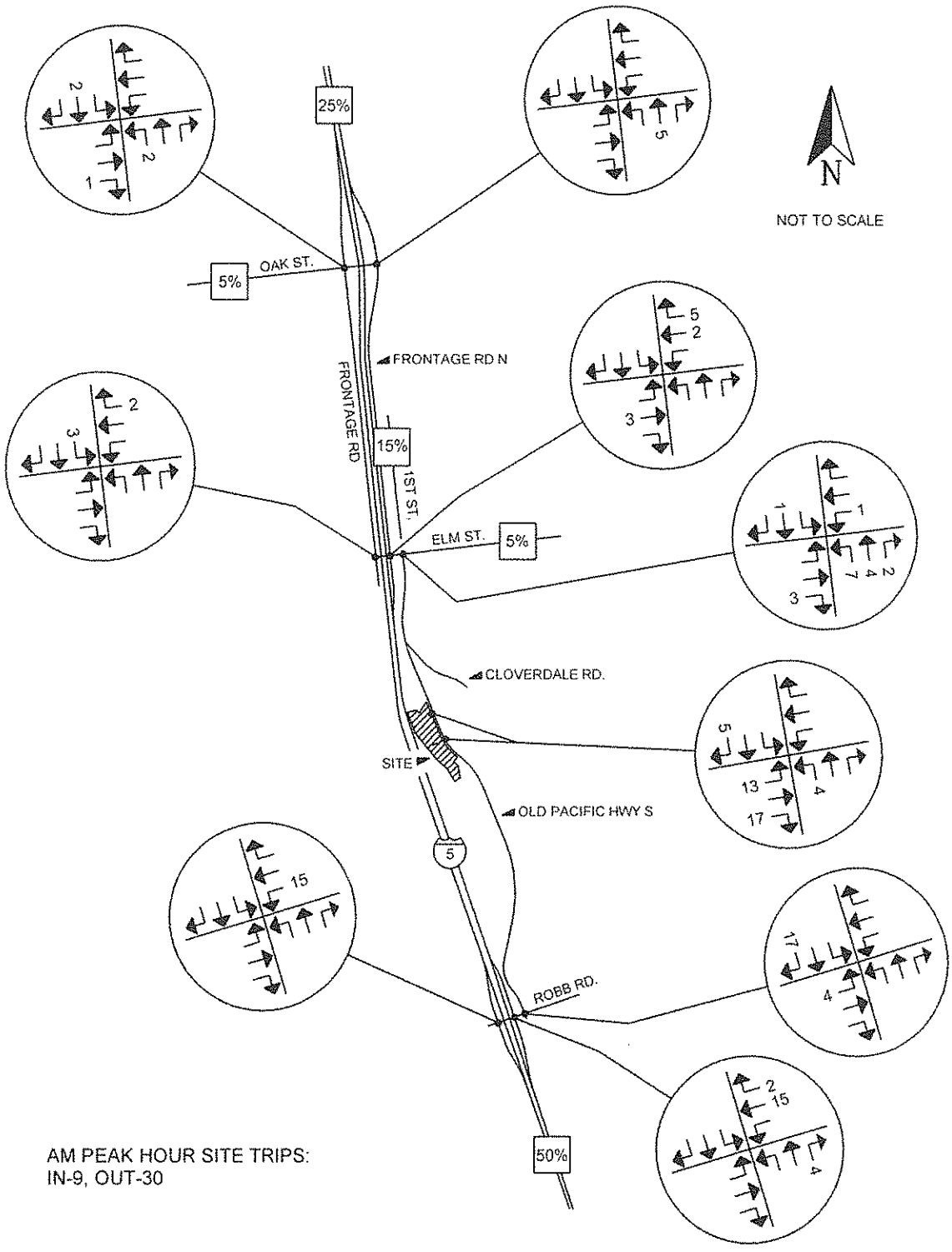

FIGURE 6a
SITE TRAFFIC DISTRIBUTION/ ASSIGNMENT, AM PEAK HOUR

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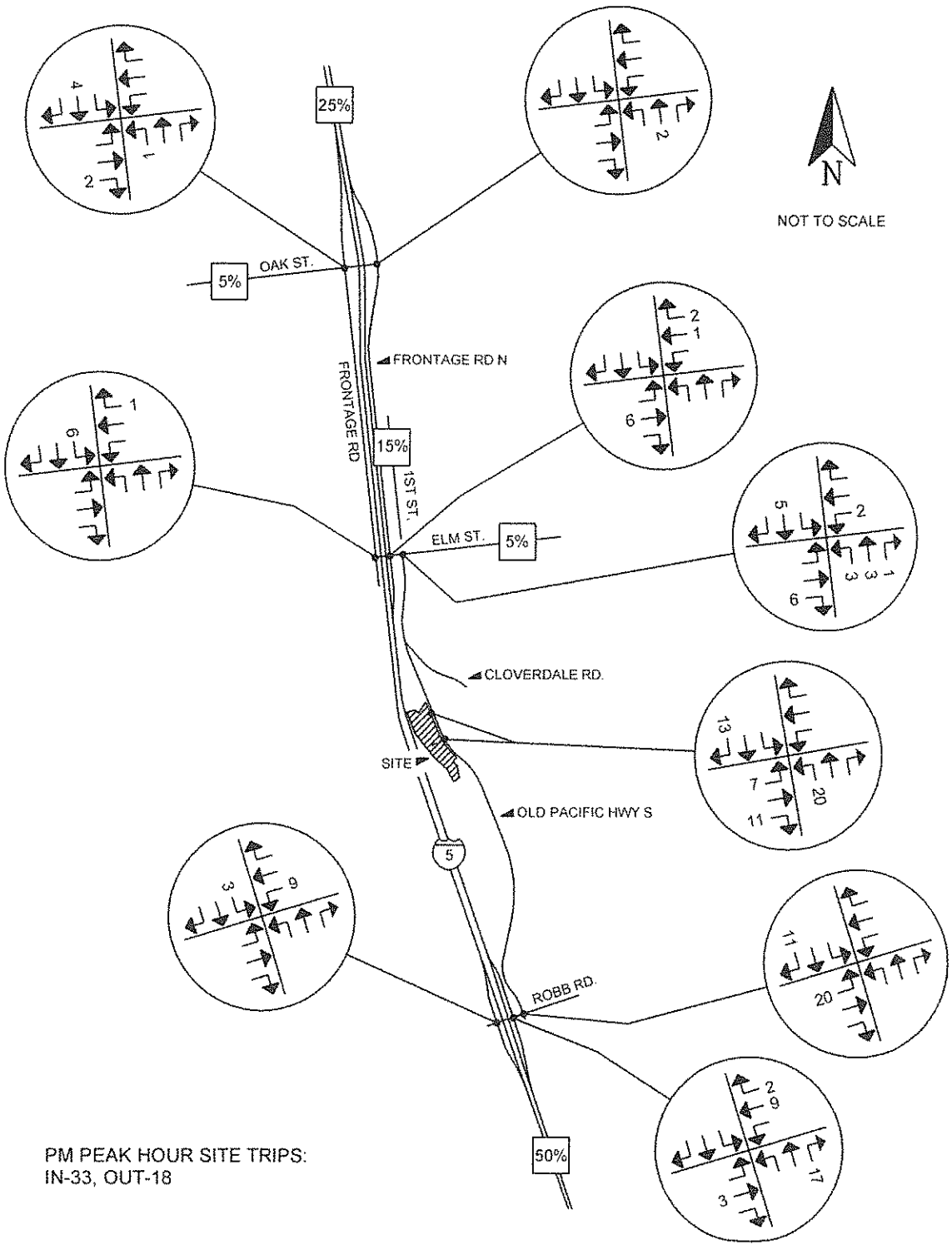

SUNSET LANDING SUBDIVISION

FIGURE 6b
SITE TRAFFIC DISTRIBUTION/ ASSIGNMENT, PM PEAK HOUR

KELLY ENGINEERING
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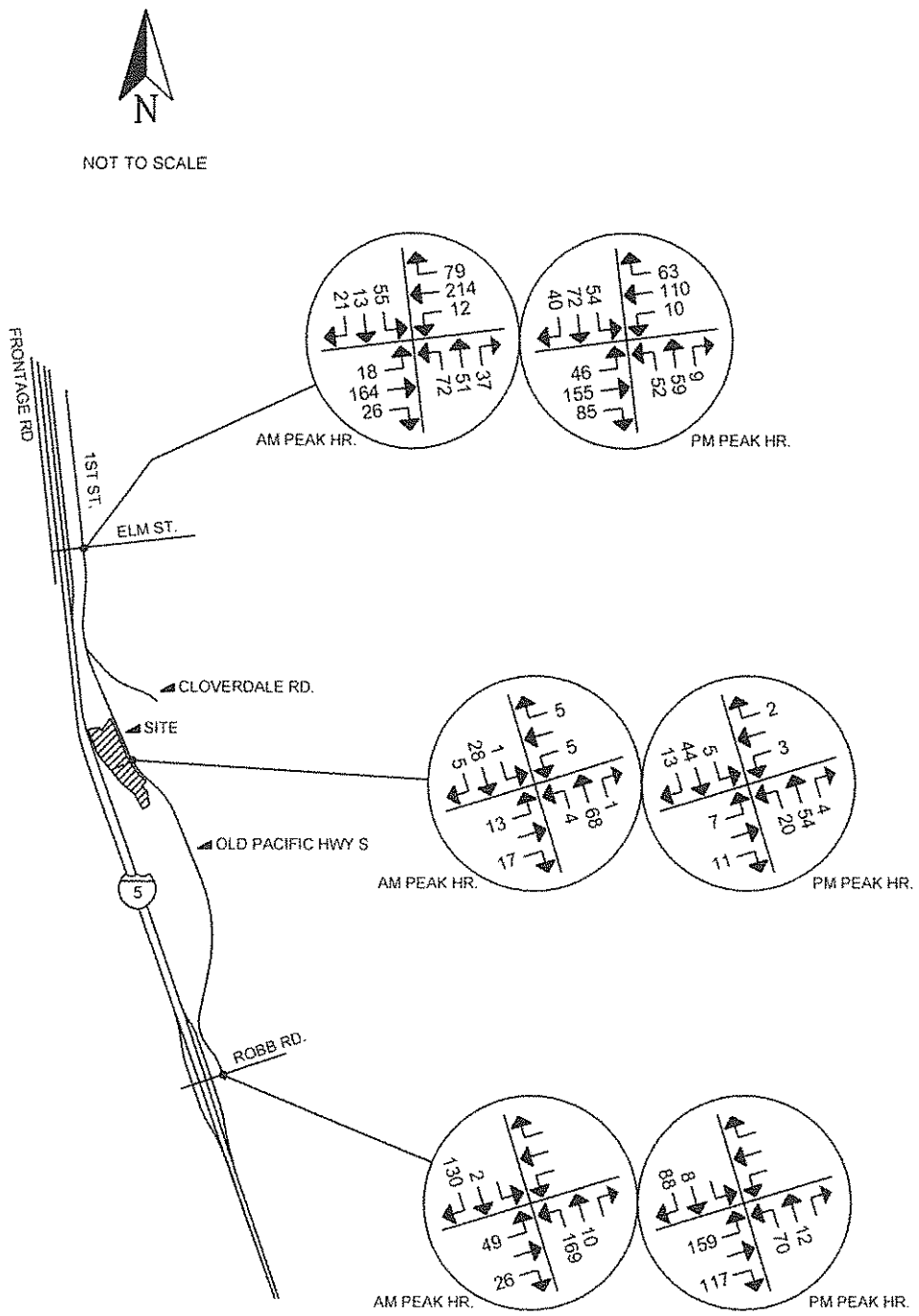
Phone: 360-433-7530



SUNSET LANDING SUBDIVISION

FIGURE 7
YEAR 2023 TRAFFIC VOLUMES
WITH PROJECT

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APPENDIX A
RAW TRAFFIC COUNT DATA

INTERSECTION TURN MOVEMENT SURVEY
OLD PACIFIC HIGHWAY & ROBB ROAD/TODD ROAD

DATE OF COUNT: 3/22/2018, 07:00-09:00
DAY OF WEEK: THUR.
WEATHER: CLOUDY, DRY
COUNTER: KAK

Time Period From – To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
07:00-07:05	0	1	9	0	0	0	7	0	0	4	0	1	22
07:05-07:10	0	0	23	0	0	0	9	0	0	2	0	2	36
07:10-07:15	0	0	12	0	0	0	7	1	0	2	0	5	27
07:15-07:20	0	0	7	0	0	0	5	0	0	3	0	0	15
07:20-07:25	**0**	**0**	**7**	**0**	**0**	**0**	**18**	**1**	**0**	**3**	**0**	**3**	**32**
07:25-07:30	**0**	**0**	**6**	**0**	**0**	**0**	**11**	**1**	**0**	**3**	**0**	**1**	**22**
07:30-07:35	**0**	**0**	**11**	**0**	**0**	**0**	**14**	**1**	**0**	**1**	**0**	**2**	**29**
07:35-07:40	**0**	**0**	**7**	**0**	**0**	**0**	**11**	**1**	**0**	**2**	**0**	**1**	**22**
07:40-07:45	**0**	**0**	**11**	**0**	**0**	**0**	**15**	**0**	**0**	**3**	**0**	**5**	**34**
07:45-07:50	**0**	**0**	**6**	**0**	**0**	**0**	**16**	**1**	**0**	**3**	**0**	**2**	**28**
07:50-07:55	**0**	**0**	**5**	**0**	**0**	**0**	**12**	**0**	**0**	**1**	**0**	**1**	**19**
07:55-08:00	**0**	**0**	**9**	**0**	**0**	**0**	**17**	**0**	**0**	**5**	**0**	**3**	**34**
08:00-08:05	**0**	**0**	**8**	**0**	**0**	**0**	**9**	**1**	**0**	**2**	**0**	**3**	**23**
08:05-08:10	**0**	**0**	**9**	**0**	**0**	**0**	**7**	**0**	**0**	**3**	**0**	**0**	**19**
08:10-08:15	**0**	**2**	**14**	**0**	**0**	**0**	**9**	**2**	**0**	**8**	**0**	**2**	**37**
08:15-08:20	**0**	**0**	**9**	**0**	**0**	**0**	**15**	**1**	**0**	**7**	**0**	**1**	**33**
08:20-08:25	0	0	7	0	0	0	9	0	0	5	0	6	27
08:25-08:30	0	0	7	0	0	0	5	1	0	2	0	3	18
08:30-08:35	0	1	6	0	0	0	3	0	0	4	0	3	17
08:35-08:40	0	1	5	0	0	0	9	0	0	7	0	3	25
08:40-08:45	0	1	6	0	0	0	2	0	0	3	0	4	16
08:45-08:50	0	0	7	0	0	0	4	1	0	4	0	2	18
08:50-08:55	0	0	9	0	0	0	5	0	0	2	0	1	17
08:55-09:00	0	1	8	0	0	0	3	0	0	1	0	3	16
Peak Hour Total	**0**	**2**	**102**	**0**	**0**	**0**	**154**	**9**	**0**	**41**	**0**	**24**	**332**
% Trucks	0	0	11	0	0	0	1	11	0	15	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 07:20-08:20
PHF Intersection: 0.93

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INTERSECTION TURN MOVEMENT SURVEY
OLD PACIFIC HIGHWAY & ROBB ROAD/TODD ROAD

DATE OF COUNT: 3/22/2018, 16:00-18:00
DAY OF WEEK: THUR.
WEATHER: SUNNY
COUNTER: KAK

Time Period From – To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
16:00-16:05	**0**	**1**	**8**	**0**	**0**	**0**	**13**	**1**	**0**	**10**	**0**	**8**	**41**
16:05-16:10	**0**	**3**	**8**	**0**	**0**	**0**	**10**	**2**	**0**	**12**	**0**	**4**	**39**
16:10-16:15	**0**	**1**	**8**	**0**	**0**	**0**	**3**	**1**	**0**	**13**	**0**	**10**	**36**
16:15-16:20	**0**	**0**	**3**	**0**	**0**	**0**	**6**	**2**	**0**	**8**	**0**	**11**	**30**
16:20-16:25	**0**	**0**	**7**	**0**	**0**	**0**	**8**	**1**	**0**	**19**	**0**	**8**	**43**
16:25-16:30	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**15**	**0**	**9**	**27**
16:30-16:35	**0**	**0**	**5**	**0**	**0**	**0**	**6**	**0**	**0**	**12**	**0**	**15**	**38**
16:35-16:40	**0**	**0**	**7**	**0**	**0**	**0**	**2**	**0**	**0**	**5**	**0**	**14**	**28**
16:40-16:45	**0**	**2**	**6**	**0**	**0**	**0**	**3**	**1**	**0**	**15**	**0**	**6**	**33**
16:45-16:50	**0**	**0**	**4**	**0**	**0**	**0**	**6**	**0**	**0**	**5**	**0**	**8**	**23**
16:50-16:55	**0**	**0**	**4**	**0**	**0**	**0**	**3**	**2**	**0**	**5**	**0**	**6**	**20**
16:55-17:00	**0**	**0**	**9**	**0**	**0**	**0**	**2**	**1**	**0**	**7**	**0**	**7**	**26**
17:00-17:05	1	0	6	0	0	0	6	0	0	11	0	10	34
17:05-17:10	0	0	6	0	0	0	2	0	0	11	0	4	23
17:10-17:15	0	1	9	0	0	0	4	1	0	11	0	9	35
17:15-17:20	0	0	11	0	0	0	5	2	0	12	0	11	41
17:20-17:25	0	2	10	0	0	0	7	0	0	12	0	8	39
17:25-17:30	0	2	5	0	0	0	10	0	0	6	0	9	32
17:30-17:35	0	0	10	0	0	0	3	0	0	7	0	7	27
17:35-17:40	0	1	8	0	0	0	3	1	0	10	0	15	38
17:40-17:45	0	0	8	0	0	0	2	1	0	8	0	8	27
17:45-17:50	0	0	5	0	0	0	2	0	0	7	0	9	23
17:50-17:55	0	1	7	0	0	0	4	0	0	7	0	5	24
17:55-18:00	0	0	7	0	0	0	5	1	0	9	0	7	29
Peak Hour Total	**0**	**7**	**70**	**0**	**0**	**0**	**64**	**11**	**0**	**126**	**0**	**106**	**384**
% Trucks	0	0	4	0	0	0	3	0	0	6	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 16:00-17:00

PHF Intersection: 0.83

KELLY ENGINEERING

OLD PACIFIC HWY S SURVEY
SITE ACCESS & OLD PACIFIC HWY S

DATE OF COUNT: 3/29/2018, 07:00-09:00
DAY OF WEEK: THUR.
WEATHER: CLOUDY, DRY
COUNTER: DSK

Time Period From -- To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
07:00-07:05	0	1	0	0	0	0	0	2	0	0	0	0	3
07:05-07:10	0	3	0	0	0	0	0	2	0	0	0	0	5
07:10-07:15	0	2	0	0	0	0	0	1	0	0	0	0	3
07:15-07:20	0	1	0	0	0	0	0	3	0	0	0	0	4
07:20-07:25	0	2	0	0	0	0	0	3	0	0	0	0	5
07:25-07:30	0	2	0	0	0	0	0	5	0	0	0	0	7
07:30-07:35	0	1	0	0	0	0	0	4	0	0	0	0	5
07:35-07:40	0	0	0	0	0	0	0	1	0	0	0	0	1
07:40-07:45	0	2	0	0	0	0	0	5	0	0	0	0	7
07:45-07:50	0	2	0	0	0	0	0	2	0	0	0	0	4
07:50-07:55	0	4	0	0	0	0	0	1	0	0	0	0	5
07:55-08:00	0	4	0	0	0	0	0	2	0	0	0	0	6
08:00-08:05	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**5**
08:05-08:10	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**5**
08:10-08:15	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**4**
08:15-08:20	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**4**
08:20-08:25	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
08:25-08:30	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**5**
08:30-08:35	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**4**
08:35-08:40	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**6**
08:40-08:45	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**6**
08:45-08:50	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**9**
08:50-08:55	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**14**
08:55-09:00	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**14**
Peak Hour Total	**0**	**21**	**0**	**0**	**0**	**0**	**0**	**57**	**0**	**0**	**0**	**0**	**78**
% Trucks	0	5	0	0	0	0	0	3	0	0	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 08:00-09:00

OLD PACIFIC HWY S SURVEY
SITE ACCESS & OLD PACIFIC HWY S

DATE OF COUNT: 3/28/18, 16:00-18:00
DAY OF WEEK: WED.
WEATHER: RAIN
COUNTER: DSK

Time Period From – To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
16:00-16:05	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**13**
16:05-16:10	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**10**
16:10-16:15	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**7**
16:15-16:20	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**6**
16:20-16:25	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**7**
16:25-16:30	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**7**
16:30-16:35	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**7**
16:35-16:40	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**7**
16:40-16:45	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**6**
16:45-16:50	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**3**
16:50-16:55	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
16:55-17:00	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**4**
17:00-17:05	0	4	0	0	0	0	0	2	0	0	0	0	6
17:05-17:10	0	4	0	0	0	0	0	5	0	0	0	0	9
17:10-17:15	0	0	0	0	0	0	0	3	0	0	0	0	3
17:15-17:20	0	3	0	0	0	0	0	1	0	0	0	0	4
17:20-17:25	0	7	0	0	0	0	0	2	0	0	0	0	9
17:25-17:30	0	7	0	0	0	0	0	3	0	0	0	0	10
17:30-17:35	0	2	0	0	0	0	0	1	0	0	0	0	3
17:35-17:40	0	1	0	0	0	0	0	2	0	0	0	0	3
17:40-17:45	0	3	0	0	0	0	0	3	0	0	0	0	6
17:45-17:50	0	1	0	0	0	0	0	2	0	0	0	0	3
17:50-17:55	0	2	0	0	0	0	0	1	0	0	0	0	3
17:55-18:00	0	1	0	0	0	0	0	0	0	0	0	0	1
Peak Hour Total	**0**	**35**	**0**	**0**	**0**	**0**	**0**	**44**	**0**	**0**	**0**	**0**	**79**
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 16:00-17:00

KELLY ENGINEERING

INTERSECTION TURN MOVEMENT SURVEY
ELM STREET & FIRST STREET

DATE OF COUNT: 3/27/2018, 07:00-09:00
DAY OF WEEK: TUE.
WEATHER: RAIN
COUNTER: KAK

Time Period From -- To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
07:00-07:05	3	2	4	0	4	2	3	2	0	1	3	1	25
07:05-07:10	0	1	3	1	8	4	7	4	0	0	5	0	33
07:10-07:15	1	0	0	0	13	1	4	3	0	0	1	0	23
07:15-07:20	1	1	0	0	6	3	4	2	0	2	2	0	21
07:20-07:25	1	2	1	0	12	2	0	5	0	0	7	0	30
07:25-07:30	1	3	2	1	12	5	7	3	2	0	7	1	44
07:30-07:35	3	1	3	1	16	3	7	0	1	1	7	0	43
07:35-07:40	**0**	**1**	**4**	**0**	**12**	**1**	**9**	**3**	**0**	**3**	**9**	**1**	**43**
07:40-07:45	**4**	**0**	**2**	**0**	**12**	**3**	**6**	**3**	**1**	**0**	**8**	**1**	**40**
07:45-07:50	**2**	**0**	**0**	**0**	**11**	**3**	**4**	**2**	**0**	**1**	**17**	**3**	**43**
07:50-07:55	**5**	**0**	**2**	**0**	**16**	**2**	**4**	**4**	**1**	**0**	**11**	**1**	**46**
07:55-08:00	**3**	**3**	**1**	**0**	**14**	**3**	**5**	**2**	**2**	**1**	**10**	**0**	**44**
08:00-08:05	**2**	**0**	**1**	**0**	**11**	**4**	**3**	**3**	**6**	**0**	**16**	**3**	**49**
08:05-08:10	**7**	**1**	**0**	**2**	**15**	**6**	**1**	**6**	**5**	**1**	**18**	**1**	**63**
08:10-08:15	**8**	**1**	**2**	**0**	**16**	**7**	**3**	**4**	**5**	**4**	**13**	**1**	**64**
08:15-08:20	**6**	**0**	**2**	**3**	**23**	**9**	**2**	**4**	**3**	**3**	**20**	**2**	**77**
08:20-08:25	**4**	**2**	**1**	**1**	**21**	**13**	**3**	**3**	**6**	**3**	**16**	**2**	**75**
08:25-08:30	**5**	**0**	**2**	**0**	**22**	**11**	**4**	**3**	**1**	**0**	**10**	**2**	**60**
08:30-08:35	**4**	**2**	**2**	**3**	**22**	**10**	**6**	**3**	**1**	**0**	**1**	**1**	**55**
08:35-08:40	2	1	1	1	14	2	1	1	0	1	1	1	26
08:40-08:45	2	1	0	0	9	2	4	3	0	0	6	3	30
08:45-08:50	3	0	1	0	8	1	4	2	0	0	4	2	25
08:50-08:55	4	0	2	1	8	2	2	4	1	1	3	1	29
08:55-09:00	2	1	1	0	9	3	1	3	0	1	2	1	24
Peak Hour Total	**50**	**10**	**19**	**9**	**195**	**72**	**50**	**40**	**31**	**16**	**149**	**18**	**659**
% Trucks	0	0	0	11	1	0	0	0	0	6	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 07:35-08:35

PHF Intersection: 0.77

KELLY ENGINEERING

INTERSECTION TURN MOVEMENT SURVEY
ELM STREET & FIRST STREET

DATE OF COUNT: 3/27/2018, 16:00-18:00
DAY OF WEEK: TUE.
WEATHER: CLOUDY, DRY
COUNTER: KAK

Time Period From – To	FROM NORTH			FROM EAST			FROM SOUTH			FROM WEST			TOTAL
	L	T	R	L	T	R	L	T	R	L	T	R	
16:00-16:05	5	4	3	1	2	12	2	5	0	1	12	5	52
16:05-16:10	4	1	3	1	7	9	4	3	0	7	9	8	56
16:10-16:15	5	5	0	0	7	7	0	4	1	6	16	3	54
16:15-16:20	4	5	2	1	8	5	2	6	1	2	14	6	56
16:20-16:25	7	5	4	1	5	2	0	1	0	3	14	2	44
16:25-16:30	7	6	0	0	3	6	3	3	2	4	7	4	45
16:30-16:35	2	2	3	1	4	5	3	3	1	3	15	5	47
16:35-16:40	8	1	4	1	6	8	1	4	0	2	9	7	51
16:40-16:45	**5**	**5**	**3**	**0**	**7**	**6**	**6**	**1**	**0**	**5**	**10**	**6**	**54**
16:45-16:50	**6**	**6**	**1**	**0**	**9**	**3**	**2**	**4**	**0**	**4**	**15**	**4**	**54**
16:50-16:55	**3**	**4**	**0**	**1**	**7**	**3**	**5**	**4**	**0**	**5**	**6**	**7**	**45**
16:55-17:00	**3**	**4**	**3**	**0**	**4**	**3**	**2**	**6**	**0**	**6**	**9**	**5**	**45**
17:00-17:05	**0**	**4**	**4**	**1**	**10**	**4**	**0**	**5**	**1**	**2**	**13**	**5**	**49**
17:05-17:10	**6**	**4**	**7**	**1**	**8**	**3**	**2**	**7**	**0**	**2**	**10**	**2**	**52**
17:10-17:15	**4**	**6**	**1**	**1**	**7**	**4**	**1**	**4**	**1**	**4**	**11**	**8**	**52**
17:15-17:20	**6**	**5**	**1**	**0**	**12**	**6**	**5**	**3**	**2**	**3**	**10**	**2**	**55**
17:20-17:25	**5**	**9**	**5**	**1**	**6**	**3**	**4**	**7**	**0**	**2**	**11**	**6**	**59**
17:25-17:30	**4**	**3**	**1**	**0**	**11**	**4**	**5**	**6**	**1**	**4**	**16**	**7**	**62**
17:30-17:35	**2**	**2**	**5**	**1**	**10**	**10**	**6**	**0**	**1**	**1**	**19**	**7**	**64**
17:35-17:40	**5**	**6**	**5**	**0**	**9**	**8**	**2**	**3**	**0**	**4**	**11**	**4**	**57**
17:40-17:45	7	3	2	1	8	6	0	4	0	2	14	1	48
17:45-17:50	4	4	3	1	5	5	2	2	0	3	13	3	45
17:50-17:55	5	3	1	0	7	4	1	2	2	2	10	4	41
17:55-18:00	6	3	2	0	6	3	0	3	0	3	10	5	41
Peak Hour Total	**49**	**58**	**36**	**6**	**100**	**57**	**40**	**50**	**6**	**42**	**141**	**63**	**648**
% Trucks	0	0	0	17	0	0	0	0	0	0	1	0	
Peds	0	5	0	0	2	0	0	1	0	0	0	0	
Bikes	0	0	0	0	0	0	0	0	0	0	0	0	

PEAK HOUR: 16:40-17:40

PHF Intersection: 0.88

KELLY ENGINEERING

APPENDIX B
COLLISION DATA

Washington State
Department of Transportation

Transportation Data, GIS & Modeling Office
7345 Linderson Way Sw, Fl 1
Tumwater, WA 98501

360-570-2490 / Fax 360-570-2449
TTY: 1-800-833-6388
www.wsdot.wa.gov

March 27, 2018

David Kelly
Kelly Engineering
316 E Fourth Plain A-4
Vancouver WA 98663

Dear Mr. Kelly:

In accordance with the Public Records Act, RCW 42.56, this letter acknowledges receipt of your request for records dated March 22, 2018 (Request Number PDR-18-0904).

We have prepared a history of officer reported crashes that occurred at or in the vicinity of the following intersections in the City of Kalama and Cowlitz County for the period of 1/1/2015 – 12/31/2017.

- Elm St @ 1st St
- Old Pacific Hwy – *east leg* (Co Rd # 33950, milepost 1.960 – 1.980) @ Todd Rd (Co Rd #32840, milepost 0.590 – 0.630) – *No Reported Crashes*
- Old Pacific Hwy – *west leg* (Co Rd # 33950, milepost 1.960 – 1.980) @ Robb Rd (Co Rd # 33320, milepost 0.000 – 0.020) – *No Reported Crashes*

Federal law 23 United States Code Section 409 governs use of the data you requested. Under this law, data maintained for purposes of evaluating potential highway safety enhancements:

". . . shall not be subject to discovery or admitted into evidence in a federal or state court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data." [Emphasis added.]

The Washington State Department of Transportation (WSDOT) is releasing this data to you with the understanding that you will not use this data contrary to the restrictions in Section 409, which means you will not use this data in discovery or as evidence at trial in any action for damages against the WSDOT, the State of Washington, or any other jurisdiction involved in the locations mentioned in the data. If you should attempt to use this data in an action for damages against WSDOT, the State of Washington, or any other jurisdiction involved in the locations mentioned in the data, these entities expressly reserve the right, under Section 409, to object to the use of the data, including any opinions drawn from the data.

With this package, your request for records is complete and closed.

If you have any further questions, you may contact me at 360-570-2490.

Sincerely,

Tanya Joblonski
Transportation Planning Technician 3
Transportation Data, GIS & Modeling Office

OFFICER REPORTED CRASHES THAT OCCURRED *at* OR *in the vicinity of the* FOLLOWING INTERSECTIONS IN THE CITY OF KALAMA & COWLITZ COUNTY

Elm St @ 1st St

Old Pacific Hwy - *east leg* (Co Rd # 33950, milepost 1.960 - 1.980) @ Todd Rd (Co Rd # 32840, milepost 0.590 - 0.630) - *No Reported Crashes*

Old Pacific Hwy - *west leg* (Co Rd # 33950, milepost 1.960 - 1.980) @ Rob Rd (Co Rd # 32320, milepost 0.000 - 0.020) - *No Reported Crashes*

01/01/2015 - 12/31/2017

Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

JURISDICTION	COUNTY	CITY	INDEXED PRIMARY TRAFFICWAY	PRIMARY TRAFFICWAY	BLOCK NUMBER	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	MILEPOST	A / B
City Street	Cowlitz	Kalama	ELM ST	ELM ST	100			150	F	E	S 1ST ST		
City Street	Cowlitz	Kalama	ELM ST	ELM ST	0	S 1ST ST							
City Street	Cowlitz	Kalama	ELM ST	ELM ST	0	S 1ST ST							
City Street	Cowlitz	Kalama	ELM ST	ELM ST	100			150	F	E	S 1ST ST		

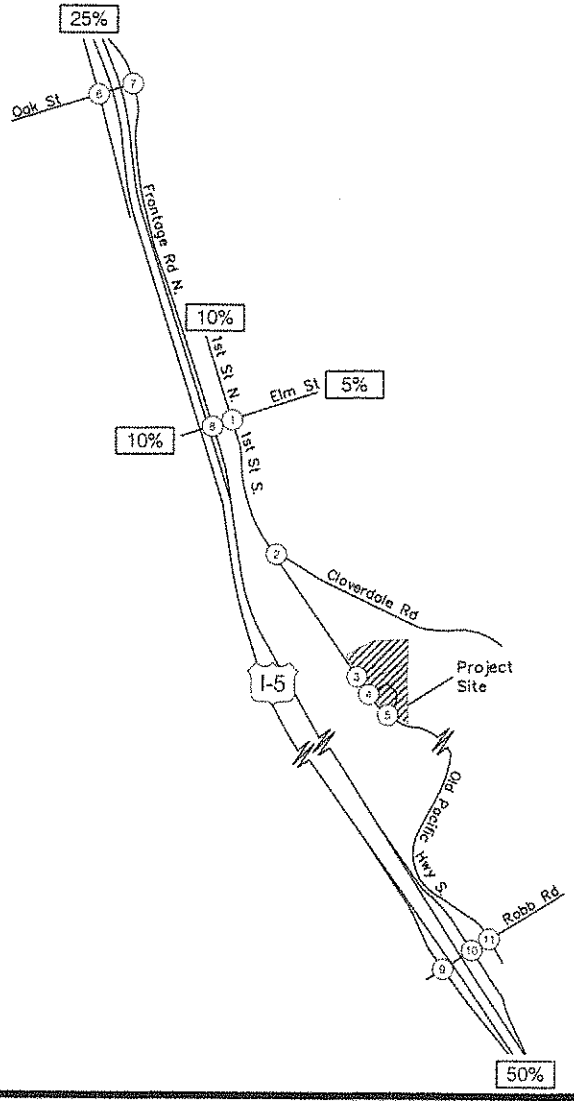
SR ONLY HISTORY / SUSPENSE IND	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	VEHICLE 1 TYPE	VEHICLE 2 TYPE
No	E458353	09/03/2015	14:35	Suspected Minor Injury	1	0	4	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb
No	E682940	06/18/2017	17:00	Possible Injury	1	0	1	0	0	Motorcycle	
No	E682940	06/18/2017	17:00	Possible Injury	1	0	1	0	0	Motorcycle	
No	E458353	09/03/2015	14:35	Suspected Minor Injury	1	0	4	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb

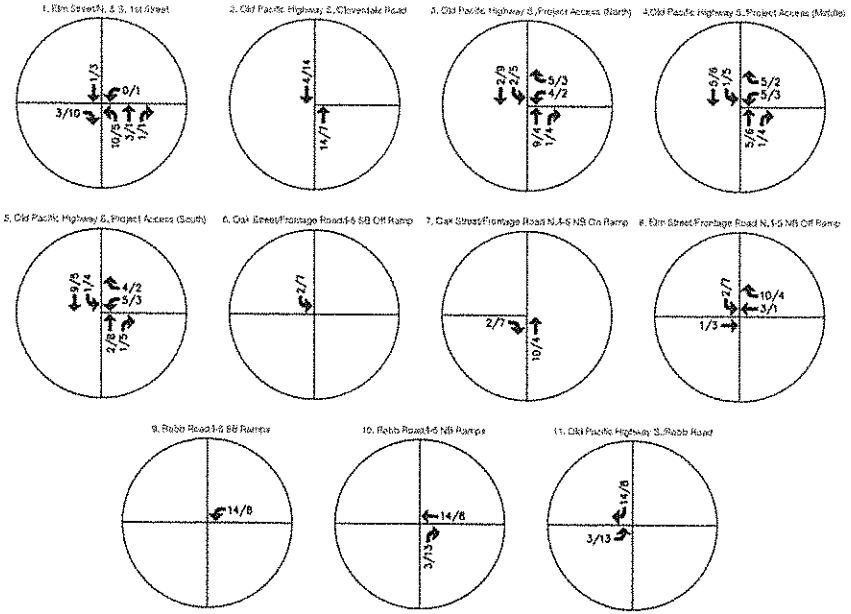
JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITION	LIGHTING CONDITION	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION
Not at Intersection and Not Related	Overcast	Wet	Daylight	One parked--one moving	Going Straight Ahead
At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Vehicle overturned	Going Straight Ahead
At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Vehicle overturned	Going Straight Ahead
Not at Intersection and Not Related	Overcast	Wet	Daylight	One parked--one moving	Going Straight Ahead

VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 2 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 3 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2)
Legally Parked, Occupied	West	East			Apparently Asleep	Inattention		None
	North	South			None			
	North	South			None			
Legally Parked, Occupied	West	East			Apparently Asleep	Inattention		None

MV DRIVER CONTRIBUTING CIRCUMSTANCE 2 (UNIT 2)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 3 (UNIT 2)	FIRST IMPACT LOCATION (City, County & Misc Trafficways - 2010 forward)	WA STATE PLANE SOUTH - X 2010 - FORWARD	WA STATE PLANE SOUTH - Y 2010 - FORWARD
		Past the Outside Shoulder of Primary Trafficway	1044945.94	254795.7
		Lane of Primary Trafficway	1044801.99	254755.24
		Lane of Primary Trafficway	1044801.99	254755.24
		Past the Outside Shoulder of Primary Trafficway	1044945.94	254795.7

APPENDIX C
IN=PROCESS TRAFFIC





LEGEND

100/128 A.M./P.M. Peak Hour Traffic Volumes

10% Peak Hour Trip Distribution

NOT TO SCALE

FIGURE 6
Trip Distribution and Assignment
Traffic Volumes

1/2931_Figures.Dwg

APPENDIX D
LEVEL OF SERVICE COMPUTER PRINTOUTS

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*DSK*	Intersection	*Elm St. & 1st St.*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2018*
Analysis Time Period	*AM Peak Hour*		

Project ID *Existing*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*16*	*149*	*18*	*9*	*195*	*72*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*50*	*40*	*31*	*50*	*10*	*19*
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*LTR*		*LTR*		*LTR*		*LTR*	
PHF	*0.77*		*0.77*		*0.77*		*0.77*	
Flow Rate (veh/h)	*236*		*357*		*155*		*100*	
% Heavy Vehicles	*0*		*1*		*0*		*0*	
No. Lanes	*1*		*1*		*1*		*1*	
Geometry Group	*1*		*1*		*1*		*1*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
Prop. Left-Turns	*0.1*		*0.0*		*0.4*		*0.6*	
Prop. Right-Turns	*0.1*		*0.3*		*0.3*		*0.2*	
Prop. Heavy Vehicle	*0.0*		*0.0*		*0.0*		*0.0*	
hLT-adj	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
hRT-adj	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*-0.0*		*-0.1*		*-0.1*		*-0.0*	

Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
hd, initial value (s)	*3.20*		*3.20*		*3.20*		*3.20*	
x, initial	*0.21*		*0.32*		*0.14*		*0.09*	
hd, final value (s)	*5.10*		*4.85*		*5.51*		*5.68*	
x, final value	*0.33*		*0.48*		*0.24*		*0.16*	
Move-up time, m (s)	*2.0*		*2.0*		*2.0*		*2.0*	
Service Time, t_s (s)	*3.1*		*2.9*		*3.5*		*3.7*	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*486*		*607*		*405*		*350*	
Delay (s/veh)	*10.64*		*12.27*		*10.22*		*9.74*	
LOS	*B*		*B*		*B*		*A*	
Approach: Delay (s/veh)	*10.64*		*12.27*		*10.22*		*9.74*	
LOS	*B*		*B*		*B*		*A*	
Intersection Delay (s/veh)	*11.14*							
Intersection LOS	*B*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*DSK*	Intersection	*Elm St. & 1st St.*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*AM Peak Hour*		

Project ID *Year 2023 w/o Project*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*18*	*164*	*23*	*11*	*214*	*79*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*65*	*47*	*35*	*55*	*12*	*21*	
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*LTR*		*LTR*		*LTR*		*LTR*	
PHF	*0.77*		*0.77*		*0.77*		*0.77*	
Flow Rate (veh/h)	*264*		*393*		*190*		*113*	
% Heavy Vehicles	*0*		*1*		*0*		*0*	
No. Lanes	*1*		*1*		*1*		*1*	
Geometry Group	*1*		*1*		*1*		*1*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
Prop. Left-Turns	*0.1*		*0.0*		*0.4*		*0.6*	
Prop. Right-Turns	*0.1*		*0.3*		*0.2*		*0.2*	
Prop. Heavy Vehicle	*0.0*		*0.0*		*0.0*		*0.0*	
hLT-adj	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
hRT-adj	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*-0.0*		*-0.1*		*-0.1*		*-0.0*	

Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
hd, initial value (s)	*3.20*		*3.20*		*3.20*		*3.20*	
x, initial	*0.23*		*0.35*		*0.17*		*0.10*	
hd, final value (s)	*5.39*		*5.13*		*5.83*		*6.04*	
x, final value	*0.40*		*0.56*		*0.31*		*0.19*	
Move-up time, m (s)	*2.0*		*2.0*		*2.0*		*2.0*	
Service Time, t_s (s)	*3.4*		*3.1*		*3.8*		*4.0*	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*514*		*643*		*440*		*363*	
Delay (s/veh)	*11.88*		*14.45*		*11.40*		*10.45*	
LOS	*B*		*B*		*B*		*B*	
Approach: Delay (s/veh)	*11.88*		*14.45*		*11.40*		*10.45*	
LOS	*B*		*B*		*B*		*B*	
Intersection Delay (s/veh)	*12.67*							
Intersection LOS	*B*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*DSK*	Intersection	*Elm St. & 1st St.*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*AM Peak Hour*		

Project ID *Year 2023 with Project*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	18	164	26	12	214	79
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	72	51	37	55	13	21
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.77		0.77		0.77		0.77	
Flow Rate (veh/h)	268		394		207		114	
% Heavy Vehicles	0		1		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1		0.0		0.4		0.6	
Prop. Right-Turns	0.1		0.3		0.2		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		-0.1		-0.0		-0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.24		0.35		0.18		0.10	
hd, final value (s)	5.47		5.21		5.88		6.13	
x, final value	0.41		0.57		0.34		0.19	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.5		3.2		3.9		4.1	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	518		644		457		364	
Delay (s/veh)	12.18		14.91		11.85		10.60	
LOS	B		B		B		B	
Approach: Delay (s/veh)	12.18		14.91		11.85		10.60	
LOS	B		B		B		B	
Intersection Delay (s/veh)	13.02							
Intersection LOS	B							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*DSK*
Agency/Co.	*Kelly Engineering*
Date Performed	*5/13/2018*
Analysis Time Period	*PM Peak Hour*

Site Information

Intersection	*Elm St. & 1st St.*
Jurisdiction	*City of Kalama*
Analysis Year	*2018*

Project ID *Existing*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*42*	*141*	*63*	*6*	*100*	*57*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*40*	*50*	*6*	*49*	*58*	*36*
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*LTR*		*LTR*		*LTR*		*LTR*	
PHF	*0.88*		*0.88*		*0.88*		*0.88*	
Flow Rate (veh/h)	*278*		*183*		*107*		*160*	
% Heavy Vehicles	*0*		*1*		*0*		*0*	
No. Lanes	*1*		*1*		*1*		*1*	
Geometry Group	*1*		*1*		*1*		*1*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	*0.2*		*0.0*		*0.4*		*0.3*	
Prop. Right-Turns	*0.3*		*0.3*		*0.1*		*0.3*	
Prop. Heavy Vehicle	*0.0*		*0.0*		*0.0*		*0.0*	
hLT-adj	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
hRT-adj	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*-0.1*		*-0.2*		*0.1*		*-0.1*	

Departure Headway and Service Time

hd, initial value (s)	*3.20*		*3.20*		*3.20*		*3.20*	
x, initial	*0.25*		*0.16*		*0.10*		*0.14*	
hd, final value (s)	*4.76*		*4.82*		*5.35*		*5.13*	
x, final value	*0.37*		*0.24*		*0.16*		*0.23*	
Move-up time, m (s)	*2.0*		*2.0*		*2.0*		*2.0*	
Service Time, t_s (s)	*2.8*		*2.8*		*3.3*		*3.1*	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*528*		*433*		*357*		*410*	
Delay (s/veh)	*10.50*		*9.37*		*9.36*		*9.64*	
LOS	*B*		*A*		*A*		*A*	
Approach: Delay (s/veh)	*10.50*		*9.37*		*9.36*		*9.64*	
LOS	*B*		*A*		*A*		*A*	
Intersection Delay (s/veh)	*9.86*							
Intersection LOS	*A*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*DSK*	Intersection	*Elm St. & 1st St.*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2018*
Analysis Time Period	*PM Peak Hour*		

Project ID *Year 2023 w/o Project*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*46*	*155*	*79*	*8*	*110*	*63*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*49*	*56*	*8*	*54*	*67*	*40*
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*LTR*		*LTR*		*LTR*		*LTR*	
PHF	*0.88*		*0.88*		*0.88*		*0.88*	
Flow Rate (veh/h)	*317*		*205*		*127*		*182*	
% Heavy Vehicles	*0*		*1*		*0*		*0*	
No. Lanes	*1*		*1*		*1*		*1*	
Geometry Group	*1*		*1*		*1*		*1*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
Prop. Left-Turns	*0.2*		*0.0*		*0.4*		*0.3*	
Prop. Right-Turns	*0.3*		*0.3*		*0.1*		*0.2*	
Prop. Heavy Vehicle	*0.0*		*0.0*		*0.0*		*0.0*	
hLT-adj	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
hRT-adj	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*-0.1*		*-0.2*		*0.0*		*-0.1*	

Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
hd, initial value (s)	*3.20*		*3.20*		*3.20*		*3.20*	
x, initial	*0.28*		*0.18*		*0.11*		*0.16*	
hd, final value (s)	*4.95*		*5.07*		*5.61*		*5.39*	
x, final value	*0.44*		*0.29*		*0.20*		*0.27*	
Move-up time, m (s)	*2.0*		*2.0*		*2.0*		*2.0*	
Service Time, t_s (s)	*3.0*		*3.1*		*3.6*		*3.4*	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*567*		*455*		*377*		*432*	
Delay (s/veh)	*11.73*		*10.11*		*9.99*		*10.40*	
LOS	*B*		*B*		*A*		*B*	
Approach: Delay (s/veh)	*11.73*		*10.11*		*9.99*		*10.40*	
LOS	*B*		*B*		*A*		*B*	
Intersection Delay (s/veh)	*10.77*							
Intersection LOS	*B*							

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ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	*DSK*	Intersection	*Elm St. & 1st St.*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2018*
Analysis Time Period	*PM Peak Hour*		

Project ID *Year 2023 with Project*

East/West Street: *Elm St.* | North/South Street: *1st St.*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*46*	*155*	*85*	*10*	*110*	*63*
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	*52*	*59*	*9*	*54*	*72*	*40*
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	*LTR*		*LTR*		*LTR*		*LTR*	
PHF	*0.88*		*0.88*		*0.88*		*0.88*	
Flow Rate (veh/h)	*324*		*207*		*136*		*187*	
% Heavy Vehicles	*0*		*1*		*0*		*0*	
No. Lanes	*1*		*1*		*1*		*1*	
Geometry Group	*1*		*1*		*1*		*1*	
Duration, T	*0.25*							

Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
Prop. Left-Turns	*0.2*		*0.1*		*0.4*		*0.3*	
Prop. Right-Turns	*0.3*		*0.3*		*0.1*		*0.2*	
Prop. Heavy Vehicle	*0.0*		*0.0*		*0.0*		*0.0*	
hLT-adj	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*
hRT-adj	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
hHV-adj	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
hadj, computed	*-0.1*		*-0.2*		*0.0*		*-0.1*	

Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
hd, initial value (s)	*3.20*		*3.20*		*3.20*		*3.20*	
x, initial	*0.29*		*0.18*		*0.12*		*0.17*	
hd, final value (s)	*5.00*		*5.14*		*5.67*		*5.45*	
x, final value	*0.45*		*0.30*		*0.21*		*0.28*	
Move-up time, m (s)	*2.0*		*2.0*		*2.0*		*2.0*	
Service Time, t_s (s)	*3.0*		*3.1*		*3.7*		*3.5*	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	*574*		*457*		*386*		*437*	
Delay (s/veh)	*12.04*		*10.29*		*10.20*		*10.59*	
LOS	*B*		*B*		*B*		*B*	
Approach: Delay (s/veh)	*12.04*		*10.29*		*10.20*		*10.59*	
LOS	*B*		*B*		*B*		*B*	
Intersection Delay (s/veh)	*11.00*							
Intersection LOS	*B*							

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2018*
Analysis Time Period	*AM Peak Hour*		
Project Description	*Existing*		
East/West Street:	*Rodd Road*	North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*154*	*9*	*0*	*0*	*2*	*103*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*165*	*9*	*0*	*0*	*2*	*110*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*41*	*0*	*24*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*44*	*0*	*25*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*165*	*0*		*0*			*69*	
C (m) (veh/h)	*1490*	*1624*					*632*	
v/c	*0.11*	*0.00*					*0.11*	
95% queue length	*0.37*	*0.00*					*0.37*	
Control Delay (s/veh)	*7.7*	*7.2*					*11.4*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*11.4*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*AM Peak Hour*		

Project Description	*Year 2023 w/o Project*
East/West Street: *Rodd Road*	North/South Street: *Old Pacific Hwy S*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*169*	*10*	*0*	*0*	*2*	*113*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*181*	*10*	*0*	*0*	*2*	*121*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*45*	*0*	*26*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*48*	*0*	*27*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*181*	*0*		*0*			*75*	
C (m) (veh/h)	*1477*	*1623*					*597*	
v/c	*0.12*	*0.00*					*0.13*	
95% queue length	*0.42*	*0.00*					*0.43*	
Control Delay (s/veh)	*7.8*	*7.2*					*11.9*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*11.9*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*AM Peak Hour*		

Project Description	*Year 2023 with Project*
East/West Street: *Rodd Road*	North/South Street: *Old Pacific Hwy S*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*169*	*10*	*0*	*0*	*2*	*130*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*181*	*10*	*0*	*0*	*2*	*139*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*49*	*0*	*26*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*52*	*0*	*27*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*181*	*0*		*0*			*79*	
C (m) (veh/h)	*1455*	*1623*					*580*	
v/c	*0.12*	*0.00*					*0.14*	
95% queue length	*0.43*	*0.00*					*0.47*	
Control Delay (s/veh)	*7.8*	*7.2*					*12.2*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*12.2*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2018*
Analysis Time Period	*PAM Peak Hour*		
Project Description	*Existing*		
East/West Street:	*Rodd Road*	North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*64*	*11*	*0*	*0*	*7*	*70*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*77*	*13*	*0*	*0*	*8*	*84*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*126*	*0*	*106*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*151*	*0*	*127*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*77*	*0*		*0*			*278*	
C (m) (veh/h)	*1515*	*1619*					*829*	
v/c	*0.05*	*0.00*					*0.34*	
95% queue length	*0.16*	*0.00*					*1.48*	
Control Delay (s/veh)	*7.5*	*7.2*					*11.5*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*11.5*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*PAM Peak Hour*		
Project Description	*Year 2023 w/o Project*		
East/West Street:	*Rodd Road*	North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*70*	*12*	*0*	*0*	*8*	*77*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*84*	*14*	*0*	*0*	*9*	*92*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*139*	*0*	*117*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*167*	*0*	*140*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*84*	*0*		*0*			*307*	
C (m) (veh/h)	*1504*	*1617*					*810*	
v/c	*0.06*	*0.00*					*0.38*	
95% queue length	*0.18*	*0.00*					*1.78*	
Control Delay (s/veh)	*7.5*	*7.2*					*12.1*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*12.1*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & Robb Road*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*PAM Peak Hour*		

Project Description	*Year 2023 with Project*
East/West Street:	*Rodd Road*
North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*
Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*70*	*12*	*0*	*0*	*8*	*88*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*84*	*14*	*0*	*0*	*9*	*106*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*159*	*0*	*117*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*191*	*0*	*140*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*84*	*0*		*0*			*331*	
C (m) (veh/h)	*1487*	*1617*					*791*	
v/c	*0.06*	*0.00*					*0.42*	
95% queue length	*0.18*	*0.00*					*2.08*	
Control Delay (s/veh)	*7.6*	*7.2*					*12.8*	
LOS	*A*	*A*					*B*	
Approach Delay (s/veh)	--	--				*12.8*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & site access*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*AM Peak Hour*		
Project Description	*Year 2023 with Project*		
East/West Street:	*site access(s)*	North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*4*	*68*	*1*	*1*	*28*	*5*
Peak-Hour Factor, PHF	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*4*	*84*	*1*	*1*	*34*	*6*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*13*	*0*	*17*	*5*	*0*	*5*
Peak-Hour Factor, PHF	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*16*	*0*	*21*	*6*	*0*	*6*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*4*	*1*		*12*			*37*	
C (m) (veh/h)	*1583*	*1524*		*889*			*940*	
v/c	*0.00*	*0.00*		*0.01*			*0.04*	
95% queue length	*0.01*	*0.00*		*0.04*			*0.12*	
Control Delay (s/veh)	*7.3*	*7.4*		*9.1*			*9.0*	
LOS	*A*	*A*		*A*			*A*	
Approach Delay (s/veh)	--	--	*9.1*			*9.0*		
Approach LOS	--	--	*A*			*A*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*DSK*	Intersection	*Old Pacific Hwy & site access*
Agency/Co.	*Kelly Engineering*	Jurisdiction	*City of Kalama*
Date Performed	*5/13/2018*	Analysis Year	*2023*
Analysis Time Period	*PM Peak Hour*		
Project Description	*Year 2023 with Project*		
East/West Street:	*site access(s)*	North/South Street:	*Old Pacific Hwy S*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*20*	*54*	*4*	*5*	*44*	*13*
Peak-Hour Factor, PHF	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*24*	*67*	*4*	*6*	*54*	*16*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*7*	*0*	*11*	*3*	*0*	*2*
Peak-Hour Factor, PHF	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*8*	*0*	*13*	*3*	*0*	*2*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*24*	*6*		*5*			*21*	
C (m) (veh/h)	*1544*	*1542*		*829*			*897*	
v/c	*0.02*	*0.00*		*0.01*			*0.02*	
95% queue length	*0.05*	*0.01*		*0.02*			*0.07*	
Control Delay (s/veh)	*7.4*	*7.3*		*9.4*			*9.1*	
LOS	*A*	*A*		*A*			*A*	
Approach Delay (s/veh)	--	--	*9.4*			*9.1*		
Approach LOS	--	--	*A*			*A*		

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APPENDIX E
REFERENCES

References

1. Trip Generation Manual, 10th Edition, 2017, Institute of Transportation Engineers.

2. Highway Capacity Manual, 2000 and 2010, Transportation Research Board, National Research Council.

3. Discussions with staff from the City of Kalama.

4. Discussions with representatives from Gray & Osborne, Inc., 701 Dexter Ave. N., Suite 200, Seattle, WA 98109.

5. Cedar Springs Subdivision Traffic Impact Analysis, H. Lee & Associates, PLLC, P.O. Box 1849, Vancouver, WA 98668.