



THETIS LAKE CAMPGROUND

Transportation Impact Assessment

Prepared for: Limona

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1.0 INTRODUCTION

1.1 BACKGROUND TO THIS STUDY

Watt Consulting Group was retained by Limona Group to complete a Transportation Impact Assessment (TIA) in support of the redevelopment of the Thetis Lake Campground Site. The existing Thetis Lake Campground and mobile home site is proposed to be redeveloped to townhouses and condominiums. The existing access off West Park Lane will continue to be utilized to access the development. See **Figure 1** for site location.



Figure 1: Site Context

The Thetis Lake Recreational area is a popular year round hiking area; however, in the summer months there is a significant spike in use due to the popularity of the area for swimming. There is limited transit service to the area which leads to higher vehicle demand as well as pedestrians walking along Six Mile Road to access transit service.

2.0 TRANSPORTATION NETWORK

2.1 EXISTING ROAD NETWORK

The site is accessed off West Park Lane which provides access to the existing campground as well as the parking lots for the Thetis Lake Recreational area. Six Mile Road connects to West Park Lane, the Highway 1 ramps, and Island Highway. Technically Six Mile Road forms part of the Six Mile Interchange as part of the ramps from Highway 1 to Island Highway; however, the road also provides access to residential/commercial developments and local and collector roads in View Royal. Six Mile Road is a two lane roadway with an urban cross section. Access to Six Mile Road is via the eastbound off ramp and westbound on ramp for the interchange and via Island Highway. Due to the design of the Six Mile Interchange only half of the interchange is near the site. The other half is accessed off Island Highway/Burnside Road. Island Highway is a four lane (five to six lane cross section) arterial road with mixed urban/rural cross section.

The intersection of the eastbound off ramp is stop/yield controlled on the ramp and free-flow on Six Mile Road, while the on ramp intersection also has free-flow conditions on Six Mile Road. The intersection of Six Mile Road/Island Highway is signalized with turn lanes on all approaches except out of the strata development.

3.0 EXISTING CONDITIONS

3.1 EXISTING TRAFFIC VOLUMES

Traffic volumes for Six Mile Road and the ramps were collected during a PM peak hour (4-5pm) traffic count on April 26, 2017. These traffic volumes were then compared to data from the BC MoTI Permanent Traffic Count stations on Six Mile Road north of the on ramp and on the off ramp to determine the summer adjustment due to increased summer use of Thetis Lake. The results of the April to July 2016 comparison found that there is minimal change in PM peak hour traffic on the off ramp; however, the volume of traffic entering/exiting the recreational area on Six Mile Road increases by 50 to 100 vph in the summer during the PM peak hour. A PM peak hour traffic count was also undertaken on April 27, 2017 for the intersection of Six Mile Road/Island Highway. The Summer PM peak hour volumes are shown in **Figures 2 and 3**.

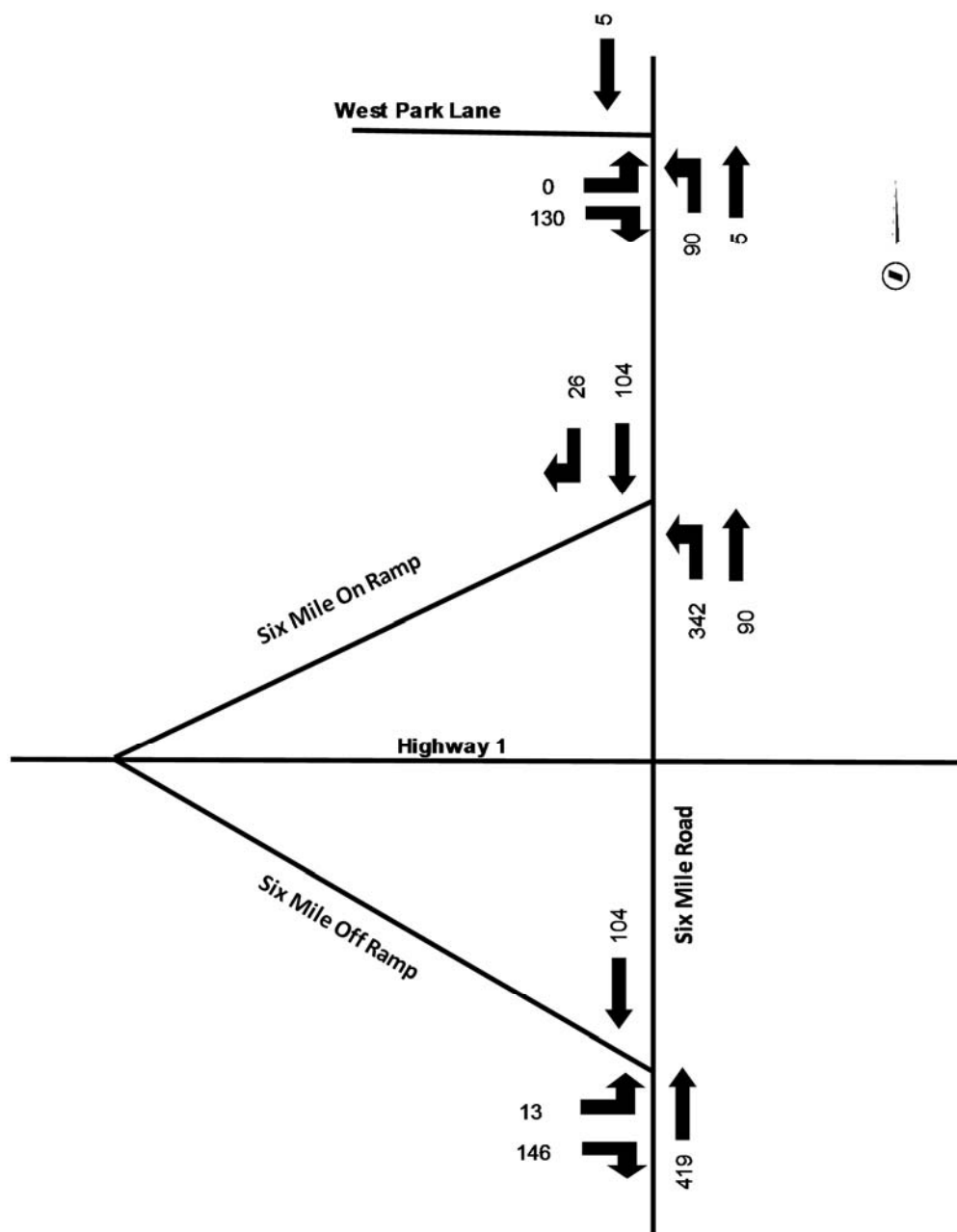


Figure 2: 2017 Traffic Volumes

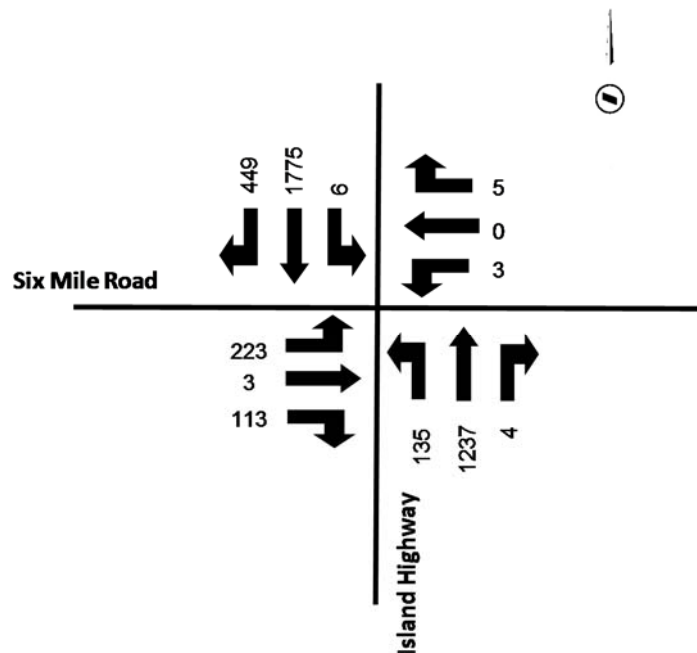


Figure 3: 2017 Traffic Volumes at Island Highway

3.2 BACKGROUND TRAFFIC VOLUMES – FUTURE HORIZONS

Using the permanent count station data (2007 to 2016) the growth in traffic on Six Mile Road and the ramps was determined to be between 2.25 and 2.5%. To be conservative a rate of 2.5% was used for traffic on Six Mile Road and the Ramps. For Island Highway a rate of 2% was used to obtain the opening day (2025). After 2025 the through volumes on Island Highway were held steady as additional growth, through on Island Highway would exceed the through capacity of a four lane road and rather than the hourly volume increasing any increase in volume would occur by a spreading of 'peak' traffic over a longer period of time.

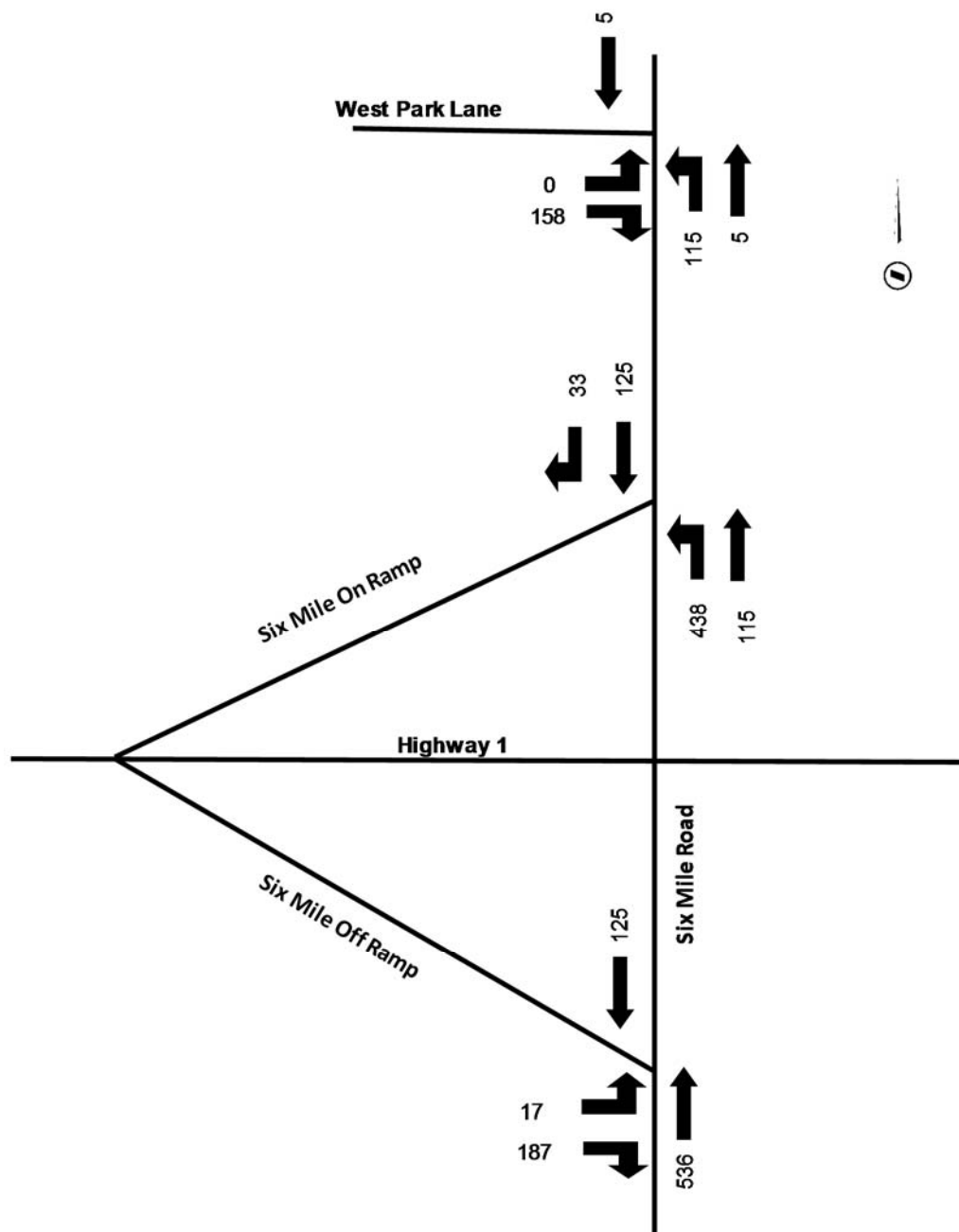


Figure 4: 2025 Background Traffic Volumes

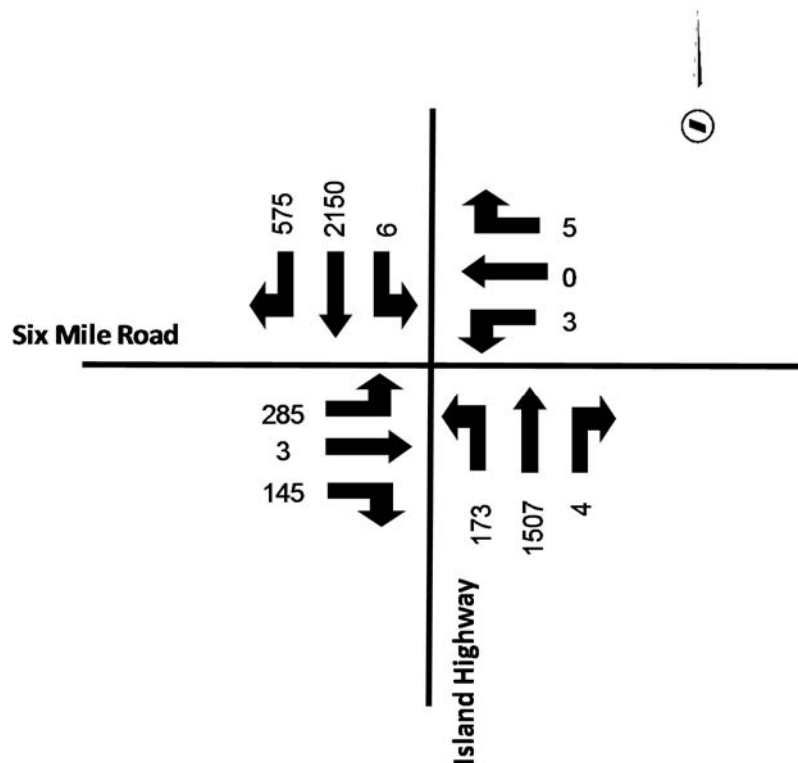


Figure 5: 2025 Background Traffic Volumes at Island Highway

4.0 PROPOSED DEVELOPMENT

4.1 PROPOSED LAND USE

The proposed land use for the site is shown in **Figure 6**. The proposed development would remove the existing mobile homes and campground and build 46 townhouses and 240 condominiums. At the time of the study a count of existing mobile homes/trailers on the site was 35.



Figure 6: Proposed Development

4.2 SITE ACCESS

The site access will be via the existing access off West Park Lane.

4.3 TRIP GENERATION

The trip generation for the proposed land use within the study area was based on ITE Trip Generation Manual's rates for Townhouse/Condominium. The development is planned to be built out over an eight year period. The full-build development intensity along with the resulting trip generation due to the removal of the existing mobile homes is summarized in **Table 1**.

TABLE 1: PM PEAK HOUR TRIP GENERATION

Land Use	Units	Rate	Trips IN	Trips OUT	Total Trips
Condominium	240	0.52/unit	84	41	125
Townhouses	46	0.52/unit	16	8	16
Existing Mobile Home	35	0.59/unit	-13	-8	-21
Total			87	41	128

4.4 TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution for the site-generated traffic was established using the existing travel patterns in the area including at the ramps and Six Mile/Island Highway. Trips were all assigned to the south of the site. The traffic is assigned as follows:

Inbound

- 20% from Langford via Off Ramp
- 20% from Colwood via Northbound Left from Island Highway
- 60% from Victoria/View Royal/Saanich via Southbound Right from Island Highway

Outbound

- 20% to Langford via On Ramp
- 30% to Colwood via Eastbound Right onto Island Highway
- 50% to Victoria/View Royal/Saanich via Eastbound Left onto Island Highway

4.5 INTERSECTION PERFORMANCE EVALUATION

The operating conditions during the peak hours at the study intersections were evaluated using the Synchro/SimTraffic software package, which is based on the Highway Capacity Manual (HCM 2010) evaluation methodology.

For un-signalized (stop-controlled) intersections, the Level-of-Service (LOS) is based on the computed delays on each of the critical movements. LOS 'A' represents minimal delays for minor-street traffic movements, and LOS 'F' represents a scenario with an insufficient number of gaps on the major street for minor street motorists to complete their movements without significant delays.

For signalized intersections, the methodology considers the intersection geometry, traffic volumes, the traffic signal phasing/timing plan, and also pedestrian volumes. The average delay for each lane group is calculated, as well as the delay for the overall intersection. The operating conditions can also be expressed in terms of volume to capacity (v/c) ratios. LOS criteria for both unsignalized and signalized intersections, as summarized in the Highway Capacity Manual, are illustrated in **Table 2**.

TABLE 2: LOS CRITERIA FOR INTERSECTIONS

Level of Service (LOS)	Average Delay for UNSIGNALIZED Intersection Movements	Average Delay for SIGNALIZED Intersection Movements
A	0 – 10 seconds per vehicle	0 – 10 seconds per vehicle
B	> 10 – 15 seconds per vehicle	> 10 – 20 seconds per vehicle
C	> 15 – 25 seconds per vehicle	> 20 – 35 seconds per vehicle
D	> 25 – 35 seconds per vehicle	> 35 – 55 seconds per vehicle
E	> 35 – 50 seconds per vehicle	> 55 – 80 seconds per vehicle
F	> 50 seconds per vehicle	> 80 seconds per vehicle

5.0 OPENING DAY

Opening day of the full development is expected to occur in 2025. Therefore 2025 was analyzed as the opening year for post development conditions. The post development traffic volumes were determined by adding the site-generated volumes to the background traffic volumes. The post-development peak hour traffic volumes and the resulting traffic operations are presented below.

Figures 7 and 8 shows the PM peak post development turning movements for the intersection in the study area.

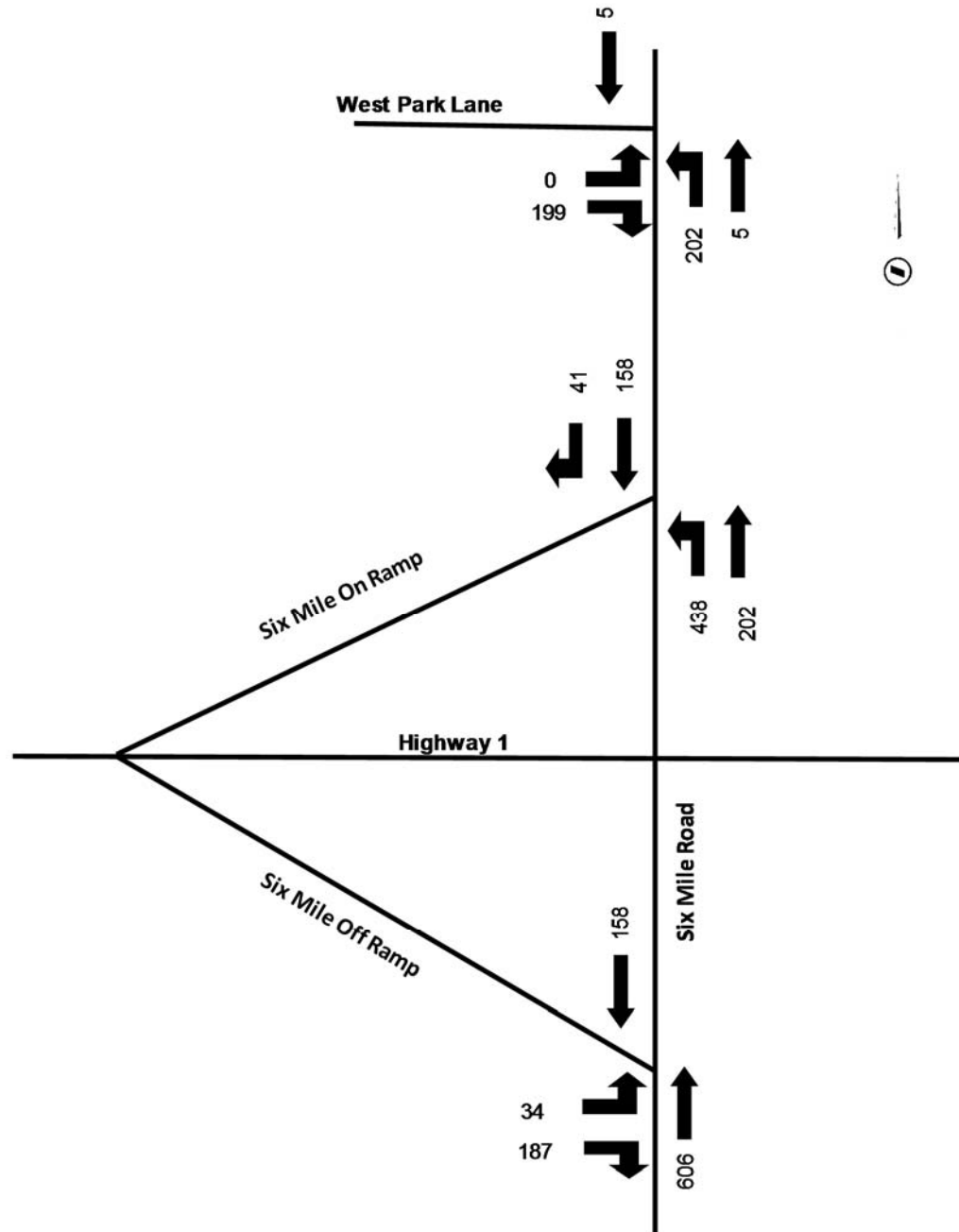


Figure 7: 2025 PM Post Development Traffic

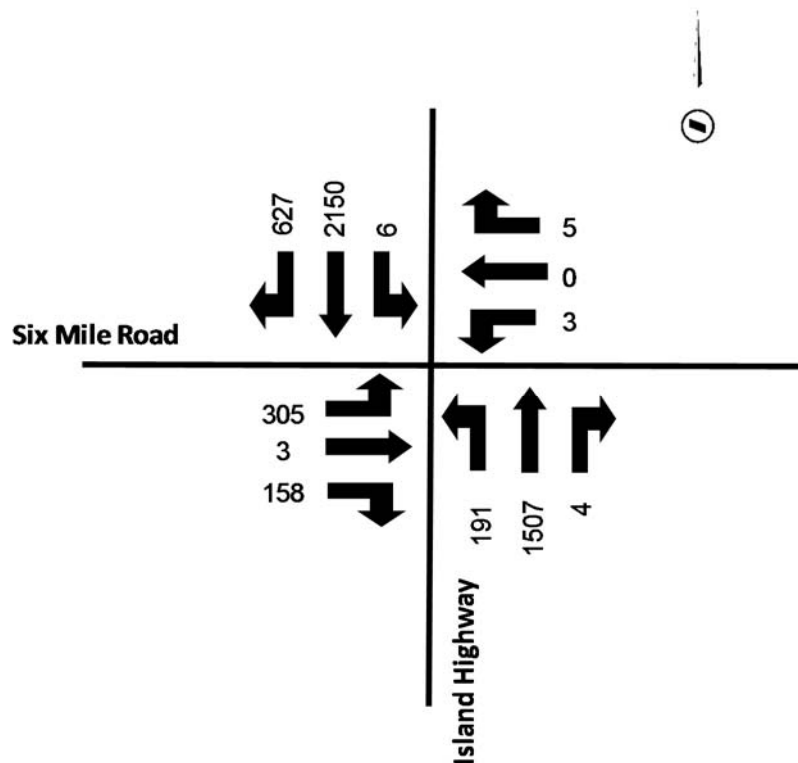


Figure 8: 2025 PM Post Development Traffic at Island Highway

TABLE 3: PM 2025 TRAFFIC CONDITIONS

Intersection/Movement		Background			Post Development		
		LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
Six Mile / On Ramp	NBL	A	8.9	11.5	A	9.1	12.2
	NBT	A	0.0	0.0	A	0.0	0.0
	SB	A	0.0	0.0	A	0.0	0.0
Six Mile / Off Ramp	NB	A	0.0	0.0	A	0.0	0.0
	SB	A	0.0	0.0	A	0.0	0.0
	EBL	B	10.4	6.5	B	11.4	6.9
	EBR	B	10.4	6.5	B	11.4	6.9
Six Mile / Island Highway	NBL	F	139.9	#83.8	F	134.8	#89.8
	NBT/R	B	10.2	138.1	B	10.3	138.1
	SBL	B	14.0	1.7	B	14.8	1.7
	SBT	D	50.5	#440.2	E	60.1	#448.0
	SBR	B	12.5	91.7	B	15.5	114.4
	EBL/T	F	95.8	#86.9	F	100.6	#96.1
	EBR	B	16.6	11.8	B	16.0	11.2
	WB	A	1.9	0.0	A	1.9	0.0

The results of the Synchro analysis shown in **Table 3** lead to following conclusions:

- The on and off-ramp intersections with Six Mile Road will continue to operate at a LOS A/B at full build-out and the change in delay is less than 1 second. The additional of the development has no impact on these intersections.
- At Six Mile Road/Island Highway, there will be background issues with the northbound left turn and eastbound left/through operating at a LOS F (failing). The development traffic will add up to six seconds to these failing movements.
- The southbound movement at Six Mile / Island Highway will be at a LOS D in 2025 without the development. With the added development traffic to Six Mile Road and the turning movements (northbound left / southbound right) the southbound through movement will experience an additional 10 seconds of delay and drop to a LOS E. This poor operate can be attributed to the expected growth (of traffic on Island Highway).

5.1 10 YEAR HORIZON

A review of conditions 10 years post opening year was also reviewed. **Figures 9 and 10** shows the peak turning movements for the intersections in the study area.

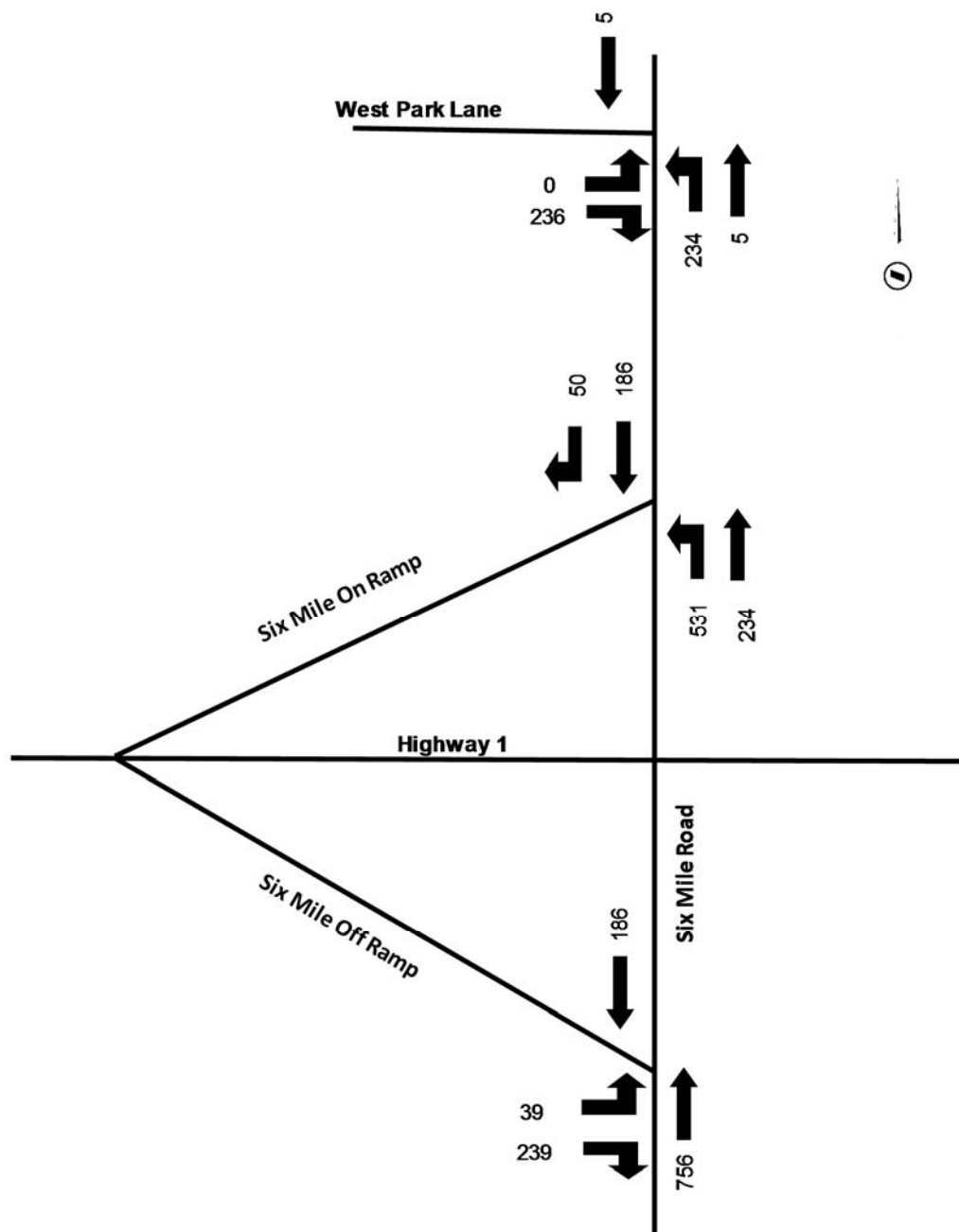


Figure 9: 2035 PM Peak Hour Post Development Traffic

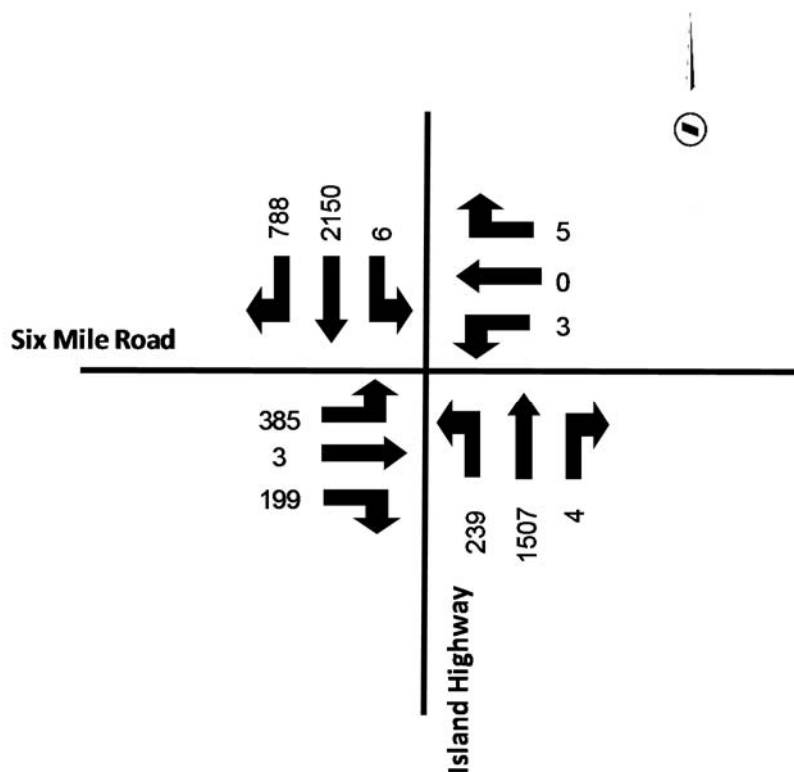


Figure 10: 2035 PM Peak Hour Post Development Traffic at Island Highway

TABLE 4: 2035 PEAK HOUR TRAFFIC CONDITIONS

Intersection/Movement		Background			Post Development		
		LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
Six Mile / On Ramp	NBL	A	9.8	18.1	B	10.1	19.3
	NBT	A	0.0	0.0	A	0.0	0.0
	SB	A	0.0	0.0	A	0.0	0.0
Six Mile / Off Ramp	NB	A	0.0	0.0	A	0.0	0.0
	SB	A	0.0	0.0	A	0.0	0.0
	EBL	B	11.4	9.4	B	12.6	10.1
Six Mile / Island Highway	EBR	B	11.4	9.4	B	12.6	10.1
	NBL	F	174.9	#110.1	F	165.5	#116.2
	NBT/R	B	10.5	137.6	B	10.5	138.1
	SBL	B	16.5	2.3	B	16.2	1.8
	SBT	E	66.9	#451.8	E	77.1	#459.6
	SBR	C	22.0	162.4	C	29.4	203.4
	EBL/T	F	127.7	#121.3	F	140.8	#129.7
	EBR	C	21.8	18.4	C	21.3	17.8
	WB	A	2.0	0.0	A	2.0	0.0

The results of the Synchro analysis shown in **Table 4** lead to following conclusions:

- All movements in 2035 at the ramps continue to operate at a LOS B or better with less than 13 seconds of average delay.
- At Six Mile Road the eastbound left/through and northbound left will continue to operate at a LOS F with and without the development. The addition of the development adds minimal additional delay to these already failing movements. The southbound movement will have dropped to a LOS E without the development due to the high volumes through the intersection.

6.0 ALTERNATIVE MODES

6.1 PEDESTRIANS

The general area has defined pedestrian facilities (crosswalks and sidewalks). A paved shoulder should be extended from the development along West Park Lane to Six Mile Road to provide a pedestrian connection for residents to the commercial areas south of Highway 1 and to Thetis Lake Recreational area.

6.2 BICYCLES

There are no existing bicycle facilities in the area beyond portions of Six Mile Road that have paved shoulders. The volume of traffic on West Park Lane and northern part of Six Mile Road are low and allow for bicycles and vehicles to share the roadway.

6.3 TRANSIT

The closest transit service is on Island Highway over 1km from the site. Based on the distance to the nearest bus stop no improvements to the transit stops are required.

7.0 CONCLUSIONS

The proposed development will have almost no impact (less than 1 second of additional delay) on Six Mile Road at the interchange ramps and West Park Lane. The addition of the development will add a minor amount of additional delay at Six Mile Road/Island Highway; however, there will be movements that operate at poor conditions and have long queues due to the existing/background traffic volumes on the network. This is due to the highway volumes using Island Highway.

A paved shoulder should be provided from the site to Six Mile Road to improve pedestrian connectivity between the site and Six Mile Road. Cyclists can be safely accommodated on Six Mile Road due to the low volume of traffic. There is no existing transit service within 1km of the site.

8.0 RECOMMENDATIONS

The developer is recommended to install a paved shoulder on West Park Lane from the site to Six Mile Road.