MEMO

TO: Josh Cairns, Andy Esarte, Claire Ellick and Chantale Blais

FROM: Saavin Khurana and Selby Thannikary

SUBJECT: **Palliser ASP TIA Update**

DATE: **June 28, 2023**

1.0 INTRODUCTION

WSP Canada Inc. (WSP) was retained by the Town of Canmore (Town) to update the Traffic Operations Assessment for Palliser Trail between the Highway 1 Ramp intersection to Benchlands Trail.

This analysis was first undertaken by Stantec in 2019. The analysis detailed the traffic implications along the intersections at Palliser Trail with the development of the Palliser Area Structure Plan (Palliser ASP) and future developments in the area including the Silvertips Resort, Stonecreek Development, and the church site.

In the Fall of 2022, the Town identified the need to update the Palliser ASP to align the remaining undeveloped lands to current Council priorities and realise the potential to meet community needs.

This memo presents the multi-modal traffic implications with the expected change in land-use, form, and densities from the 2019 Stantec report.

2.0 BACKGROUND

In June 2019, Stantec completed their Traffic Operations Analysis for Palliser Trail. At the time of the study, there was a clear understanding on the expected developments within the Silvertip Area Structure Plan, however specific densities and land-uses within the Palliser ASP was not available for all lands. **Figure 1** presents the development areas that were considered for the previous study.

Figure 1 Development Areas (2019 Stantec Study)

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From the preceding figure, the expected land-uses within the Palliser ASP were known for Areas 5, 6, and 7, and unknown for the areas in between.

For the purpose of this study, it is assumed that the background development noted in Areas 1, 2, 3 and 4 remain unchanged.

3.0 PROPOSED PALLISER ASP LAND-USE

The proposed land-uses for the updated Palliser ASP are shown in **Figure 2**. The area for most part is currently undeveloped, with Areas 4, 6, and 9 constructed with townhouses and Area 11 with a fire hall.

Figure 2 Proposed Land-Use Concept

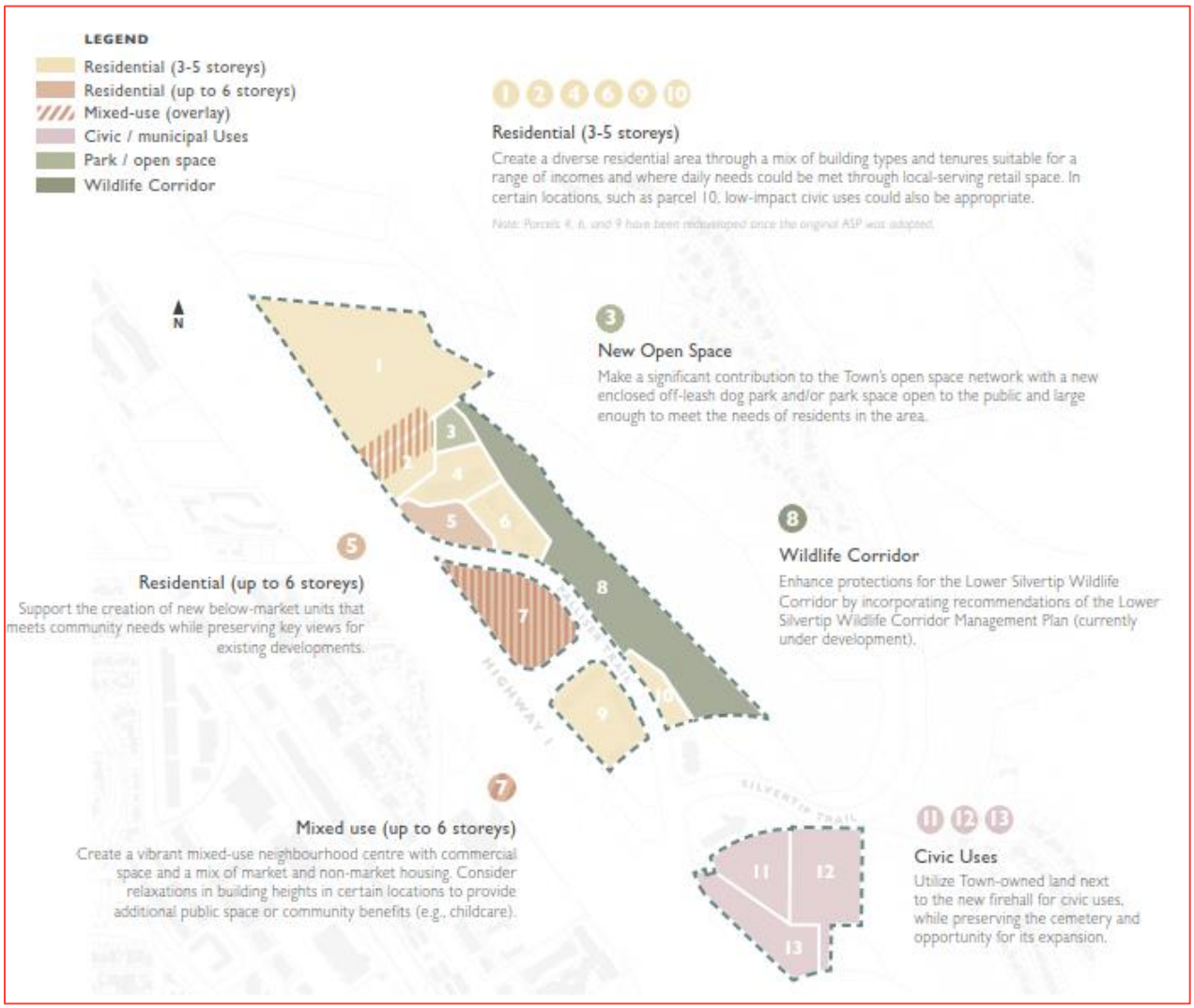


Table 1 notes the expected density for the Palliser Lands based on the proposed land-use above. As shown in the both the figure above and table below, the proposed new land-use concept for the Palliser Lands prioritises the development of diverse housing options.

Table 1 Expected Densities for the Palliser Lands

	Area	Parcel Size (ha)	Proposed Form	Unit Estimate	Commercial (sq ft)
Undeveloped	1	4.0	Townhouse/ Low-Rise Residential	480	10,400
	2	0.9	Low-Rise Residential	80	5,200
	3	0.4	Park Space / Dog Park	0	-
	5	0.8	Low- / Mid-Rise Residential	110	-
	7	2.3	Low- / Mid-Rise Mixed Use	300	36,400
	10	0.5	Townhouse	10	-
	12	2.2	Civic (cemetery)	0	-
	13	1.5	Civic (office, RCMP, retail)	0	110,000
Developed	4, 6, 9	3.8	Townhouse	305	4, 6, 9
	11	1.4	Civic (firehall/ cemetery)	0	11

The remaining undeveloped lands are expected to be fully built-out by 2035.

Based on correspondence with the Town regarding the construction timelines, Areas 2, 5, 7 and 10 will be developed by 2030, and Areas 1, and 13 completed by 2035.

4.0 STUDY INTERSECTIONS

As this study is to understand the multi-modal traffic implications with the change in land-uses from the 2019 Stantec report, the traffic modelling will use the traffic volumes from the previous study factored up to the Friday PM peak hour in the month of June.

The study area is shown on **Figure 3**, which includes the following three study intersections:

Palliser Trail / Highway 1 Ramp
Palliser Trail / Silvertip Trail
Palliser Trail / Benchlands Trail

Figure 3 Study Area

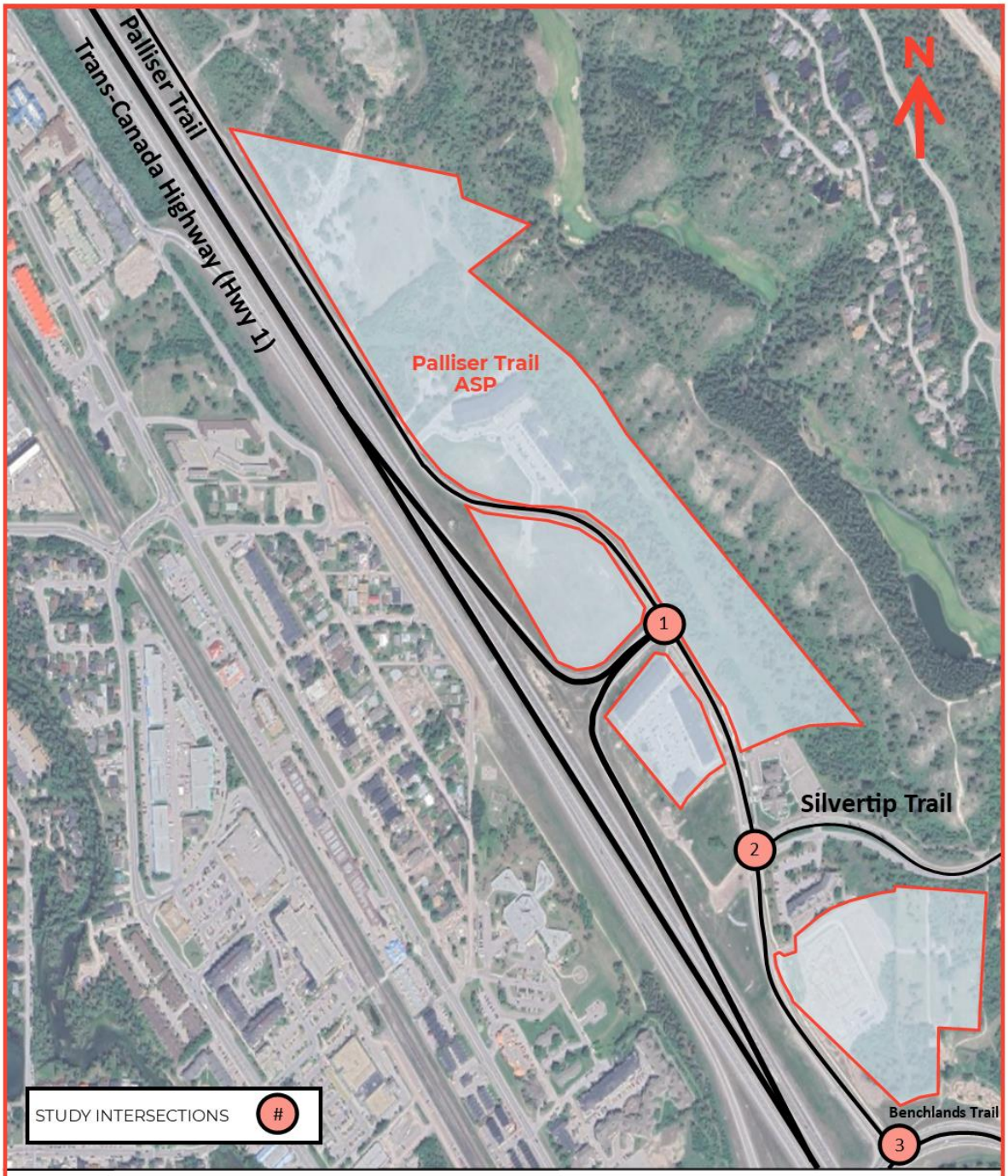


FIGURE 3

Study Area
Palliser ASP TIA Update

Not to Scale

5.0 FUTURE OPERATING CONDITIONS

The future operating conditions were evaluated for the full build-out of the Palliser ASP, and the traffic analysis for the post development conditions were conducted for the weekday PM peak hours.

5.1 BACKGROUND TRAFFIC VOLUMES

Turning movement counts used for this analysis are counts from the 2019 Stantec report that were collected on Friday, April 27, 2018, from 3:00 PM to 7:00 PM. As the traffic counts were collected in April 2018, the turning movement volumes were adjusted to June traffic conditions by applying a factor of 1.16.

Figure 4 presents the background PM peak hour traffic volumes.

5.2 BACKGROUND DEVELOPMENT

For the analysis of the full build-out horizon, there were adjacent developments within the study area that were not captured in the 2018 traffic counts. Consistent with the 2019 Stantec report, this study is expecting the full development of the Silvertip Lands for this study's full build-out horizon.

Table 2, which was extracted from the 2019 Stantec report notes the expected number of trips to be generated by the Silvertip Lands.

Table 2 Background Development PM Peak Hour Vehicle Trips (Stantec, 2019)

Background Developments	Land Use Description	Quantity	In	Out	Total
Silvertip Residential	Multifamily Housing (Mid-Rise)	324 units	87	56	143
	Single Family Housing	50 units	31	18	49
Silvertip Village	Conference Centre	300,000 ft^2	23	208	231
	Hotel	1,300 rooms	188	249	437
	General Commercial	130,000 ft^2	152	130	282
		Total	**481**	**661**	**1142**

Figure 4 Background Traffic Volumes

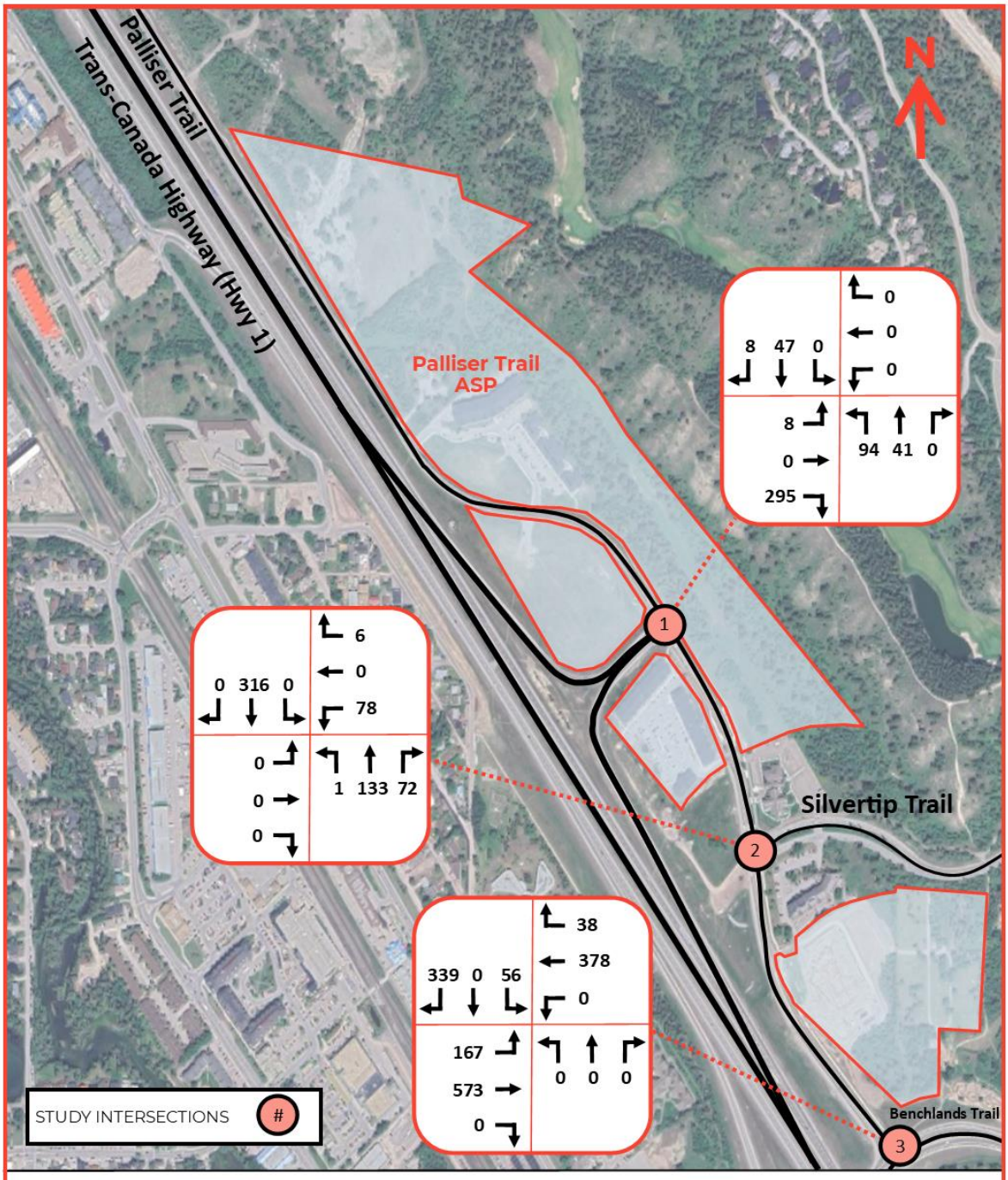


FIGURE 4

2018 June Adjusted Background Traffic Volumes
Palliser ASP TIA Update

Not to Scale

5.3 TRIP GENERATION- PALLISER LANDS (UPDATED ASP)

Trip generation is the process of estimating the amount of vehicular traffic a development would generate and add to the surrounding roadway system based on the land-use, development size and according to the methodology set out by the Institute of Transportation Engineers (ITE).

5.3.1 TRIP GENERATION FOR DEVELOPED PALLISER LANDS

For the developed townhouse complexes within the Palliser Lands ASP, the PM peak hour trip generation estimates were calculated using the ITE *Trip Generation, 11th Edition*. The ITE trip generation fitted curve equation was used for the PM peak hour as summarised in **Table 3**.

Table 3 ITE Trip Generation Fitted Curve Equation- Multifamily Housing

Areas	Land Use Description	ITE Code	Units	Trip Rate / Fitted Curve Equation	In/Out Split In	Out
4, 6, 9	Multifamily Housing (Mid-Rise)	220	Dwelling Units	T = 0.43(X) + 20.55	63%	37%

Table 4 presents the net estimated vehicle trips generated from the existing developed complexes, assuming full occupancy. For this particular land-use, it is expected the townhouses will generate 152 vehicle trips (96 inbound / 56 outbound) in the PM peak hour.

Table 4 Expected Number of Vehicle Trips from Developed Palliser Lands

Areas	Land Use Description	Quantity	In	Out	Total
4, 6, 9	Multifamily Housing (Mid-Rise)	305	96	56	152

5.3.2 TRIP GENERATION FOR REMAINING UNDEVELOPED PALLISER LANDS

For the remaining undeveloped lands within the Palliser Lands ASP, the PM peak hour trip generation estimates were calculated using either the average trip rates or fitted curve equations for the PM peak hour as summarised in **Table 5**.

Table 5 ITE Trip Generation PM Peak Hour Trip Rates for Remaining Undeveloped Lands

Areas	Land Use Description	ITE Code	Units	Trip Rate / Fitted Curve Equation	In/Out Split In	Out
1, 2, 7	Low-Rise Residential with Ground-Floor Commercial GFA (1-25k)	230	Dwelling Units	0.36	71%	29%
3	Public Park	411	Acres	0.11	71%	29%
5	Multifamily Housing (Mid-Rise)	221	Dwelling Units	0.39	61%	39%
10	Multifamily Housing (Low-Rise)	220	Dwelling Units	T = 0.43(X) + 20.55	63%	37%
11,12	Cemetery	566	Acres	0.46	31%	69%
13	General Office Building	710	Sq Ft. GFA	Ln(T) = 0.83 Ln(X) + 1.29	17%	83%

Table 6 presents the net estimated vehicle trips generated from the remaining undeveloped lands. It is expected the remaining lands will generate 562 vehicle trips (294 inbound / 268 outbound) in the PM peak hour.

Table 6 Expected Number of Vehicle Trips from the Remaining Undeveloped Palliser Lands

	Land Use Description	Quantity	In	Out	Total
1	Low-Rise Residential with Ground-Floor Commercial GFA (1-25k)	480	123	50	173
2	Low-Rise Residential with Ground-Floor Commercial GFA (1-25k)	80	20	9	29
3	Public Park	0.99	0	0	0
5	Multifamily Housing (Mid-Rise)	110	26	17	43
7	Low-Rise Residential with Ground-Floor Commercial GFA (1-25k)	300	77	31	108
10	Multifamily Housing (Low-Rise)	10	16	9	25
11,12	Cemetery	2.2	1	3	4
13	General Office Building	566	31	149	180
		Total	**294**	**268**	**562**

5.3.3 INTERNAL TRIPS

As the Palliser ASP becomes fully built-out and the proposed commercial and office spaces are fully occupied and tenanted, it is expected that a number of trips generated by the mixed-use development will be internally captured meaning that those trips would both begin and end within the development areas without using the external road network.

As such, the methodology from the Transportation Research Board's National Cooperative Highway Research Program (NCHRP) Report 684 was used to estimate the internal capture for this mixed-use development based on the expected land-uses and size of development.

Table 7 presents the expected number of external trips by the existing and future development within the Palliser ASP after the reduction of internal trips.

Table 7 Palliser ASP Internal Trips

	In	Out	Total
Palliser ASP Vehicle Trips	390	324	714
Internal Capture	-62	-54	-116
External Vehicle Trips	**328**	**270**	**598**

5.4 TOTAL DEVELOPMENT TRIPS

As part of the previous study, it was acknowledged that development was to occur along and connecting to Palliser Trail. To project future operating conditions, it was assumed that there have been no changes to the proposed land-uses at the Silvertip development.

For this revised analysis, the following developments were considered:

- Silvertip Residential
- Silvertip Village
- Town land/ Developed Palliser Lands
- Palliser Trail ASP (Revised)

Table 8 presents the net estimated vehicle trips generated during the PM peak hour from all the development lands within the study area. It is expected that the revised Palliser ASP will generate an additional 83 vehicle trips during the PM peak hour.

Table 8 Revised Number of Expected Vehicle Trips from Developments Near and Along Palliser Trail

	Stantec 2019 Report			Updated Palliser ASP		
	In	Out	Total	In	Out	Total
Background Development	481	661	1142	481	661	1142
Palliser Lands	275	240	515	328	270	598
Total	756	901	1657	809	931	1740

5.5 TOTAL PERSON TRIPS

In 2018, the Town released the updated Integrated Transportation Plan (Transportation Plan) to guide transportation decisions by identifying transportation infrastructure requirements and policies to attain their vision. As population and visitation is expected to increase and current capacity constraints on existing infrastructure, the Town is targeting to reduce the proportion of vehicle trips to 60%. **Table 9** presents the number of trips by cycling, walking and transit along Palliser Trail that are expected to be generated by the development of the Palliser Lands and background development.

Although a 60/40 (vehicular to non-vehicular) split will be used for the traffic analysis for this study, the Palliser ASP has an opportunity to significantly expand transit-use and cycling with the proposed investment in pedestrian and cycling infrastructure and the implementation of transportation demand management measures (TDM).

As the Palliser ASP proposes pathway connections and a pedestrian and cyclist underpass under the Trans-Canada Highway, further consideration of supporting this investment with TDM measures would not only incentivise residents to chose non-vehicular modes but also manage existing infrastructure and support further investment into more convenient and reliable sustainable options.

A new underpass across the Trans-Canada Highway would expect 15-20% of pedestrians and cyclists from the developments to use the underpass rather than crossing at Benchlands Trail.

Table 9 Trips by Alternative Transportation Modes

	Cycle			Walk			Transit		
	In	Out	Total	In	Out	Total	In	Out	Total
Background Development	114	156	270	85	117	202	28	39	67
Palliser Lands	86	64	150	65	48	113	22	16	38
Total	200	220	420	150	165	315	50	55	105

Based on the 60/40 split for the purpose of the traffic analysis, **Table 10** presents the number of person trips by either vehicle or non-vehicle modes (walking, cycling, public transportation).

Table 10 Total Person Trips

	Vehicle Trips			Non-Vehicle Person Trips		
	In	Out	Total	In	Out	Total
Background Development	288	397	685	227	312	539
Palliser Lands	220	163	383	173	128	301
Total	508	560	1068	400	440	840

5.6 TRIP DISTRIBUTION

Trip distribution was identified based on the area road network, and the 2018 adjusted turning movement counts.

The proposed trip distribution to and from the study development areas are shown in **Table 11**. Note that the proposed distribution differs for accesses and intersections north and south of the Highway 1 ramp.

Table 11 Trip Distribution

Access Locations	Link	Trip Distribution%	
		Inbound	Outbound
North of the Highway 1 Ramp	Highway 1 Ramp	5%	15%
	Silvertip Trail	5%	0%
	Benchlands Trail- East	75%	72%
	Benchlands Trail- West	15%	13%
South of the Highway 1 Ramp	Highway 1 Ramp	35%	15%
	Benchlands Trail- East	13%	70%
	Benchlands Trail- West	52%	15%

Trip Assignment of the development trips at full build-out is presented in **Figure 5**.

5.6 POST DEVELOPMENT TRAFFIC VOLUMES

The post development traffic volumes were determined by superimposing the new development generated volumes on the background traffic volumes. The post development volumes at full build-out for the PM peak period is shown in **Figure 6**.

Figure 5 Development Traffic Volumes

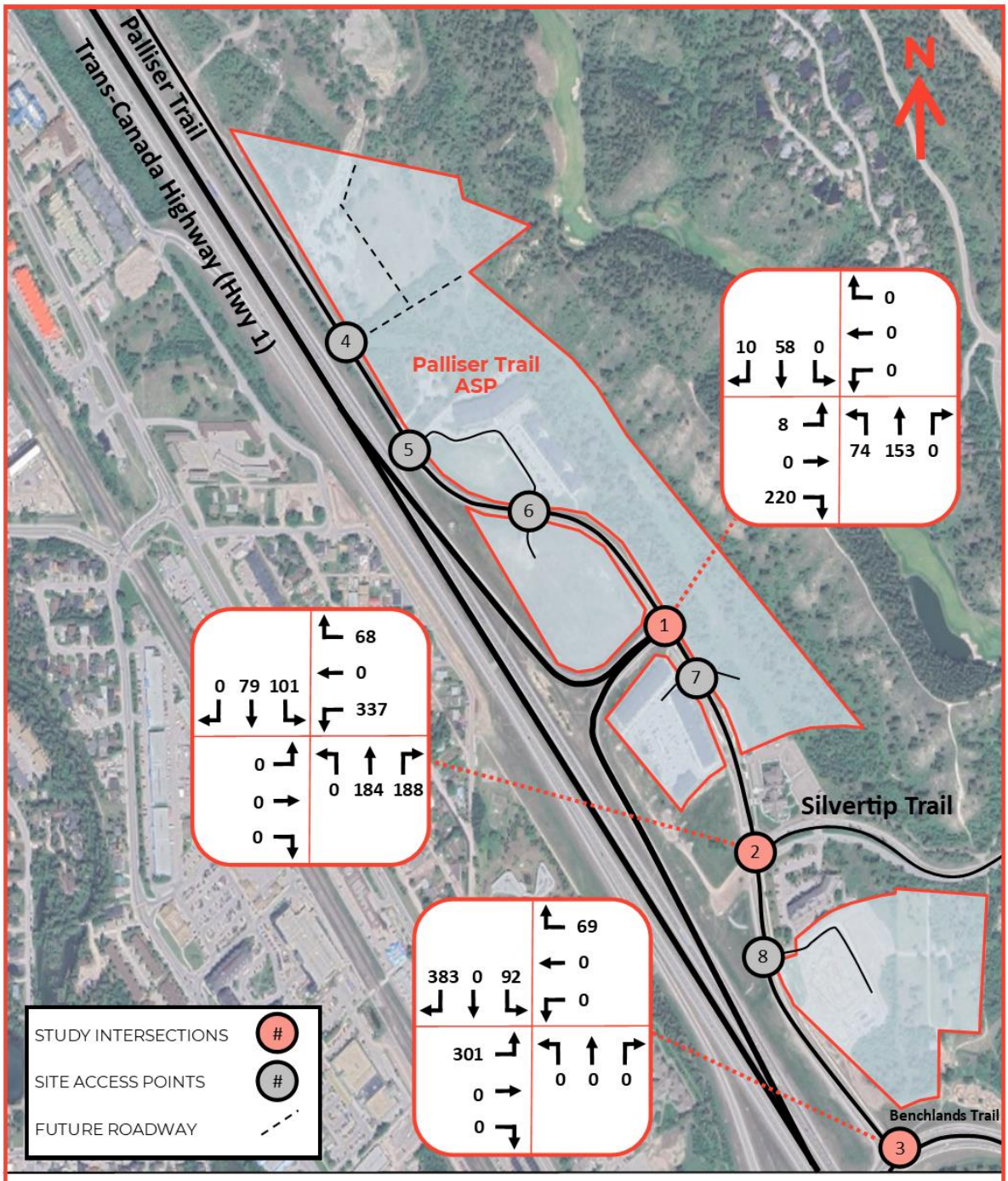


FIGURE 5

Development Traffic Volumes (Full Build-Out)
Palliser ASP TIA Update

Not to Scale

Figure 6 Post Development Traffic Volumes

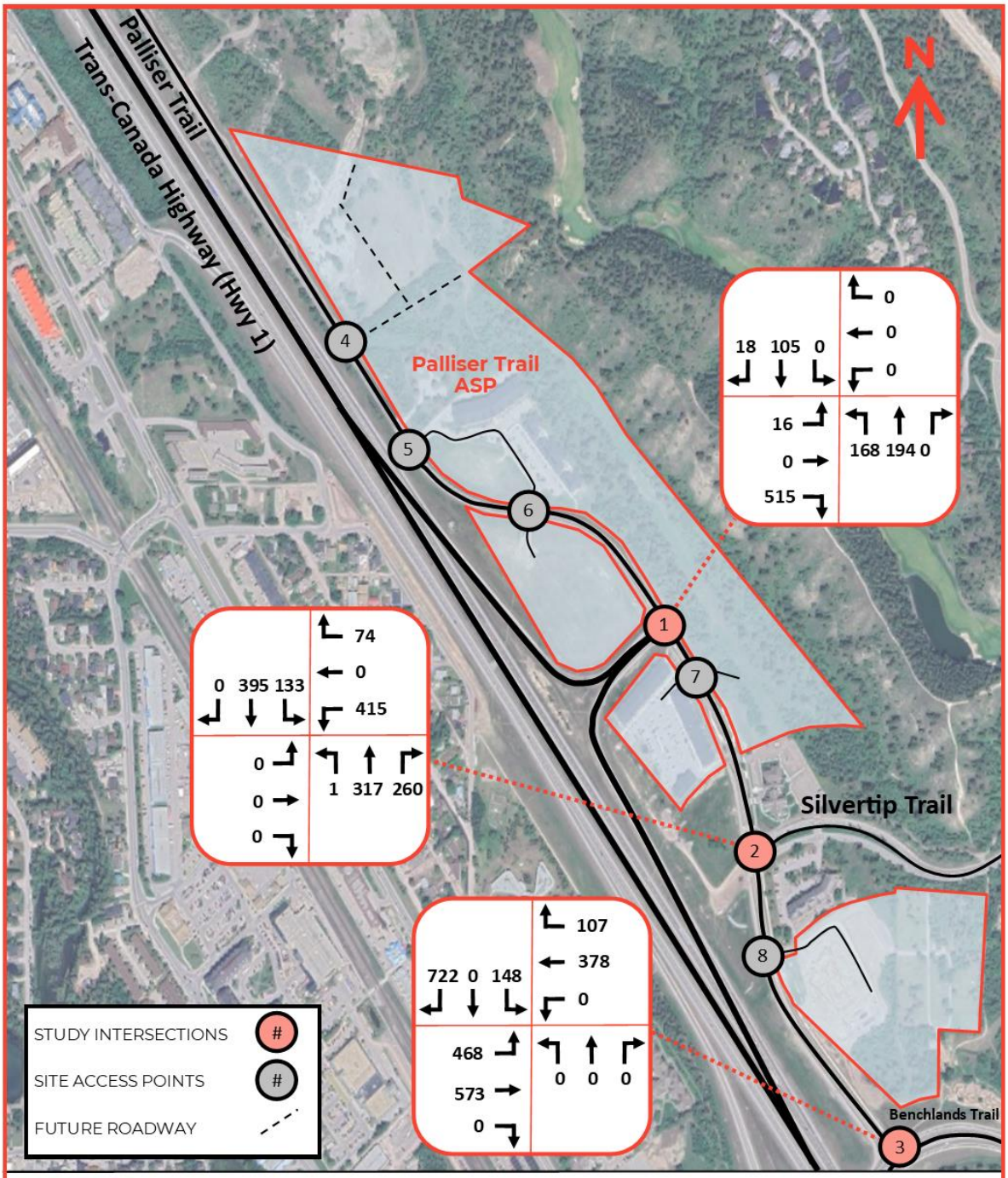


FIGURE 6

Post Development Traffic Volumes
Palliser ASP TIA Update

Not to Scale

5.7 OPERATING CONDITIONS

Capacity analysis was completed at the intersections and accesses for the weekday PM peak hour along Palliser Trail within the study area using Synchro software version 11. Synchro is a traffic software package used to determine traffic conditions based on volumes, laning, and type of traffic control and calculates average delays and queue lengths for each movement at an intersection. Average delays are then translated into Level of Service.

An intersection capacity analysis provides an indication of traffic operations based on calculations of volume-to-capacity (v/c) ratio and delays for individual movements at an intersection. The v/c ratio, also referred to as degree of saturation, represents the sufficiency of an intersection to accommodate the vehicular demand. As the v/c ratio approaches 1.00, traffic flow may become unstable resulting in delay and queuing. Once the demand exceeds the capacity (i.e. a v/c ratio greater than 1.00), traffic flow is unstable and excessive delay and queuing is expected.

Under these conditions, vehicles may require more than one signal cycle to pass through the intersection. The Level of Service (LOS) for an intersection provides an indication of the quality of traffic operations and relates to the delay being experienced by vehicles. Intersection LOS denoted by letter grades 'A' through 'E' indicates a satisfactory level of operations, with 'A' being free flow and level 'E' representing conditions approaching congestion. LOS 'F' represents increasingly congested traffic conditions.

LOS definitions for signalized and unsignalized intersections are outlined in the Highway Capacity Manual, 6th Edition and summarised below in **Table 12**.

Table 12 Level of Service Criteria for Study Intersections (HCM 6th Edition)

Signalized Control Delay (s)	Unsignalized Control Delay (s)	LOS by Volume-to-Capacity Ratio v/c ≤ 1.0	LOS by Volume-to-Capacity Ratio v/c > 1.0
≤10	≤10	A	F
>10 and ≤20	>10 and ≤15	B	F
>20 and ≤35	>15 and ≤25	C	F
>35 and ≤55	>25 and ≤35	D	F
>55 and ≤80	>35 and ≤50	E	F
>80	>50	F	F

5.7.1 OPERATIONAL ANALYSIS

Based on the proposed internal circulation within the Palliser ASP, the study intersections were analysed with consideration to the interaction with possible accesses to the respective Palliser development areas.

A summary of the post development operating conditions is shown in **Table 13**. Detailed Synchro and SimTraffic output results can be found in **Appendix A**.

Table 13 Post Development Operating Conditions

Intersection	Attribute	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Overall Intersection LOS
Palliser Trail - Highway 1 Ramp	Volume	16	-	515	-	-	-	168	194	-	-	105	18	B
	v/c Ratio	0.05	-	0.65	-			0.13		-	-	0.08		
	LOS	C	-	C	-			A		-	-	A		
	95% Q (m)	15.7	-	51.6	-			24.1		-	-	4.0		
Palliser Trail - Silvertip Trail	Volume	-	-	-	415	-	74	1	317	260	133	395	-	F
	v/c Ratio	-			4.31	-	0.17	0.00			0.16	0.25	-	
	LOS	-			F	-	B	A			A	A	-	
	95% Q (m)	-			215.9	-	272.1	49.1			18.8	35.7	-	
Palliser Trail - Benchlands Trail	Volume	468	573	-	-	378	107	-	-	-	148	-	722	B
	v/c Ratio	0.76	0.54	-	-	0.64	0.27	-			0.56	-	0.52	
	LOS	B	B	-	-	C	C	-			C	-	A	
	95% Q (m)	87.1	75.6	-	-	95.1	59.8	-			32.6	-	35.4	

For the Post Development Operating Conditions:

Palliser Trail- Highway 1 Ramp:

The intersection is expected to function at a Level-of-Service of B, with near free-flow movement for northbound traffic along Palliser Trail.
It is expected that for those vehicles eastbound turning right that there will be delay and an inability to turn right as there is expected to be queuing along Palliser Trail during the peak hour due to the operation and traffic volumes at the intersections to the south.

Palliser Trail- Silvertip Trail:

The unsignalized intersection is expected to fail at full-build out of the development due to the number of vehicles making the westbound left movement. As the side-street approaches are stop-controlled, the left turning vehicles require a gap in traffic northbound and southbound along Palliser Trail in order to safely make the maneuver.

Palliser Trail- Benchlands Trail:

The intersection is expected to function at a Level of Service B, and within acceptable level of services along all approaches of the intersection.

5.7.1.1 SENSITIVITY ANALYSIS: INTERSECTION OF PALLISER TRAIL AND SILVERTIP TRAIL

As it is expected that the unsignalized intersection of Palliser Trail and Silvertip Trail will perform at failing operating conditions at full build-out, a sensitivity analysis was performed to understand the modal split required for the intersection to function at an acceptable level of service.

The two modal splits that were analysed was the 40/60 (vehicular to non-vehicular), and the 20/80 mode splits. The expected intersection operating conditions is noted in **Table 14**.

Table 14 Unsignalized Operating Conditions by Modal Split at Palliser Trail / Silvertip Trail

Modal Split	Critical Movement LOS and V/C Ratio (m)		Intersection Level of Service
40/60	F	2.19	F
20/80	F	0.97	C

Based on the Synchro analysis for the two sensitivity analysis scenarios, a 20/80 mode split is required for the intersection to function at an overall acceptable level of service. However, note, that the individual left-turning movement is expected to continue at a LOS F, will the approach near its design capacity.

Through this sensitivity analysis, it was found that the overall intersection fails as the vehicle mode split exceeds 23% with 207 vehicles making the westbound left-turn.

5.7.1.2 ROUNDABOUT OPERATIONS: PALLISER TRAIL AND SILVERTIP TRAIL INTERSECTION

Using SIDRA INTERSECTION (Version 9) software, the intersection of Palliser Trail and Silvertip Trail was evaluated operating as a one-lane roundabout.

As shown below in **Table 15**, the roundabout is expected to operate at an overall LOS A, with the critical movement being the westbound left-turn movement.

The operating conditions as a roundabout is significantly improved based off the existing unsignalized condition at the intersection, and this implementation is expected to improve the overall movement through the Palliser Trail corridor.

Table 15 Roundabout Operating Conditions at Palliser Trail / Silvertip Trail

Intersection	Attribute	WBL	WBR	NBL	NBT	NBR	SBL	SBT	Overall Intersection LOS
Palliser Trail - Silvertip Trail	v/c Ratio	0.78		0.63			0.47		A
	LOS	B	A	A			B	A	
	95% Q (m)	81.0		44.7			27.6		

5.7.3 ACCESS REVIEW

Based on the proposed internal circulation within the revised Palliser ASP, existing and future access points were analysed using Synchro with consideration to the expected traffic operations at the study intersections along Palliser Trail.

The access operating conditions are noted in **Table 16**.

The expected access points to service the developments along Palliser Trail, was shown in **Figure 5**. All access points were analysed as site access stop controlled and are expected to function well however, with the number of vehicle trips expected to be generated by Area 13, the average approach delay during the peak hours could be up to a minute.

For access points south of the intersection of Palliser Trail and Highway 1 Ramp, left turning vehicles leaving their respective sites may require courtesy gaps to safely turn left during the peak hours.

Table 16 Palliser Lands Access Operating Conditions

Access #	Servicing Areas	Access Control Device	Peak Hour Capacity Utilization / Average Delay	
4	1, 2, 3	Palliser Trail- Free Flow/ Site Access- Stop Controlled	4%	10 seconds
5	4, 5	Palliser Trail- Free Flow/ Site Access- Stop Controlled	3%	11 seconds
6	6, 7	Palliser Trail- Free Flow/ Site Access- Stop Controlled	1%	13 seconds
7	9, 10	Palliser Trail- Free Flow/ Site Access- Stop Controlled	2%	24 seconds
8	11, 12, 13	Palliser Trail- Free Flow/ Site Access- Stop Controlled	56%	57 seconds

In the PM peak hour, it is expected that vehicles exiting the development site from the access at Steward Road may experience delays up to a minute before an acceptable, safe gap in traffic along Palliser Trail occurs, with 95th percentile queues of up to 20 metres. It is recommended that the Town monitor the access at full build-out to ensure safe operations for those motorists accessing Palliser Trail to and from Steward Road. Through the monitoring of the access, if modifications are required, the Town may consider restricting left-turns from the site.

As the Town seeks to confirm the proposed land-uses of the Palliser Trail ASP, it is advised that for any further changes to the land-uses considered for Area 13 account for the expected generated vehicle trips and minimize those peak hour trips from the Steward Road Access or encourage trips by alternative modes such as walking, cycling or transit.

6.0 ANTICIPATED DOWNTOWN PARKING DEMAND

6.1 PARKING SUPPLY

It has been identified through various historical parking reviews of the Downtown Core that the vehicular parking supply is highly utilized, particularly during the peak summer demand periods. As such, it is recommended that parking management strategies and policies be implemented to significantly reduce the need for parking for vehicles.

It was noted by the Town that the vehicle parking supply allocated to the full build-out of the Palliser ASP are 40 parking spaces. However, with the consideration of the parking management strategies in the following section, the Town has an opportunity to manage the development parking to the proposed supply up to a net zero parking demand.

6.2 PARKING MANAGEMENT STRATEGIES

The following parking management strategies are recommended to the Town for consideration to either incentivize travel by alternative modes of transport and/or reduce the vehicle parking demand in the downtown core area. These

strategies are referenced from the Town of Canmore's Parking Policy Review (2023) and conforms to the Palliser Parking Policy.

IMPROVEMENT TO USER INFORMATION

To efficiently manage vehicle traffic and parking supply and demand, the consideration for providing convenient and accurate information on parking pricing and supply availability will allow those considering driving to the downtown core to (re-)consider their mode-choice.

By allowing the opportunity to evaluate the cost-benefit to travel by each of the modes, this in-turn should reduce vehicle-use and incentivize the use of public transportation and active transportation modes. The reduction in parking demand could range from 20-40%.

SHARED PARKING

The conversion to shared parking in the downtown core is vital to allow for the existing parking facilities to be used more efficiently and allow for multiple users to share a given space.

To effectively implement shared parking the Town should consider the use of short-term pricing (30 minutes to 2-hour parking) to allow for maximum turnover to serve short stops.

The conversion to shared parking has found to reduce parking by 10-30%.

CAR-SHARE SERVICES

The availability of car-share services within the Palliser Developments is a cost-effective alternative for residents to owning a vehicle when the required use is infrequent. For multi-family households these options have been found to limit vehicle ownership.

The potential reduction in parking and vehicle ownership is between 5-15%.

PUBLIC TRANSPORTATION IMPROVEMENT

The Town's recent completion of the Canmore Parking Policy Review and the Integrated Transportation Plan has set out ambitious goals and consideration to improve public transportation and its overall mode split.

The following considerations should promote the shift to alternative modes of transportation:

- Currently Canmore's Roam bus service (routes 5C and 5T) are fare-free. As Route 3 has approximately 29% higher ridership per month during the summer months (Bow Valley Transit Plan, 2023), the modification to fare-free for all routes should incentivize the use of public transit and provide some relief to parking demand during the peak months.
- As Route 3 is a one-way transit line, the consideration of providing return service year-round, will allow residents to plan around the readily accessible transit service.
- The planned improvements to the Roam bus service including the increased frequency of Route 3 and the introduction of the seasonal Canmore Route between the Town and Nordic Centre and Grassi Lakes Trail Head, will increase reliability for the overall service and an additional route that is accessible by the Palliser ASP with the underpass across the Trans-Canada Highway.

ACTIVE TRANSPORTATION IMPROVEMENTS

The Palliser ASP is planning to significantly expand walking and cycling options with the proposed pathway connections within the ASP and the pedestrian and cyclist underpass under the Trans-Canada Highway. The underpass connection is vital for the connection to public transportation to address the first mile/last mile link to public transportation to/from the downtown core.

As pedestrian and cycling volumes increase, the pathways leading to the Downtown Core may become congested and result in a greater number of interactions between pedestrians and cyclists, leading to degradation to the functional quality of the pathway. As such, wider pathways or separated walking / cycling facilities may be a future consideration as development of the Palliser ASP lands continues in order to maintain a high-quality level of service for active transportation users.

The availability of walking and cycling options along or connecting to transit corridors typically reduce vehicle ownership by 5-15%.

6.3 EXPECTED PARKING DEMAND

Using the proposed 60/40 modal split, the assumed trip distribution and assignments, the anticipated vehicular and non-vehicular parking demands to the Downtown Core was estimated for the full build-out of the Palliser ASP.

The demand was estimated for both vehicular and bicycle parking. Summarized in **Table 17** is the estimated parking demand for bicycles and vehicles at full build-out.

Table 17 Anticipated Parking Demand from Development

Type of Parking Space	Full Build-Out
Bicycle Parking Spaces	**350 spaces**
Vehicle Parking Spaces	60/40 modal Split: 280 Parking Management Strategies: -180 Improved Transit Service: -60 **40 spaces**

7.0 CONCLUSIONS AND RECOMMENDATIONS

PALLISER LANDS ASP UPDATE

An updated traffic analysis for the Palliser ASP refined plan has been undertaken by WSP that considers the revised development stats, anticipated phasing strategy and transportation network layout.

The analysis also considers the timing of adjacent surrounding developments including the Silvertips Resort, Palliser Affordable Housing development, Stonecreek Development, and the church site which all can be accessed using Palliser Trail.

PALLISER LANDS AND BACKGROUND DEVELOPMENT TRIPS

The traffic analysis undertaken in this study was multi-modal, with consideration for vehicular, transit and active transportation users. Integral to this analysis is achievement of the target modal splits from the Town of Canmore's ITP, which establishes a target of 60% vehicular and 40% non-vehicular modal choice.

The Palliser ASP along with the background developments are expected to generate 1740 trips. In terms of the number of trips by mode choice; 1068 trips were estimated to be vehicle trips, with 840 trips by either walking, cycling or transit-use. From the previous analysis completed in 2019 by Stantec, this is an additional 83 vehicle trips during PM peak hour.

FUTURE OPERATIONS

Anticipated traffic from the Palliser ASP development was estimated by mode and then assigned to the transportation network based on engineering judgement, anticipated origin-destinations based on land-use mixes, and the previous analyses undertaken in the 2019 Stantec report.

Following assignment of these trips to the Palliser Trail corridor at the various study intersections including future access points to the Palliser ASP, the results of the vehicular operations analysis indicate the study intersections of Palliser Trail and Highway 1 Ramp operating at an acceptable level of service, with the intersection of Palliser Trail and Silvertip Trail expected operate at a failing level of service as an unsignalized intersection and the intersection of Palliser Trail and Benchlands Trail operating at an acceptable level of service with expected increase in delay and queueing.

RECOMMENDATION #1: It is recommended that the Town monitor the intersection of Palliser Trail and Silvertip Trail as the Palliser ASP reaches full-build out, and residential and commercial units become tenanted. Based on our analysis, once the intersection exceeds the threshold of 207 west-bound left turning vehicles, the intersection is recommended to be upgrade to either a signalised intersection or a roundabout.

The operating conditions as a roundabout is significantly improved based off the existing unsignalized condition at the intersection, and this implementation is expected to improve the overall movement through the Palliser Trail corridor.

DEVELOPMENT ACCESSES ALONG PALLISER TRAIL

Based on the proposed circulation within the Palliser ASP, existing and future access points were analysed using with consideration to the expected traffic operations at the study intersections along Palliser Trail.

All access points were analysed as site access stop controlled and are expected to function well however, with the number of vehicle trips expected to generate by Area 13, the average approach delay during the peak hours could be up to a minute.

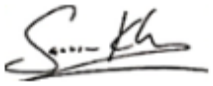
RECOMMENDATION #2: It is recommended that the Town monitor the access at full build-out to ensure safe operations for those motorists accessing Palliser Trail to and from Steward Road. Through the monitoring of the access, if modifications are required, the Town may consider restricting left-turns from the site.

PARKING MANAGEMENT STRATEGIES

RECOMMENDATION #3: Based on the proposed 60/40 modal split, the assumed trip distribution and assignments, the anticipated vehicular and non-vehicular parking demands to the Downtown Core, it is estimated that 350 bicycle parking spaces and 40 vehicle spaces will be required in the downtown core to service the Palliser ASP and background developments.

To limit vehicle parking to 40 spaces in the downtown core, it is imperative that the Town consider implementing all of the parking reduction strategies noted in Section 6.2.

As the Town considers the parking reduction strategies and options, it should be noted that a combination or the implementation of all the strategies should expect greater incentive and opportunity for residents and visitors to consider alternative modes of transportation.



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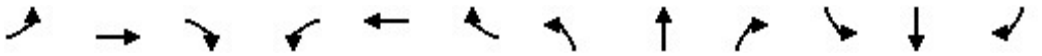
APPENDIX A

SYNCHRO OUTPUTS

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	515	168	194	105	18
Future Volume (Veh/h)	16	515	168	194	105	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	17	548	179	206	112	19
Pedestrians	20			20	20	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.0			1.0	1.0	
Percent Blockage	2			2	2	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	726	162	151			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	726	162	151			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	35	87			
cM capacity (veh/h)	323	840	1383			

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	17	548	385	131
Volume Left	17	0	179	0
Volume Right	0	548	0	19
cSH	323	840	1383	1700
Volume to Capacity	0.05	0.65	0.13	0.08
Queue Length 95th (m)	1.0	29.7	2.7	0.0
Control Delay (s)	16.7	17.0	4.3	0.0
Lane LOS	C	C	A	
Approach Delay (s)	16.9		4.3	0.0
Approach LOS	C			

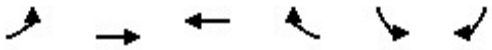
Intersection Summary			
Average Delay	10.4		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	415	0	74	1	317	260	133	395	0
Future Volume (Veh/h)	0	0	0	415	0	74	1	317	260	133	395	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	0	441	0	79	1	337	277	141	420	0
Pedestrians		50			50			50			50	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		5			5			5			5	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1358	1418	520	1280	1280	576	470			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1358	1418	520	1280	1280	576	470			664		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	83	100			84		
cM capacity (veh/h)	75	101	495	102	123	460	1021			864		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	0	441	79	615	141	420
Volume Left	0	441	0	1	141	0
Volume Right	0	0	79	277	0	0
cSH	1700	102	460	1021	864	1700
Volume to Capacity	0.00	4.31	0.17	0.00	0.16	0.25
Queue Length 95th (m)	0.0	Err	3.7	0.0	3.5	0.0
Control Delay (s)	0.0	Err	14.4	0.0	10.0	0.0
Lane LOS	A	F	B	A	A	
Approach Delay (s)	0.0	8482.1		0.0	2.5	
Approach LOS	A	F				

Intersection Summary				
Average Delay	2601.5			
Intersection Capacity Utilization	96.9%	ICU Level of Service	F	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	468	573	378	107	148	722
Future Volume (vph)	468	573	378	107	148	722
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850
Total Lost time (s)	4.0	7.0	7.0	7.0	7.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.81	1.00	0.97
Flpb, ped/bikes	0.98	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1666	1781	1781	1221	1692	1467
Flt Permitted	0.34	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	602	1781	1781	1221	1692	1467
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	498	610	402	114	157	768
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	498	610	402	114	157	768
Confl. Peds. (#/hr)	50			50	50	50
Confl. Bikes (#/hr)				20		20
Turn Type	pm+pt	NA	NA	Perm	Prot	Free
Protected Phases	7	4	8		1	
Permitted Phases	4			8		Free
Actuated Green, G (s)	44.4	44.4	24.8	24.8	11.6	70.0
Effective Green, g (s)	44.4	44.4	24.8	24.8	11.6	70.0
Actuated g/C Ratio	0.63	0.63	0.35	0.35	0.17	1.00
Clearance Time (s)	4.0	7.0	7.0	7.0	7.0	
Vehicle Extension (s)	3.0	5.0	5.0	5.0	3.0	
Lane Grp Cap (vph)	618	1129	630	432	280	1467
v/s Ratio Prot	c0.18	0.34	0.23		0.09	
v/s Ratio Perm	c0.33			0.09		c0.52
v/c Ratio	0.81	0.54	0.64	0.26	0.56	0.52
Uniform Delay, d1	8.2	7.1	18.9	16.1	26.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.6	1.9	4.9	1.5	2.6	1.3
Delay (s)	15.8	9.0	23.7	17.6	29.4	1.3
Level of Service	B	A	C	B	C	A
Approach Delay (s)		12.0	22.4		6.1	
Approach LOS		B	C		A	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	29	0	49	72	0	93
Future Volume (Veh/h)	29	0	49	72	0	93
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	31	0	52	77	0	99
Pedestrians	10		10			10
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	210	110			139	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	210	110			139	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	100			100	
cM capacity (veh/h)	756	916			1412	

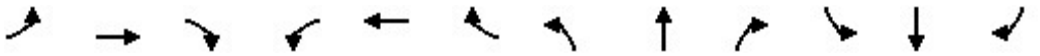
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	31	129	99
Volume Left	31	0	0
Volume Right	0	77	0
cSH	756	1700	1412
Volume to Capacity	0.04	0.08	0.00
Queue Length 95th (m)	0.8	0.0	0.0
Control Delay (s)	10.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	10.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	0	121	36	0	122
Future Volume (Veh/h)	17	0	121	36	0	122
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	18	0	129	38	0	130
Pedestrians	10		10			10
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	298	168			177	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	298	168			177	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	673	851			1367	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	167	130
Volume Left	18	0	0
Volume Right	0	38	0
cSH	673	1700	1367
Volume to Capacity	0.03	0.10	0.00
Queue Length 95th (m)	0.5	0.0	0.0
Control Delay (s)	10.5	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.5	0.0	0.0
Approach LOS	B		

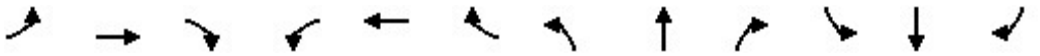
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	143	0	39	157	14	0	0	16	6	0	0
Future Volume (Veh/h)	0	143	0	39	157	14	0	0	16	6	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	152	0	41	167	15	0	0	17	6	0	0
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	192			162			428	436	172	446	428	194
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	192			162			428	436	172	446	428	194
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	98	99	100	100
cM capacity (veh/h)	1350			1384			501	484	846	478	489	822

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	152	223	17	6
Volume Left	0	41	0	6
Volume Right	0	15	17	0
cSH	1350	1384	846	478
Volume to Capacity	0.00	0.03	0.02	0.01
Queue Length 95th (m)	0.0	0.5	0.4	0.2
Control Delay (s)	0.0	1.6	9.3	12.6
Lane LOS		A	A	B
Approach Delay (s)	0.0	1.6	9.3	12.6
Approach LOS			A	B

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	38.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	12	4	0	1	23	363	5	3	605	12
Future Volume (Veh/h)	2	0	12	4	0	1	23	363	5	3	605	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	2	0	13	4	0	1	24	386	5	3	644	13
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.0			1.0			1.0			1.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1114	1116	670	1126	1120	408	667			401		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1114	1116	670	1126	1120	408	667			401		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	97	98	100	100	97			100		
cM capacity (veh/h)	172	195	442	164	194	623	899			1130		

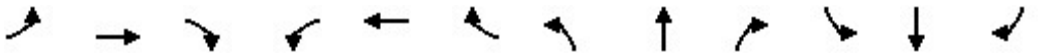
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	15	5	415	660
Volume Left	2	4	24	3
Volume Right	13	1	5	13
cSH	366	193	899	1130
Volume to Capacity	0.04	0.03	0.03	0.00
Queue Length 95th (m)	0.8	0.5	0.5	0.0
Control Delay (s)	15.3	24.2	0.8	0.1
Lane LOS	C	C	A	A
Approach Delay (s)	15.3	24.2	0.8	0.1
Approach LOS	C	C		

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	49.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	65	11	565	10	6	805
Future Volume (Veh/h)	65	11	565	10	6	805
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	69	12	601	11	6	856
Pedestrians	10		10			10
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.0		1.0			1.0
Percent Blockage	1		1			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			301			
pX, platoon unblocked						
vC, conflicting volume	1494	626			622	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1494	626			622	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	47	97			99	
cM capacity (veh/h)	130	469			935	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	81	612	6	856
Volume Left	69	0	6	0
Volume Right	12	11	0	0
cSH	145	1700	935	1700
Volume to Capacity	0.56	0.36	0.01	0.50
Queue Length 95th (m)	16.8	0.0	0.1	0.0
Control Delay (s)	57.2	0.0	8.9	0.0
Lane LOS	F		A	
Approach Delay (s)	57.2	0.0	0.1	
Approach LOS	F			

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Total Lost time (s)												
Lane Util. Factor												
Frt												
Flt Protected												
Satd. Flow (prot)												
Flt Permitted												
Satd. Flow (perm)												
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type			Perm	Perm								Perm
Protected Phases		4			8						6	
Permitted Phases			4	8						6		6
Actuated Green, G (s)												
Effective Green, g (s)												
Actuated g/C Ratio												
Clearance Time (s)												
Vehicle Extension (s)												
Lane Grp Cap (vph)												
v/s Ratio Prot												
v/s Ratio Perm												
v/c Ratio												
Uniform Delay, d1												
Progression Factor												
Incremental Delay, d2												
Delay (s)												
Level of Service												
Approach Delay (s)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 1: Palliser Trail & Highway 1 Ramp

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (m)	21.3	53.2	31.1	7.2
Average Queue (m)	4.5	34.7	9.5	0.5
95th Queue (m)	15.7	51.6	24.1	4.0
Link Distance (m)			169.5	222.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Palliser Trail & Silvertip Trail Driveway/Silvertip Trail

Movement	WB	WB	B40	B40	NB	SB	SB
Directions Served	L	TR	T	T	LTR	L	TR
Maximum Queue (m)	219.8	212.8	69.4	69.4	62.3	18.6	51.8
Average Queue (m)	210.1	149.1	59.0	58.6	21.7	10.7	11.0
95th Queue (m)	215.9	272.1	64.9	64.5	49.1	18.8	35.7
Link Distance (m)	186.7	186.7	53.2	53.2	108.0		91.7
Upstream Blk Time (%)	100	27	100	94			0
Queuing Penalty (veh)	0	0	0	0			1
Storage Bay Dist (m)						10.0	
Storage Blk Time (%)						15	3
Queuing Penalty (veh)						58	4

Intersection: 3: Benchlands Trail & Palliser Trail

Movement	EB	EB	WB	WB	B31	SB	SB
Directions Served	L	T	T	R	T	L	R
Maximum Queue (m)	88.8	86.8	110.7	76.1	18.6	38.7	44.1
Average Queue (m)	54.8	41.4	53.4	23.1	2.8	17.8	17.0
95th Queue (m)	87.1	75.6	95.1	59.8	27.9	32.6	35.4
Link Distance (m)			99.7		90.3		277.6
Upstream Blk Time (%)			3	0	1		
Queuing Penalty (veh)			0	0	0		
Storage Bay Dist (m)				160.0		80.0	
Storage Blk Time (%)			3	0			
Queuing Penalty (veh)			3	0			

Intersection: 4: Palliser Trail & Access (for Areas 1,2,3)

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	16.7	2.7	2.7
Average Queue (m)	6.0	0.1	0.1
95th Queue (m)	14.0	1.5	1.6
Link Distance (m)	124.1	138.6	63.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Palliser Trail & Access (for Areas 4,5)

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	13.8	4.2	3.7
Average Queue (m)	3.9	0.2	0.2
95th Queue (m)	11.9	2.1	2.1
Link Distance (m)	126.1	178.8	138.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Access (for Area 7)/Access (for Area 6) & Palliser Trail

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	3.3	14.7	13.0	8.8
Average Queue (m)	0.1	2.0	3.8	1.3
95th Queue (m)	1.9	9.2	11.5	6.4
Link Distance (m)	178.8	222.5	79.6	94.1
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Palliser Trail & Access (for Area 9)/Access (for Area 10)

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	17.4	8.9	27.8	21.7
Average Queue (m)	4.4	1.3	6.2	2.2
95th Queue (m)	13.2	6.4	20.0	11.1
Link Distance (m)	46.2	65.9	91.7	169.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Palliser Trail & Steward Road (Access for Areas 11,12,13)

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (m)	34.7	23.5	7.8	19.9
Average Queue (m)	12.8	2.3	0.4	2.1
95th Queue (m)	26.2	12.3	3.7	11.1
Link Distance (m)	69.2	277.6		108.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			35.0	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 9: SB Highway 1 Ramp & Benchlands Trail

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 37: Highway 1 Ramp

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 66