Hartland Landfill Neighbourhood Intersection Improvement Study

Capital Regional District

FINAL REPORT

April 2022

ISL Engineering and Land Services Ltd. Is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

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1.0 Introduction

1.1 Background

Hartland Landfill, owned and operated by the Capital Regional District (CRD), is located within the northwest rural area of the District of Saanich and is the only solid waste disposal facility in the Capital Region; serving about 383,000 people and receiving approximately 140,000 tonnes of municipal solid waste per year. The operation is a multi-purpose facility providing collection for recycling, household hazardous waste, and salvageable items, as well as yard and garden waste collection and processing, controlled waste disposal, and landfill service to commercial and residential customers. Estimates show that at present filling rates, the current design capacity is expected to be reached in 2049. To extend the life of the landfill, CRD adopted a new Solid Waste Management Plan to significantly reduce waste and improve its facility. One of the plan's commitments is to improve traffic operations and road safety of the nearby intersections within the neighbourhood as CRD aims to relocate the commercial vehicle access of the site from the southeast corner through Hartland Avenue to the north side of the site along Willis Point Road in the near future.

Existing road safety risks along Hartland Avenue for commercial hauling vehicles and residential passenger cars, as well as internal landfill road safety, play a role in the reasons for the facility access relocation. These risks include steep grades, winding routes, tight and abrupt turns, and poor sightlines, as well as hidden driveways. Hartland Avenue is also the street for local residents to access their homes and a route for mountain bikers and hikers to access Mount Work Regional Park. Growing concerns have also been raised by the public and coalition groups about the traffic and safety (collisions) of Willis Point Road, Wallace Drive, and West Saanich Road, as well as the associated intersections nearby.

CRD's Hartland Landfill Neighbourhood Intersection Improvement Study builds on the recently completed *Hartland Landfill Alternate Access Transportation Impact Analysis* and takes into account public feedback. ISL Engineering (ISL), along with PBX Engineering, were retained to undertake the study. The outcomes of the study aim to improve road safety and traffic operation of the nearby key intersections for all road users while aligning with the District of Saanich (the District) transportation plans and principles.

1.2 Study Objectives and Methodology

The study objectives are to review traffic conditions, evaluate historic collisions, identify any existing and potential safety and operational issues, and develop possible transportation countermeasures for the study intersections. The study methodology was established as follows:

1. Data Collection and Review (background, traffic, hauling, & collision data);
2. Intersection Operations Analysis (weekday AM/PM & 2021/2024/2030 horizons);
3. Detailed Collision Analysis (collisions occurring between 2015 and 2019);
4. Other Road User Review;
5. In-Service Road Safety Review – undertaken on November 10, 2021;
6. Potential Safety Issues Identification (operational, collision, other road users, geometric, etc.);
7. Possible Mitigation Measures Development;
8. Progress Package (study findings summary) and Meeting – submitted on November 22, 2021;
9. High-Level Multiple Account Evaluation;

10. Conceptual Design and Preliminary Cost Estimate;
11. Public Consultations; and,
12. Documentation (methodology, assumptions, analyses, & recommendations).

1.3 Study Intersections

Hartland Landfill is located in northwest Rural Saanich, close to the boundaries with Highlands, Central Saanich, and Juan De Fuca Electoral Area. The primary access road to the landfill is Hartland Avenue, which runs east-west and connects at the southeast corner of the site. The north of the site is Willis Point Road; the new landfill access will be provided along this roadway. Hartland Avenue and Willis Point Road intersect on their east ends with Wallace Drive and West Saanich Road (Highway 17A), respectively. Both access roads are connected through West Saanich Road and are classified as major roads and truck routes by the District, with the exception of the section of Wallace Road north of Willis Point Road, which is classified as a collector with prohibition of heavy trucks. All roadways have two lanes in each direction with vertical and horizontal curves. Within the study area, the posted speed limits range from 40 to 60 kilometres per hour (km/h). The four study intersections for this Neighbourhood Intersection Improvement Study are shown in the photographs below.

Hartland Avenue & West Saanich Road

Hartland Avenue & Interurban Rail Trail / Interurban Road

Wallace Drive & West Saanich Road / Interurban Rail Trail

Willis Point Road and Wallace Drive

As shown in the site photos, most of these intersections are unsignalized three-legged T-intersections, some with connections to trails, left-turn bays, and/or channelized right turns; all with full turning movements at each approach. Hartland Avenue and Willis Point Road intersections act as gateways to Hartland Landfill, Mount Work Regional Park, and local residences. A map of the study area and intersections with existing laning configurations has been provided in **Figure 1.1**.

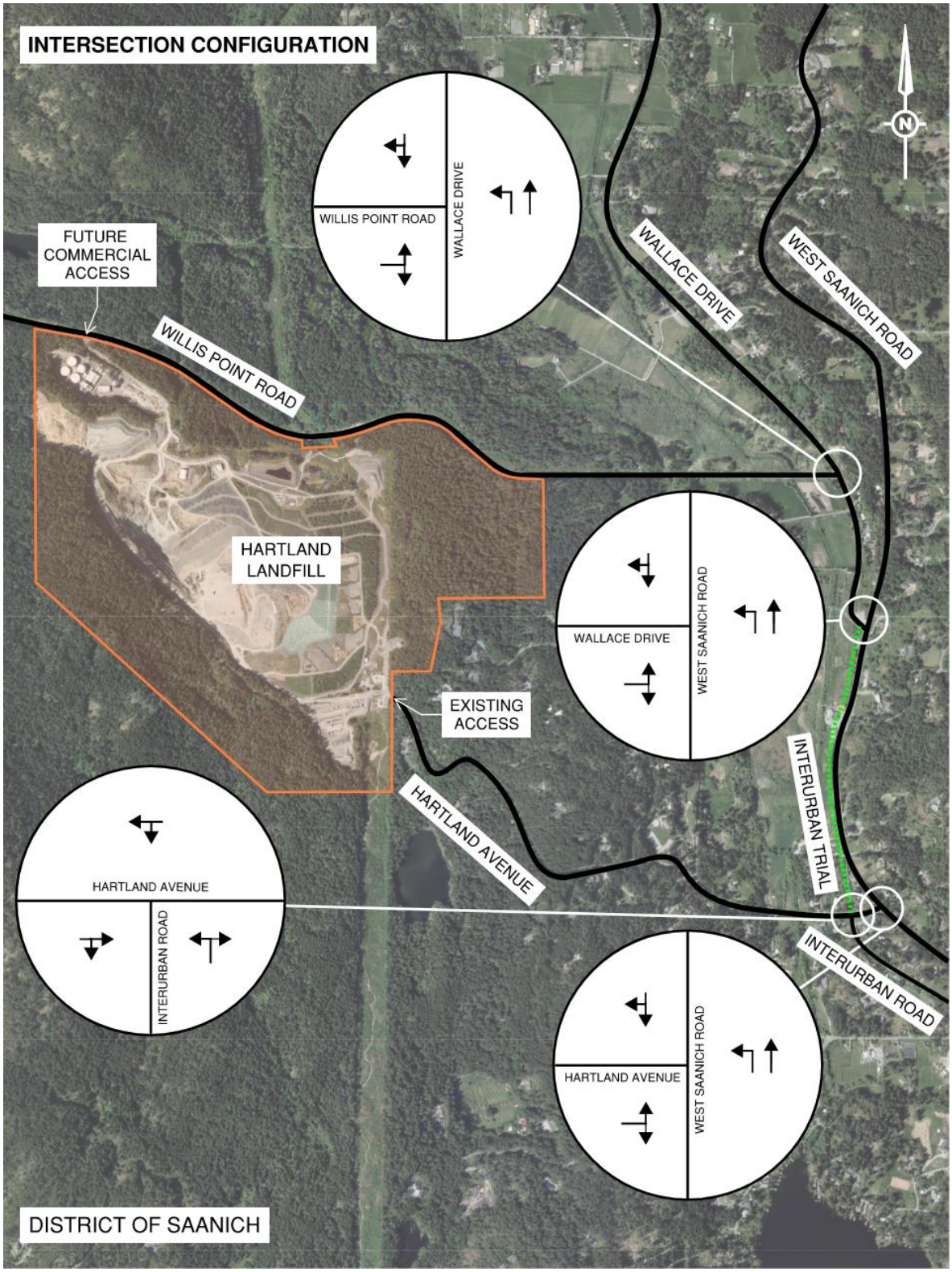


Figure 1.1: Study Intersection Configuration

1.4 Relevant Documents

A background review of engineering, strategic, and technical documents was completed to understand characteristics of the project limits, study site, and planning direction, as well as public feedback. Although they were mostly studied and documented in reference to the broader solid waste management planning process, some information provides a starting point in considering the existing and future condition assessments.

It is understood that the project scope should focus on intersection transportation improvements considering the commercial access relocation of Hartland Landfill. The key elements (study findings and mitigation ideas) from these documents that are relevant to this study are summarized below.

Hartland Landfill Alternate Access Transportation Impact Analysis

In September 2020, Bunt & Associates Engineering completed a thorough investigation for CRD regarding the preferred location and routing for vehicle access of the Hartland Landfill study site. These findings, summarized below, will be considered in this study. The benefits of landfill traffic approaching from the north (the main facility entrance in the future) were identified as:

- Route with lower grades and larger turning radius along Willis Point Road;
- Opportunity to design and provide safer access and enhanced gateways to site as well as park; and,
- Alleviation of traffic conflict with residents along Hartland Avenue.

Furthermore, analyses of hourly vehicle profiles (2020) for Willis Point Road and Hartland Avenue show that the COVID-19 pandemic reduced the number of “travel to work and school” trips. However, Willis Point Road is forecast to remain below capacity (at least 20%) under all scenarios, even if the commercial landfill access is relocated to Willis Point Road. Meanwhile, Hartland Avenue is currently over capacity.

Area Residents Consultation Results

Between November 2020 and January 2021, through consultations with CRD, Highlands District, Prospect Lake District, and Willis Point Community Association, members shared their concerns, questions, and ideas for potential safety improvements and community benefits. Ideas for potential traffic infrastructure improvements were generated for consideration:

- Traffic operations and road safety improvements where Wallace Drive meets West Saanich Road, Willis Point Road, as well as Interurban Rail Trail;
- New bicycle lanes on Willis Point Road between Wallace Drive and Ross Durrance Road;
- Better road cycling infrastructure along Wallace Drive and crossing to connect to Interurban Rail Trail;
- Additional police enforcement for speeding; and,
- Closely monitoring impacts of this operational change following implementation.

2.0 Traffic Characteristics

2.1 Traffic Data

Weekday morning and afternoon traffic volume data for the four study intersections of Hartland Avenue at West Saanich Road and Interurban Road / Interurban Rail Trail, and Wallace Drive at West Saanich Road and Willis Point Road were collected by ISL staff on October 13 and 14, 2021 (Wednesday and Thursday). This data was supplemented with 2017 and 2019 traffic counts conducted by TransTech Data Services and provided by CRD. Additionally, CRD provided ISL with the most recent two years of hauling/scale data for the landfill (2020 to 2021), which were used to determine the number of trips generated by the landfill.

Taking into consideration the landfill's operating hours, the AM and PM peak hours for this study were determined to be 7:30 to 8:30 and 15:30 to 16:30, respectively. Peak hour analyses have primarily been completed with the 2021 data, but some results were determined using the earlier data for the purpose of comparing with vehicle volumes before the COVID-19 pandemic. The peak hour factor and heavy vehicle percentage were also calculated individually for each intersection, averaging 0.92 and 5%, respectively.

Trip Generation

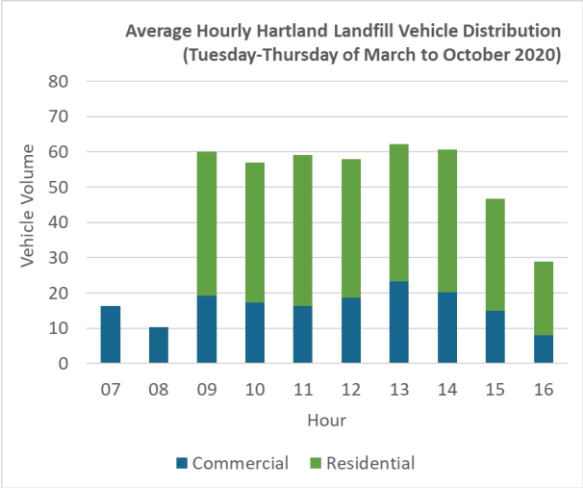
The hauling/scale datasets consist of entries/exits for every load brought to the landfill. They also describe the type of refuse deposited, used to determine whether the trip was residential or commercial, and the associated date/time. To be consistent with the previous traffic study and to capture the busiest days of the week, the data was sorted to show the average number of trips taken in and out of the landfill during the AM and PM peak hours on an average weekday (Tuesday to Thursday). The months considered for averaging were between March and October, as the landfill is typically less busy during winter. Data from 2021 was used for this study to ensure the most up-to-date volumes possible. Furthermore, as landfill staff and contractors are not counted in the data, values extracted from the previous traffic study were used for these trips. The summary of the calculated trip generation is provided in **Table 2.1**.

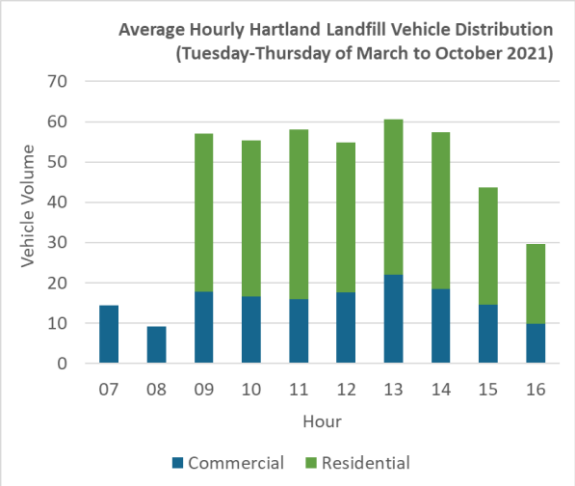
Table 2.1: 2021 Hartland Landfill Peak Hour Trip Generation

Trip Generation	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Total	In	Out	Total	In	Out
Commercial Traffic	**31**	17	14	**32**	15	17
Residential Traffic	**40**	23	17	**58**	29	29
Staff/Contractors	**12**	10	2	**15**	5	10
Total	**83**	50	33	**105**	49	56

The 2021 generated trips were slightly higher than those from the previous traffic study (2019 data). The weekday AM peak hour had 9 more trips in total, and the PM peak hour had 15 more trips. Although the COVID-19 pandemic caused a shift to online work for many people, resulting in fewer commuting trips, it has not impacted trips to the landfill.

Figure 2.1 shows the distribution of residential and commercial vehicles to Hartland Landfill on an average weekday (Tuesday to Thursday and March to October) in 2020 and 2021. A comparison of the total vehicle trips over the course of 2020 and 2021 between Tuesday and Thursday has also been included.





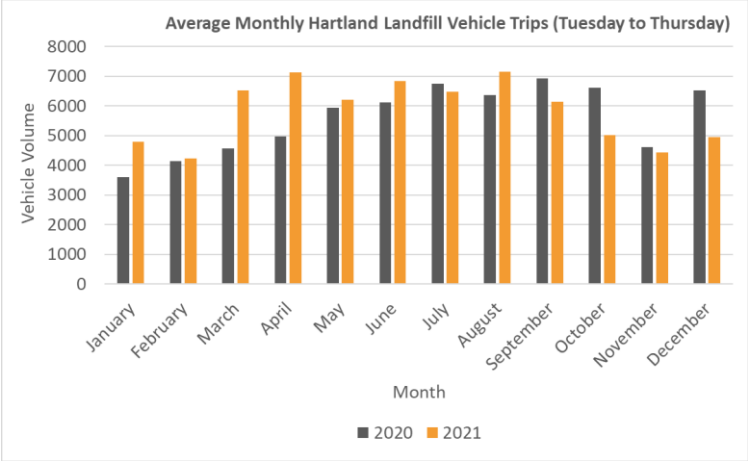


Figure 2.1: 2020-2021 Trips to Hartland Landfill (Commercial/Residential) by Hour/Month

Following trip generation, the vehicle volumes were redistributed and assigned to the road network. The proportions were based on the trip distribution used in the previous traffic study and observations of the existing traffic volumes at each of the study intersection. It was determined that 70% of trips accessing the landfill would come from the south along West Saanich Road, 15% would come from the north along West Saanich Road (through Central Saanich), 10% would come from the north along Wallace Drive (also through Central Saanich), and 5% would come from the west along Willis Point Road.

Horizon Year Scenarios

Three horizon year scenarios have been analyzed for this traffic study, as per the preliminary plan (primary access relocation) of CRD:

- 2021 (Base) – residential and commercial traffic access Hartland Landfill through Hartland Avenue (southeast of the site);
- 2024 – all commercial traffic would be diverted to a new access (connecting from the north side of the site) from Willis Point Road, while all residential traffic would continue to use the existing access (Hartland Avenue); and,
- 2030 – all traffic (residential and commercial) would use the north access to enter/exit the landfill from Willis Point Road.

The distribution of trips generated by the landfill in 2024 and 2030 horizon years are shown in **Figures 2.3** and **2.5**, respectively.

Baseline and Projected (Horizon Scenario) Traffic Volumes

The trips generated by the Hartland Landfill in 2021 were first subtracted from the 2021 base volumes. This data represented the traffic volume (background) within the study area that were not generated by the site. These volumes along all roadways in the project limits except Hartland Avenue were then factored linearly using a 1% annual growth factor, consistent with historical population growth trends. As discussed with CRD, Hartland Avenue was excluded because significant residential growth is not expected along the road in the coming years.

The generated trips were redistributed for the 2024 and 2030 horizon year scenarios. The traffic volumes at the study intersections during 2021, 2024, and 2030 can be found in **Figures 2.2**, **2.4**, and **2.6**, respectively. Additionally, a table comparing the volume changes in percentages from horizon year scenarios to base year is provided in **Table 2.2**. It should be noted that each percent change at the study intersections includes not only redistribution of landfill trips but also background traffic growth. Hence, except for the intersection of Hartland Avenue at Interurban Road, overall traffic volumes of the other study intersections continue to increase over the horizon years, despite the relocations of both commercial and residential accesses for Hartland Landfill.

Table 2.2: Percent Change in Intersection Volume from Baseline (2021) to Horizon Years

Peak Hour	Intersection	% Change from 2021	
		2024	2030
AM	Hartland Avenue and West Saanich Road	2%	5%
	Interurban Road and Hartland Avenue	-27%	-61%
	Wallace Drive and West Saanich Road	5%	14%
	Wallace Drive and Willis Point Road	12%	28%
PM	Hartland Avenue and West Saanich Road	2%	5%
	Interurban Road and Hartland Avenue	-19%	-49%
	Wallace Drive and West Saanich Road	5%	14%
	Wallace Drive and Willis Point Road	10%	26%

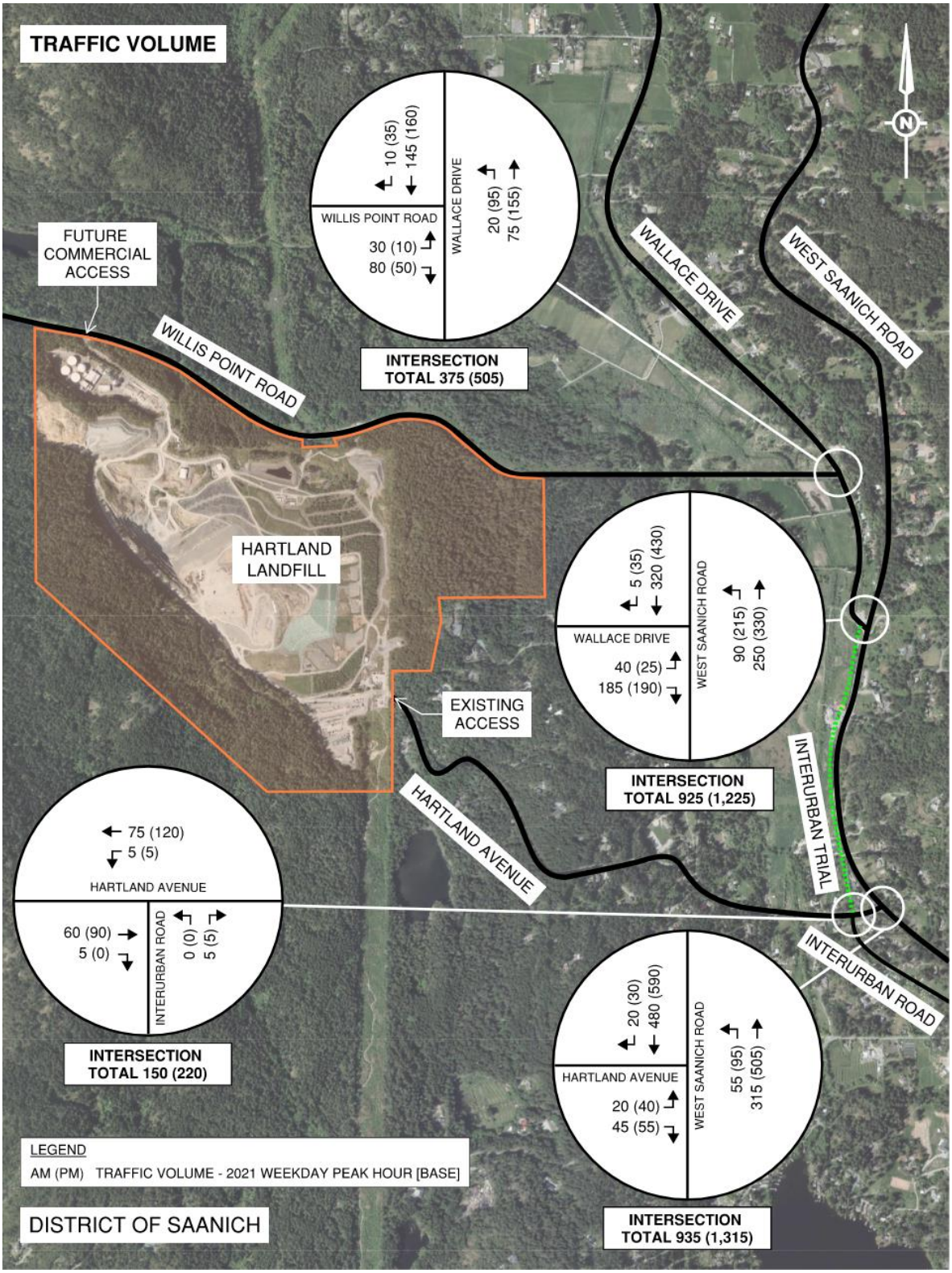


Figure 2.2: 2021 Base Traffic Volumes

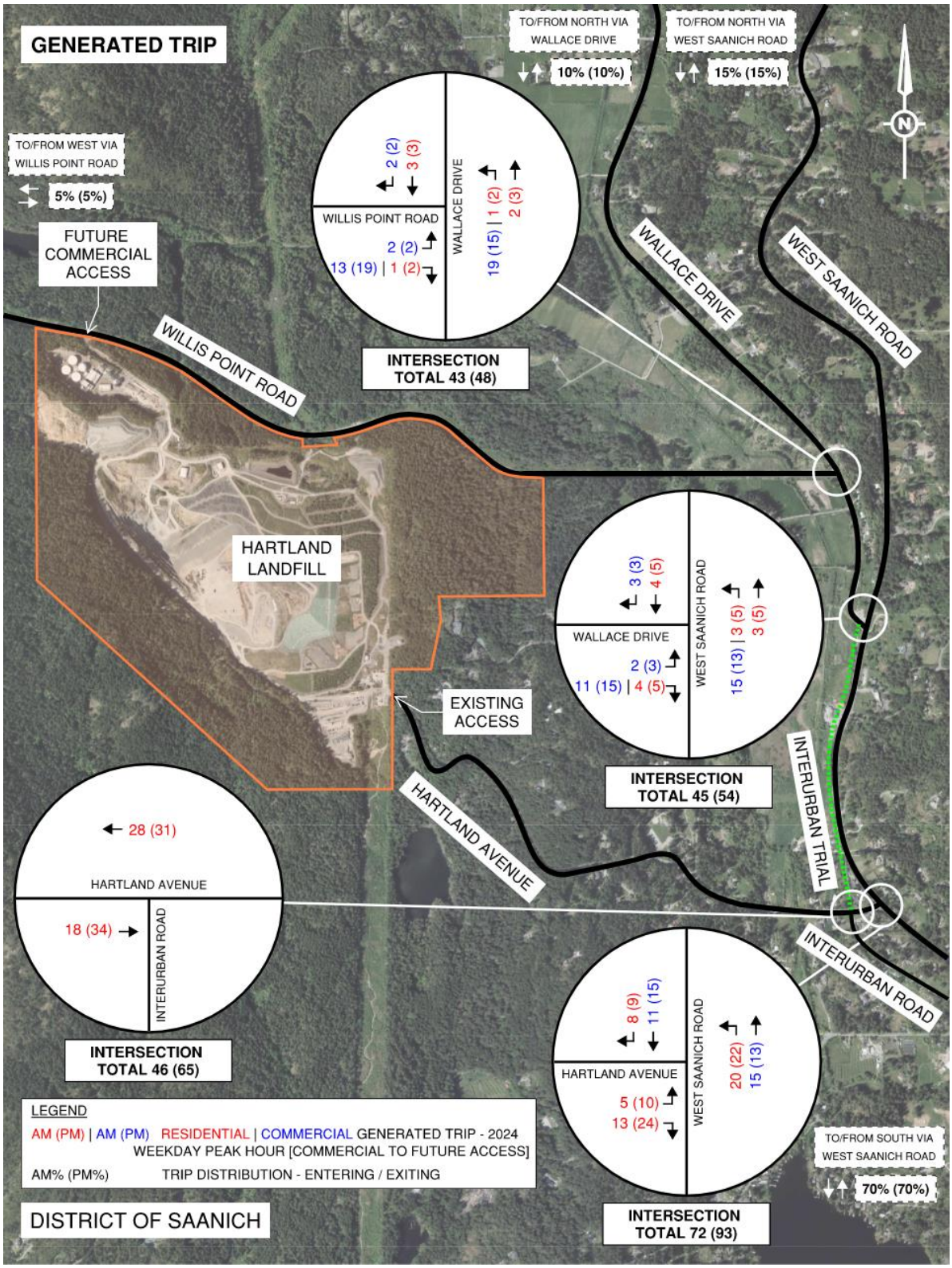


Figure 2.3: 2024 Estimated Generated Trips

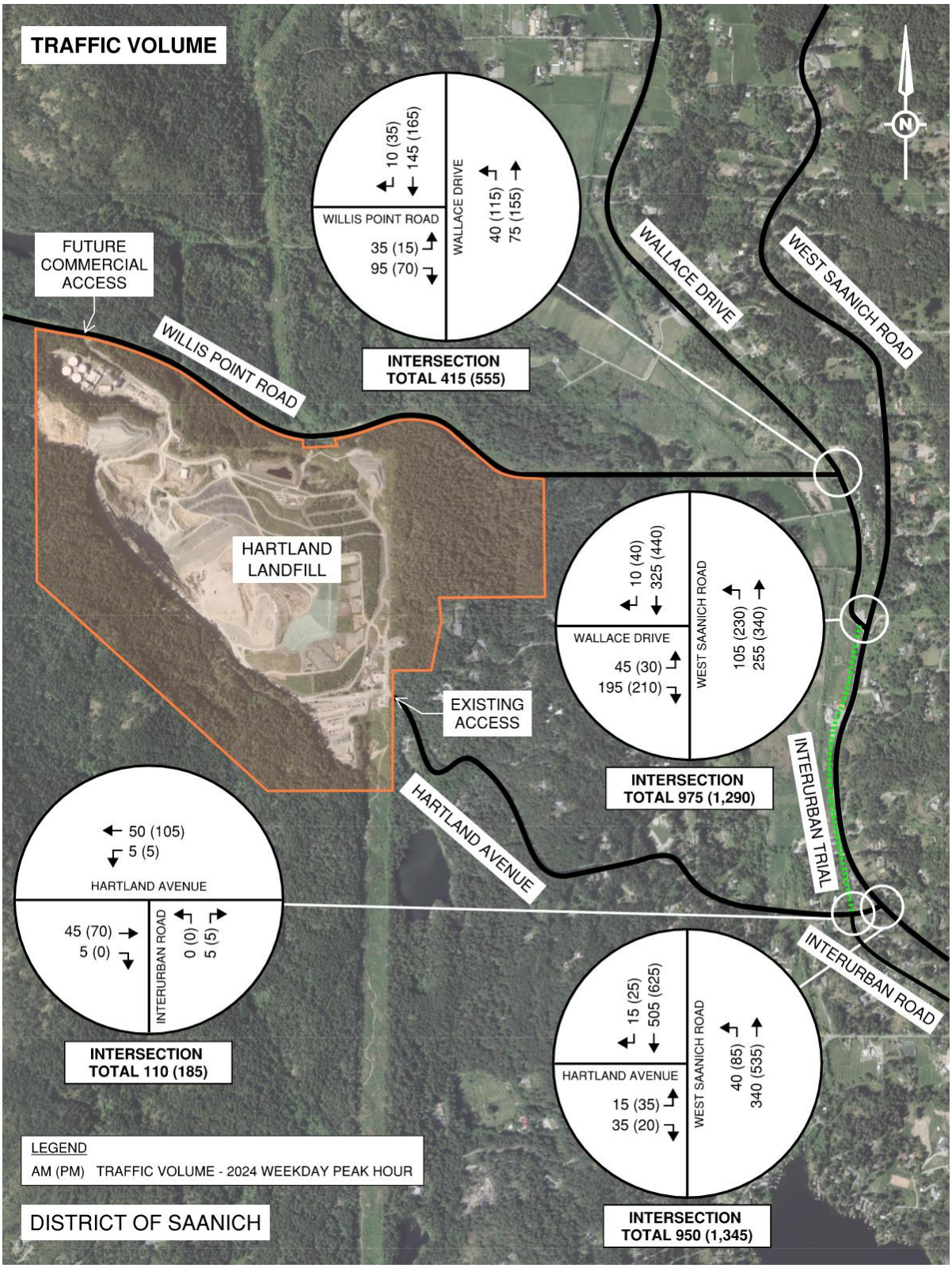


Figure 2.4: 2024 Projected Traffic Volumes

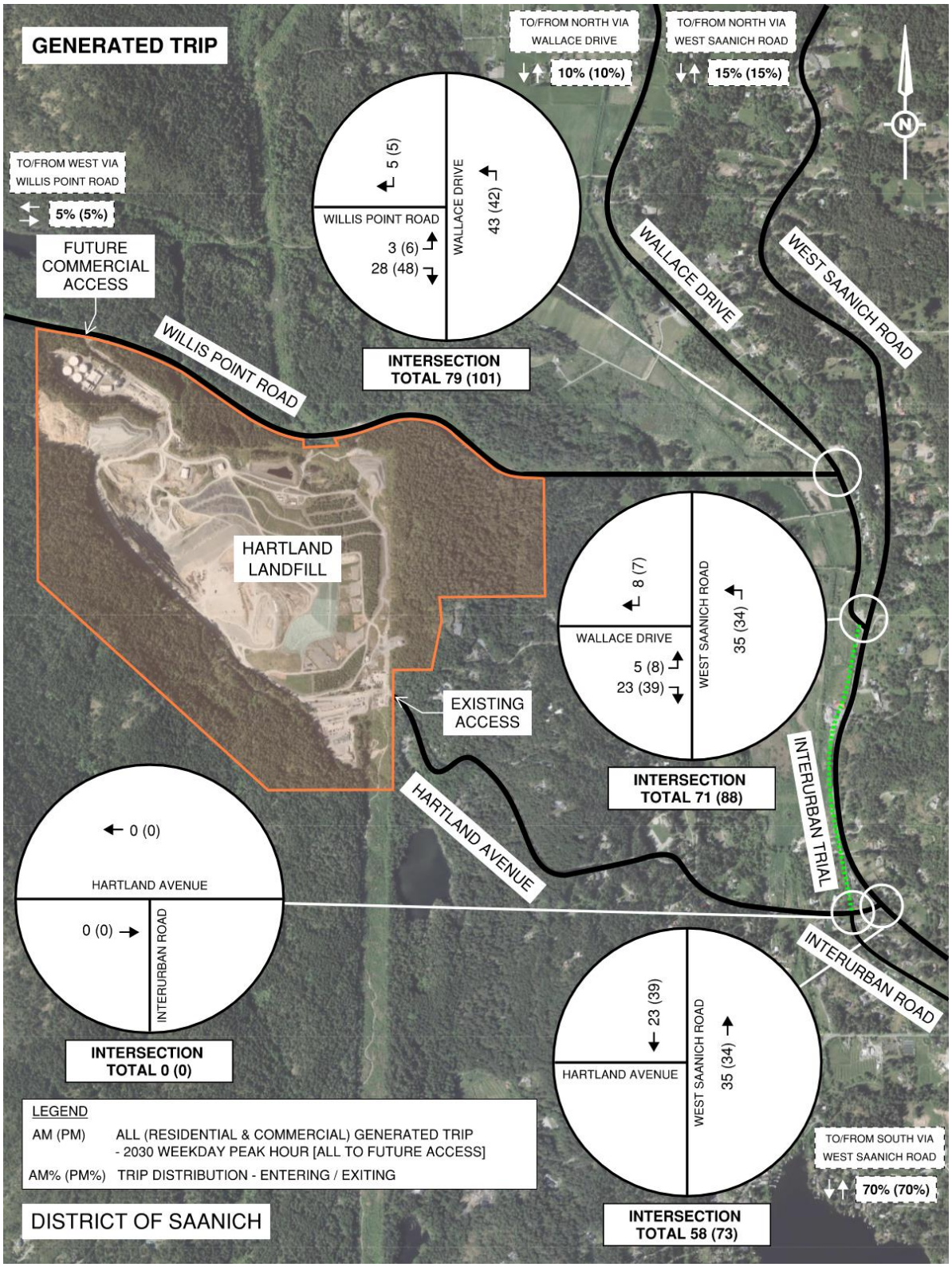


Figure 2.5: 2030 Estimated Generated Trips

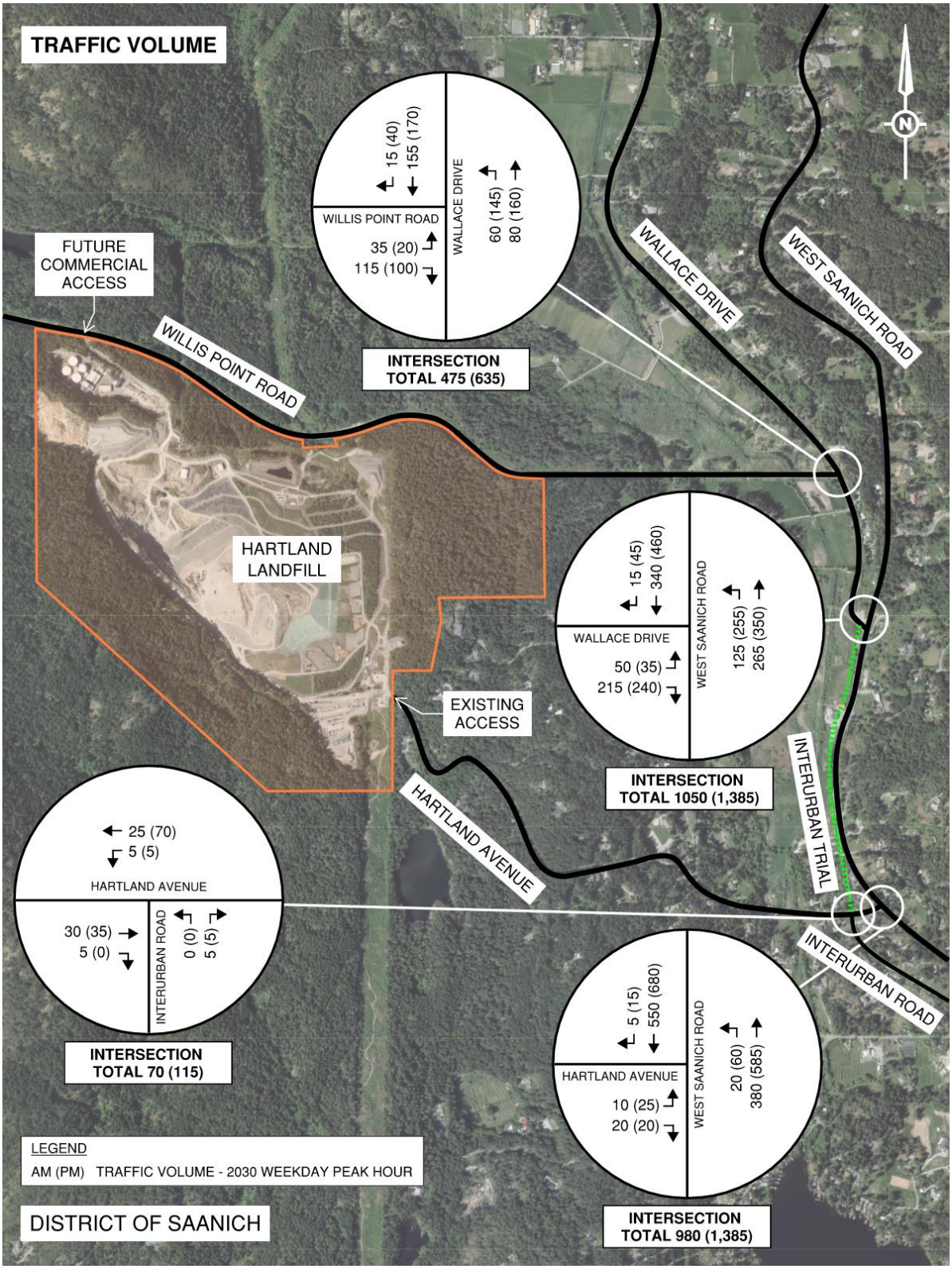


Figure 2.6: 2030 Projected Traffic Volumes

2.2 Traffic Operation

Intersection/Approach Performance

The traffic operation performance of the study intersections were analyzed using Synchro/SimTraffic software (Version 10), which is based on the standard methods of the *Highway Capacity Manual* (HCM 6). Measures of effectiveness used in this study include control delay (in seconds per vehicle), level of service (LOS), volume/capacity (v/c) ratio, and 95th percentile queue length (in metres). LOS of D or better and v/c ratio lower than 0.95 are generally considered acceptable for both unsignalized (stop-control) and signalized intersections in the industry; otherwise, improvement measures should be considered for any critical movements (LOS E and F). LOS is defined based on the average control delay for overall intersections and individual turning movements in **Table 2.3**. 95th percentile (maximum) queue length for each movement was also estimated to determine if queues would exceed the available storage.

Table 2.3: LOS Definition for Signalized and Unsignalized Intersections in HCM 6

Traffic Control	LOS	A	B	C	D	E	F
Signalized	Delay (seconds per vehicle)	0 - 10	10 - 20	20 - 35	35 - 55	55 - 80	> 80
Unsignalized		0 - 10	10 - 15	15 - 25	25 - 35	35 - 50	> 50

The intersection and approach LOS of the 2021 (base), 2024, and 2030 horizon years during the weekday AM and PM peak hours are illustrated in **Figure 2.7**. Based on the analysis results, all study intersections were predicted to operate at acceptable levels during all peak hours and horizon years; mostly at LOS A while, for Wallace Drive and West Saanich Road during the weekday PM peak hour in 2030, at LOS C.

For individual approaches, the eastbound approach at Hartland Avenue and West Saanich Road currently (2021) operates at LOS E during the weekday PM peak hour but is expected to improve once the commercial haulers are relocated to the future access. During the 2024 PM peak, the eastbound approach at Wallace Drive and West Saanich Road was predicted to operate at LOS E, and by 2030 at LOS F. No significant issues were noted with the v/c ratios or queue lengths at any of the study intersections or their approaches.

It should be noted that the landfill traffic (commercial and residential) makes up approximately 4% of the total traffic volumes entering the study area as a whole, and about a weighted average of 8% of the traffic travelling through each study intersection (as most vehicles entering the study area to travel to the landfill will leave using the same intersections within a single peak hour). These low percentages indicate that critical movements (LOS E and F) were mainly due to background traffic (annual growth) rather than the traffic relocated or generated by the landfill.

Comparison with 2019 Data (Pre-Pandemic)

As requested by CRD, traffic analyses were also conducted using 2019 volumes (pre-pandemic) with the current trip generation. Overall, this did not have a significant impact on any intersections as a whole. The approaches with lower LOS mentioned above did see a small increase in delay; however, most notably, the eastbound approach LOS at Wallace Drive and West Saanich Road during the 2030 AM peak hour was E (only slightly better than the 2030 PM peak hour) when using the 2019 volumes. No other approaches had a critical change in LOS.

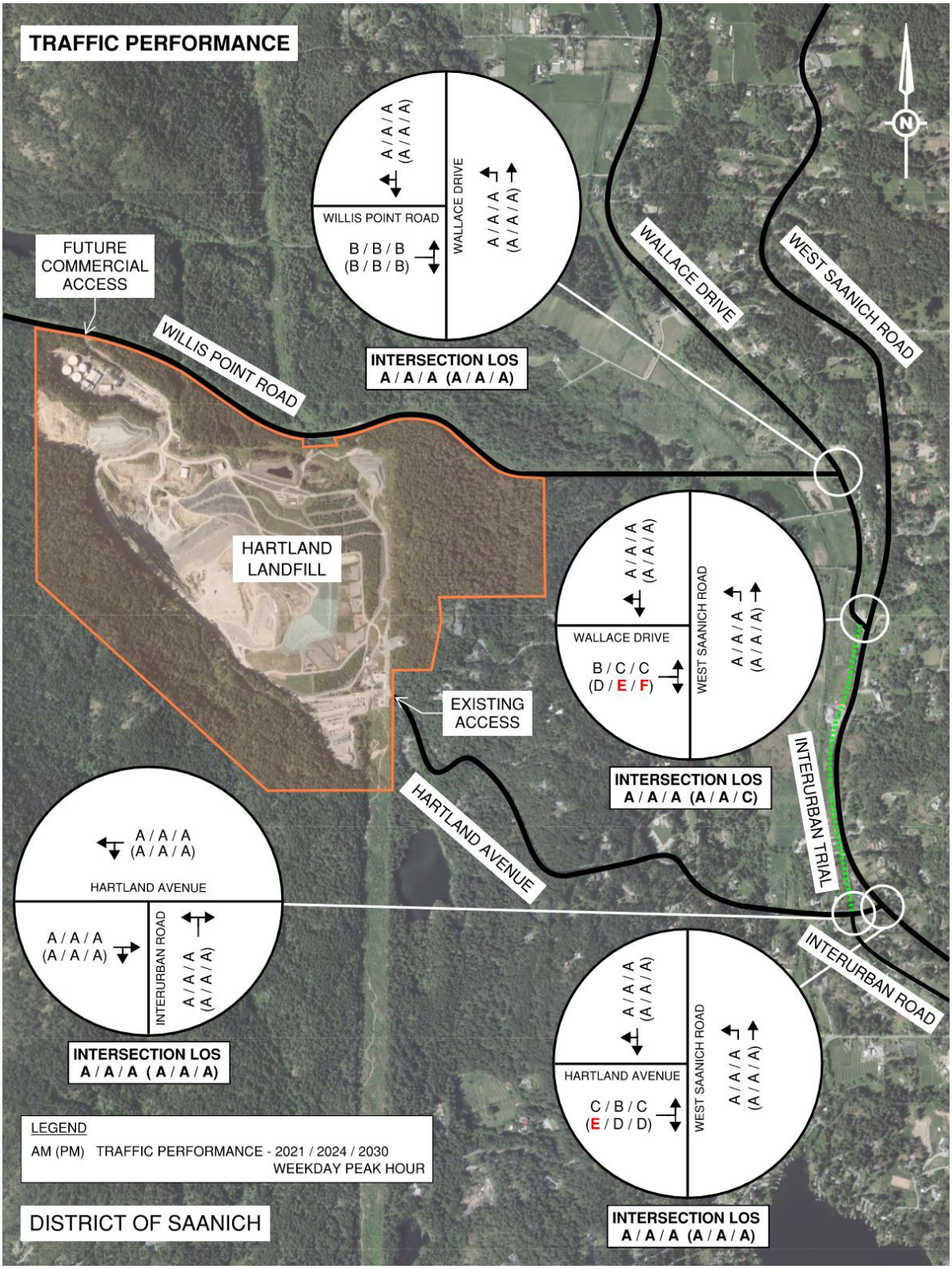


Figure 2.7: Level of Service by Turning Movement, Peak Hour, and Year

Comparison with "Do Nothing" and "Commercial Access Only Relocation" Scenarios

In addition to analyzing the agreed horizon years per Section 2.1, weekday peak hour assessments were also undertaken for the following alternative scenarios:

- "Do nothing" scenario (2024) in which no Hartland Landfill traffic is diverted to the north access;
- "Do nothing" scenario in 2030; and,
- A 2030 scenario in which only commercial traffic is diverted to the north Willis Point Road access.

Thus, in total, analyses were performed for one scenario in 2021, two scenarios in 2024, and three scenarios in 2030. **Tables 2.4** and **2.5** show comparisons between the LOS and critical movements of the 2024 and 2030 horizon scenarios, respectively. For a complete comparison, findings of the 2024 Commercial Access Only Relocation and 2030 Commercial & Residential Accesses Relocation scenarios were included from the previous section.

Table 2.4: Comparison of 2024 Horizon Traffic Operations Analysis Scenarios

Study Intersection	Peak Hour	Do Nothing		Commercial Access Only Relocation	
		LOS	Critical Movement	LOS	Critical Movement
Hartland Avenue and West Saanich Road	AM	A	-	A	-
	PM	A	-	A	-
Interurban Road and Hartland Avenue	AM	A	-	A	-
	PM	A	-	A	-
Wallace Drive and West Saanich Road	AM	A	-	A	-
	PM	A	-	A	EB [E]
Willis Point Road and Wallace Drive	AM	A	-	A	-
	PM	A	-	A	-

Table 2.5: Comparison of 2030 Horizon Traffic Operations Analysis Scenarios

Study Intersection	Peak Hour	Do Nothing		Commercial Access Only Relocation		Commercial & Residential Accesses Relocation	
		LOS	Critical Movement	LOS	Critical Movement	LOS	Critical Movement
Hartland Avenue and West Saanich Road	AM	A	-	A	-	A	-
	PM	A	EB [E]	A	EB [E]	A	-
Interurban Road and Hartland Avenue	AM	A	-	A	-	A	-
	PM	A	-	A	-	A	-
Wallace Drive and West Saanich Road	AM	A	-	A	-	A	-
	PM	B	EB [E]	B	EB [F]	C	EB [F]
Willis Point Road and Wallace Drive	AM	A	-	A	-	A	-
	PM	A	-	A	-	A	-

All intersections are expected to perform at LOS C or better overall, regardless of which future scenario. Moving all landfill traffic to the north access could change overall LOS of the Wallace Drive and West Saanich Road intersection from B to C during the 2030 PM peak hour. Critical movements are observed in the 2024 PM peak at the eastbound approach of Wallace Drive and West Saanich Road when commercial traffic is relocated to the north access. The eastbound LOS of Wallace Drive at West Saanich Road also changes from E to F during the 2030 PM peaks when commercial (as well with residential) traffic is diverted to the north access (instead of through Hartland Avenue).

However, the eastbound LOS of Hartland Avenue at West Saanich Road improves from E to D during the 2030 PM peak if all landfill traffic is diverted to the north access. This relatively minor effect of the changes can be attributed to the fact that traffic caused by the landfill makes up a small percentage of total volume at the study intersections.

As shown in **Table 2.6**, the percentage of landfill traffic denotes the percentage of commercial and residential traffic that is generated by the Hartland Landfill compared to the total expected traffic during the 2030 horizon year. At the major study intersections (i.e. West Saanich Road), the landfill traffic is expected to constitute about an average of 6% of the total intersection entering traffic volumes in 2030.

Table 2.6: Landfill Traffic as a Percentage of Total Intersection Entering Traffic Volumes in 2030

Study Intersection	Peak Hour	Landfill Traffic Percentage		
		Do Nothing	Commercial Access Only Relocation	Commercial & Residential Accesses Relocation
Hartland Avenue and West Saanich Road	AM	8%	7%	6%
	PM	7%	7%	5%
Interurban Road and Hartland Avenue	AM	59%	45%	0%
	PM	47%	35%	0%
Wallace Drive and West Saanich Road	AM	3%	5%	7%
	PM	2%	4%	6%
Willis Point Road and Wallace Drive	AM	3%	11%	18%
	PM	3%	8%	16%

It is noted that aside from Interurban Road at Hartland Avenue, the study intersection that would experience the largest change in share of landfill traffic volume is Willis Point Road at Wallace Drive, increasing from 3% in the “do nothing” scenario to 16%-18% if both accesses are relocated. This is primarily due to the relatively low volume of background traffic that travel through Willis Point Road and Wallace Drive normally, and the fact that most vehicles accessing the landfill would have to travel through it if the primary vehicular access were to be relocated.

2.3 Speed Data

In addition to the traffic count data, speed data were also provided by CRD. This data was collected in March and April of 2019 by TransTech for the District. The average vehicle speed observed, 85th percentile (operating) speed observed, and percentages of vehicles violating the posted speed limit were determined by direction and shown in **Table 2.4**.

Table 2.7: Vehicle Speed Data

Roadway	Between		Posted Speed Limit	Eastbound / Northbound			Westbound / Southbound		
				Average Speed	85th Percentile Speed	Violations %	Average Speed	85th Percentile Speed	Violations %
Hartland Avenue	West Saanich Road	Hartland Landfill	40	64	73	99	62	71	98
Wallace Drive	Willis Point Road	Municipal Boundary	50	59	68	88	58	66	85
West Saanich Road	Wallace Drive	Municipal Boundary	60	63	70	69	66	72	85
West Saanich Road	Hartland Avenue	Prospect Lake Road	60	62	68	64	63	70	72
West Saanich Road	Hartland Avenue	Wallace Drive	60	68	74	91	67	74	83
Willis Point Road	Wallace Drive	Municipal Boundary	60	71	82	83	68	78	81

It was found that most vehicles to/from the study intersections exceeded the posted speed limits. Although the posted speed limit along Hartland Avenue varies between 40 and 50 km/h, with the latter being used to determine the percentage of violations, almost no vehicles were recorded travelling below 40 km/h. Excluding Hartland Avenue due to the varying posted speed limit and significant exceedance of the lower speed limit, it was found that the average speed of vehicles at the study intersections is 7 km/h higher than the posted speed limit; the 85th percentile speed is on average 14 km/h higher.

2.4 Warrant Analysis

Warrants are intended as a guide to standardize the thresholds at which different transportation facilities are often provided. They are not the only way to support a potential improvement, and often engineering judgement may be necessary to support an improvement that does not meet warrant criteria. Traffic signal warrant analysis using the Transportation Association of Canada (TAC) *Traffic Signal and Pedestrian Signal Head Warrant Handbook* was conducted for the study intersections. The process involves using several variables, such as peak hour volumes, distances to nearest signalized intersection, heavy vehicle percentages, and more, to determine a warrant value that, if it is greater than 100, indicates that a signal could be warranted.

The signal warrant requires six hours of data total: two hours each from the morning, midday, and afternoon peak hours. Since only morning and afternoon peak hour data were collected during the traffic counts, the midday data was estimated. This was done by analyzing the historical full-day volumes along the major roads of each intersection and determining the ratio of the midday peak to morning peak. This ratio was then applied to the morning peak hour turning volumes at each intersection for each analytical year to approximate their respective midday peak hour turning volumes (about 90% for the intersections along West Saanich Road).

Using this methodology, a signal may be warranted (warrant value of 114) at the intersection of Wallace Drive and West Saanich Road in 2030, although the overall unsignalized intersection was predicted to operate at an acceptable level (LOS C). Moreover, signal warrant analysis of the 2030 alternative scenarios (“do nothing” and commercial access only relocation) revealed that a signal may be warranted regardless of the landfill access relocations. At Wallace Drive and West Saanich Road, 2030 “do nothing” scenario yields a warrant value of 101, while this study intersection has a warrant value of 106 for the commercial access only relocation scenario. Because the baseline conditions and 2024 horizon scenario do not warrant a traffic signal, the necessity of signalization can be reevaluated at a later date as traffic patterns evolve.

It is found that with full traffic signal (in reference to timings and optimizations from other intersections in Saanich), the overall intersection is expected to operate under LOS B during both peak hours in 2040. As the study intersections are generally expected to operate at LOS C or better overall during both peak hours and scenarios in all horizon years, and that the landfill traffic only makes up less than about 6% of the total entering traffic volumes at the major West Saanich Road study intersections, no intersection improvements are required as a result of landfill access relocations. However, with the background traffic growth, it is suggested that the District may consider to improve the Wallace Drive and West Saanich Road intersection (at least eastbound approach), even without or prior to relocations of both accesses (2% to 7% of the total entering traffic volumes) by 2030.Furthermore, subject to the timeline of relocating the residential landfill access, the District may also consider improving the Hartland Avenue operations at West Saanich Road.

3.0 Collision Characteristics

3.1 ICBC Claim Data

Six-year ICBC claim data of the study intersections, from January 1, 2015 to December 31, 2020, were collected, filtered, and assessed. According to ICBC, it should be noted that crash data and trends from 2020 may be impacted by the COVID-19 pandemic; as such, the 2020 collision dataset is excluded. 2021 data is not available at the time of this study, but it is expected that it may have also been impacted by the ongoing pandemic. In total, 75 collisions were reported at the study intersections from 2015 to 2019, though none occurred at the intersection of Interurban Road / Interurban Rail Trail at Hartland Avenue. After a detailed review of the claim's descriptions, it was found that six collisions occurred outside of study intersection and the remaining 69 collisions occurred at the three intersections:

- 4 claims at the intersection of Hartland Avenue and West Saanich Road;
- 46 claims at the intersection of Wallace Drive and West Saanich Road; and,
- 19 claims at the intersection of Willis Point Road and Wallace Drive.

Overall, this resulted in an average collision frequency of 13.8 collisions per year in the study area.

3.2 Collision Severity

Approximately 41% (or 28 in five-year) of collisions resulted in injuries, while no fatal collisions were reported during the five-year study period. The remaining 59% (or 41 in five-year) were property damage only (PDO) collisions. The Collision Severity Index (CSI) for each study intersection was determined using a weighted average of 100 as fatal, 10 as injury, and 1 as PDO, and is provided in **Table 3.1**. It was found that collisions were more severe along West Saanich Road.

Table 3.1: Collision Severity Index

Study Intersection	Collision Severity		Total	CSI
	Injury	PDO		
Hartland Avenue and West Saanich Road	2	2	4	5.5
Wallace Drive and West Saanich Road	19	27	46	4.7
Willis Point Road and Wallace Drive	7	12	19	4.3
Total	**28**	**41**	**69**	

3.3 Collision Distributions and Diagrams

The following section shows the summaries of collision distributions and diagrams of collision types (**Figures 3.1** to **3.6**) for the intersections at Hartland Avenue and West Saanich Road, Wallace Drive and West Saanich Road / Interurban Rail Trail, and Willis Point Road and Wallace Drive.

Hartland Avenue at West Saanich Road

Collision Frequency: 0.8 per year (total = 4)

Collision Severity Index: 5.5 (casualty = 50%)

Collision with Pedestrian: 0 (0% of total)

Collision with Cyclist: 1 (25% of total)

Figure 3.1: Collision Distributions – Hartland Avenue at West Saanich Road & Trail

Summary: Due to small sample size of the collision data, only a few temporal trends can be observed. However, according to the collision diagram, it is noted that two multi-vehicle rear-end collisions were reported at the intersection, one each in the north-south directions. The remaining two collisions includes a southbound crossing cyclist hit by an eastbound right-turn vehicle (failed to stop) and a wildlife-related collision occurred between a deer and a northbound vehicle.

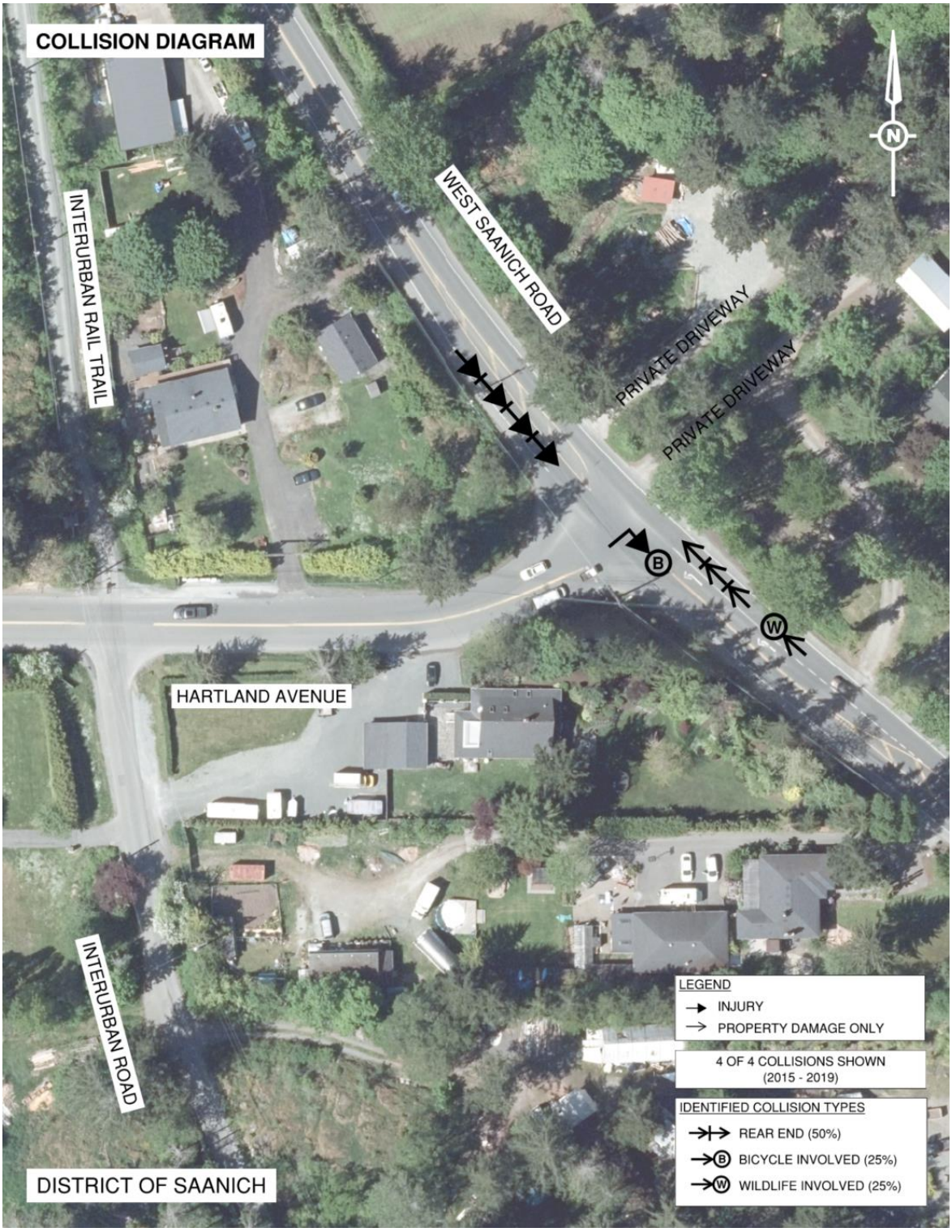
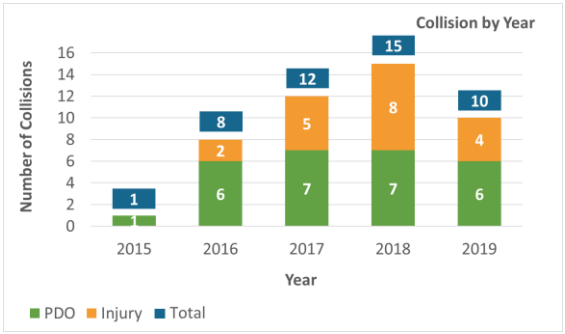


Figure 3.2: Collision Diagram (2015 to 2019) – Hartland Avenue at West Saanich Road & Trail

Wallace Drive at West Saanich Road & Interurban Rail Trail

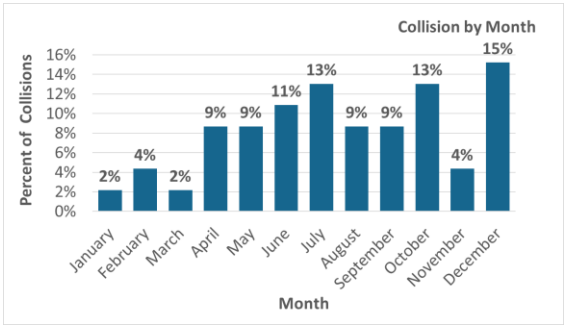


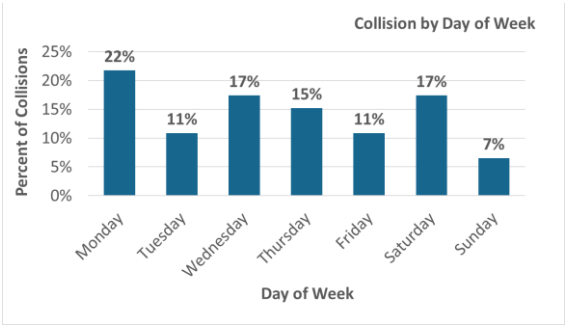
Collision Frequency: 9.2 per year (total = 46)

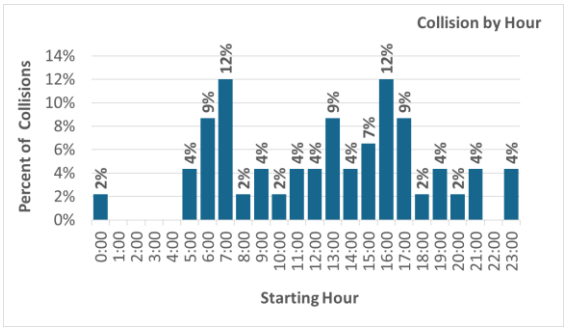
Collision Severity Index: 4.7 (casualty = 41%)

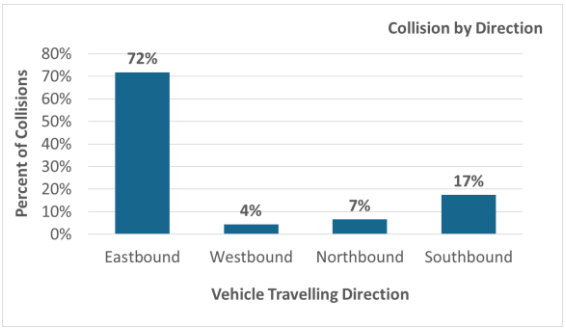
Collision with Pedestrian: 0 (0% of total)

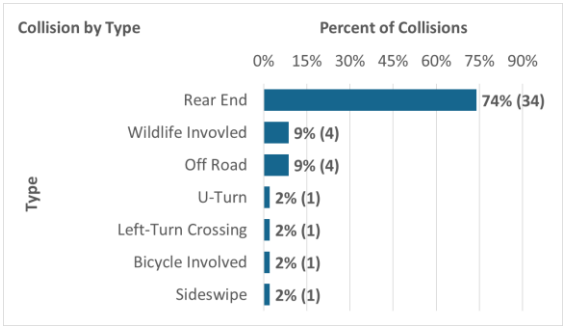
Collision with Cyclist: 1 (2% of total)











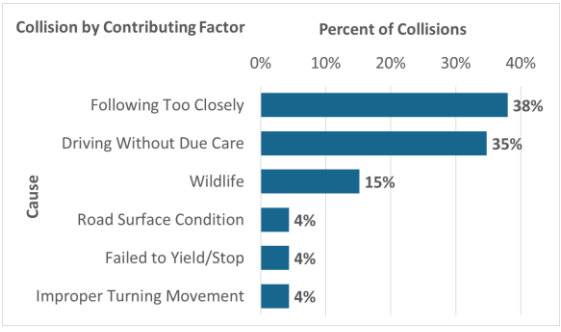


Figure 3.3: Collision Distributions – Wallace Drive at West Saanich Road & Trail

Year: Collisions increased to a peak of 15 (33% of total collisions) in 2018 before dropping in 2019; out of the 15 collisions, the majority of them involved injuries. It was followed by 2017 with 12 collisions.

Month: The highest number of collisions (15 or 33% of total collision) was recorded during the summer season (June to August), although the individual month with the highest number of collisions was December (15%). Higher recreational traffic volumes were also expected in the summer. The fall season (September to November) had the second highest number of collisions with 26%.

Day of Week: Monday had the highest percent of total collisions (22%) and the average weekday percent of 15% is higher than the average weekend percent of 12%, indicating more collisions related to weekday commuter traffic.

Hour of Day: Collision frequencies were the highest in the morning (06:00 to 08:00 hours) and afternoon (16:00 to 1800 hours) – 21% of total collisions each; indicating a mix of commuter and possibly shopping (at Red Barn Market) traffic, which aligns with the morning and afternoon peak hours

Vehicle Travelling Direction: Most collisions occurred in the eastbound approach (right-turn) – about 72% of total collisions, which might be due to high vehicle turning speeds and the relatively long stretch with minimal number of driveways/accesses. It was followed by the southbound downhill direction (17%).

Collision Type: The collision type for each reported collision was reviewed and confirmed. Rear-end was the predominant casualty collision type: 34 collisions (74%), followed by off-road and wildlife-involved (9% each). When vehicles travelling a long stretch of roadway in a free-flow condition approach a traffic control or turn into a yield-and-go condition, drivers might not adjust their vehicle speeds and continue to drive aggressively, potentially increasing the collision risk.

Contributing Factors: Potential contributing factors related to reported collisions are identified from the detailed review of each claim report. Vehicles following too closely was the most dominant contributing factor – about 38% of total collisions, followed by motorists driving without due care (35%). Both contributing factors were primarily involved in right-turn rear-end collisions in the eastbound approach (channelized right-turn lane). At this intersection, eastbound right-turn as well as southbound through volumes are relatively high.

Collision Diagram: Most collisions at this intersection were rear ends, of which the majority occurred in the eastbound right-turn lane. This was primarily caused by vehicles following too closely in the right-turn channelize island and not being able to fully stop when the vehicle ahead yielded to southbound traffic (at time, in high speeds). The next most common collision types were off-road and wildlife incidents. There was also a collision between a southbound crossing bicycle and northbound left-turn vehicle (failed to yield).

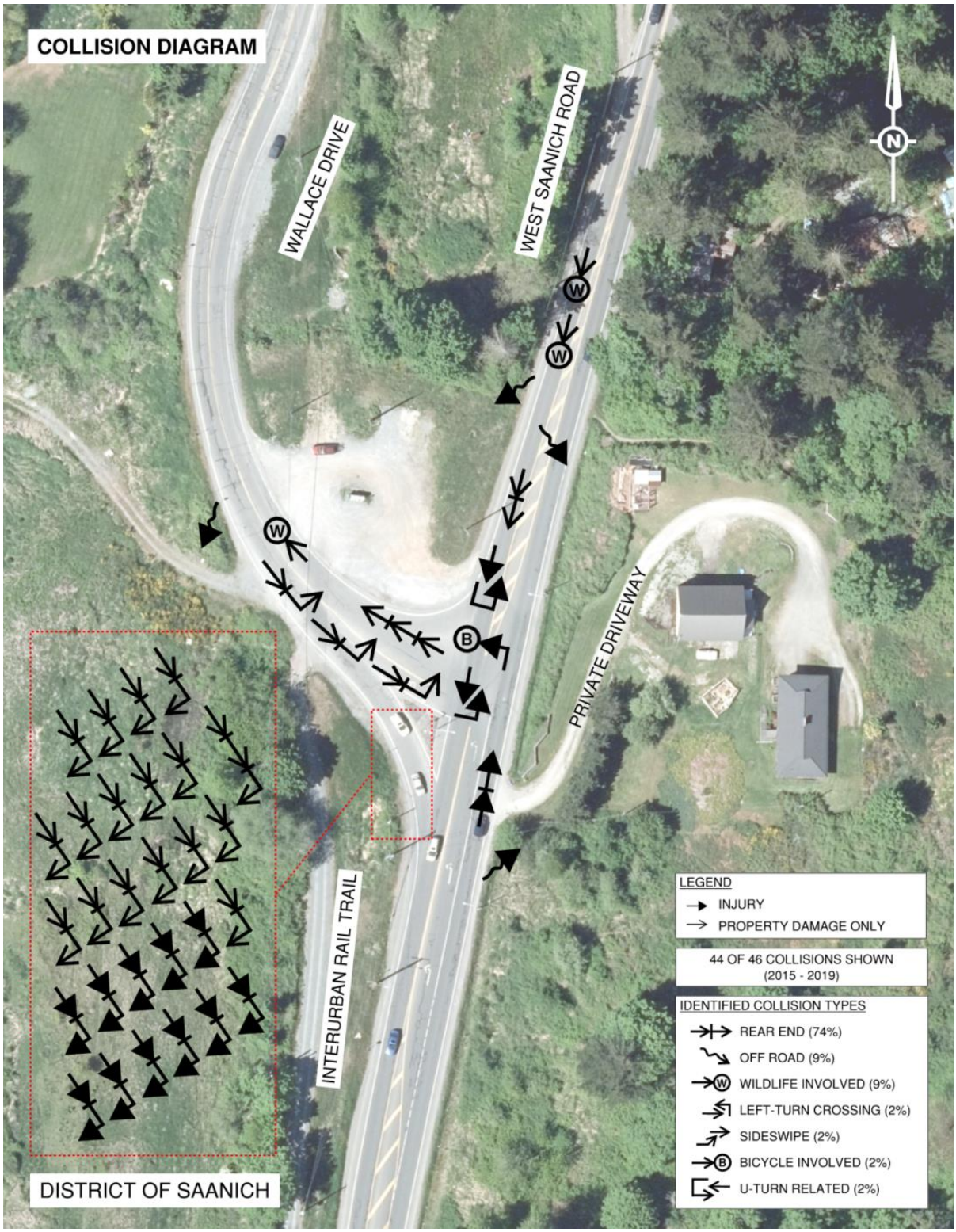
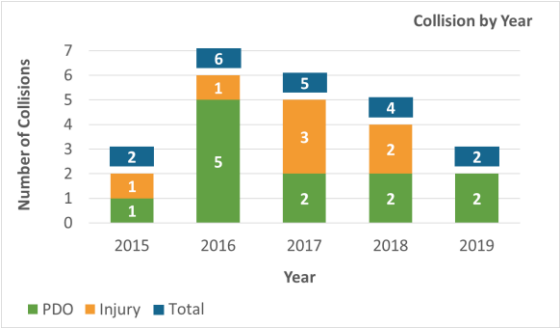


Figure 3.4: Collision Diagram (2015 to 2019) – Wallace Drive at West Saanich Road & Trail

Willis Point Road at Wallace Drive

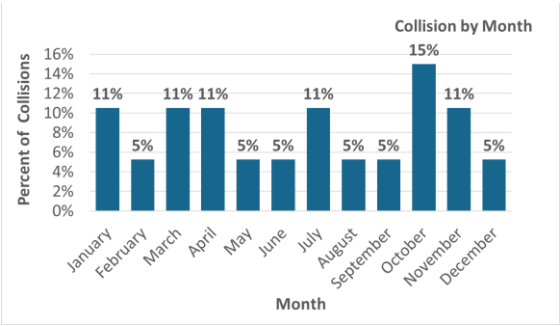


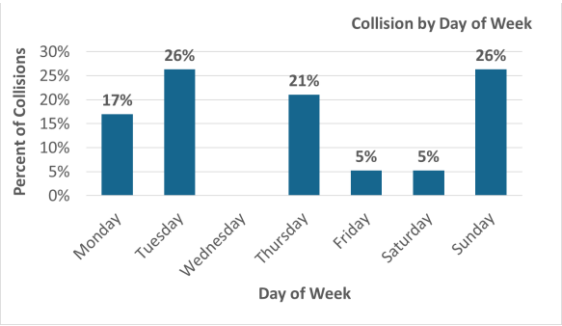
Collision Frequency: 3.8 per year (total = 19)

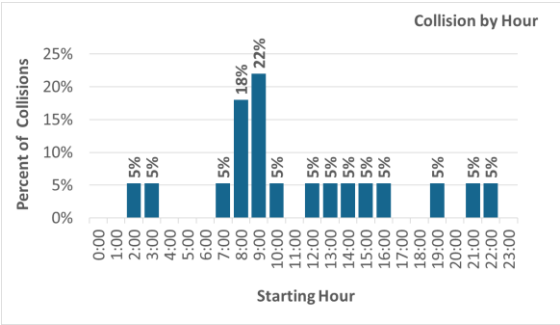
Collision Severity Index: 4.3 (casualty = 37%)

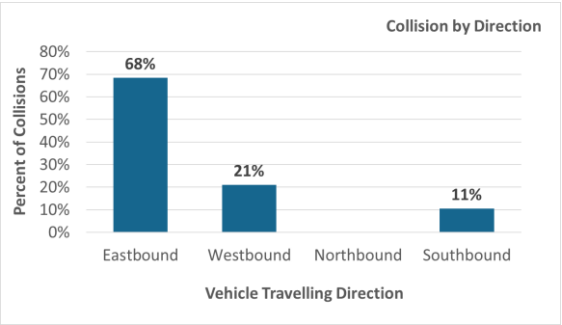
Collision with Pedestrian: 0 (0% of total)

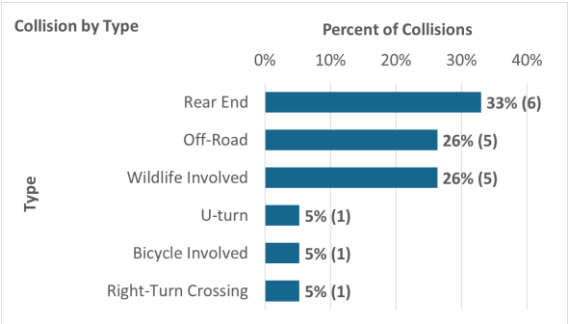
Collision with Cyclist: 1 (5% of total)











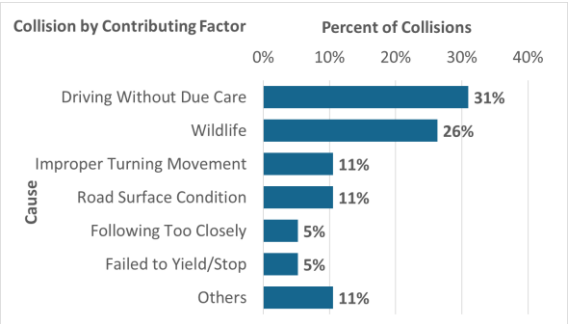


Figure 3.5: Collision Distributions – Willis Point Road at Wallace Drive

Year: 2016 had the highest number of collisions – 6 collisions (32% of total collisions), followed by 2017 with 5 collisions. The number of annual and injury collisions generally dropped after 2016.

Month: The fall (September to November) season experienced the highest number of total collisions (6 collisions, 31%), followed by spring (March to May) with 27% of the collisions. A high number of collisions recorded during the wet seasons might be related to poor road conditions combined with steep grades.

Day of Week: The highest number of reported collisions occurred on both Tuesday and Sunday – with 26% of total collisions each, followed by Thursday with 19%. A higher number of weekend collisions (an average of approximately 16%) might be due to high recreational traffic.

Hour of Day: The number of collisions was highest in the morning between 0800 and 1000 hours – about 40% of total collisions. This two-hour period is aligned with the morning peak traffic pattern (rush hour).

Vehicle Travelling Direction: Most collisions occurred in the eastbound approach – about 68% of total collisions, which might be due to higher traffic speeds and the relatively long, wide stretch with minimal driveways/accesses.

Collision Type: Rear-end was the predominant collision type – 6 collisions (33%); all of which were related to right-turn rear-end at the channelized eastbound right-turn movement. When vehicles travelling a long stretch of roadway in a free-flow condition approach a traffic control or turn into a yield-and-go condition, drivers might not adjust their vehicle speeds and continue to drive aggressively, potentially increasing the collision risk.

Contributing Factor: From review of the claim descriptions, driving without due care (6 collisions) as well as wildlife (5 collisions) were the major collision causes. Both factors primarily involved collisions along the west leg. ‘Other’ contributing factors included alcohol and speeding.

Collision Diagram: Similar to Wallace Drive at West Saanich Road, the highest number of collisions at this intersection were rear-ends between eastbound right-turn vehicles. Majority of injury collisions also occurred in the eastbound direction. This was primarily due to vehicles not driving with due care and lower vehicle speed when following other vehicles at the channelized right-turn lane. Off-road and wildlife-involved incidents were again tied for the most common collision type behind rear ends, mostly along the west leg. One vulnerable road user related collision was reported, involving a westbound vehicle and a bicycle on the shoulder (west leg).

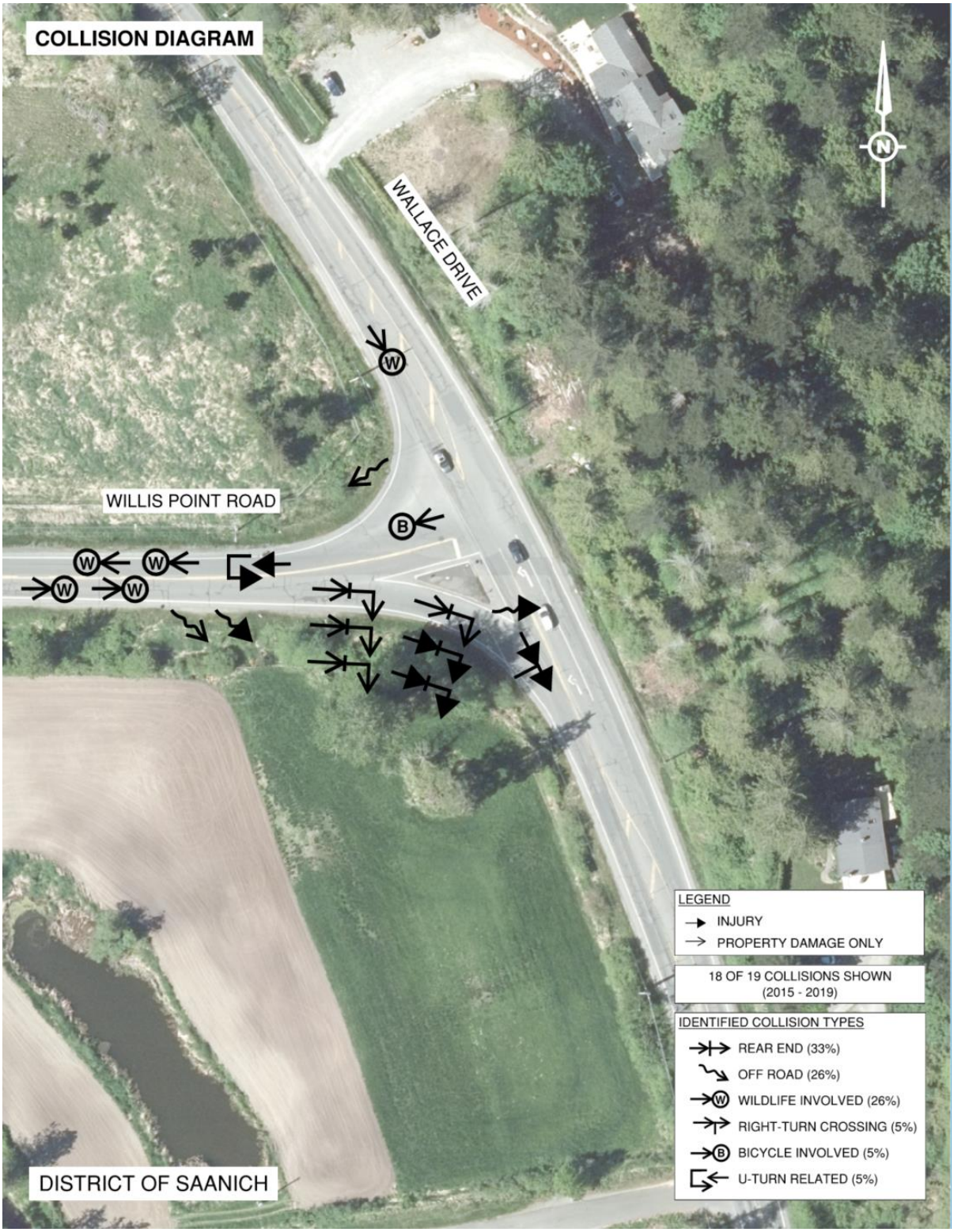


Figure 3.6: Collision Diagram (2015 to 2019) – Willis Point Road at Wallace Drive

4.0 Existing Active Transportation and Transit Facilities

The planned changes to the landfill facility will improve safety for active modes on Hartland Avenue by reducing traffic volumes and truck percentages, but will reduce safety for active modes on the other routes in the study area by increasing traffic volumes and truck percentages. Based on review of the alternative scenarios described in Section 2.2, the roadway section of Wallace Drive between Willis Point Road and West Saanich Road could experience a 16% increase in vehicle traffic during the 2030 horizon if the primary landfill access were relocated (when compared with the “do nothing” scenario); the section of West Saanich Road between Wallace Drive and Hartland Avenue would experience a 4% increase in traffic under the same conditions. As such, it may be prudent to improve safety on these negatively impacted routes to a level that reflects best practice.

4.1 Best Practice

It is common to design any new facilities to be accessible for everyone and comfortable for all ages and abilities. Facility types can vary between rural and urban areas, but a common theme is separation from traffic when speeds and volumes are higher. In rural areas, such as this neighbourhood, this is often achieved using multi-use pathways that can accommodate all active modes in less space that separate pedestrian and cycling (or rolling) facilities than are more common in urban areas. While separation between pedestrians and cyclists is always preferable, the lower volumes typical in rural areas mean that a shared active modes facility can work reasonably well. Due to the longer-distance facilities that are often required in rural areas, a shared facility is often more cost effective and practical to implement.

When considering potential improvements, the objectives must first be determined. Shoulder improvements improve safety only for people currently travelling actively; they do not tend to enable or encourage more people to do so. More substantial improvements that are comfortable for more people may increase active mode share. The Interurban Rail Trail and Road connections provides the greatest opportunity to attract more people and could be the focus of any upgrades. Improving the crossings using crosswalk treatments and enhancements such as street lighting may be sufficient to give people travelling along this route improved safety at conflict points. However, the Interurban Rail Trail and Road are not present throughout the entire study area, and on other routes improvements in addition to the interurban upgrades may be required to improve safety.

Widening to add safer facilities must consider adjacent topography, utility conflicts, drainage requirements, and ongoing maintenance requirements. In such locations, all ages and abilities can most cost effectively be accommodated using multi-use pathways, minimizing the amount of construction compared with sidewalks and protected bike facilities. These can often be constructed on one side and ideally minimizing the need to switch sides. Drainage is most often provided in ditches, which may be relocated or undergrounded, but this brings increased maintenance requirements. Ideally the ditch would be kept between any facility and the roadway to create a buffer and allow both the road and pathway to drain to the ditch, away from property. Narrow pathway widths can be utilized where there are flat grades and good sightlines, but on steeper grades where speed differentials between pedestrians and wheeled modes will be higher, wider pathway widths should be considered. However, speed differentials are becoming increasingly problematic on all grades due to electrically assisted mobility options and where possible wider facilities should always be pursued to increase the comfort for all users.

While a multi-use pathway is the most space efficient way to provide an all ages and abilities facility, cycling groups that currently use these roads may be the 'strong and fearless' type and reluctant to use such a pathway where they need to negotiate pedestrians or manage their speed. These cycling groups may continue to use the roadway, which they are entitled to do.

4.2 Active Transportation

All roadways at the study intersections are single-lane roads, sometimes with turn lanes provided. West Saanich Road includes a shoulder bike lane but, due to the semi-rural nature of the roadway, this may be used by pedestrians also, to access bus stops as an example. This does not provide a comfortable space to walk or cycle and does not meet guidance for all ages and abilities. Those people currently using this are either the 'strong and fearless' type who are comfortable mixing with traffic, or doing so out of necessity; that is, they are reliant on walking, cycling, or transit as a mode of transportation. Given the speed and volume of traffic along West Saanich Road are higher than is comfortable for most people to mix with traffic, an active transportation facility along this roadway would require separation from traffic to be safe for all ages and abilities.

The parallel Interurban Rail Trail and Road provides a traffic-free route between Hartland Avenue and Wallace Drive, as well as a lightly trafficked narrow roadway to the south, which is used primarily for local access and does not provide a through route for motor vehicles. One issue already identified is the lack of safe crossing facilities on Hartland Avenue between the Interurban Rail Trail on the north side and Interurban Road on the south side. This area has already been identified for a potential crossing improvement. Being slightly more remote with fewer eyes on the route than West Saanich Road, some may see this route as a less attractive option than those where there is more passing traffic, increasing personal safety if not traffic safety. The Interurban Rail Trail ends at Wallace Drive with no notable destinations nearby. Anybody using the Interurban Rail Trail would have to continue their trip on less-safe facilities.

Hartland Avenue, which currently leads to the landfill, has no dedicated active transportation infrastructure and would benefit from the planned relocation of the main vehicle access location, reducing the volume of traffic and percentage of trucks on this corridor. With this traffic removed, the existing rural road may be reasonably comfortable for active modes and comfortable for more people than it currently is. This should be confirmed through traffic volume counts and speed surveys, and if necessary, traffic calming measures could be added.

Wallace Drive connects West Saanich Road to Willis Point Road. Wallace Drive has two vehicle lanes in either direction and narrow shoulders not suitable for active modes. The north end of the Interurban Rail Trail terminates at this location and people travelling actively here are dropped onto the roadway, which is uncomfortable for most. Extending the pathway along Wallace Drive would maintain the traffic-free route within the study area. The usefulness of such a substantial infrastructure improvement would be subject to it providing a connection to a destination.

Wallace Drive towards West Saanich Road – facing south

Otherwise, it would simply drop people on the road slightly further north. This separation will be increasingly important as traffic volumes and the percentage of trucks increase along this route.

Willis Point Road provides a similar experience to Wallace Drive, being uncomfortable for most people to consider travelling by active modes. A multi-use pathway separate from traffic could remove conflict with traffic and extend to the landfill site, reducing conflicts with traffic where they're most likely to be increased as an outcome of this project. Extending such a pathway slightly west of the landfill site to the trail system around Durance Lake would provide a meaningful destination from the Interurban Rail Trail along an all ages and abilities facility. It is acknowledged that this trail network can also be accessed from Hartland Avenue.

4.3 Access to Transit

There is one transit service operating along West Saanich Road. Route 83 is considered a local route with service frequency in the range of 20 to 120 minutes depending on time of day with higher frequencies at peak times. While ridership and boarding/alighting volumes are likely low in the neighbourhood, those that do use transit may be reliant on it, and it can represent an essential service for some. Inadequate access and a safe space to wait reflects a common transportation inequity found in rural areas.

There are transit stops on West Saanich Road at the intersection of Hartland Avenue and Wallace Drive, both accessible through the Interurban Rail Trail that parallels West Saanich Road. All stops are identified by a pole and flag located in the grass verge behind the shoulder bike lane. There is no formal pedestrian route to/from these stops and no safe or comfortable space to wait for a bus. This becomes more of an issue in winter months as walking to the stop and waiting at the stop represents a greater risk to safety, while simply waiting in the grass verge during poor weather is uncomfortable and less accessible.

West Saanich Road at Wallace Drive – northbound

Where service frequency is limited, people tend to arrive earlier at their stop to avoid a long wait for the next bus; providing a comfortable and safe space to wait would makes transit a more viable option. These stops would benefit from paved waiting areas and ideally a shelter with lighting and seating. Additionally, there are no crosswalks on West Saanich Road to allow people to safely cross between the stops, the Interurban Rail Trail, and adjacent streets. These locations would benefit from the inclusion of a Special Crosswalks or Rapid Rectangular Flashing Beacons to improve safety after dark and increase driver compliance in general on a route where drivers may not be expecting to stop.

Crossing locations would have to be verified on site to ensure sight lines are adequate and bus stop waiting areas would have to reviewed for each site to confirm the extent of construction required and mitigation around slopes and drainage.

5.0 Identified Traffic Operational and Road Safety Issues

5.1 In-Service Road Safety Review

On Wednesday, November 10, 2021, an ISL Road Safety Engineer conducted detailed in-service road safety reviews, which included drive-through (driver's perspective) and walkabout (pedestrian's perspective) of the study intersections. The field reviews were undertaken during the weekday peak (rush hours) and off-peak periods to observe the traffic patterns and driver's behaviours (current condition without commercial/residential access relocation). The TAC *Field Observation Report* was referenced for each study intersection during the field review. It includes operational and physical checklists, covering road safety issues that are related to transportation users, operations, and infrastructure. Photographs, videos, and notes of the observations were also taken.

5.2 Identified Road Safety Issue

Based on the traffic operations analyses, collision data assessments, in-service safety reviews, and previous study/feedback, major road safety issues at the study intersections were identified. The overall potential contributing factors for each identified issue were also determined. In general, a high number of intersection collisions within the project limits can be attributed to:

- Driver behaviours (following too closely and driving without due care) – consistently cited as the most common contributing factors, and may include behaviours, such as aggressive and distracted driving;
- Conflicts with crossing bicycles – motorists not noticing or yielding to crossing cyclists, or motorists slowing down due to crossing bicycles, generating rear-end collisions with the following vehicles; and,
- Unexpected wildlife – similar to conflicts with cyclists, drivers not able to stop in time for unexpected wildlife crossing the roadway.

Hartland Avenue at West Saanich Road – Eastbound

Hartland Avenue at West Saanich Road – facing Southeast

Individual road safety issues (operational, geometric, vulnerable users, etc.) of the study intersections are identified and illustrated on the associated aerial image in the following **Figures 5.1** to **5.3**.

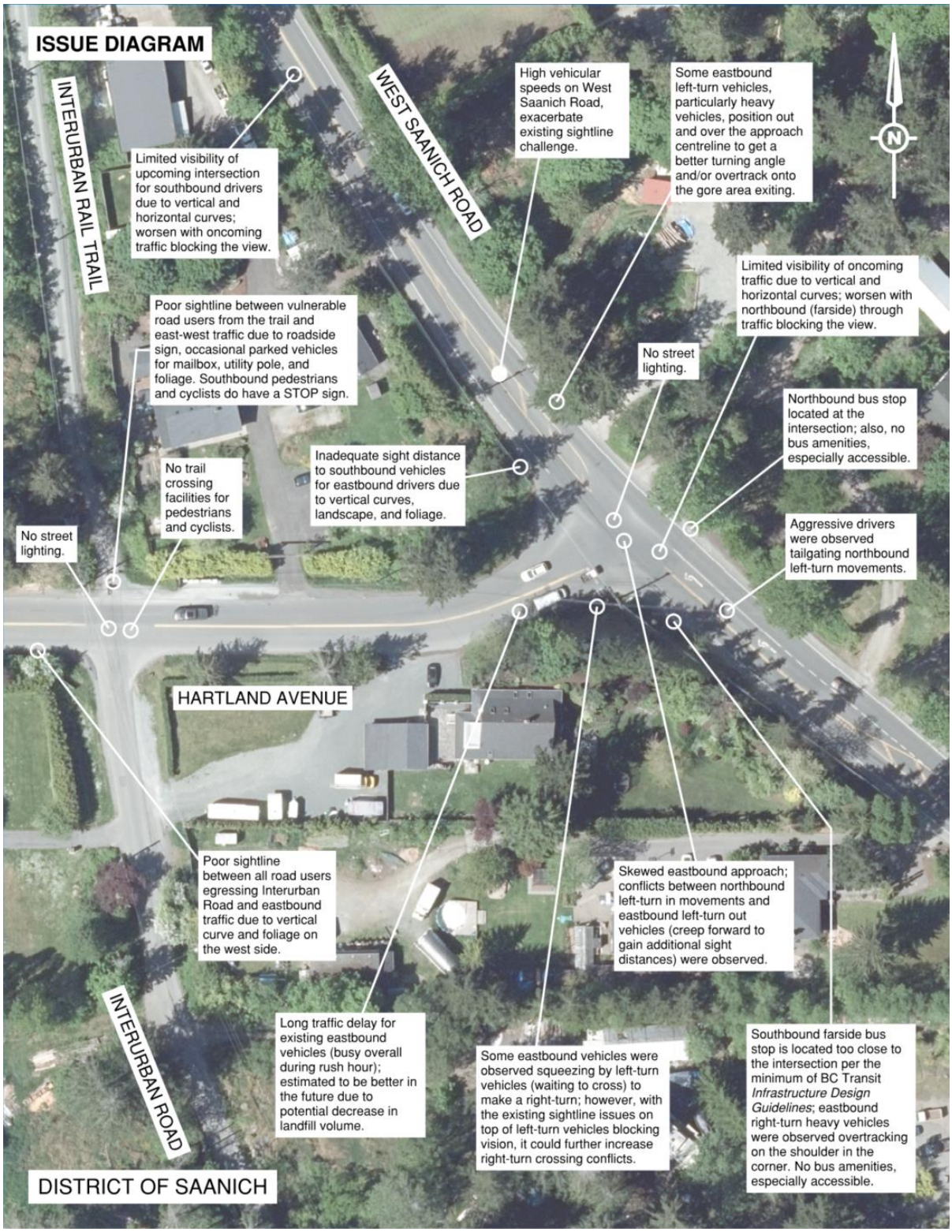


Figure 5.1: Identified Road Safety Issues – Hartland Avenue at West Saanich Road & Trail

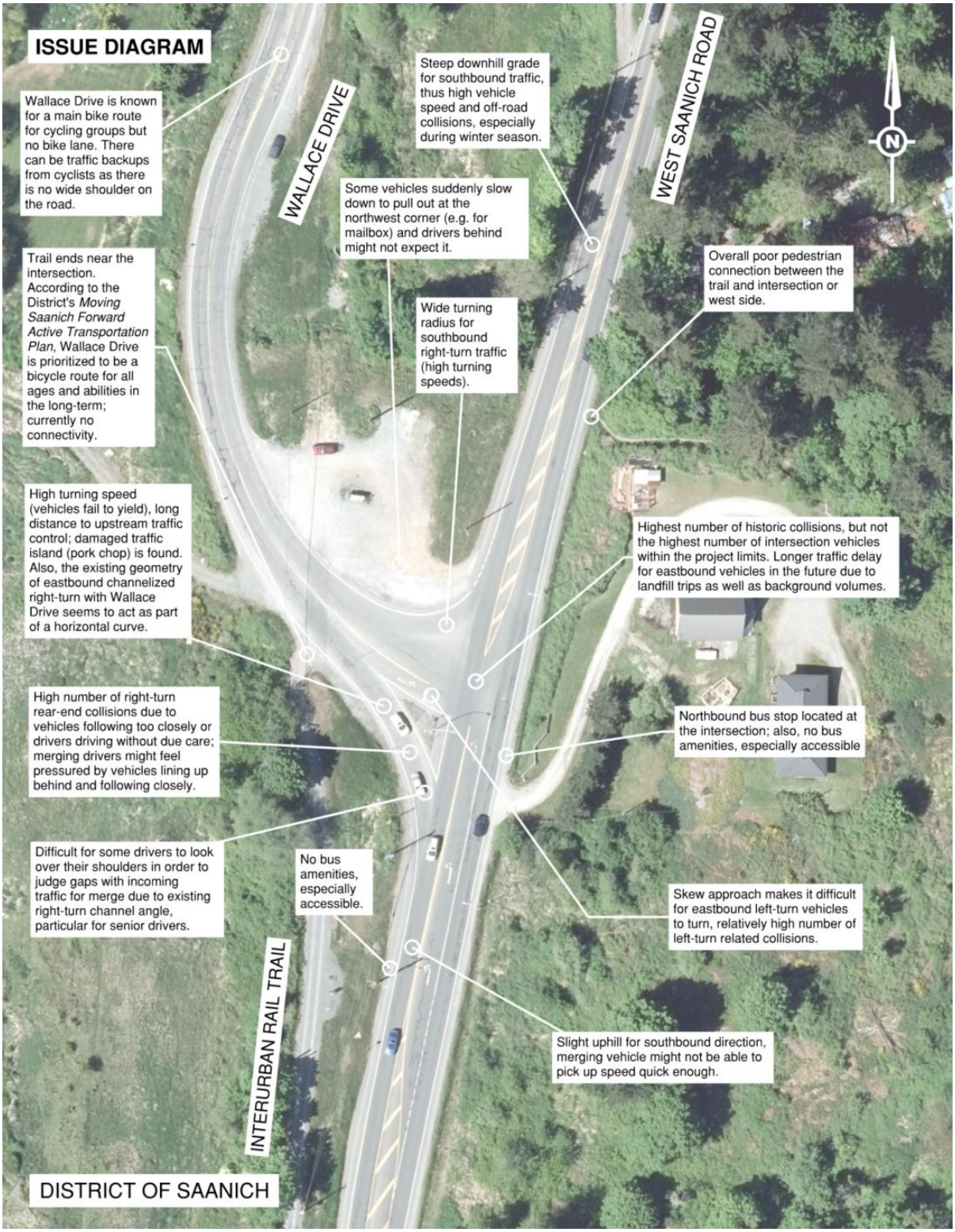


Figure 5.2: Identified Road Safety Issues – Wallace Drive at West Saanich Road & Trail

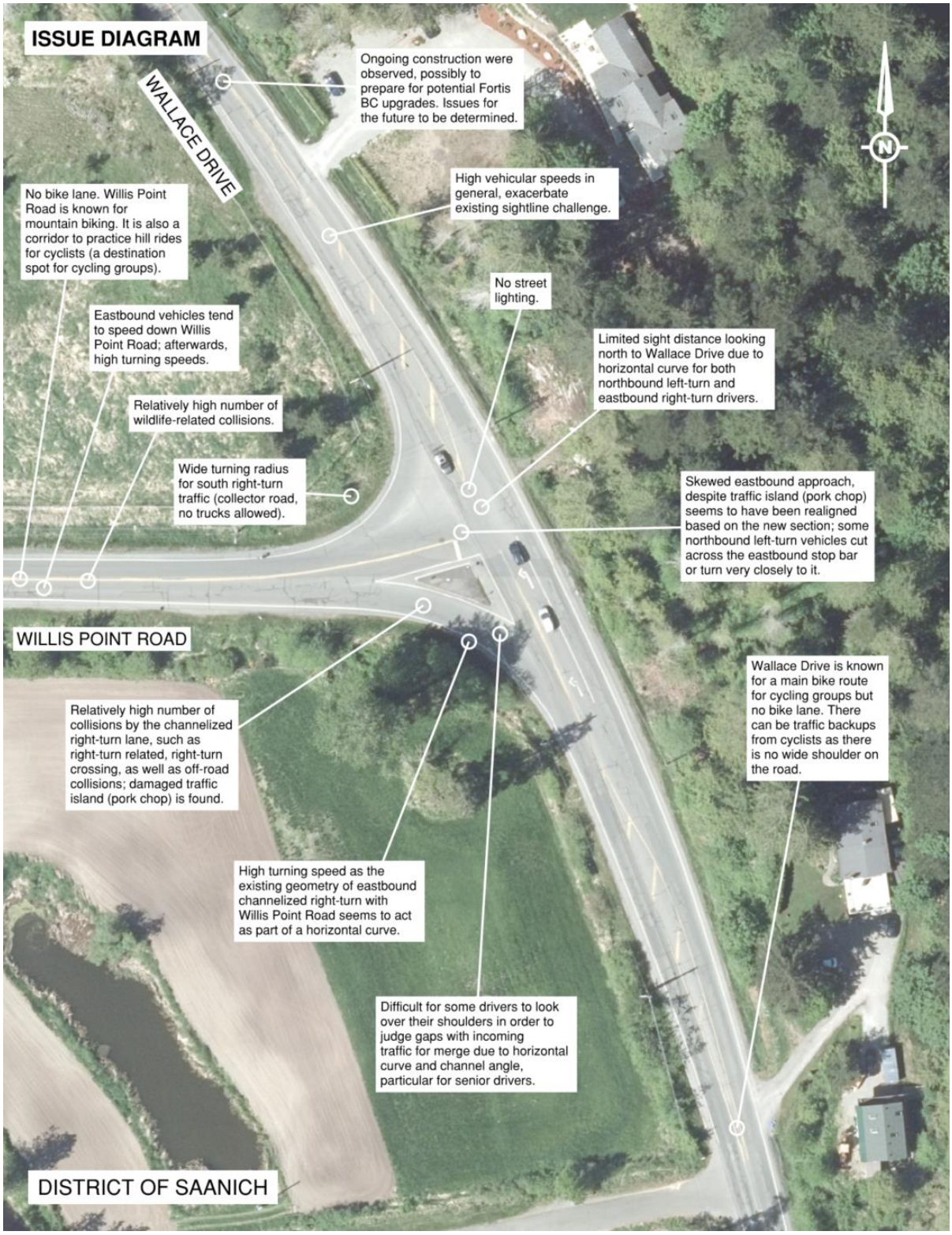


Figure 5.3: Identified Road Safety Issues – Willis Point Road at Wallace Drive

6.0 Recommended Countermeasures

To mitigate the road safety and traffic operations issues, site-specific recommended countermeasures, in the categories of operational, geometric, vulnerable users, and other, were developed and discussed in the following sections. Also taking into account the existing facilities, lists of countermeasures for the study intersections are summarized and illustrated in **Tables 6.1**, **6.2**, and **6.4** and **Figures 6.1** to **6.3**, respectively. It is expected that certain countermeasures would be part of the District's operations/maintenance program or need to be coordinated with other agencies.

It should be noted that recommendations were developed based on various transportation issues (e.g. road safety), rather than concerns solely caused by changes to the landfill access. When considering the following measures, thought should be given to their relationship with increases in background volume and magnitude. For instance, relocating all landfill traffic to the north would result in an approximate 16% increase in total volume at Willis Point Road / Wallace Drive in 2030 when compared with "do nothing", meanwhile a 4% increase at Wallace Drive / West Saanich Road.

Hartland Avenue at West Saanich Road & Interurban Rail Trail / Road

Table 6.1: Recommended Countermeasures – Hartland Avenue at West Saanich Road & Trail

Identified Issue	Recommended Countermeasure
Operational	
Poor traffic operations	Provide dedicated eastbound right-turn lane
Geometric	
Skewed intersection approach	Realign and/or extend eastbound approach; adjust intersection pavement markings
Inadequate sight distance	Modify landscape and/or trim foliage at the northwest corner of West Saanich Road
Vulnerable User	
Poor sightline to trail crossing	Provide sign and marked crosswalk with elephant feet for north-south crossing pedestrians and cyclists, including lighting improvements – **details to be followed**
No pedestrian facility	Provide "Pedestrian Improvements (at least 1 side)" between both study intersections to the southbound bus stop per the District's *Moving Saanich Forward Active Transportation Plan*
	Paint white edge line along Hartland Avenue; walkable shoulder per the British Columbia Ministry of Transportation and Infrastructure (the Ministry) *Active Transportation Design Guide* [preferably off-street]
Bus stop close to intersection	Relocate northbound bus stop to farside
	Relocate southbound bus stops further south
No accessible bus amenity	Provide bus stop amenities per the BC Transit *Infrastructure Design Guidelines*
On-street bus stops	Convert bus stops from on-street to full pullout bay with dash bike lane lines
Other	
Limited intersection visibility	Provide an Intersection Ahead sign for southbound traffic
Missing street lighting	Confirm overall street lighting is sufficient
Difficult to see markings at night	Maintain/upgrade reflective pavement markers
Insufficient sight distances	Trim foliage regularly

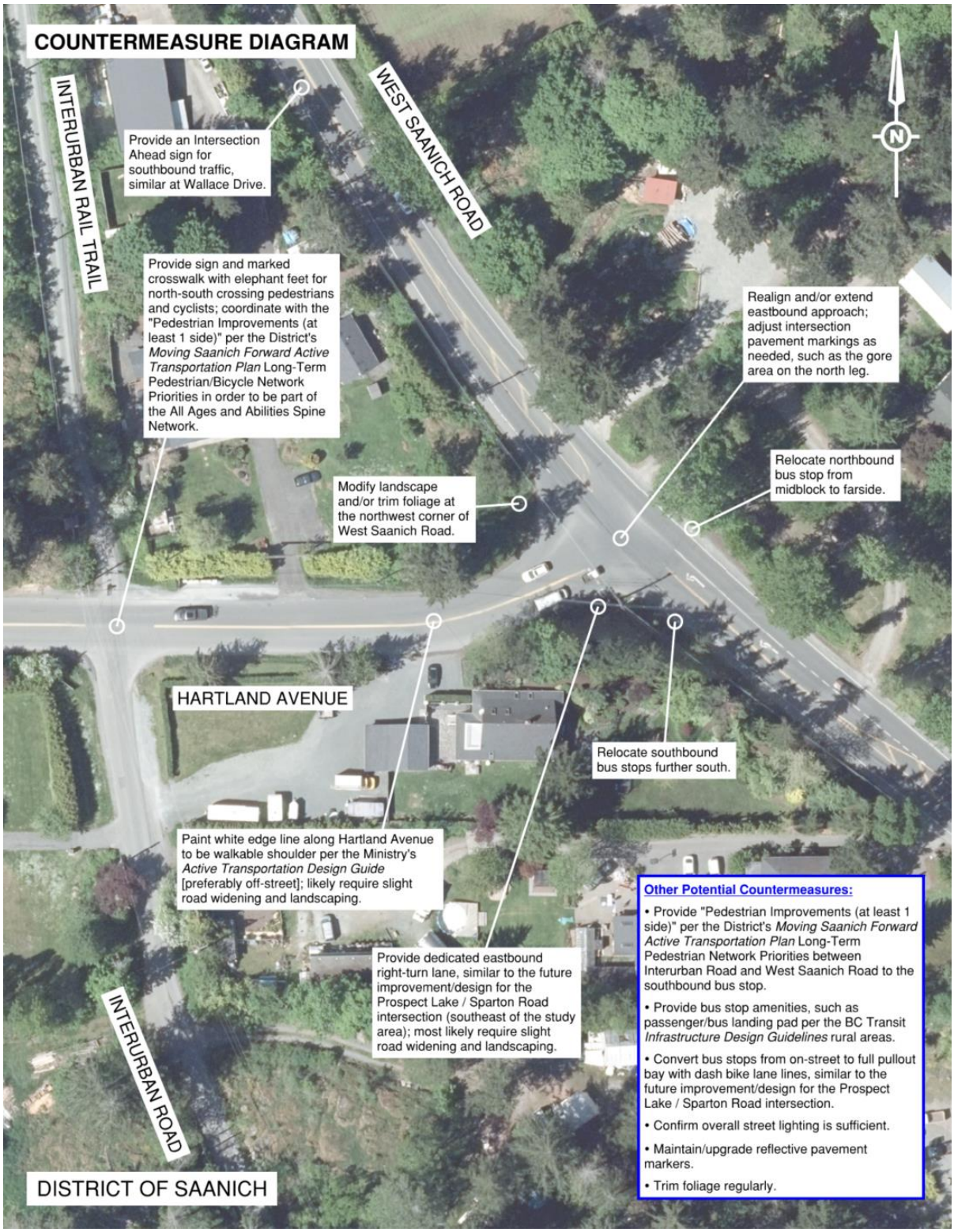


Figure 6.1: Recommended Countermeasures – Hartland Avenue at West Saanich Road & Trail

Provide sign and marked crosswalk with elephant feet for north-south crossing pedestrians and cyclists

The TAC *Pedestrian Control Guide* is a decision support tool which helps determine whether a location could be considered for pedestrian crossing facilities and what treatment would be most appropriate. The process begins with a preliminary assessment, which helps determine if the location should be considered for a crossing facility. This preliminary assessment considers three indicators, and at least two of three must be satisfied in order to be considered for pedestrian crossing facility. The three indicators are as follows:

First Indicator: Minimum Average Hourly Pedestrian Volume
For the first indicator the location must satisfy both the minimum requirements for crossing pedestrians and vehicle traffic volumes. The minimum number of crossing pedestrians is 15 Equivalent Adult units (EAUs), and the minimum vehicle traffic volume is 1,500 vehicles per day. It was found that during the surveyed six-hour, a total of about 30 crossing pedestrians were observed, an average of about five pedestrians per hour. This average pedestrian volume is below the minimum 15 EAUs required to satisfy this indicator; that said, the highest peak hour (PM) volume observed was 17 EAUs. This indicator condition was not met. However, it was noted that the survey was conducted after rainy weather with wet surfaces, and as such a higher number of crossing pedestrians could potentially be observed during dry and nice weather, especially during summer.

Second Indicator: Proximity of Another Traffic Control
To satisfy the second indicator, the distance between the crossing location and the next closest alternative traffic control device is considered; this distance must be greater than 100 to 200 metres (m). The distance can vary depending on jurisdiction; however, due to a lack of sidewalks or shoulder pavement markings available, it is suggested a shorter distance be considered in this case as walking on the shoulder may not be desirable for pedestrians. The distance between Interurban Road and West Saanich Road is about 80 to 90 m, depending on the side of implementation and if the eastbound approach of West Saanich Road is to be realigned; thus, this condition is considered met.

Third Indicator: Does it provide system connectivity or is it a pedestrian desire line?
The third indicator is to determine whether the crossing location could provide continuity or encourage pedestrian network connections in the neighborhood. Even if the pedestrian volumes are not indicative of requiring a crossing, the location could be deemed important enough based on the layout of the rest of the pedestrian network and could encourage additional pedestrian trips with the implementation of the crossing. This indicator is determined using engineering judgement and neighborhood context. The crossing location is proposed along the trail. This connection is planned to be utilized by all ages and abilities in the future. Therefore, it could be identified that this crossing could provide system connectivity and a desire line. In this case, the third indicator condition is met.

Therefore, since at least two of the three indicators could be met, the provision of a north-south pedestrian crossing could be considered at the intersection of Interurban Rail Trail / Road at Hartland Avenue. Based on the Treatment Selection Matrix (appropriate crossing facility type), with less than average 4,500 vehicles per day, vehicle speed limit of 50 km/hr or less, and a total of two lanes (one in each direction), twin parallel line or zebra crosswalk markings with side-mounted signs on both sides of the road are suggested, as opposed to a rectangular rapid flashing beacon (RRFB). For this trail, it should also provide ‘elephant feet’ for north-south crossing bicycles in addition to the sign and marked crosswalk as well as lighting improvements.

Wallace Drive at West Saanich Road & Interurban Rail Trail

Table 6.2: Recommended Countermeasures – Wallace Drive at West Saanich Road & Trail

Identified Issue	Recommended Countermeasure
Operational	
High vehicle-vehicle conflicts	Modify the eastbound right-turn lane, consider "unchannelizing" (removing) the existing laning configuration to convert it back to a standard dedicated lane/bay with stop control (sign); similar to the future improvement/design for the Prospect Lake / Sparton Road intersection (southeast of the study area) – **see the following Multiple Account Evaluation section for details**
Geometric	
Skewed intersection approach	Realign the eastbound left-turn lane; might be supported by extending traffic island
Wide turning radius	Reduce the southbound right-turn radius
Vulnerable User	
Discontinued trail and crossing	Extend the off-street trail further north along Wallace Drive to Willis Point Road, with crossing treatment further down Wallace Drive and/or modify this intersection, trail, and mailbox area
No pedestrian facility	Provide "Pedestrian Improvements (at least 1 side)" along West Saanich Road and Wallace Drive, connecting to both east/west trails and bus stops, per the District's *Moving Saanich Forward Active Transportation Plan*
Inadequate bicycle facility	Widen shoulders to be accessible by bicycles per the Ministry's *Active Transportation Design Guide* [preferably off-street]
	Increase trail sign or add additional Share Road signage for cyclists [preferably off-street]
Bus stop close to intersection	Relocate northbound bus stops from midblock to farside, possibly closer to the northeast trail.
No accessible bus amenity	Provide bus stop amenities per BC Transit *Infrastructure Design Guidelines*
On-street bus stop	Convert bus stops from on-street to full pullout bay with dash bike lane lines
Other	
Relatively high vehicular speeds	Provide a speed reader board for southbound traffic
	Install anti-skid pavement for southbound approach
	Increase police enforcement for vehicle speeding or unsafe movements
Missing street lighting	Confirm overall street lighting is sufficient
Difficult to see markings at night	Maintain/upgrade reflective pavement markers
Insufficient sight distances	Trim foliage regularly

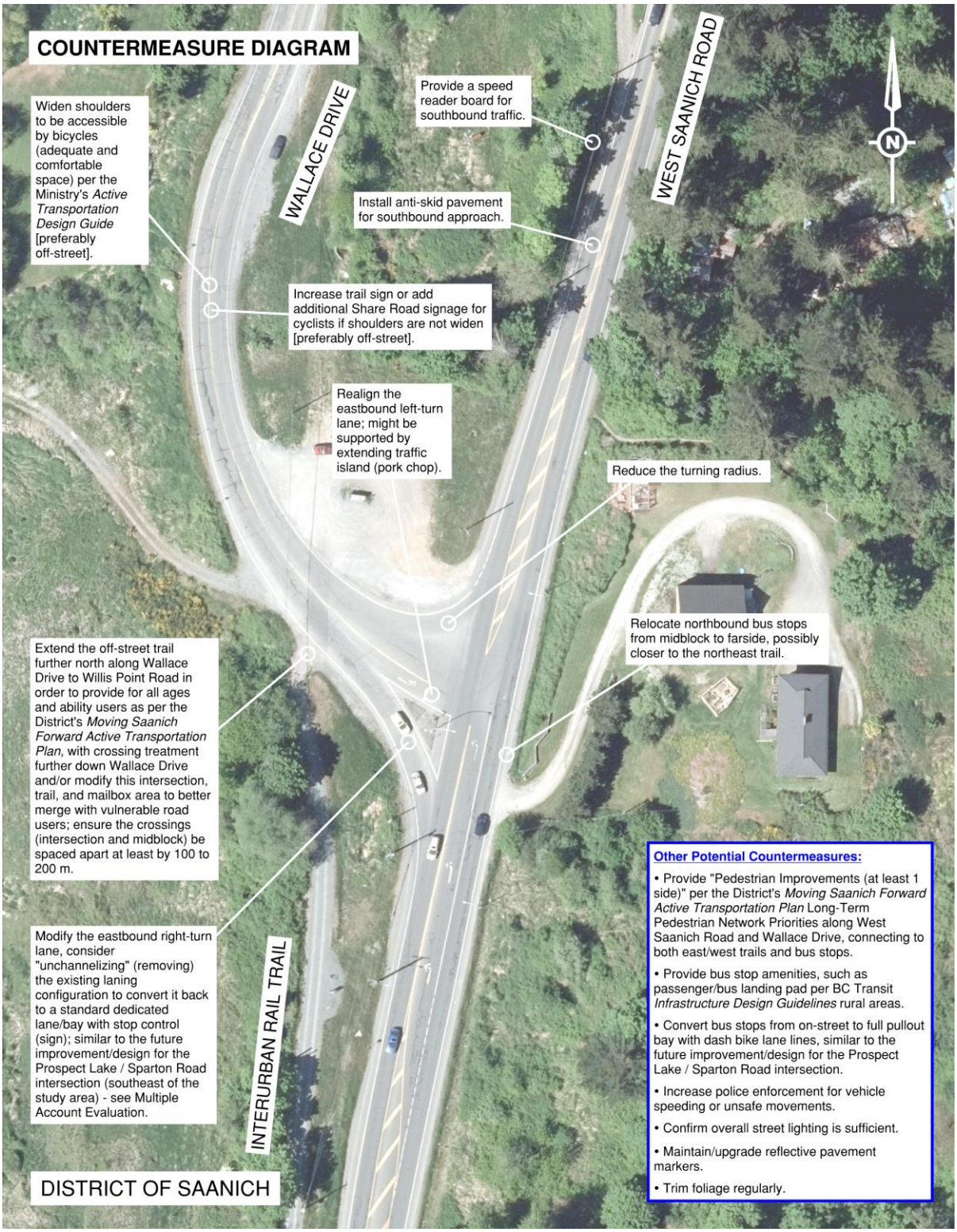


Figure 6.2: Recommended Countermeasures – Wallace Drive at West Saanich Road & Trail

Modify the eastbound right-turn lane

To improve the eastbound right-turn movements, three alternative options were developed:

- **Option 1: Conversion from Yield to Stop Control –** Laning configuration will remain the same.
- **Option 2: Smart Channel with Yield Condition** – It is noted that the current geometry of the northwest channelized island is conventional. Therefore, with the conversion of the traffic control to yield condition, the installation of a high-entry angle channel, also known as Smart Channel, could be considered for the following reasons: decreased turning speed more consistent with yield condition due to increased entry angle; reduced viewing requirement for motorists and less neck rotation required for motorists; and increased visibility of pedestrians/cyclists if crossing to/from the pork chop. However, there is a possibility that the presence of both left and right turn vehicles may block the driver's visibility of each other. Therefore, the feasibility and effectiveness of the Smart Channel installation should be reviewed and verified in the detailed design. To further improve the safety operation, the yield sign could also be converted to a stop sign (similar to previous recommendation); however, driver noncompliance may still be encountered.
- **Option 3: "Unchannelizing" to convert back to a standard laning configuration** – Channelized island will be converted to provide a standard dedicated right-turn lane with stop control (sign).

To assess which improvement option provides the most effective solution to the identified issues, a simplified Multiple Account Evaluation method was adopted (**Table 6.3**). Various evaluation criteria were reviewed, and some were selected from the following categories: traffic operations, vehicle safety, vulnerable road users, and other (construction cost and land impact):

Table 6.3: Multiple Account Evaluation (MAE) for Eastbound Right-Turn

Evaluation Criteria		Option 1 Convert to Stop Control	Option 2 Implement Smart Channel with Yield	Option 3 "Unchannelizing" back to standard laning
Traffic Operations	Average Right-Turn Delay	○	◎	●
	95th Percentile Queue	○	◎	◎
	Heavy Vehicle Turning Path	◎	◎	◎
Vehicular Safety	Vehicle-Vehicle Conflicts	◎	○	◎
	Visibility to Oncoming Traffic	◎	●	○
	Right-turn Rear End	◎	●	●
	Drivers' Compliance	◎	◎	●
Vulnerable Road Users	Safety	◎	◎	●
Other	Construction Cost	◎	○	○
	Land Impact	◎	◎	◎

Legend: ● (positive impact) → ◎ (minimal or no impact) → ○ (negative impact)

No weighting was assigned to the above MAE criteria for CRD's consideration, while the combined effect of each option was determined from the number of positive and negative impacts. Accordingly, it is identified that Option 3: Removal of Channelized Island (provision of dedicated right-turn lane) has more positive and less negative impacts and is thus considered as the recommended solution.

Willis Point Road at Wallace Drive

Table 6.4: Recommended Countermeasures – Willis Point Road at Wallace Drive

Identified Issue	Recommended Countermeasure
Operational	
High vehicle-vehicle conflicts	Modify the eastbound right-turn lane, consider removing channelized island and adding dedicated lane; similar to the future improvement/design for the Prospect Lake / Sparton Road intersection (southeast of the study area) – **see the previous Multiple Account Evaluation section for reference**
Geometric	
Wide turning radius	Reduce the southbound right-turn radius
Vulnerable User	
Insufficient pedestrian facility	Provide off-street trail along Willis Point Road and Wallace Drive connecting to Interurban Rail Trail by West Saanich Road in order to provide for all ages and ability users as per the District's *Moving Saanich Forward Active Transportation Plan*
Inadequate bicycle facility	Classify and provide bicycle lane along Willis Point Road to be part of the bicycle network in the future as per the Long-Term Bicycle Network Priorities of the District's *Moving Saanich Forward Active Transportation Plan*, especially separating further from recreational and commercial vehicles after relocation of Hartland Landfill primary access
	Widen shoulders to be accessible by bicycles (adequate and comfortable space) per the Ministry's *Active Transportation Design Guide* [preferably off-street]
	Increase trail sign or add additional Share Road signage for cyclists [preferably off-street]
Other	
Unexpected crossing wildlife	Provide wildlife signage to alert east-west motorists
Relatively high vehicular speeds	Increase police enforcement for vehicle speeding or unsafe movements
Missing street lighting	Confirm overall street lighting is sufficient
Difficult to see markings at night	Maintain/upgrade reflective pavement markers
Insufficient sight distances	Trim foliage regularly

Figure 6.3: Recommended Countermeasures – Willis Point Road at Wallace Drive

7.0 Design Concept and Cost Estimate

Based on the identified transportation-related issues and recommended countermeasures, CRD provided ISL with a list of improvement measures for each study intersection to be included in conceptual design and cost estimate.

Where applicable, mitigation measures for all road users are presented with conceptual drawings (overlaying aerial photograph as the base) for the study intersections, such as geometric changes. Notes with respect to impacts to slopes, landscapes (retaining walls), ditches, utility poles, trees (removals), as well as property lines (rights-of-way) are included. Truck turning paths were analyzed using a HSU (heavy single-unit) design vehicle (i.e. vehicle can make all movements in the lane) as well as WB-20 (20-m wheelbase) control vehicle (i.e. may track over truck apron, bike lane, etc.). For major traffic control modifications and laning reconfigurations, a summary of the forecasted traffic operations was also assessed and provided. All conceptual designs can be found in **Appendix A**.

Cost estimates (Class D with 40% contingency) were developed for each of the associated recommendations based on the latest unit rates for construction materials and devices. All design concepts considered solutions that reduce the maintenance burden on the road authorities and adjacent property owners. Details regarding the cost estimates can be found in **Appendix B**.

If the District was to undertake a package of safety improvements, discussions with ICBC should occur to determine the resulting Road Improvement Program contribution. With continued cooperation between the District and ICBC, the study identifies opportunities to make the study area safer for all road users.

Design and Construction of Intersection Improvements where Wallace Drive meets West Saanich Road

The concept for the recommended countermeasures of Wallace Drive at West Saanich Road per Table 6.2 was designed and is shown as **Concept 1**. Some highlights of the intersection improvement measures include:

- Eastbound right-turn bay with stop control, converted from the existing channelization (removal). The right-turn storage length is designed to be about 35 m long (accommodating about six vehicles), based on the 95th percentile queue (from SimTraffic analysis results) of the 2030 PM peak hour worst-case scenario (commercial & residential accesses relocation). The intersection LOS as a whole improved to A, with eastbound right-turn movement operating at LOS B during the AM peak hour and LOS D during the PM peak.
- Enhanced pedestrian/bicycle connections, especially between Caldecot Park and Interurban Rail Trail (also extended further downstream of Wallace Drive south side).
- Speeder Reader Board for southbound drivers, West Saanich Road upstream per the TAC *Application Guidelines for Speed Display Devices* with consideration of existing slope and visibility.
- Shifted access to the existing mailbox gravel area (northwest), further down Wallace Drive.

The estimated total cost of the recommended countermeasures (per Table 6.2) for the Wallace Drive and West Saanich Road stop-controlled (one-way) intersection is approximately **$560,000**.

Two additional improvement options (signalization and roundabout) were requested and tested for this study intersection to potentially improve traffic operations as well as address safety concerns. Note these measures were not included in Table 6.3 for consideration due to proposing a different traffic control type, whereas this study's MAE focused on the individual eastbound right-turn movement.

SIGNALIZATION

A conceptual design for a signalized intersection at Wallace Drive and West Saanich Road was developed as is shown as **Concept 2**. In addition to new traffic signal heads and pedestrian lights with push buttons, this concept, in terms of overall geometry, is similar to the previous concept (unsignalized intersection). Based on results of the warrant analyses, a signal may be warranted in 2030. The baseline conditions and 2024 horizon scenarios did not warrant a signal.

Based on 2030 analysis, the implementation of a full traffic signal at this intersection would have several effects when compared with an unsignalized intersection. During the AM peak hour, it was found that LOS improved from B to A for both eastbound movements. Similarly, eastbound approach improved from LOS D to B during the PM peak. Although the northbound left-turn queue increased, the 95th percentile queue was less than the existing storage length.

The estimated total cost of the recommended countermeasures (per Table 6.2) for the Wallace Drive and West Saanich Road intersection with full traffic signal is approximately **$782,000**.

ROUNDABOUT

The concept for raised one-lane roundabout with traversable apron option was assessed as an alternative to the signal option to improve the LOS in the 2024 horizon and is shown as **Concept 3**. However, to test the worst-case scenario, traffic operation performance of 2030 peak hours with both commercial and residential accesses relocated were analyzed. SIDRA Intersection (Version 8) software was used, and the default settings (e.g. entry radius/angle) were generally applied in reference to the Ministry's *Supplement to TAC Geometric Guide* (e.g. environmental factor). Island diameter of about 30 m for the roundabout was modelled based on the TAC *Canadian Roundabout Design Guide.*

In 2030, this roundabout is expected to operate at acceptable levels (LOS A/B for overall and individual) during both peak hours; that is, including improving eastbound approach from LOS E/F to LOS A/B. No significant issues were noted with the v/c ratios or queue lengths at any of the approaches.

In order for heavy trucks to turn safely, the roundabout would be realigned, mainly for the south leg. Other various changes were also made to minimize potential vehicle-bicycle conflicts, such as transition ramps for cyclists between on-street bike lane and sidewalks/trails. The residential driveway on the southeast side is recommended to be shifted further north and prior to the Caldecote Park.

The estimated total cost of the recommended countermeasures (per Table 6.2) for the Wallace Drive and West Saanich Road roundabout is approximately **$1,964,500**.

Design and Construction of Intersection Improvements where Wallace Drive meets Willis Point Road

The concept for the recommended countermeasures of the Willis Point Road and Wallace Drive intersection per Table 6.4 was designed and is shown as **Concept 4**. Some highlights of the improvement measures include:

- Eastbound right-turn bay with stop control, converted from the existing channelization (removal). The right-turn bay has a storage length of 20 m, which is able to accommodate the 20 m (95th percentile queue) modelled in the 2030 PM peak hour (assuming both accesses relocated). The intersection continues to operate at LOS A during both peak hours and all horizon years, with the eastbound approach operating at LOS B.
- Interurban Rail Trail on the southwest quadrant of Wallace Drive and Willis Point Road.

The estimated total cost of the recommended countermeasures (per Table 6.4) for the Willis Point Road and Wallace Drive stop-controlled (one-way) intersection is approximately **$207,500**.

A mini-roundabout concept was requested and tested for this study intersection to potentially improve traffic operations and address safety concerns

MINI-ROUNDABOUT

The mini-roundabout was conceptually designed for the Wallace Drive and Willis Point Road intersection and is shown as **Concept 5**. Similar to assessing the Wallace Drive and West Saanich Road roundabout using SIDRA, a one-lane mini-roundabout (20 m in diameter with fully traversable apron) was also tested for this location during the 2030 peak hours (scenario with both commercial and residential accesses relocated), and all movements were found to operation at LOS A. In other words, the eastbound approach performance improved from LOS B. No significant issues were noted with the v/c ratios or queue lengths at any of the approaches.

The estimated total cost of the recommended countermeasures (per Table 6.4) for the Willis Point Road and Wallace Drive mini-roundabout is approximately **$1,137,000**.

Design and Construction of Trailhead Improvements where the Interurban Rail Trail crosses Wallace Drive

Improvements to the pedestrian/bicycle crossing at Wallace Drive to/from the Interurban Rail Trail were incorporated into the Wallace Drive and West Saanich Road intersection improvement (west leg approach) conceptual designs (Concepts 1, 2, and 3).

Implementation of Electronic Signalling to Control Commercial Vehicle Flow on Willis Point Road

High-level cost of implementing a signalized intersection at the relocated Hartland Landfill commercial access (residuals treatment facility) and Willis Point Road (not part of the study area) was also requested at a later stage of this project.

The estimated total cost this intersection improvement measure is approximately **$250,000**. This cost is based on electrical improvements and does not include civil related improvements.

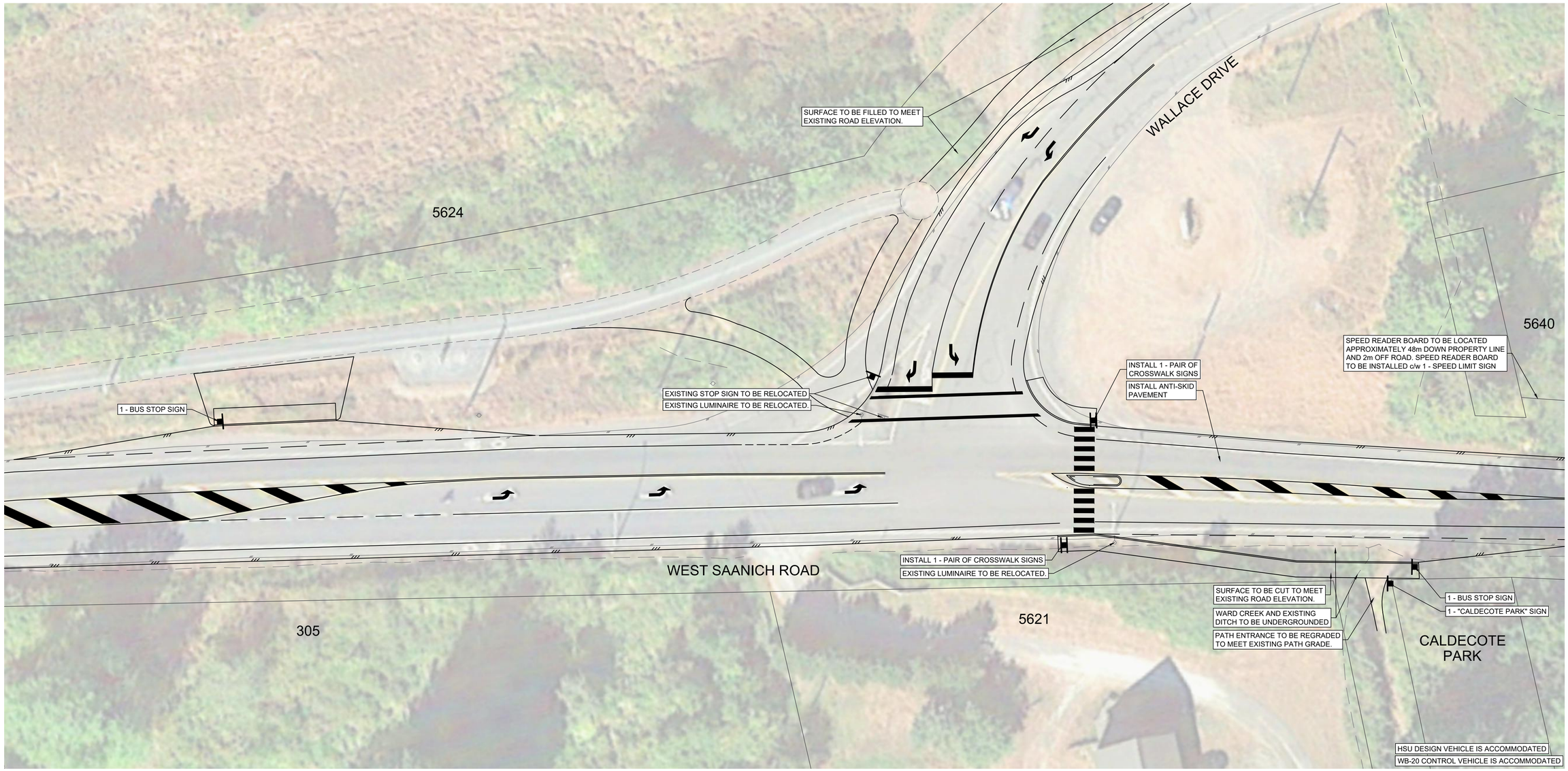
Design and Construction of Recommended Countermeasures at Hartland Avenue and West Saanich Road & Interurban Rail Trail

Concepts for the recommended countermeasures along Hartland Avenue between West Saanich Road and Interurban Rail Trail / Interurban Road per Table 6.1 were designed and are shown as **Concept 6**. Some highlights of the improvement measures include:

- Eastbound left-turn bay with a storage length of about 15 to 20 m, accommodating the simulated 95th percentile queues during 2030 PM peak hours (assuming only commercial access relocation). The intersection as a whole operates at LOS A regardless of peak hour or horizon, although the eastbound movement operates at LOS D during the 2030 PM peak hour and LOS B during the 2030 AM peak hour.
- Enhanced pedestrian/bicycle connections, including signs and marked crosswalk with elephant feet for north-south pedestrians and cyclists as well as mailbox gravel area (north of Hartland Avenue) at the Interurban Rail Trail / Interurban Road.

The estimated total cost of the recommended countermeasures (per Table 6.1) along the Hartland Avenue stop-controlled intersections between West Saanich Road and Interurban Rail Trail / Interurban Road is approximately **$584,500**. Additional line item with cost for rectangular rapid flashing beacons and equestrian height buttons (**$21,000**) was requested and included in the estimate separately.

APPENDIX A
Conceptual Design Drawings



PLAN: WALLACE DR AT WEST SAANICH RD CONCEPT
1:250

CONCEPT 1
WALLACE DRIVE AND WEST SAANICH ROAD

1:250 0 5 15m

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1620 Cook St, Victoria, BC V8T 3P1
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WALLACE DR AT WEST SAANICH RD

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CONTRACT NUMBER	-	DRAWING NUMBER	CONCEPT 1	ISSUE	1	SHT. No.	1 OF 1

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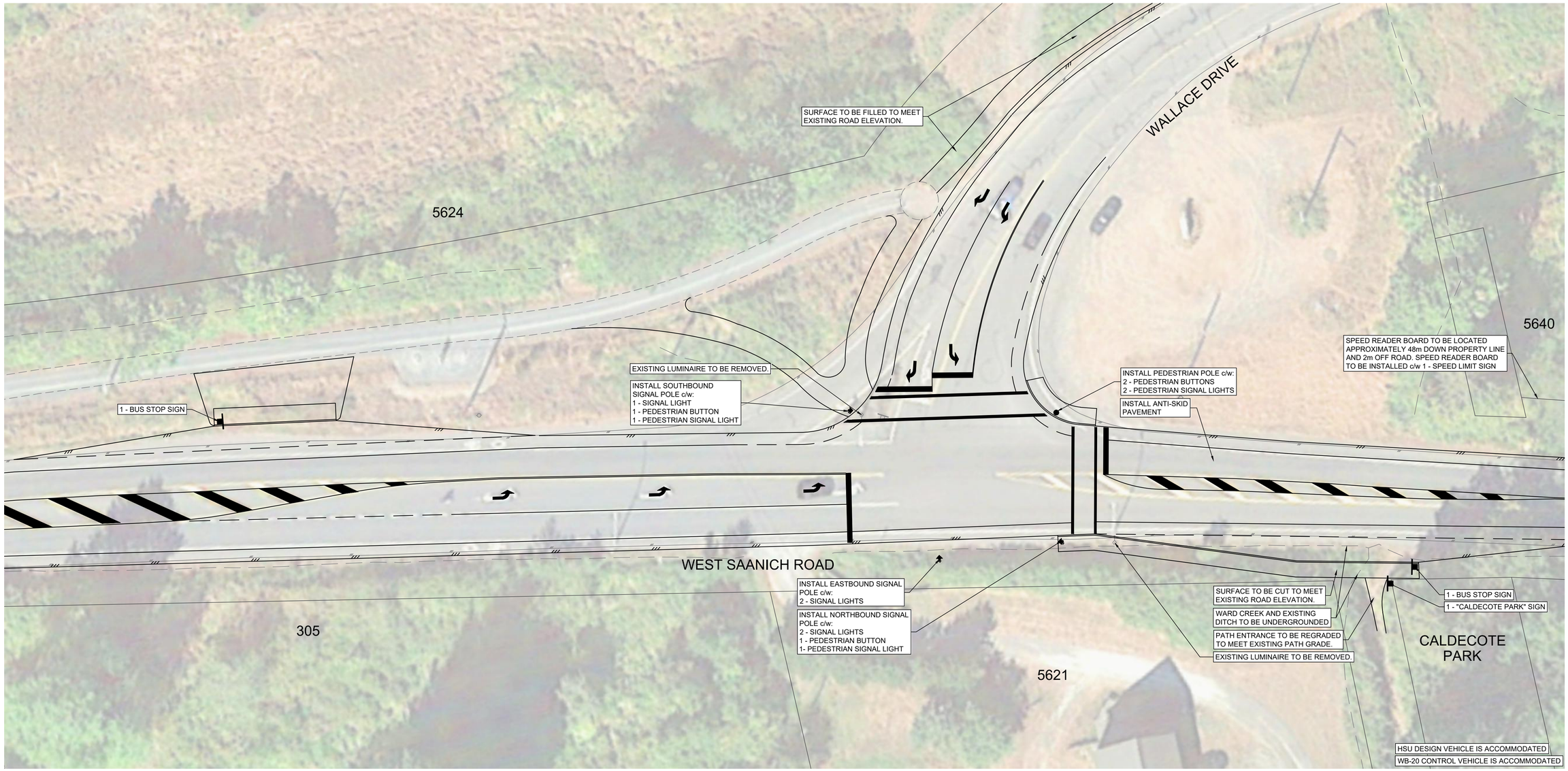
PLOT DATE: April 14, 2022



PLAN: WALLACE DR AT WEST SAANICH RD CONCEPT
1:250

CONCEPT 2
WALLACE DRIVE AND WEST SAANICH ROAD (SIGNALIZED)

1:250 0 5 15m

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WALLACE DR AT WEST SAANICH RD

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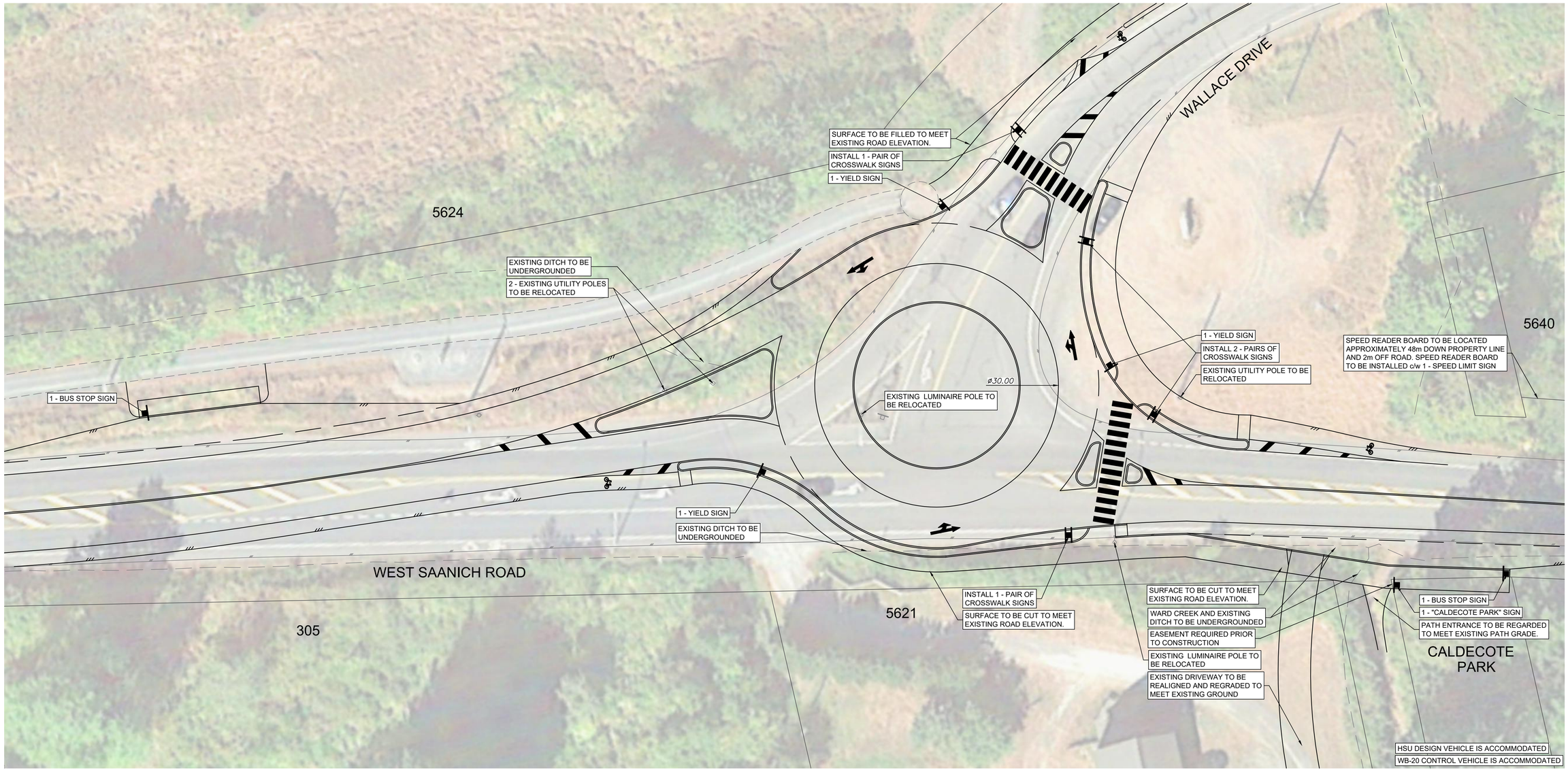

PLAN: WALLACE DR AT WEST SAANICH RD CONCEPT
1:250

CONCEPT 3
WALLACE DRIVE AND WEST SAANICH ROAD (ROUNDABOUT)

1:250 0 5 15m

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WALLACE DR AT WEST SAANICH RD

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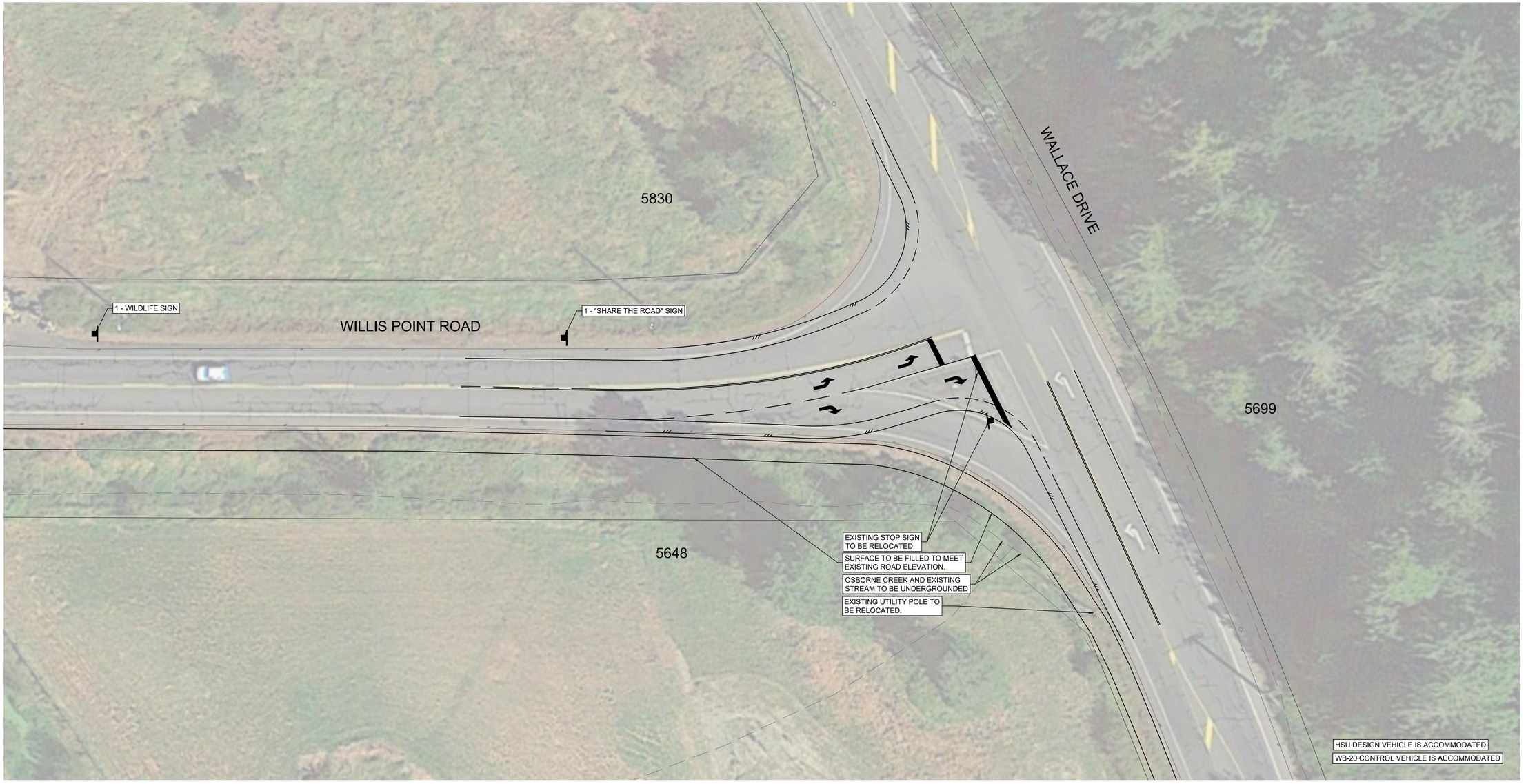

PLAN: WILLIS POINT RD AT WALLACE DR CONCEPT
1:250

CONCEPT 4
WILLIS POINT ROAD AND WALLACE DRIVE

1:250 0 5 15m

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WILLIS POINT RD AT WALLACE DR

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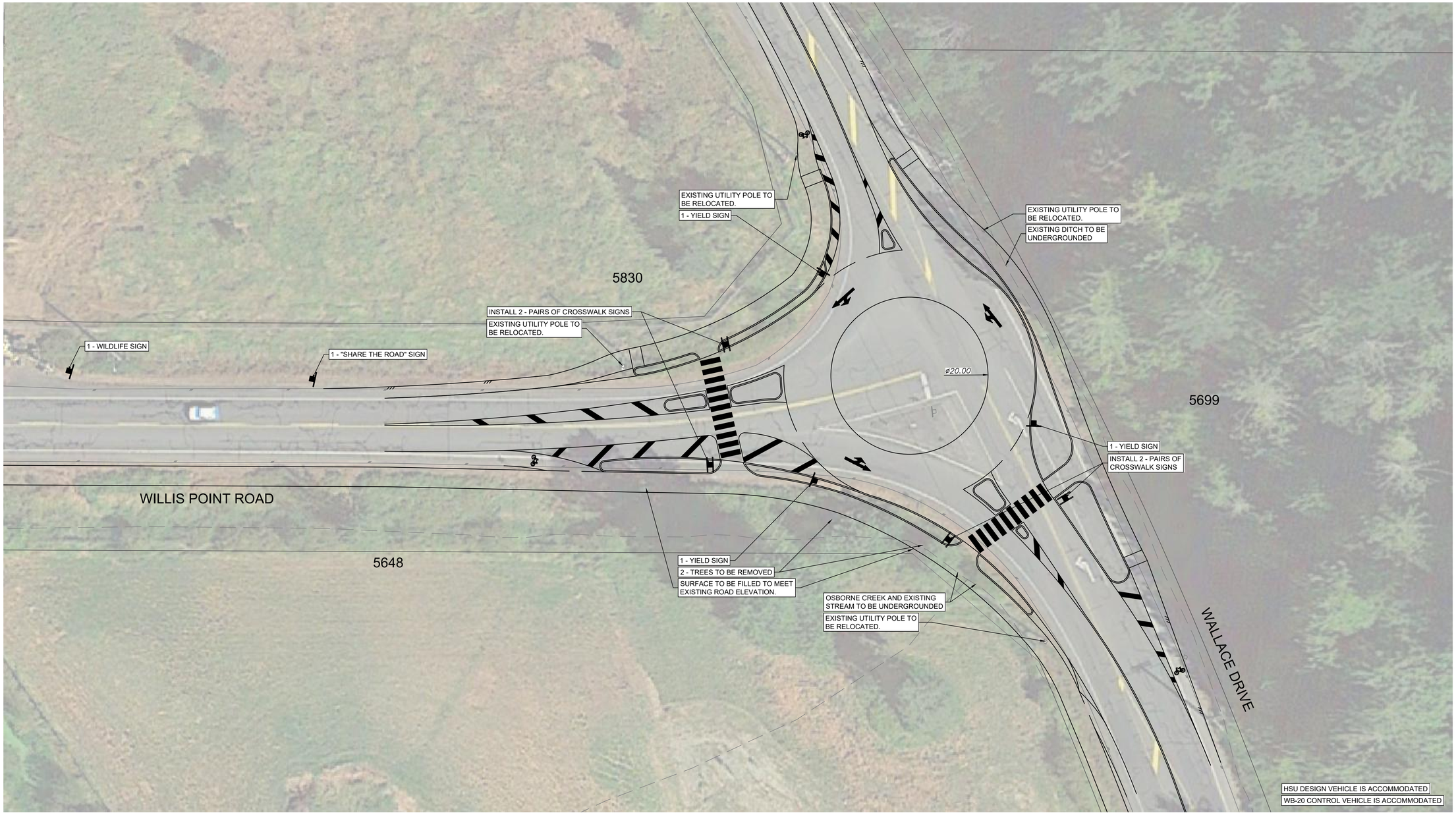

PLAN: WILLIS POINT RD AT WALLACE DR CONCEPT
1:250

CONCEPT 5
WILLIS POINT ROAD AND WALLACE DRIVE (MINI-ROUNDABOUT)

0 5 15m
1:250

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WILLIS POINT RD AT WALLACE DR

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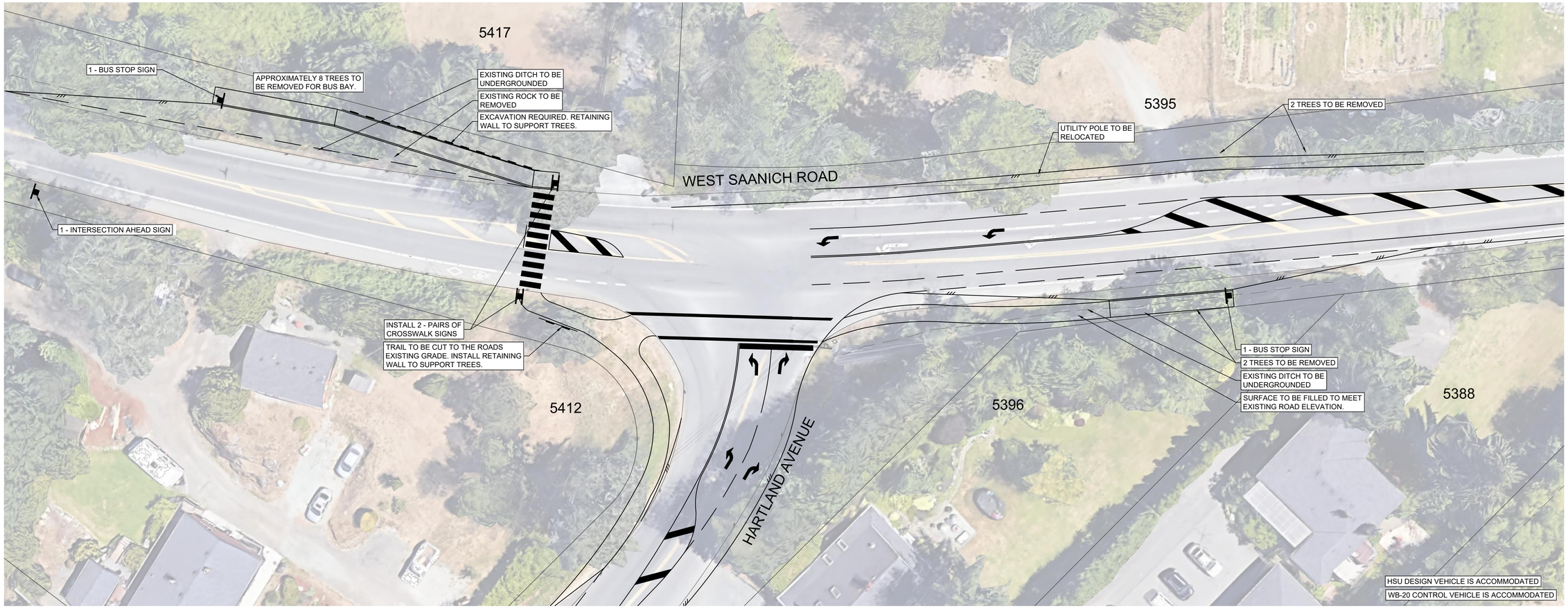

PLAN: HARTLAND AVE AT WEST SAANICH RD CONCEPT
1:250

CONCEPT 6
HARTLAND AVENUE AND WEST SAANICH ROAD

1:250 0 5 15m

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HARTLAND AVE AT WEST SAANICH RD

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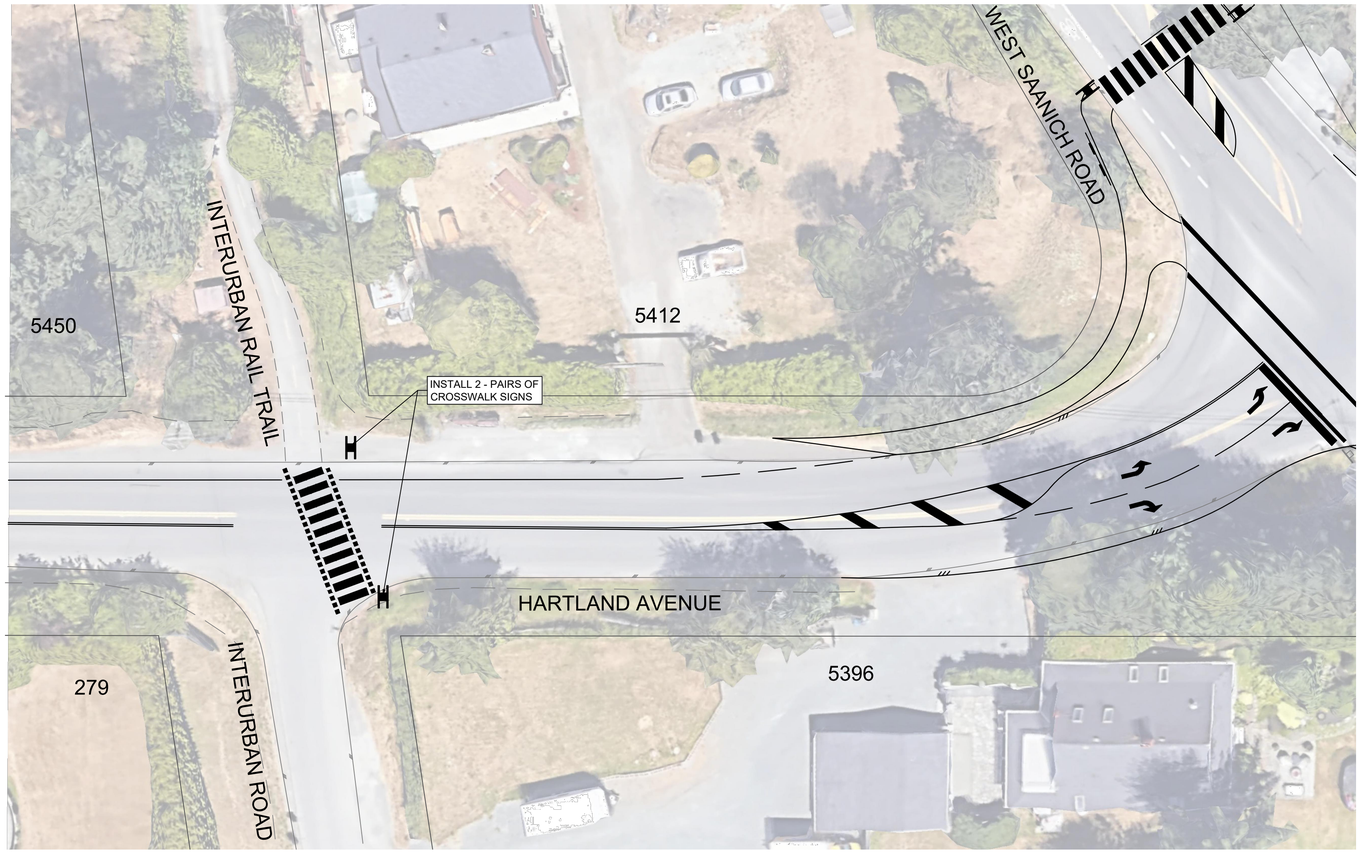

PLAN: HARTLAND AVE AT INTERURBAN RAIL TRAIL CONCEPT
1:250

CONCEPT 6
HARTLAND AVENUE AND INTERURBAN RAIL TRAIL / INTERURBAN ROAD

1:250 0 5 15m

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HARTLAND AVE AT INTERURBAN RAIL TRAIL

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PLOT DATE: April 14, 2022

APPENDIX B
Cost Estimate Tables

Recommended Countermeasure Cost Estimate

Concept 1: Wallace Drive and West Saanich Road

Item	Quantity	Unit	Unit Price	Total
Concept 1: Wallace Drive and West Saanich Road				
Removals - Asphalt and Concrete	1,450	square metre	$10.00	$14,500.00
Removals - Clearing and Grubbing	1	lump sum	$10,000.00	$10,000.00
Common Excavation	1,000	cubic metre	$25.00	$25,000.00
Third Party Relocations	1	lump sum	$10,000.00	$10,000.00
Drainage Allowance	1	lump sum	$25,000.00	$25,000.00
Retaining Wall Allowance	1	lump sum	$15,000.00	$15,000.00
Imported Gravel - Base and Subbase	800	tonne	$50.00	$40,000.00
Asphalt - Roadway	450	tonne	$250.00	$112,500.00
Asphalt - Pathway	300	square metre	$150.00	$45,000.00
Concrete - Sidewalks	140	square metre	$125.00	$17,500.00
Concrete - Curb/ Gutter	60	lineal metre	$150.00	$9,000.00
Concrete Medians	10	square metre	$250.00	$2,500.00
Pavement Markings and Signage	1	lump sum	$20,000.00	$20,000.00
Streetlighting Allowance	1	lump sum	$15,000.00	$15,000.00
Engineering Allowance (10%)	1	lump sum	$39,000.00	$39,000.00
			Total	**$400,000.00**
			Total (40% Contingency [Rounded])	**$560,000.00**

Concept 2: Wallace Drive and West Saanich Road (Signalized)

Item	Quantity	Unit	Unit Price	Total
Concept 2: Wallace Drive and West Saanich Road (Signalized)				
Removals - Asphalt and Concrete	1,450	square metre	$10.00	$14,500.00
Removals - Clearing and Grubbing	1	lump sum	$10,000.00	$10,000.00
Common Excavation	1,000	cubic metre	$25.00	$25,000.00
Third Party Relocations	1	lump sum	$10,000.00	$10,000.00
Drainage Allowance	1	lump sum	$25,000.00	$25,000.00
Retaining Wall Allowance	1	lump sum	$15,000.00	$15,000.00
Imported Gravel - Base and Subbase	800	tonne	$50.00	$40,000.00
Asphalt - Roadway	450	tonne	$250.00	$112,500.00
Asphalt - Pathway	300	square metre	$150.00	$45,000.00
Concrete - Sidewalks	140	square metre	$125.00	$17,500.00
Concrete - Curb/ Gutter	60	lineal metre	$150.00	$9,000.00
Pavement Markings and Signage	1	lump sum	$20,000.00	$20,000.00
Streetlighting Allowance	1	lump sum	$15,000.00	$15,000.00
Traffic Signals Allowance	1	lump sum	$150,000.00	$150,000.00
Engineering Allowance (10%)	1	lump sum	$50,000.00	$50,000.00
			Total	**$558,500.00**
			Total (40% Contingency [Rounded])	**$781,900.00**

Concept 3: Wallace Drive and West Saanich Road (Roundabout)

Item	Quantity	Unit	Unit Price	Total
Concept 3: Wallace Drive and West Saanich Road (Roundabout)				
Removals - Asphalt and Concrete	4,000	square metre	$10.00	$40,000.00
Removals - Clearing and Grubbing	1	lump sum	$25,000.00	$25,000.00
Common Excavation	3,400	cubic metre	$25.00	$85,000.00
Third Party Relocations	1	lump sum	$60,000.00	$60,000.00
Drainage Allowance	1	lump sum	$60,000.00	$60,000.00
Retaining Wall Allowance	1	lump sum	$15,000.00	$15,000.00
Imported Gravel - Base and Subbase	5,000	tonne	$50.00	$250,000.00
Asphalt - Roadway	1,350	tonne	$225.00	$303,750.00
Asphalt - Pathway	650	square metre	$150.00	$97,500.00
Concrete - Sidewalks	30	square metre	$125.00	$3,750.00
Concrete - Curb/ Gutter	280	lineal metre	$150.00	$42,000.00
Concrete Medians	945	square metre	$250.00	$236,250.00
Pavement Markings and Signage	1	lump sum	$30,000.00	$30,000.00
Streetlighting Allowance	1	lump sum	$35,000.00	$35,000.00
Engineering Allowance (10%)	1	lump sum	$120,000.00	$120,000.00
			Total	**$1,403,250.00**
			Total (40% Contingency [Rounded])	**$1,964,500.00**

Concept 4: Willis Point Road and Wallace Drive

Item	Quantity	Unit	Unit Price	Total
Concept 4: Willis Point Road and Wallace Drive				
Removals - Asphalt and Concrete	500	square metre	$15.00	$7,500.00
Removals - Clearing and Grubbing	1	lump sum	$5,000.00	$5,000.00
Common Excavation	400	cubic metre	$25.00	$10,000.00
Third Party Relocations	1	lump sum	$10,000.00	$10,000.00
Drainage Allowance	1	lump sum	$15,000.00	$15,000.00
Retaining Wall Allowance	1	lump sum	$5,000.00	$5,000.00
Imported Gravel - Base and Subbase	500	tonne	$50.00	$25,000.00
Asphalt - Pathway	170	square metre	$150.00	$25,500.00
Pavement Markings and Signage	1	lump sum	$10,000.00	$10,000.00
Streetlighting Allowance	1	lump sum	$15,000.00	$15,000.00
Engineering Allowance (10%)	1	lump sum	$20,000.00	$20,000.00
			Total	**$148,000.00**
			Total (40% Contingency [Rounded])	**$207,200.00**

Concept 5: Willis Point Road and Wallace Drive (Mini-Roundabout)

Item	Quantity	Unit	Unit Price	Total
Concept 5: Willis Point Road and Wallace Drive (Mini-Roundabout)				
Removals - Asphalt and Concrete	2,500	square metre	$10.00	$25,000.00
Removals - Clearing and Grubbing	1	lump sum	$15,000.00	$15,000.00
Common Excavation	1,500	cubic metre	$25.00	$37,500.00
Third Party Relocations	1	lump sum	$50,000.00	$50,000.00
Drainage Allowance	1	lump sum	$50,000.00	$50,000.00
Retaining Wall Allowance	1	lump sum	$10,000.00	$10,000.00
Imported Gravel - Base and Subbase	2,000	tonne	$50.00	$100,000.00
Asphalt - Roadway	700	tonne	$250.00	$175,000.00
Asphalt - Pathway	750	square metre	$150.00	$112,500.00
Concrete - Curb/ Gutter	180	lineal metre	$150.00	$27,000.00
Concrete Medians	380	square metre	$250.00	$95,000.00
Pavement Markings and Signage	1	lump sum	$15,000.00	$15,000.00
Streetlighting Allowance	1	lump sum	$25,000.00	$25,000.00
Engineering Allowance (10%)	1	lump sum	$75,000.00	$75,000.00
			Total	**$812,000.00**
			Total (40% Contingency [Rounded])	**$1,136,800.00**

Concept 6: Hartland Avenue and West Saanich Road & Interurban Rail Trail / Interurban Road

Item	Quantity	Unit	Unit Price	Total
Concept 6: Hartland Avenue and West Saanich Road & Interurban Rail Trail / Interurban Road				
Removals - Asphalt and Concrete	280	square metre	$25.00	$7,000.00
Removals - Clearing and Grubbing	1	lump sum	$15,000.00	$15,000.00
Common Excavation	900	cubic metre	$25.00	$22,500.00
Third Party Relocations	1	lump sum	$20,000.00	$20,000.00
Drainage Allowance	1	lump sum	$25,000.00	$25,000.00
Retaining Wall Allowance	1	lump sum	$15,000.00	$15,000.00
Imported Gravel - Base and Subbase	1,400	tonne	$50.00	$70,000.00
Asphalt - Roadway	500	tonne	$250.00	$125,000.00
Asphalt - Pathway	300	square metre	$150.00	$45,000.00
Concrete - Sidewalks	60	square metre	$125.00	$7,500.00
Concrete - Curb/ Gutter	30	lineal metre	$250.00	$7,500.00
Pavement Markings and Signage	1	lump sum	$10,000.00	$10,000.00
Streetlighting Allowance	1	lump sum	$10,000.00	$10,000.00
Engineering Allowance (10%)	1	lump sum	$38,000.00	$38,000.00
			Total	**$417,500.00**
			Total (40% Contingency [Rounded])	**$584,500.00**
Additional Item for Concept 6: Hartland Avenue and Interurban Rail Trail / Interurban Road				
Rectangular Rapid Flashing Beacons and Equestrian Height Buttons	1	lump sum	$15,000.00	$15,000.00
			Total	**$15,000.00**
			Total (40% Contingency [Rounded])	**$21,000.00**