



**Proposed SilverBack Development
Sechelt, BC**

TRAFFIC IMPACT STUDY

Prepared for: **Porpoise Bay Developments**
Prepared by: **Bunt & Associates Engineering Ltd.**
File: **4536-01**
Date: **December, 2005**

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December 5, 2005

File No. 4536-01

Mr. Gabriel Khoury
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*Transportation Planners
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**Re: SilverBack Development, Sechelt, BC
Traffic Impact Study**

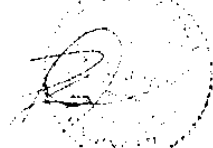
Dear Mr. Khoury:

Please find attached herewith our traffic impact assessment of the SilverBack Development proposed by Porpoise Bay Developments Ltd. The traffic report provides a comprehensive analysis of existing and projected future traffic conditions at key locations on the area road network, identifies road improvement requirements to mitigate anticipated traffic impacts, and describes various transportation demand management measures to encourage trips by non-automobile travel modes including walking, cycling, and public transit.

The methodology that we have used for the traffic study follows the procedures recommended by the Institute of Transportation Engineers (ITE), and the vehicle trip rates assumed for the component uses of the project either meet or exceed the trip rates reported in the ITE Trip Generation Handbook (7th Edition).

Thank you for the opportunity to be of assistance with this exciting project for the Sechelt area. Please call should you have any questions or require additional assistance.

Yours truly,
BUNT & ASSOCIATES


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SCHEDULE A

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1. INTRODUCTION

Bunt & Associates Engineering Ltd. has been retained by Porpoise Bay Developments to provide traffic and transportation planning advice for their SilverBack development proposal located in Sechelt, British Columbia.

The proposed development is a golf resort based residential project located on the Porpoise Bay waterfront just north of the community of Sechelt. The project features a new golf course and clubhouse, a hotel and conference centre, commercial uses, and up to approximately 1,600 residential homes and condominiums catering to both year-round and seasonal residents. It will be set out in the most sustainable manner to integrate the different land uses to reduce reliance on automobile trips and encourage walking and cycling trips within the community.

This report updates a previous Traffic Impact Study prepared by Bunt & Associates in May 2005. The update report takes into consideration the subsequent feedback from the District of Sechelt and the British Columbia Ministry of Transportation (MoT). Additionally, this report provides an opportunity to update the future traffic predictions adopted in the original report. In particular, the following areas have been revised:

- The seasonal adjustment factor for highway traffic;
- The composition of year-round versus seasonal (second home) residents;
- Changes to the composition of the commercial uses;
- Trip rates for the residential elements;
- Differing trip distribution patterns among the different land-uses;

The May 2005 report identified a number of highway improvements that would be required to accommodate the added traffic associated with the proposed development as well as general growth in area traffic (background traffic). This report separates out the improvements into those that are required to accommodate the development and those that are required to accommodate the forecast background traffic growth. It will establish at what point improved highway infrastructure is required to accommodate the proposed scheme, and this will determine the development staging strategy. In particular it will focus on:

- What, if any, changes are required to the existing road network to accommodate initial stage development of the SilverBack project;
- The impact of the planned new "Link Road" across Sechelt First Nations lands connecting Sechelt Inlet Road to the Sunshine Coast Highway 101 in terms of accommodating subsequent development of the SilverBack project.

This report will first review the existing traffic conditions before describing the development proposal. In the following sections the development proposal will be reviewed in the context of sustainability, background traffic, trip generation and distribution, and traffic operations. Overall it will provide a strategy for accommodating the traffic generated by the proposed development and provide guidance on the measures that can help to alleviate the effects of long term traffic growth.

2. EXISTING CONDITIONS

This section will describe existing conditions, including site context, surrounding land-uses, street network, and traffic operations. Also described are possible future road improvement considerations that may have bearing on the SilverBack development proposal. Reference will be made in passing to pedestrian, cycling and transit infrastructure, as these matters will be considered in more detail at Section 4 in the context of the development proposal.

SITE LAYOUT AND SURROUNDING LAND-USES

The development site is located some 4.5 kilometres north of Sechelt on Sechelt Inlet Road and its location is shown in **Exhibit 1**. It is generally set within natural wooded areas though bisected by the Sechelt Inlet Road with the main development area located to the east of this road.

ROAD NETWORK

The Sechelt Inlet Road / East Porpoise Bay Road corridor will form the main connection between the development site, Highway 101 and the Sechelt Town Centre area. This corridor operates generally as a two lane road (one lane per direction) though the width in some places is narrower than what would be recommended for a rural local standard road.

At the southern end of this corridor, East Porpoise Bay Road connects with Wharf Road to form a 4-way stop controlled intersection in Sechelt. This intersection has single lane approaches in all directions.

Further south, Wharf Road connects with Highway 101 and Dolphin Street. This intersection is signalized with pedestrian facilities across all four approaches. There are two lane approaches from the east, north and west. On the south approach, there is a single lane approach up to about 20 metres south of the stop line. At this point a dedicated right turn lane is formed which feeds into its own dedicated lane on eastbound Highway 101 leading away from the intersection.

The main traffic movements at this intersection are on Highway 101 which is reflected in the traffic signal phasing that features a left turn advance phase for the east to south movement along the highway and a dedicated right turn lane for the north to east movement. By observation the highway traffic movements through this intersection, particularly the west to south left-turn movement, appears to operate at or near to capacity during peak traffic periods. Traffic operations at this location will be considered in more detail in Section 7 of the report.

To the east of this intersection, Sxwelatp Avenue intersects Highway 101 and also operates with traffic signal control. North of the highway this route connects to St. Mary's Hospital to the west and a shopping plaza to the east anchored by Extra Foods. There are two lanes in each direction on Highway 101 together with a dedicated left turn lane for eastbound highway traffic turning north to

either the hospital or shopping centre. There are two lanes on the southbound approach to the Highway 101 intersection.

FUTURE HIGHWAY IMPROVEMENTS

There are a number of key road improvements in the Sechelt area that are being considered to improve future traffic flow conditions in the town. These include:

Link Road

The so called "link road" is planned on the east side of the town and would directly connect Highway 101 with Sechelt Inlet Road, across Sechelt First Nation lands. The southern portion of this road is already in place providing access to St. Mary's Hospital and the shopping centre described above, and connects to Highway 101 opposite Sxwelatp Avenue. North of the hospital access, the Link Road would extend northwards until it meets with the existing access road for the gravel pit. From there conceivably the new road could extend westward to an existing intersection at Sechelt Inlet Road, or alternatively further north to a new intersection with Sechelt Inlet Road. **Exhibit 2** shows the area road system and the possible future routing of the Link Road.

This Link Road would be developed in consultation with the Sechelt First Nations and the District of Sechelt. While there is no set time line at present for the new road, there is acknowledgement from all parties that it should be implemented as soon as possible.

In the context of the SilverBack development proposal, this Link Road is viewed as being essential to the viability of the project in that it would provide a more direct access route to the Sunshine Coast highway corridor and Langdale Ferry. It will also have the benefit of removing development traffic and other through traffic from other streets in Sechelt. In particular, the Link Road will divert traffic away from the congested Highway 101 / Wharf Road intersection and significantly benefit future traffic operations at this location. This is a strategically important consideration for the SilverBack project and is reviewed in more detail later in the report.

Highway 101 / Wharf Road

The MoT and the District of Sechelt have identified operational concerns with the Highway 101 / Wharf Road intersection. The operation of this intersection will become more pressured in the future with continuing growth and development of the Sunshine Coast even without the SilverBack development.

Much of the capacity problem at this intersection results from the high volume left-turn movement for the single lane westbound to southbound highway traffic flow. Section 7 of the report describes a relatively modest change in traffic signal phasing at this intersection to improve traffic operation and better accommodate initial phase development at SilverBack. Over the longer term, as highway traffic continues to increase with ongoing development along the Sunshine Coast, more significant road improvement measures will almost

certainly be required.

Even though Highway 101 forms a key part of the provincial highway system, it is also functions as an important street within the District of Sechelt for local traffic access particularly to the commercial uses of the downtown core. Improvements to this section of Highway 101 through downtown Sechelt would have to be carefully planned to provide the appropriate balance between the highway traffic function and the local traffic access function.

One option would be to construct a "bypass" route around Sechelt for Highway 101 traffic. However, there is limited scope to do this as Sechelt is situated on a narrow stretch of land between two bodies of water. Alternatively the alignment of Highway 101 through the Wharf Road/Dolphin Street intersection could be modified to eliminate the capacity pressured east to south left-turn movement. In Section 7 of the report a number of suggestions will be made to improve the operation of this intersection to accommodate future traffic growth.

ROAD NETWORK

Bunt & Associates conducted intersection traffic counts on Friday 21st April (14:00 – 19:30) and Saturday 22nd April (14:00 – 17:00), 2005, to document existing Friday afternoon and Saturday afternoon peak period traffic flows at the following intersections:

- Highway 101 / Wharf Road;
- East Porpoise Bay Rd / Wharf Rd;
- Site Access / Sechelt Inlet Road;

Friday was chosen for the weekday PM peak given that this is the busiest day of the week on the Sunshine Coast, especially with people traveling their at the weekends. The Friday PM peak hour was found to be from 16:00 to 17:00 hours at each of the intersections surveyed. On the Saturday the peak hour was found to be between 14:15 and 15:15.

In addition to this, the movements in and out of Sxwelatp Avenue were surveyed in early May to understand the level of movements generated by St Mary's Hospital and the food store.

3. DEVELOPMENT PROPOSAL

Porpoise Bay Developments is proposing a golf-course based residential resort development located approximately 4.5 kilometres north of Sechelt. This development would comprise of the following uses:

- up to 1600 residential units (single family homes and condominiums);
- 120 room lodge/ hotel;
- 66 hectare (164 acre) 18 hole golf course with club house;
- 300 – 400 person conference centre;
- 2,787m² (30,000 sq ft) of commercial floor space providing locally serving shops and services.

This development is located across three parcels of land that will be accessed from Sechelt Inlet Road. The main development area is located east of Sechelt Inlet Road, with two smaller development parcels west of the road.

RESIDENTIAL

The residential component of the SilverBack development will have a significant bearing on the trip generation and distribution characteristics of the development as a whole. A key consideration is that much of the residential development is expected to appeal to recreational/seasonal users as a "second home" with considerably different traffic characteristics to year-round residents.

The May 2005 traffic report was premised on an assumed split of 30% for year-round residents and 70% seasonal residents. This was based on conditions at other similar resort / residential development projects in BC, including the Predator Ridge Golf Course Resort, Vernon Bridge, where this split was agreed at the planning stage. In fact, subsequent surveys at this resort have shown that even this split was conservative, where over 70% of the units are seasonal homes. In further support of this split, the feedback from the initial marketing response for the SilverBack development was a 30% / 70% between year-round / seasonal.

Responding to feedback received from the District of Sechelt, the updated report assumes a more balanced 50/50 split between year-round residents and seasonal/vacation residents.

Another important consideration is the anticipated mix of (i) mature adult / empty nester / retiree households and (ii) family based households likely to locate in this development. Given the amenities proposed for this development with the golf course and waterfront recreational opportunities, a high proportion of the mature adult / empty nester / retiree community is expected to take up residence. For the purposes of this analysis, it has been assumed that the year-round residents will be evenly split between the mature adult / empty nester / retiree household group and the family household group. A similar split is assumed for the seasonal residents.

For each residential described above, the traffic analysis assumes that 25% of the housing will be in the form of single family dwellings and 75% will be in the form of multiple family condominium townhouses and apartments.

Commercial Component

This element of the development is aimed at primarily serving the needs of residents and guests within the development thus reducing the need to travel outside the development area. A considerable portion of the commercial traffic is expected to be internal to the development and will not add trips to the area road system outside the project.

Golf Course

As with the commercial element, customers to the proposed golf course are likely to be largely made up of residents and guests of the SilverBack development. Here again many of the trips generated by the golf course will likely be made by residents of the development and therefore internal to the project.

Hotel / Lodge and Conference Centre

This element of the development will bring tourists to the Sechelt area with spin-off benefits to the town and the development. It is expected that the activities between the hotel and conference centre will be closely related and this will be reflected on the number of internal trips within the development. There will also be synergy between the hotel and other parts of the development including the golf course and commercial elements.

Road Infrastructure

There are 5 road access points proposed to connect the development to Sechelt Inlet Road that will serve to better distribute traffic along this route. The most significant of these in terms of traffic usage is expected to be the southern access connecting to the main eastern section of the development and the commercial activities on the west side. A new four-way intersection will be formed to serve these parts of the development, likely to operate either as a two-way or four-way stop controlled intersection (operation of this intersection is considered in Section 7). Traffic roundabout or even full traffic signal control may also be considered at this location to best manage future traffic volumes.

On the eastern section of the development a new loop road will be constructed that will have a southern and northern connection with Sechelt Inlet Road. This road will have the potential to loop any future bus services back to Sechelt.

It is planned to upgrade the Sechelt Inlet Road within the boundaries of the development to better service the projected traffic increase. Where practical, it is planned to provide for 3.7 metre wide traffic lanes and ideally 1.0 to 1.8 metre bicycle lanes along both sides of the roadway. However, there may be sections where this cannot be achieved and road/lane widths may need to be reduced.

Project Staging

It is planned to complete the golf course, hotel and some portion of the residential component as the Initial Stage of the SilverBack development. Subsequent stage development of the project would include the commercial uses, build out of the residential component, and the conference centre. This staging is reflected in the capacity analysis provided in Section 7 of the report.

4. ACCESSIBILITY

At the Regional and Local Government level, planning policy encourages new developments to be designed in the most sustainable manner to encourage walking, cycling and public transit use as significant modes of travel. In following paragraphs, the development proposal is reviewed in the context of these modes.

WALKING

Walking is a realistic transport mode for most people over short distances i.e. up to 2 kilometres or 40 minutes walk time. This threshold is primarily dependent on the purpose of the journey, while factors such as the surrounding environment, safety, person's fitness, car ownership, parking availability etc, are also relevant.

On the basis of this threshold, there is the potential that future residents and visitors to the development will be within walking distance of all the facilities that are provided. Hence, it is anticipated that walking would be the primary mode for internal trips.

CYCLING

A person's willingness to cycle is based on a number of lifestyle factors including health benefits, cost savings (automobile use and parking), convenience; while infrastructure also plays an important role through the safety of routes, gradients, cycle storage facilities, etc.

Cycling is a realistic transport option for most people over short to medium distances i.e. up to 8 kilometres or 30 / 35 minutes cycle. Indeed, journeys within this distance provide the greatest opportunity to replace car trips. This threshold indicates that the whole of Sechelt is within cycling distance of the development site.

One of the characteristics of resort location's is that cycling is a popular recreational activity as well as convenient way from getting from 'A' to 'B' as people inherently tend to travel shorter distances in 'resort' communities.

As part of the development proposal it is planned to provide cycle lanes where possible on the part of Sechelt Inlet Road within the boundaries of the development.

Within the development, cycle parking will be provided at locations where there is demand, such as at the commercial units, hotel, golf course etc. As well, the development will be laid out in a manner that encourages cycling throughout by providing appropriate road widths, shared paths with pedestrians, etc.

PUBLIC TRANSIT

A person's willingness to use public transit is based on a number of factors including eligibility to drive, car availability, parking space at the end of the journey, cost, convenience, relative journey times with other modes, etc. Public Transit is a practical proposition for distances of 4 kilometres and above.

There are no existing bus services operating on Sechelt Inlet Road. This is most likely due to the fact that there is insufficient demand at the moment. However, once the SilverBack development starts to be developed there is added potential, at some future point, for bus transit – likely community shuttle service - along Sechelt Inlet Road connecting to Sechelt.

The development has been laid out so that there is the potential to loop a bus service through the main east side of the development. This would mean that all of the development could potentially be within quick walking distance (400 metres) of a bus stop.

5. BACKGROUND TRAFFIC FLOWS

This section sets out the background traffic data that will form the baseline for the study. It will take into consideration seasonal changes, background traffic growth and other relevant planned developments.

SEASONAL CHANGES

In tourist areas, such as the Sunshine Coast, traffic flows on strategic routes can vary significantly between different months of the year. It is important that the surveyed traffic flows reflect the peak seasonal period in order to ensure the robustness of the assessment.

In Section 2, it was established that the traffic surveys were conducted in late April 2005. This month therefore needs to be considered in the context of the peak summer traffic months of June, July and August.

To assess the season variations on Highway 101, data from the MoT automatic traffic count station (Reference 6201) located approximately 15 kilometres north of Langdale was reviewed for the Year 2003. Although this data dates to 2003, it is still considered to be relevant as it is being used to assess relative changes in traffic flow as opposed to actual volumes.

Attached in **Exhibits 3 and 4** is the graphical representation of the daily flows for the Year 2003 on a Friday and Saturday covering the following time periods:

- End of April (similar time to when the survey was conducted)
- Average for April
- Average for July
- Average for August

These exhibits demonstrate that the peak traffic periods on a Friday and Saturday occur in the month of August; the traffic flows are influenced by the BC Ferry arrival/departure times at Langdale; and, the Saturday peak is earlier in the day in the August compared to April.

The seasonal factor for the Friday condition has been based on the average Friday peak period (4:00pm to 6:00pm) between April and August. This is considered to be robust given the higher peak period observed towards the end of April i.e. at a similar time of the month to when the survey was conducted.

For the Saturday condition, the peak traffic period differed between April and August, where the August peak was about 2 hours earlier. For this day, the seasonal factor was therefore based on the April 2003 data (2:00pm to 3:00pm), while August was based on the period between (11am to 1pm).

Table 5.1 outlines the basis for the seasonal traffic adjustments and shows that the seasonal factor for the Friday condition is +27%, while the factor for the Saturday is +24%. These factors were applied to only the Highway 101 traffic

movements; the seasonal traffic variations would not be expected for traffic on local streets.

Table 5.1: Seasonal Traffic Factor

	Friday PM Peak			Saturday Midday Peak		
	NB	SB	TOTAL	NB	SB	TOTAL
April	-	-	1,623	-	-	1,410
April Avg.	812	710	1,522	715	691	1,406
June Avg.	-	-	1,754	-	-	1,446
August Avg.	1,054	876	1,930	1,009	736	1,745
August/April	1.298	1.234	1.268	1.411	1.065	1.241

In the May 2005 report, a factor of 46% was used for both the Friday and Saturday cases. This factor was based on data from the automatic count station (Reference 6289) located around 15 kilometres north of Sechelt on Highway 101. This count station is not considered as representative of the flows through Sechelt as the volumes are significantly lower than those observed south of Sechelt on Highway 101, and reflect far more recreational traffic use. Also the factor was based on averaging all the days in May and August and comparing the relative levels for each month. Hence, it did not take into consideration daily or hourly variations.

BACKGROUND TRAFFIC GROWTH

The District of Sechelt advised use of a figure of 2.5% per year growth when calculating future background traffic. While this level of growth may be applicable for AADT flows, it is unlikely to be representative throughout all hours of the day, and in particular in the peak traffic periods where there is generally less scope to accommodate such growth. Also, it may be not reflective of the seasonal peak month of the year in which the surveyed flows are based.

Additionally, it is also important to recognize that a component of traffic growth includes new developments, such as the SilverBack development. Hence, there is a certain degree of 'double' counting and this should be taken into account when interpreting the operation of the study network intersections for future design years.

For the purposes of this analysis, the 2.5% figure has been applied as a linear growth rate rather than compound growth for the peak periods given the above comments. This equates to between 2% to 2.5% compound growth per year over the study horizons under consideration and is representative of moderate to high traffic growth for the peak traffic periods being analyzed.

OTHER PLANNED DEVELOPMENTS

The District of Sechelt has advised of other planned future developments that will contribute to future traffic increases on the area street system, including a possible 100 unit development south of Porpoise Bay Provincial Park. The traffic

from this other development has been accounted for in the traffic growth that is being applied for the SilverBack traffic study.

The Extra Foods grocery store and gas station development located adjacent Highway 101 opposite Sxwelatp Avenue has been in operation for some time now and its generated traffic is included in the April 2005 traffic counts. The grocery store and gas station is the Phase 1 development of a planned shopping centre on this site. Proposed Phase 2 development on this site would see the addition of 29,000 sq ft of retail space and 20,000 sq ft of office space. Additional parking would be constructed together with a new right-in/right out access to Highway 101 (Alt. Access 1). Phase 3 development consists of another 48,000 sq ft of retail floor space, additional parking and a right turn entry access off the highway (Alt. Access 2). Traffic generated by this future development of the shopping centre has been incorporated into the background traffic assumption for the SilverBack traffic analysis. It is assumed that Phase 2 of the shopping centre will be completed by 2008, and Phase 3 by the 2016 horizon year.

SUMMARY

It is important to note that the analysis for this development proposal is being assessed during the peak traffic on the busiest weekday and during the peak month of the year. In addition to this, general traffic growth has been applied at a rate of 2.5% per year.

These factors combined will significantly inflate the surveyed traffic flows in April 2005. This will have a significant impact on the operation of the road network, irrespective of the SilverBack development flows. This should be a material consideration in the interpretation of the operation capacity on the road network, and in particular at the intersection of Wharf Road / Highway 101.

6. TRIP GENERATION AND DISTRIBUTION

This section sets out the methodology for determining the trip generation and distribution of the development proposal. It will take into consideration each element of the development as they will have their own unique characteristics.

TRIP GENERATION

Trip rates were determined from the ITE Trip Generation Manual (Edition 7). Table 6.1 sets out the trip rates for each element of the development for the Friday and Saturday periods being considered in this study.

Table 6.1: Development Proposal based on ITE Trips Rates

Item	No. Units	Friday		Saturday	
		Trip rate	In / Out (%)	Trip rate	In / Out (%)
Single family (All year)	100	1.10 ⁽¹⁾	62/38	0.6	53/47
Single family (mature residents)	100	0.25 ⁽²⁾	59/41	0.25	59/41
Single family (2nd home)	200	0.31 ⁽³⁾	44/56	0.36	48/52
Multi/ duplex/ affordable (All year)	300	0.65 ⁽³⁾	59/41	0.28	52/48
Multi/ duplex/ affordable (mature residents)	300	0.25 ⁽²⁾	53/47	0.25	53/47
Multi/ duplex/ affordable. (2nd home)	600	0.31 ⁽³⁾	44/56	0.36	48/52
Lodge / hotel (units)	120	0.51 ⁽⁴⁾	50/50	0.51	50/50
Golf Course (acres)	164	0.39 ⁽⁵⁾	43/57	0.64	52/48
Conference Centre (people)	315	0.50 ⁽⁶⁾	45/55	0.25	70/30
Commercial restaurant (1000 sq ft)	10	9.02 ⁽⁷⁾	62/38	10.82	59/41
Commercial specialty (1000 sq ft)	20	5.02 ⁽⁸⁾	56/44	4.2	50/50

Notes: (1) ITE Ref 210; (2) ITE Ref 251/252; (3) ITE Ref 221/230; (4) ITE Ref 310; (5) ITE Ref 430; (6) Bunt first principles; (7) ITE Ref 931,932 (8) ITE Ref 814

TRIP DISTRIBUTION

As with the trip rates, each element of the development will have its own directional trip distribution characteristics. In the following paragraphs the methodology will be set out for the trip distribution including the proportion of trips expected to be internal to the development.

A brief description of the travel characteristics is provided below for each component of the development.

Residential - Mature – this group is likely to travel the least and it is expected that much of their activities will be within the development area or in Sechelt given the local facilities that it has to offer.

Residential - All Year (family) – this group would follow the typical travel patterns of people living in an urban area, where access to work, school, shopping and leisure activities, etc. will be part of the daily routine. It is expected that much of this activity will be concentrated in the Sechelt area, however a bigger weighting has given to trips outside the Sechelt area compared to that for the 'Mature' group.

Residential – Second Home – this group will be heavily influenced by the Ferry Service at Langdale whether coming up for a long weekend or for visiting for a longer period of time. This pattern would also be observed if the owners decided to rent their residential unit. These patterns are reflected in the inbound trip distribution, however they would be expected in the outbound trip distribution as this would be more similar to the residential 'All Year', i.e., residents will be less likely returning to the Langdale Ferry during the Friday or Saturday afternoon periods.

Commercial - a reasonable proportion of the trip attraction for this use will be from within the development, and indeed much of the viability of this element is based on the new residential and hotel. There will likely also be some degree of attraction from people living in Sechelt proper.

Hotel / Golf Course / Conference Centre – there will an appreciable level of cross visitation between these components and other parts of the development. Also, as with the 'Second Home' residential group, the Langdale Ferry would have a significant influence on the trip distribution.

Summarized in Table 6.2 is a full breakdown of the trip distribution adopted for each of the development components described above and this graphically shown in the exhibits included as appendix material.

Table 6.2: Trip Distribution

Item	Internal	Sechelt Inlet Road (north)	Sechelt	Highway 101 North	Highway 101 South	Hosp& Shop. Centre
Residential Mature	20%	8%	40%	10%	20%	2%
Residential All Year	10%	3%	40%	15%	30%	2%
Residential Second Home	10%/15%	5%/ 5%	20%/40%	10%/15%	50%/20%	5%/5%
Commercial	30%	10%	15%	15%	25%	0%
Hotel/Golf Course /Conference Cent.	15%	5%	10%	10%	60%	0%

Table 6.3 summarizes the predicted external trip volumes associated with the SilverBack development (trips using the area road system outside the development boundary) based on the factors set out in Table 6.2.

Table 6.3: External Trip Levels

Item	Friday		Saturday	
	In	Out	In	Out
Single family - All year	60	37	29	25
Single family - Mature	12	8	12	8
Single family - Second Home	24	29	31	34
Multi/ duplex/ affordable - All year	101	70	39	36
Multi/ duplex/ affordable - Mature	31	28	32	28
Multi/ duplex/ affordable - Second Home	72	87	93	101
Lodge / hotel (units)	26	26	26	26
Golf Course (acres)	23	31	46	43
Convention Centre	60	74	47	20
Commercial restaurant (1000 sq ft)	39	24	45	31
Commercial specialty (1000 sq ft)	39	31	29	29
Totals	488	444	424	370

The next stage of the traffic distribution process is to assign the development flows to the road network. A full set of the existing and future flow projections for the study area road system is provided as appendix material.

7. TRAFFIC OPERATIONS

This section will first establish the traffic flow data to assess the different horizons for the development proposal. This will then be modeled on the study network to determine the operational capacity at the intersections being reviewed.

TRAFFIC FLOWS

The following discussion pulls together the traffic flow data established in the previous sections, and this is set out in the context of the future horizons that are being considered for the development proposal. Projected traffic flow diagrams are included as appendix material and summarized below is a description of some of the key flow diagrams.

April 2005 – existing Friday PM (afternoon) and Saturday PM (afternoon) peak hour traffic flows were surveyed in April 2005 and May 2005 and are presented in Flow Diagrams 1A and 1B;

August 2005 – the April/May observed traffic flows on Highway 101 were factored up by 27% and 24% respectively for the Friday and Saturday cases to account for increased summer seasonal traffic (see Flow Diagrams 2A and 2B);

August 2006 – the August traffic flows were factored up by 2.5% for the Friday and Saturday cases to account for Background Traffic Growth over this one year period (see Flow Diagrams 3A and 3B);

August 2008 – as above but Background Traffic has increased by 7.5%, or 2.5% per year over three years (see Flow Diagrams 4A and 4B);

Other Development (Phase 2) – Shopping Centre (Highway 101) - Traffic Flows for Phase 2 development of the shopping centre assumed to be open by 2008 (see Flow Diagrams 5A and 5B);

Other Development (Phase 3) – New Shopping Centre (Highway 101) - Traffic Flows for Phase 3 development of the shopping centre assumed to open by 2016 (see Flow Diagrams 6A and 6B);

August 2016 – as above but Background Traffic has increased by 25%, or 2.5% per year over ten years (see Flow Diagrams A and B);

Development SilverBack (Initial Stage) – this includes development of the proposed golf course, hotel/lodge, and up to 500 residential units (see Flow Diagrams 8A and 8B);

Link Road (existing flows) – traffic diversion of projected existing traffic movements 2016 (see Flow Diagrams 9A and 9B);

Link Road (with all SilverBack development traffic) - diversion of existing traffic movements plus addition of SilverBack development traffic at full build out of the project (see Flow Diagrams 14A and 14B);

TRAFFIC EFFECTS AT WHARF ROAD / HIGHWAY 101

Table 7.1 summarizes the percentage changes in traffic flows at the Wharf Road / Highway 101 intersection, which is key node on the study network. This will allow an appreciation of the relative impacts of the seasonal adjustment, background traffic growth, other developments and the SilverBack development traffic at this intersection.

Table 7.1: Weekday PM Peak Hour Traffic at Highway 101 / Wharf Road

Scenario	Friday		Saturday	
	Total (veh/hr)	Base Point April 2005	Total (veh/hr)	Base Point April 2005
April 2005	2,315	100%	1,772	100%
August 2006	2,635	114%	1,998	113%
August 2008	2,821	122%	2,140	121%
August 2016	3,380	144%	2,562	145%
Shopping Centre (Phase 2)	59	2.5%	45	2.5%
Silverback First Stage	233	10%	199	11%
Silverback All & Link Road	247	11%	211	12%

It is evident from the above that the combination of season variations and background traffic at this intersection increases the traffic flows on the Friday by about 22% in 2008, and about 44% by 2016. These increases will have significant bearing on the operation of this intersection. It also shows that with the Initial Stage of the SilverBack development proposal in place, the traffic flow increases by 10% above the base point, while with the full development in place, and the new link road, there is only an 11% increase. It is worth noting that in the design year 2016 the completed SilverBack development would potentially represent just 7.3% of the total traffic flows at this intersection.

For the Saturday case a similar pattern was observed with the increases in traffic flows due to seasonal and traffic growth. Also, the April 2005 traffic flows are about 550 vehicles less than the Friday PM peak. Given this, and that the development traffic flows through this intersection are lower during this period, the capacity analysis that follows has therefore concentrated on the Friday PM period as the "worst case" scenario.

CAPACITY ANALYSIS

The capacity analysis of the future Background and Total Traffic forecasts was conducted using standard techniques. The traffic volumes were compiled using the Synchro 6.0 traffic analysis package with the test of existing volumes using current traffic signal settings provided by the MoT. For future traffic analysis, traffic signal phasing and splits were optimized to minimize delays.

For traffic impact analysis, the procedures employed were to test the Volume/Capacity ratio (V/C) and Level of Service (LOS) at the different intersections for existing conditions and for future Background Traffic conditions as a measure of the base conditions without the development traffic. Comparable tests of the Total Traffic forecasts then demonstrate the incremental effect of the development site traffic.

Where traffic conditions are found to be unacceptable, improvements to bring the traffic operations levels back to acceptable levels were identified where feasible. The standard methodology in this regard is to achieve a V/C ratio of 0.9 or better with a LOS of D or better. In cases where the existing V/C ratio exceeds 0.9, the requirement to meet the 'acceptable' test is to match or exceed the existing V/C ratio.

As stated above the capacity assessment has concentrated on the Friday PM peak hour period where the background and development traffic flows are higher. The study network encompasses the following intersections:

- Wharf Road / Highway 101,
- Wharf Road / East Porpoise Bay Road,
- Highway 101 / Link Road intersection (Sxwelatp Avenue),
- Main Development Access to SilverBack on Sechelt Inlet Road,

The analysis has concentrated in the following 3 scenarios:

Scenario A - the operation of the Wharf Road / Highway 101 with background traffic increases and no Link Road in place.

Scenario B - reviews the Initial Stage development at SilverBack, but with no Link Road in place. It focuses on the operation of the intersections at Wharf Road / Highway 101 and Wharf Road / East Porpoise Bay Road where the development will have the most significant effect in this scenario.

Scenario C – includes the full development of SilverBack and with the Link Road complete (removing much of the development traffic from Wharf Road). This scenario also considers the operation of the Highway 101 / Shopping Centre and the Main Access intersection.

Scenario A: Background Traffic Growth and no Link Road

Table 7.2 presents a summary of the Highway 101 / Wharf Road intersection's operation with just seasonal and background traffic (including Shopping Centre) included for the design years 2005 and 2016. In the 2016 assessment, the intersection has been optimized.

Table 7.2: Highway 101 / Wharf Road Background Traffic

Critical Movements	2005		2016	
	V/C	LOS	V/C	LOS
EBT	0.60	C	1.05	F
WBL	1.02	E	1.08	F
NBT	0.3	B	0.5	C
SBL	0.45	B	1.08	F
Overall	0.73	C	1.07	D

It is evident from the above table the intersection is overcapacity on at least three approaches in the design year 2016. This is not surprising given that there is expected to be a 40% increase in background traffic flows over this 10 year period. Possible improvements to this intersection have been suggested at the end of this section to accommodate future traffic growth patterns.

Scenario B: Initial Stage of Development at SilverBack but no Link Road

The Initial Stage of development at SilverBack is planned to include the golf course, hotel, and up to 500-600 residential units. This scenario has been modelled with 3 years traffic growth to make some allowance for background traffic growth.

Table 7.3 presents the operation of the intersection with the Initial Stage of the SilverBack development proposal in place. This assessment includes an improvement to the intersection with a southbound Wharf Road left-turn advance signal phase, but no change to the existing traffic laning.

Table 7.3: Highway 101 / Wharf Road First Stage of Development

Critical Movements	No Improvement		SBLF Improvement	
	V/C	LOS	V/C	LOS
EBT	0.85	D	0.92	E
WBL	1.02	E	1.02	E
NBT	0.40	C	0.82	E
SBL	1.05	F	0.90	D
Overall	1.01	C	0.95	D

The above analysis demonstrates that with a minor upgrade to the traffic signal phasing at the Highway 101 / Wharf Road intersection, the impact of the added traffic from Initial Stage development at SilverBack can be offset. The critical traffic movement (westbound to southbound left-turns) is at the same level of operation as in the April 2005 model. This includes accommodating three years of traffic growth and Phase B development of the shopping centre traffic further east on Highway 101.

Similarly, the Wharf Road / East Porpoise Bay Intersection has been assessed and this is summarized in Table 7.4. It is evident from this table that there are no operational issues at this intersection under this Initial Stage development scenario for the SilverBack project.

Table 7.4: Wharf Road / East Porpoise Bay Road

Critical Movement	LOS
EB	B
WB	B
NB	B
SB	C
Overall	C

Scenario C: Build out of SilverBack Development with Link Road

The following analysis summarizes all the intersections on the study network and includes the traffic for the full build out development of the SilverBack project, plus Phase B and Phase C development of the Highway 101 shopping centre, and background traffic growth over a 10 year period to the Year 2016. The analysis further assumes that the planned Link Road across the Sechelt First Nations land is completed and provides a direct connection between Sechelt Inlet Road and Highway 101.

Under this scenario the development impact at the Wharf Road / Highway 101 intersection is reduced by about 50 vehicles per hour during the Friday PM peak hour from the Initial Stage development scenario without the Link Road. In other words, the impact of the SilverBack development is reduced over time at the Highway 101 / Wharf Road intersection, once the Link Road is in place.

The following summarizes the analysis for each intersection in turn.

Table 7.5 summarizes the operational analysis for the Highway 101 / Wharf Road intersection.

Table 7.5: Highway 101 / Wharf Road 2016

Critical Movements	No Improvement		Minor Improvement	
	V/C	LOS	V/C	LOS
EBT	1.00	F	1.05	F
WBL	1.12	F	1.07	E
NBT	0.62	C	0.95	E
SBL	1.08	F	1.08	F
Overall	1.09	D	1.05	D

The analysis confirms that Highway 101 / Wharf Road intersection in its present configuration will be over capacity by the 2016 horizon year, even with the Link Road in place. This is the case whether or not the SilverBack development proceeds. At the end of this section, more significant improvements at this intersection will be suggested to accommodate future traffic growth projections.

Table 7.6 summarizes the operation of the Wharf Road / East Porpoise Bay Road intersection.

Table 7.6: Wharf Road / East Porpoise Bay Road 2016

Critical Movement	Existing	Minor Improvement
	LOS	LOS
EB	B	B
WB	C	B
NB	C	C
SB	E	C
Overall	D	C

It is evident from this table there is a slight issue with the southbound approach. However, this can be improved by adding an additional left turn lane at this approach by simply altering the pavement markings.

Table 7.7 summarizes the operational performance of the Link Road / Highway 101 intersection.

Table 7.7: Link Road / Highway 2016

Critical Movements	Excluding Dev. Traffic		With Dev. Traffic No Improvement		With Dev. Traffic With Improvements	
	V/C	LOS	V/C	LOS	V/C	LOS
EBL	0.82	D	1.00	F	0.82	D
EBL	0.52	A	0.55	B	0.49	A
WBT	0.92	C	1.01	E	0.93	C
SBL	0.80	D	1.00	F	0.79	D
Overall	0.87	C	0.99	F	0.88	C

The analysis indicates that weekday PM peak hour traffic volumes at this intersection nears capacity by the 2016 horizon year whether or not the SilverBack project proceeds. Construction of a dual left-turn for the southbound to eastbound left-turn movement from the Link Road to Highway 101 would improve traffic operations at this intersection even with the added traffic resulting from full development of the SilverBack project.

However a number of assumptions have made about the operation of this intersection with regard to background growth, shopping centre traffic etc resulting in an increase of around 200% movements (ex. SilverBack development traffic). This is further commented on at the end of this section.

The operational characteristics of the SilverBack main site access on Sechelt Inlet Road are summarized in Table 7.8.

Table 7.8: Main Site Access / Sechelt Inlet Road

Critical Movement	LOS
EB	A
WB	B
NB	B
SB	C
Overall	C

The analysis confirms that a 4 way stop control intersection works satisfactorily for future traffic to the 2016 horizon year. Alternatively this access intersection to Sechelt Inlet Road can either be developed as a small roundabout or under full traffic signal control.

FURTHER CONSIDERATIONS

The above capacity analysis has demonstrated that with the application of a moderately high traffic growth factor, this has a profound affect on the operation of the road network, especially when it is applied to the peak hour of day on the peak day of the week and in the peak month of the year.

It will be a policy decision of the MOT in BC and / or the District of Sechelt to decide if the highway network should be designed to accommodate this level of traffic growth in the peak season.

Notwithstanding the above, it is appreciated that with whatever traffic growth is applied to the intersection of Wharf Road / Highway 101, the operational performance of this intersection is likely to deteriorate over the coming years. A number of sensitivity tests have therefore been undertaken at this intersection to assess the affect of alternative improvements on its operational capacity.

This analysis has not been included in the report, but set out below is a list of measures that can improve the capacity without radically altering the intersection layout. These are in addition to the southbound Wharf Road left turn advance signal phase proposed as part of the Initial Stage development of the SilverBack project.

- Prohibit the northbound left turn movement from Highway 101 to Dolphin Street, at least during peak traffic periods;
- Introduce an additional southbound and northbound lane on Wharf Road (south of Dolphin Street);
- Increase the westbound to southbound left-turn capacity for Highway 101 traffic by converting the westbound approach from the existing left-turn lane plus shared through/right turn lane to a left-turn plus shared left/through/right-turn lane, and east-west split signal phasing;
- Provide an alternative through route to Highway 101 (North) to bypass the Sechelt Town Centre area and eliminate the problematic Highway 101 left-turn movement.

At the Link Road / Highway 101 intersection, a number of assumptions have been made on the base traffic flows, including the background traffic growth. This has resulted in the traffic flows increasing by over 200% at this intersection compared to those currently observed, irrespective of the SilverBack development flows. It is our view that the operation of this intersection should be considered in more detail as part of the design assessment for the new Link Road. This would also include the design of the Link Road's intersection with Sechelt Inlet Road.

8. CONCLUSIONS & RECOMMENDATIONS

Porpoise Bay Developments is proposing a golf course based residential resort development located on the Porpoise Bay waterfront approximately 4.5 kilometres north of Sechelt. The project is planned to feature a new golf course and club house, a 120 room hotel, approximately 30,000 square feet of locally serving restaurants and commercial shops and services, a conference centre, and up to 1,600 residential units in the form of single family dwellings and condominiums.

Initial stage development of the project is planned to include the golf course and hotel, and approximately 500-600 units of residential development. This initial stage development is expected to generate approximately 300 vehicles per hour of traffic on the area road system during the weekday afternoon peak traffic period, or on average 5 vehicles per minute.

Subsequent development will provide the planned commercial uses, the conference centre, and the balance of the residential component. At build out, the SilverBack development is predicted to add around 900 to 950 new vehicle trips vehicles over the peak hourly period to the area road system.

From a traffic standpoint, the most critical issue for the SilverBack development is the road connection between the project and the Sunshine Coast Highway (Highway 101).

Presently this connection is provided via Sechelt Inlet Road to Porpoise Bay Road to Wharf Road which intersects Highway 101 at Dolphin Street. The Highway 101 / Wharf Road intersection operates under traffic signal control and is characterized by the 90 degree turn that Highway 101 follows through the intersection (i.e., the east and south legs of the intersection). As such, the westbound highway traffic is required to turn left through the intersection to proceed south, while eastbound traffic is required to make a channelized right-turn (initially heading north then turning right to travel eastbound toward the Langdale Ferry Terminal). The intersection overall presently operates at an acceptable 73% of capacity during the summer Friday afternoon period; however, the westbound to southbound left-turn highway traffic movement operates at capacity and pressured Level of Service (LOS) "E" delay conditions.

Continued development growth on the Sunshine Coast will place further operational pressures on this intersection and is expected to result in saturated traffic operation within the next 10 years even without the SilverBack development.

There is, however, residual capacity at the Highway 101 / Wharf Road intersection to accommodate additional traffic over the next few years, particularly so with a minor upgrade to the existing traffic signal phasing to include a southbound Wharf Road advance left-turn signal phase. With this traffic signal phasing improvement, the intersection can accommodate continued increase in area "background" traffic over the next few years plus the additional 300-350 vehicles per hour of new traffic generated by initial stage development

of the SilverBack project. The intersection of Wharf Road and Porpoise Bay Road, which presently operates with four-way stop sign control, will continue to operate well within capacity with this initial level of traffic increase.

To go beyond this initial level of traffic however will require either substantial upgrades to the Wharf Road corridor leading to Highway 101 and at the Highway 101 / Wharf Road intersection, or alternatively that a new road link be provided to connect Highway 101 to Sechelt Inlet Road. In fact this new "Link Road" connection is being actively considered by the Sechelt First Nations, across whose lands the road link would necessarily traverse, providing connection to the existing Sxwelatp Avenue intersection with Highway 101 that already operates under traffic signal control.

The Link Road connection would be capable of serving the additional traffic generated by build out of the SilverBack development as well as new traffic associated with future phase development of the existing shopping centre at the Highway 101 intersection. Some upgrade to the intersection with Highway 101 may be likely, including potentially a dual southbound to eastbound left-turn lane configuration.

Even with the Link Road in place, the intersection of Highway 101 / Wharf Road as presently configured is expected to reach capacity conditions over the next 10 years. Further upgrade to this intersection would be required, possibly the development of a dual westbound left-turn lane (or at least a left-turn plus shared left/through laning configuration) to better service the westbound Highway 101 left-turn movement through the intersection. Alternatively a realignment of Highway 101 through the intersection to become the "through traffic" movement both eastbound and westbound would significantly enhance future traffic operation though this will likely impact adjacent commercial properties and needs to be carefully considered.

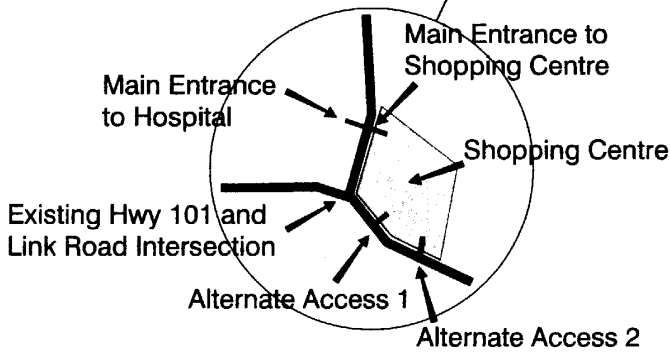
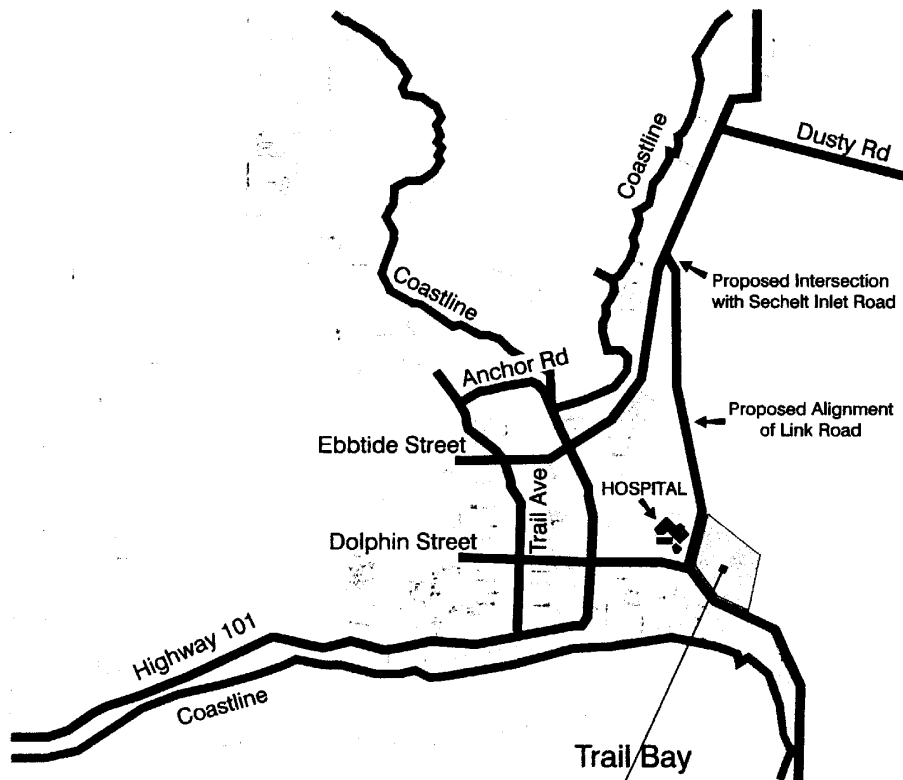
In summary, it is recommend that consideration be given to a minor upgrade to the traffic signal phasing at the Highway 101 / Wharf Road intersection to provide a southbound Wharf Road left-turn advance signal phase. This improvement provides sufficient capacity at this intersection to accommodate continuing increase in area traffic over the next few years plus up to 300-350 vehicles per hour (weekday PM peak period) of additional traffic generated by initial stage development of the SilverBack development. This initial stage development at SilverBack is expected to include the golf course and hotel development plus 500-600 residential units.

Beyond this initial level of traffic growth, it is concluded that future phase development of the SilverBack project will require that the planned Link Road across the Sechelt First Nations lands be constructed to provide an alternate vehicle connection to the Highway 101 corridor.

In the unlikely event that implementation of the Link Road is delayed or does not proceed at all, then further improvements will be required to the Wharf Road corridor and at the Wharf Road / Highway 101 intersection to accommodate future development phases at SilverBack beyond the initial 500-600 residential units and golf course/hotel development.

The recommended off-site services are summarized in attached Schedule A to this report.

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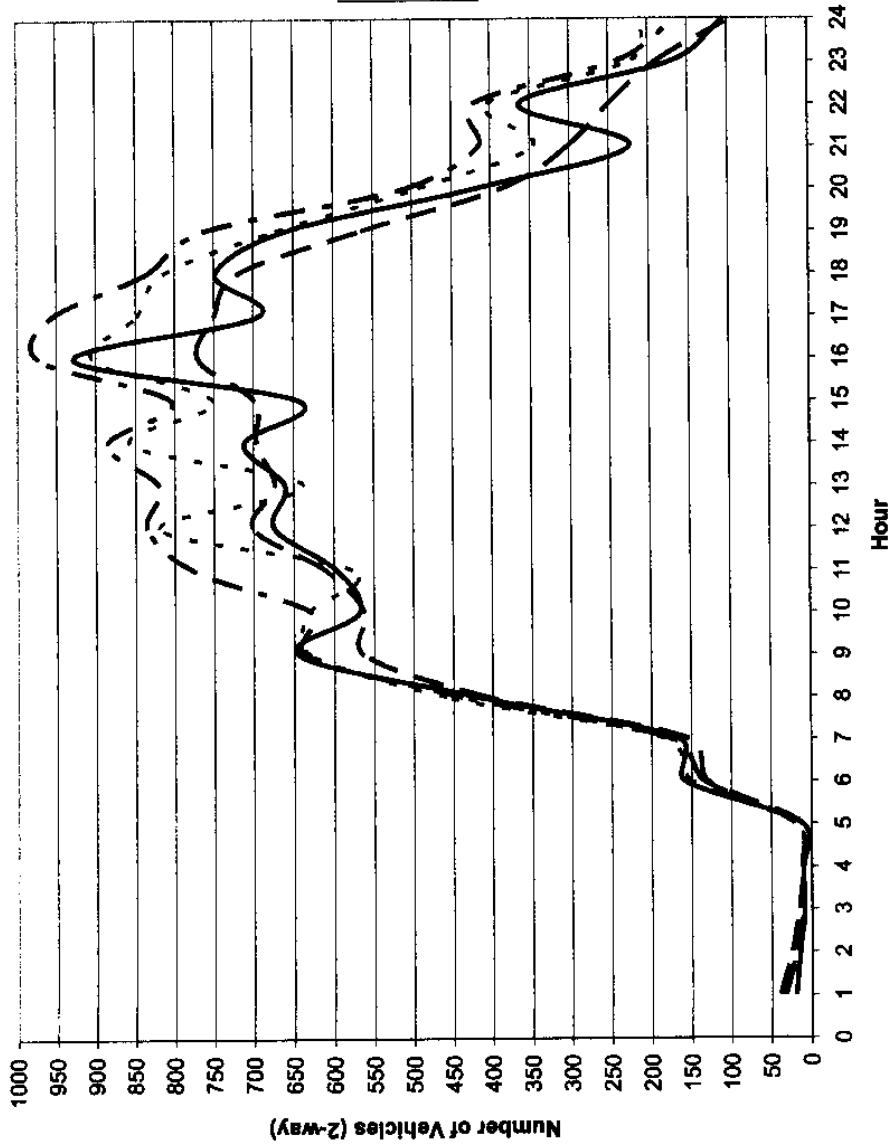


Proposed Link Road Location
Proposed Mixed Use Development, SilverBack, Sechelt BC

Exhibit

2

Friday Two-way Traffic Counts (Count Station 6201)



— 25-Apr-03
 - - April Fridays Average
 . . . June Fridays Average
 - . August Fridays Average

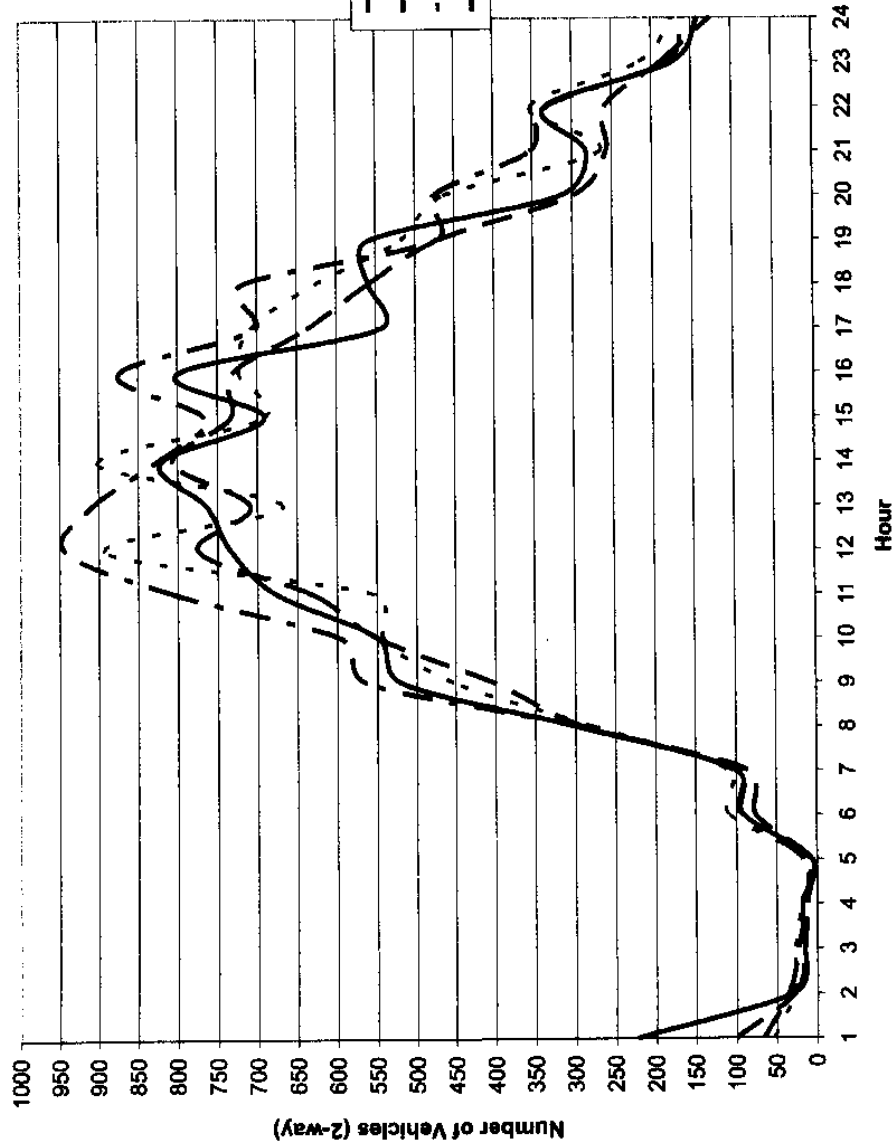
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Exhibit
3

Friday Traffic Variation
Proposed Mixed Use Development, SilverBack, Schelt BC

B U N T
& ASSOCIATES

Saturday Two-way Traffic Counts (Count Station 6201)



4536-01
N.T.S.

Exhibit
4

Saturday Traffic Variation
Proposed Mixed Use Development, SilverBack, Schelt BC

B | U | N | T
& ASSOCIATES