RIVERSTONE HOLDINGS LIMITED

Proposed Fiordland Link Experience Project

TRAFFIC IMPACT ASSESSMENT

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TABLE OF CONTENTS

PROPOSED FIORDLAND LINK EXPERIENCE
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1. INTRODUCTION

This report has been commissioned by Riverstone Holdings Limited as part of its application for a Department of Conservation concession to develop and operate a tourism experience to be known as the Fiordland Link Experience through the Department of Conservation's Snowdon State Forest Park situated between the western edge of Lake Wakatipu and Te Anau. The Fiordland Link Experience will establish an enhanced travel and visitor experience between Queenstown and Lake Te Anau, and provide improved access to the range of visitor experiences available from Lake Te Anau in and around the Fiordland area including Te Anau, the lake and Milford Sound. The project has the advantage of reducing the total travel distance and time for existing on-road operations between Queenstown and Lake Te Anau, as well as effectively dispersing the peak visitor demands in Milford Sound and along the State Highway 94 route into Milford Sound. The project would also reduce tourist coach volumes with associated safety and operational benefits associated with the regular movement of tour coaches on route from Queenstown to Lake Te Anau.

This report presents an outline of the traffic issues relevant to assessment of the concession application to the Department of Conservation.

Traffic Design Group has been engaged by the Riverstone Holdings Limited to prepare a traffic impact assessment report relating to the traffic and transportation matters arising from the Fiordland Link Experience project. This report is intended to accompany the concession application to operate The Fiordland Link Experience within land managed by the Department of Conservation ("DOC") primarily within the Snowdon State Forest Park located west of Lake Wakatipu.

The Fiordland Link Experience aims to create a new tourism experience between Queenstown and Lake Te Anau, which will consequently have the added benefit of addressing some of the existing pressures experienced along the existing tourist transport route through to Milford Sound.

The proposed route involves three legs comprising different travel modes which are described briefly as follows.

- **Catamaran** from Queenstown to Mt Nicholas across Lake Wakatipu
- **All Terrain Vehicle (ATV)** from wharf facilities at Mt Nicholas to a new terminal facility building located between the Mavora Lakes Road and the existing swing bridge over the Mararoa River, just upriver from the Kiwi Burn stream
- electrically powered **Monorail** between the Kiwi Burn and the Best Western Hotel site at Te Anau Downs adjoining State Highway 94, the Te Anau-Milford Road.

From the Te Anau Downs terminus there will be a range of travel options such as boat trips on Lake Te Anau to both the Te Anau township and other locations around the edge of Lake Te Anau. Coach trips would be available from the Te Anau Downs terminal to Milford Sound and other parts of the Te Anau/Fiordland area.

Each leg of the trip is designed to cater for a passenger load of 160 people with both the frequency and scheduling of trips responding to seasonal demand.

2. LOCATION IN ROAD NETWORK

The road transportation environment potentially affected by the Fiordland Link Experience project encompasses sections of the designated State Highway Network including State Highway 6A ("SH6A") from central Queenstown to Frankton, State Highway 6 ("SH6") between Frankton and Five Rivers, State Highway 97 ("SH97") between Five Rivers and Mossburn, and State Highway 94 ("SH94") between Mossburn and Te Anau Downs. Other non-State Highway roading links in the area include Centre Hill Road and Mavora Lakes Road between SH94 and the Kiwi Burn, Mount Nicholas Road, Von Road and a short section of the Mount Nicholas Station access road connecting to the proposed catamaran wharf facilities on the shores of Lake Wakatipu.

The proposed route and the surrounding road network are shown as Figure 1.

As the diagram shows, the network structure is dominated by the defined State Highway network links between Queenstown, Mossburn, Te Anau and Milford Sound. These routes are intended and managed to provide high levels of through-traffic movement between major centres, however due to their position within rural environments between these centres, are also called upon to cater for individual property access to and from farms, dwellings and other activities along their length. From time to time some sections of the State Highway routes are affected by stock-droving activities.

The local road sections beyond the State Highway cater primarily for property access, although the more remote position of dwellings, properties and the various other attractions and facilities along these roads between the SH94 route and Lake Wakatipu means that property access and through movement functions are strongly linked in each vehicle trip. Stock movements along and across these roads are a regular feature of the operation of these routes.

3. TRAFFIC VOLUMES

3.1 Daily Traffic Volumes

The average annual daily traffic (AADT) volumes made available by Transit NZ for the State Highway routes in the area are shown in the table below. The limited information available for Mt Nicholas, Mavora Lakes and Von Road is also included. The pattern of daily volumes on the road network is also illustrated graphically in Figure 2.

ROAD	LOCATION	2003 AADT (vehicles per day)
SH 6A	Stanley Street	14,830
	Frankton	14,220
SH 6	Between SH6/SH6A and Airport	11,390
	Kawarau Falls Bridge	6,220
	South of Peninsula Road	2,850
SH 97	Five Rivers -Mossburn	1,000 (est)
SH 94	Mararoa, past Princhester Creek Bridge	1,260
	Te Anau East	1,910
	Te Anau School	3,000
	Te Anau Upukerora River	1,110
	Retford Stream	520
	Falls Creek Bridge	500
Mavora Lakes Road		<50 (estimated)
Von Road		<50 (estimated)
Mt Nicholas Road		<50 (estimated)

Table 1 – Average Daily Traffic Volumes

It is evident that the pattern in the State Highway network is dominated by traffic volumes in the urban areas of Queenstown, Frankton and Te Anau. In general, outside these urban areas the greatest volumes occur along SH6 between Frankton and Lumsden/Mossburn with up to 2,300 vpd recorded south of Kelvin Heights reducing to around 1,400 vpd between Garston and the SH97 turn-off at Five Rivers. Between Te Anau and Milford Sound, the daily two-way volume of all traffic is generally between about 700 and 800 vpd. Some minor variation in the local volumes of traffic reported between the Upukerora River site and the Retford Stream sites, is considered to result partly from differences in the method of counting at each site (Upukerora being a tube count site, while the Retford Stream site is an electronic loop site), and different times of the year at which the counts are undertaken.

3.2 Seasonal Patterns

Figure 3 illustrates the pattern of daily volumes as reported at the two semi-continuous count stations operated by Transit NZ at Retford Stream (north of Te Anau) and at Mararoa (east of Te Anau). The variation in daily volume is clearly evident both through each of the days of a week as well as the longer time-based seasonal patterns with the winter months (May-August) representing the lower activity periods. During summer months (November – February) the average daily counts are typically 30-50% higher than the annual average counts for each of the sites.

Further comparisons of the counts at these two sites showing peak (December) and low-season (August) is presented in the attached Figures 4 and 5.

It is evident again that the summer volumes (December) are typically 2-4 times higher than the winter (August) volumes at both sites. Figure 5 illustrates that the typical pattern of activity through the day is similar in August and December with the December count being higher with more pronounced peaks of activity in the morning and evening peak period.

This is consistent with the use of the route by visitors, of which there are more during summer, travelling to Milford Sound and Te Anau during the morning and returning in the evening.

3.3 Traffic Stream Composition

The SH94 (Mararoa) count station records the vehicle types using the standardised classifications used by Transit NZ. The most recent information from this site has been interrogated to show the proportion composition of the daily traffic stream, and is summarised below.

VEHICLE CLASS	PROPORTION OF TRAFFIC IN CLASS (%) (OCTOBER 2003)
1. Cars/Vans	78.7
2. Cars/Vans towing	4.7
3. Two Axle Trucks	9.0
4. Three Axle Vehicles	2.9
5. Three Axle Articulated Vehicles	0.3
6. Four Axle Vehicles	0.4
7. Four Axle Articulated Vehicles	0.1
8. Five Axle Articulated Vehicles	0.3
9. Six Axle Articulated Vehicles	0.2
10. Six Axle Articulated Vehicles (Axle spacing >1.4m)	0.2
11. Seven Axle Vehicles	0.5
12. Six, Seven & Eight Axle Vehicles (Axle spacing <=2.2m)	0.8
13. Eight and Nine Axle A or B Trains	0.2
14. Others	1.6

Table 2 – Vehicle Classifications

As expected, cars and vans make up the greatest proportion (83%) of the total daily two-way traffic flow. Various kinds of medium and heavy vehicles make up the remaining 17%.

Buses and tour coaches are generally classified within Class 4, while some of the two-axle buses will be included within Class 3. Class 3 accounts for approximately 9% of the total traffic flow with Class 4 contributing a further 2.9% of the total traffic volume. With reference to the range of average daily traffic volumes recorded at Mararoa over a typical year, the expected daily coach volume would be typically within the range of 20-72 coach movements per day along this route at this point. This is generally consistent with observations made throughout the data collection phase of this assessment where on a typically weekday during March 2004 a total of 29 coaches were observed leaving Queenstown bound for Te Anau between 7.00 and 8.30am. It is however noted that these observations were made at the Frankton roundabout junction of SH6 and SH6A and would not have included the various coach movements originating from Te Anau or points elsewhere along SH6 south of Queenstown.

3.4 Traffic Growth

Traffic data from four sites on SH94 has been used to estimate average annual growth rates along the route over the most recent five-year period. These sites are:

- Mararoa
- Te Anau East
- Te Anau School
- Retford Stream

The average growth rate from 1998-2002 was found to range from 3% to 8% per annum (expressed as a percentage of the measured daily traffic volume for 2002). This is illustrated graphically in Figure 6.

The graph shows that the higher growth rates 6% and 8% p.a. respectively were recorded at Mararoa and at the Te Anau School site within the built-up area of Te Anau. The 4% p.a. average growth rate calculated for the Retford Stream site indicates that there is a continuing but generally modest growth rate for traffic destined for Milford Sound. Clearly all sites have experienced and are continuing to experience growth in daily volumes representing an overall increase in the amount of vehicular activity in the area arising not only from the on-going growth in the tourism sector but also as a result of development within the wider Te Anau area. These patterns are expected to continue through the next several years, with the recent release of additional residential land at Te Anau likely to bolster the increased activity generated within and connecting to the Te Anau urban area.

4. ROAD SAFETY

A search was undertaken of the Land Transport Safety Authority's Crash Analysis System (CAS) for the route between Queenstown and Milford Sound made up of SH6 and SH94. The search included the entire route from a point immediately south of the Kawarau Bridge at Frankton through to Milford Sound.

In the most recent five-year period, including the available data from the yet to be finalised records of 2003, there were some 11 fatal crashes causing 14 fatalities along this route. Seven of these occurred on SH94. All but two occurred in dry and fine conditions. The factors involved in these accidents varied widely and included loss of control, failure to give way, loss of control whilst overtaking and alcohol. The vast majority of crashes were single vehicle.

5. THE PROPOSAL

The Fiordland Link Experience will provide an alternative visitor travel experience for the popular tourist route between Queenstown and Lake Te Anau with improved linkages to Milford Sound from the Te Anau Downs Terminus site. Riverstone Holdings is looking to develop an additional range of visitor travel options to other alternative destinations such as Middle Sound on Lake Te Anau and the Fiordland Link Experience proposal would feed into these onward travel options. The proposal will comprise three separate yet co-ordinated transport modes

extending across different terrains providing visitors and travellers to the Fiordland area with an entirely new transport experience compared with the existing tour-coach based travel route.

The Fiordland Link Experience proposal will be comprised of the following route sections.

5.1 High Speed Catamaran (Queenstown – Mount Nicholas))

Commencing from a new wharf terminus to be located within central Queenstown (location yet to be confirmed) a custom-built, high-speed catamaran vessel will transport up to 160 passengers across Lake Wakatipu. Current planning and investigations have determined that such a vessel complete with on-board facilities including toilets and refreshments could reach a cruising speed of 24 knots could complete the journey across the lake to Mount Nicholas in approximately 30 minutes (including 3 minutes for manoeuvre at each end of the route).

5.2 All Terrain Vehicles (Mount Nicholas Wharf – Kiwi Burn)

Once the catamaran arrives at the wharf located adjacent to the Mount Nicholas station on the western shores of Lake Wakatipu, passengers would proceed directly into custom-built All Terrain Vehicles ("ATV's") for the road trip from Mount Nicholas to the Kiwi Burn bridge area some 40km to the north along existing sections of Von Road and Mavora Lakes Road. Both roads are public unsealed roads with open road 100km/h speed limits.

The route would traverse a number of different types of landscape over the route section including the Von Gorge where the existing gravel road climbs/descends a vertical distance some 180m over 1.7km of road at an average gradient of 1 in 9.4, past a number of shingle fans and through large sections of open, flat river valley.

It is anticipated that in the open sections of the route the travel speed of the ATV's would approach 70-75 km/h, while for the steeper sections within the Von Gorge for example, travel speeds would be in the order to 40-45 km/h. Overall, the route section from Mount Nicholas to the Kiwi Burn would take approximately 43 minutes to complete.

5.3 Monorail (Kiwi Burn – Te Anau Downs)

Others will describe this section and the particular features of the section in more detail, however from a general transportation assessment perspective this section encompasses travel via a fixed route monorail type train system with capacity for at least 160 passengers within specially designed units. The track would extend in a northerly alignment from an interchange terminus at the Kiwi Burn Stream situated approximately 1.9km south of the Mavora Lakes Road turn-off and the intersection with Von Road. The terminus building would be located approximately 150m west of the Mavora Lakes Road and include turning facility for both the monorail unit itself as well as the ATV's. More discussion about the terminus and its anticipated operation is given later in a subsequent section.

The monorail route would then extend to the north across the Kiwi Burn Stream along a track constructed from concrete beam sections, between about 1m and 3m above the natural ground surface. As the entire monorail track will in effect be one complete bridge, those parts of the track where it crosses significant streams and rivers will be handled in much the same way as other parts of the route, as will those locations where farm property access roads or pedestrian tracks are crossed so as to allow vehicles and pedestrians as appropriate to pass safely beneath.

It is anticipated that ultimately the monorail would incorporate passing bay sections at positions approximately 10, 20 and 30km from the Kiwi Burn. These facilities would allow the safe managed passage of monorail units moving in opposite directions at these three mid-route locations. The other sections of the route would provide only a single direction of movement at a time. Tracking and management of the monorail units within the system would be undertaken using GPS or similar tracking systems and computer control.

A possible forest canopy walk may also be incorporated within the route adjacent to one of the passing bay sites. This facility would allow passengers to walk within a controlled environment on top of the forest canopy. Others will describe this more fully.

At the northern end of the route the monorail would terminate at a terminus located adjacent to the Best Western Hotel at Te Anau Downs. The monorail would be carried over the SH94 route by a suitably designed over-bridge providing suitable and safe clearance to the highway traffic below and constructed in accordance with the relevant Transit NZ standards. In a similar way to the previously-described Kiwi Burn terminus, the Te Anau Downs terminus would provide suitable turning area for the monorail and interchange facilities with the road coaches collecting passengers for the next leg. The current planning of the terminal buildings has indicated that a 70m long by 18m wide terminus structure would allow suitable clearance between the monorail unit along one side of the platform and the coaches on the opposite side.

The Te Anau Downs terminal would be required by practical highway operation constraints such as travel speed, visibility distances and safety to connect to SH94 at least 250m south of the apex of the curve in the highway adjacent to the Best Western site. At present there are three access roads connecting with the Best Western Hotel site, Grumpy's Backpacker hostel and the Department of Conservation Lake Mistletoe visitor carpark.

5.4 Possible Linkages Beyond Fiordland Link Experience

It is envisaged that the Fiordland Link Experience will provide a high-quality visitor experience through areas currently largely inaccessible to large number of tourists visiting the area. It has the potential to provide improved visitor access into Te Anau, Lake Te Anau as well as onward connections to Milford Sound and the wider Fiordland area for those visitors choosing to visit this part of the country.

From a transportation and trip management perspective, a central benefit of the proposal relates to the particular opportunities that the Fiordland Link Experience timing and scheduling will afford to the existing visitor patterns between Queenstown and Te Anau, and especially through to Milford Sound. The resulting visitor movements into and out of Milford Sound by road will be far less intense with a greater spread of movements occurring through the course of each day. As will be discussed in greater detail in subsequent sections of this report, the ability of the Fiordland Link Experience to deliver people from central Queenstown to the western terminus at Te Anau Downs/Best Western within a travel time of a little over 2 hours compared with the on-road coach travel time of approximately 3¼ hours (2hr 15min to Te Anau plus 30min spent at Te Anau for morning tea on the outward journey plus a further 30min from Te Anau to Te Anau Downs and a further 1¾ hours from Te Anau Downs to Milford Sound including photograph stops along the outbound route).

When compared to the existing road transport connection provided by SH6 and SH94, the Fiordland Link Experience trip would offer a significantly reduced travel time and distance as well as improved comfort and scenic value. The following is summary of the equivalent route distance and typical trip time between Queenstown and Te Anau Downs for the existing coach-based travel, compared with what would be available with the Fiordland Link Experience:

SECTION	TRIP LENGTH (km)		AVERAGE TRAVEL TIME (hh:mm)	
	EXISTING	FIORDLAND LINK	EXISTING	FIORDLAND LINK
Queenstown – Te Anau Downs	209	106	3h 15m	2h 3m

Table 3 : Trip Comparison (Queenstown – Te Anau Downs)

The proposal would result in a reduction of approximately 103km or some 50% and trip time over the same section is reduced by around 1¼ hours or a 40% saving over the equivalent commercial coach trip from Queenstown.

For the longer route between Queenstown and Milford Sound, the following table compares trip times and distances.

SECTION	TRIP LENGTH (km)		AVERAGE TRAVEL TIME (hh:mm)	
	EXISTING	FIORDLAND LINK	EXISTING	FIORDLAND LINK
Queenstown – Milford Sound	299	195	4h 45m	3h 25m

Table 4 : Trip Comparison (Queenstown – Milford Sound)

For this full trip from Queenstown to Milford Sound, the proposed Fiordland Link Experience will result in trip time savings of around 1h 20m and travel distance savings of over 100km in each direction; both equivalent to savings of approximately 30 - 40% compared with current coach-based travel.

6. TERMINUS FACILITIES

As described earlier, the monorail section of the Fiordland Link Experience will operate within a 40km section between the Kiwi Burn terminal adjacent to the Mavora Lakes Road approximately 1.9km south of the Mavora Lakes turn-off and the Te Anau Downs/Best Western site adjoining SH94 just south of Te Anau Downs approximately 28.6km north of Te Anau. The monorail system will require terminus stations to allow passengers access from ground level onto the monorail units themselves. The terminus stations will also act as the cross-over between the other transport modes (ATV's at Kiwi Burn and tour coaches at Best Western). The efficient and convenient functioning of this interchange process at both of the termini is important to the overall success of the Fiordland Link Experience and is critical to the timing and co-ordination of the sectors within the overall trip. Other terminus facilities are also proposed at the Queenstown base (the location of which has yet to be determined) and also at the Mount Nicholas wharf site where passengers would interchange between the high-speed catamaran and the ATV's.

6.1 Queenstown

In the case of the Queenstown site it is expected that the existing Steamer Wharf facility would be used for various types of passenger arrivals such as

- tour coach,
- other organised road passenger transport (eg. shuttle, taxi, midi-coach),
- independent passenger car arrivals,
- arrivals on foot.

The present facilities at Steamer Wharf currently catered successfully for the TSS Earnslaw excursions between Queenstown and Walter Peak, and it is anticipated that these facilities would be readily able to cater for the Fiordland Link Experience departures and arrivals at Queenstown.

The detail of the use of the Steamer Wharf facilities would be developed and confirmed subsequent to this application.

6.2 Mount Nicholas

The interchange between the catamaran and proposed ATV's can occur relatively readily via the proposed wharf facility (possibly adopting the existing wharf facility and ATV platform). It is anticipated that passengers would simply disembark from the catamaran tied up alongside and move directly from the wharf area onto the ATV's. For a full catamaran load of 160 passengers a total of four 40-seater ATV's would be required. If all four ATV's were alongside the wharf simultaneously then the loading platform would need to up to 60-70m in length, however it would be more efficient to provide space for say two ATV's to collect the first passengers of the catamaran and to minimise walking distances and times. With appropriate group management of disembarking passengers and providing ATV's are positioned at the platform in time to meet

the incoming catamaran, each ATV should be able to be fully loaded within two to three minutes. As will be discussed in more detail in a subsequent section of this report, a total interchange time of 10 minutes has been allowed for this interchange function at Mount Nicholas.

Limited facilities and terminal structure are proposed at Mount Nicholas. Toilets and refreshments will be available on the catamaran, with only very limited facilities at the Mount Nicholas wharf. The limited provision of these facilities at this location is considered to greatly assist in the co-ordination and efficient transfer of passengers between these two modes. Some form of canopy structure may assist in minimising the impact of rain on passengers.

6.3 Kiwi Burn

The terminus building proposed at Kiwi Burn would necessarily involve more structure and facilities in order to cater for the movement of both passengers themselves between the ATV and monorail modes, but also turning and queuing facilities for the monorail and ATV's. The monorail design specifications indicate a minimum turning circle diameter of 60m. The plans accompanying the concession application (labelled TM05, Rev.C) show the concept layout of the Kiwi Burn terminus, including monorail turning, ATV platform and turning area and the terminus building itself including toilet and administration facilities.

A new vehicle access road approximately 200m in length (including a turnaround loop) would be constructed between the Mavora Lakes Road and the terminus including a formed and sealed intersection (with the Mavora Lakes Road carriageway sealed for a minimum of 50m either side of the junction) and appropriate Give Way intersection controls. For the convenience and comfort of Fiordland Link Experience passengers, the access road into the terminus would be sealed from Mavora Lakes Road. For the reasons of dust reduction and to allow easy manoeuvring of ATV's adjacent to the terminus building, the access road should be sealed to a minimum of 6.0m where two-way movement is needed. For the proposed turn-around loop a lesser sealed width could be justified where only single lane movement is anticipated. As with the Mount Nicholas facility, the ability for ATV's to enter the terminus area via the sealed access road and draw immediately alongside the monorail terminus platform, is a key part of the effective and convenient movement of passengers between modes.

The detailed design of the platforms has yet to be confirmed however some preliminary analysis has been undertaken to assess

- typical passenger movement between ATV's and the monorail, and
- emergency movement of passengers out of a monorail vehicle arriving at the terminus.

It is standard railway design practise to consider for station design purposes the emergency evacuation situation of a train arriving "on fire" at a railway platform which itself is already fully occupied by passengers waiting for an arriving train. The design assessment must ensure that all passengers – those on the arriving train and those waiting on the platform – are able to evacuate the station within a time of not more than 4.5 minutes. To provide a further margin of

safety, the calculation of evacuation rate is to be performed excluding the egress route of highest capacity.

The following key assumptions and calculation steps have been performed:

- each of 10 monorail units carrying 16 passengers ("pax"), and a total monorail train capacity of 160 pax plus crew,
- typical door capacity - 60 pax per minute per metre door width (ppm/m)
- average walking speed of 1.2metres per second (m/s)
- typical emergency stair capacity – 63 ppm/m (down), 56 ppm/m (up)

With the preliminary platform design allowing a length of 70m and using the above emergency design considerations to allow all passengers to clear the incoming monorail train units and the platform to designated assembly points outside the terminus, there would need to be a minimum of two doors at least 1m in width serving each monorail (16 pax) unit and at least two 1m wide stairs serving the platform overall. It is understood that the preliminary design for the monorail units will provide a door on each side of each row of four seats, easily satisfying these calculated minimum requirements. For convenience and customer service therefore, the quality of access/egress movement between the monorail and the ATV's would be somewhat higher than the minimums need for evacuation.

More detailed checks of these emergency capacity calculations would need to be undertaken once the platform and terminus design are confirmed, however the current indications are that the capacity and door arrangements of the monorail units and general form of the proposed terminus platform will perform effectively under emergency evacuation situations.

6.4 Te Anau Downs Terminus

Similar design considerations are relevant to the Te Anau Down terminus also. The additional considerations at this site include the increased standard of particularly vehicle access to and from the State Highway and the bridging requirements for the monorail track to pass over the highway. The passenger movement capacity considerations are identical to those described in Section 6.3 in relation to monorail door capacity (at least two doors on each 16 pax. monorail unit), and the provision of suitable emergency access stairs and/or ramps to clear both a full platform of 160 passengers plus a full incoming monorail with a capacity load of 160 passengers. As identified above, it is understood that the preliminary design for the monorail units will provide a door on each side of each row of four seats, easily satisfying these calculated minimum requirements.

7. CONSTRUCTION EFFECTS

7.1 Expected Traffic Generation

The civil engineering details of the monorail construction will be separately detailed by others, however in terms the traffic issues associated with the establishment and construction phases the following assessment has been prepared to summarise the expected traffic generation arising from the monorail route, terminus and associate facilities.

The monorail structure itself is proposed to be comprised primarily of 20m hollow-concrete beam sections 1.0m deep and 0.8m wide. In some sections of the route particularly where the nature of the local topography dictates smaller radius curves, 10m long beams will be required. They will be manufactured off-site and transported by road to both terminus ends (Kiwi Burn and Te Anau Downs) from where the construction of the monorail will commence in parallel. Other construction phase traffic would typically be expected to include:

- deliveries of a range of construction materials for both the monorail line itself and the terminus buildings (e.g. cement, steel, timber and sundry items);
- road construction activities;
- construction equipment (e.g. bobcat, excavators for terminal station construction purposes);
- construction staff.

Based on a 40km monorail length and consideration that 90% of the length would be constructed using 20m sections the transport of concrete beams would involve up to 2200 deliveries of beams to the project. While the particular construction management and scheduling of the project may affect whether a greater portion of the project is initiated at either end, for this assessment it is estimated that approximately half of all concrete bean deliveries would be undertaken to the Kiwi Burn (i.e. some 1100 beams) with the remainder to Te Anau Downs. Preliminary estimates prepared by the project team and its construction advisers indicate that a monorail line construction period of some 24 - 30 months would be appropriate. The advice given by the concrete beam manufacturers is that around six beams could be delivered to the project per day (assuming a transport period of some 300 -400 days), with three per day to each end of the project.

Other construction related traffic including staff activity would be expected to be in the range of 20 – 30 light vehicle movements per day at each end of the site, together with up to 20 heavy vehicle traffic movements per day. For much of the construction period the number of traffic movements would be far less and primarily related to individual staff car (or organised shuttle bus) movements to and from the terminus ends of the project.

7.2 Routes Potentially Affected

The concrete beams, other construction materials and staff involved in the construction are expected to travel via the State Highway network from the main centres and those sections of Centre Hill Road and Mavora Lakes Road as far as the Kiwi Burn terminus. Transport to the Te Anau Downs terminus can be achieved entirely via the State Highway network.

The route from SH94 to the Kiwi Burn terminus can be undertaken via either Centre Hill Road (16.2km from SH94 to Mavora Lakes Road junction) or Mavora Lakes Road (14.2km from SH94 to the junction). The Kiwi Burn terminus is situated a further 13.9km north along Mavora Lakes Road from this intersection and 1.9km south of the Mavora Lakes turnoff.

Both Mavora Lakes Road and Centre Hill Road provide moderate to high standards of gravel road carriageway through to the Kiwi Burn. Centre Hills Road has been sealed to a 6.5m wide standard for the first 3.5km in from SH94. Within the gravel road sections both routes generally provide a gravel formation width of between 6.0 and 6.5m in width. The current low vehicle usage of the road means that most drivers will adopt a central vehicle position which for the most part means a 5.5m wide "three wheel track" pattern commonly seen throughout the route. However, the construction of the gravel road formation allows full usage of the 6 – 6.5m road structure as needed and through some sections of the road a "four wheel track" pattern of use can be observed.

During inspections undertaken along this road, travel speeds of between 60 and 70km/h were observed when following the few other vehicles also using the route. The rural farming use made of the area indicates that occasional heavy vehicle movement along the route can be expected. As set out above, the expected volume of heavy traffic use even during the period when the concrete beam sections are delivered to the Kiwi Burn terminus site, would amount to approximately six truck trips or 12 individual truck movements along the road spread through the course of each day. It is concluded from this assessment that the existing width and structural form of the gravel roads (plus the sealed section of Centre Hill Road) are adequate in their existing form to accommodate the expected increase in traffic associated with the construction of the monorail and associated terminus building.

Rural roading design standards and guidelines such as the AUSTROADS Rural Road Design indicate that gravel roads providing two-way with of at least 6.5m can typically accommodate volumes to up to 200 vpd (two-way) without the need for carriageway sealing. The key determinant when assessing the ability for gravel roads to accommodate additional heavy traffic movements is typically the structural strength of the road pavement and base materials. Given the that existing routes serve farming and associated primary production activities it is considered that there would be sufficient structural strength and life available within the Circle Hill and Mavora Lakes Road routes through to Kiwi Burn to accommodate the beam transport vehicles, however detailed consideration of these by a suitably qualified road/pavement design engineer would be necessary prior to the associated resource consent application for the project.

Use of SH94 through to the Te Anau Downs end of the project is currently at a far better sealed highway standard and is considered to pose no impediment to the safe and effective movement

of both light and heavy vehicles (including trucks transporting 20m beam sections) to the northern terminus of the project.

7.3 Upgrading Needed

Other than the proposed formation and sealing of the access road into the Kiwi Burn terminus and intersection of the terminus access road with Mavora Lakes Road, there are no identified issues with the proposed use of either Mavora Lakes or Centre Hill Roads for use by construction phase traffic associated with the Kiwi Burn terminus and monorail. Adoption of the SH94 route through Te Anau extending through to Te Anau Downs is similarly confirmed as an appropriate and generally moderate increase in use of an existing physical resource and will not be required to be supported by additional upgrading or reconstruction as part of the Fiordland Link Experience project.

8. LOGISTICS AND TIMETABLING

8.1 Passenger Loadings

The project proponents have investigated a number of alternative passenger loading and capacity scenarios before settling on a trip loading of 160 passengers. The catamaran across Lake Wakatipu will have a capacity of at least 160 passengers (potentially up to 200) while the ATV's between Mount Nicholas and Kiwi Burn will match this capacity level through the use of four 40-seat vehicles or two 80-seat vehicles. Similarly, the monorail is initially intended to operate with a configuration comprised of ten 16-seat monorail carriages. From Te Anau Downs there would be a range of onward travel options available for visitors including coach trips to Milford Sound, Te Anau and other parts of the Fiordland area, as well as boat trips on Lake Te Anau.

The actual levels of passenger loadings using the Fiordland Link Experience will naturally vary across each day as well as across seasons. Some early estimates of the seasonality were developed by the applicant Riverstone Holdings Limited during the preliminary scoping of the project, however it is considered that from a transport perspective a useful source of this seasonality is the average daily traffic patterns recorded along the State Highway route between Te Anau and Milford Sound. Some of this data was presented in the diagrams appearing earlier in this report, and for the purposes of developing the transport-related passenger forecast projections, the following table of seasonality factors has been developed from the Retford Stream continuous count site maintained by Transit NZ. An annual average, daily traffic count for the site has been calculated by Transit NZ for the purposes of summary and reporting, however the more accurate picture of month-by-month variation in traffic volume has been collected from the regular count summaries recorded throughout the year.

The following table displays the 12 monthly factors derived by dividing the average traffic volume collected for each month through the year by the annual average traffic volume. Some interpolation between the data points has been necessary due to the absence of some monthly counts.

MONTH	SEASONALITY FACTOR (proportion of annual average count)
January	2.06
February	1.64
March	1.40
April	1.25
May	0.66
June	0.51
July	0.38
August	0.44
September	0.48
October	0.77
November	1.00
December	1.42

Table 5 : Seasonality Factors

As can be seen and as is consistent with the on-road count patterns presented earlier in this report, the summer months between December and March represent much higher levels of on-road traffic with the monthly average vehicle counts (and for the purposes of this current investigation passengers) being up to 100% above or double the annual average count, and nearly four times the low season July count.

This pattern of monthly seasonal factors differs somewhat from the patterns and values adopted by Riverstone Holdings Limited as part of its visitor projection and capacity loading calculations. A comparison of these patterns is made elsewhere in the Environmental Impact Assessment (EIA) report accompanying the DOC Concession Application. The Riverstone Holdings data more closely reflects the primary individual visitor patterns at Milford Sound itself, whereas the on-road traffic count basis derived from the Retford Stream site relates to the surrogate measure of vehicle counts and at a location encompassing the wider Te Anau-Milford area including visitors to the Milford Track, Lake Te Anau and the Hollyford Valley.

In summary the January level of activity recorded at the Retford Stream site represents a monthly factor approximately 30% higher than the equivalent activity level used in the Riverstone Holdings capacity analysis, while the September, October and November values were found to be between 30 and 50% lower than Riverstone Holdings' figures.

Overall and as will be explained in greater detail in the EIA report, the patterns of seasonal activity derived from the two independent sources reflect closely similar patterns over the course of a year.

8.2 Travel Speeds, Timing and Overall Programming

Figure 7 illustrates the pattern of vehicle and transport movements associated with the capacity operation of the Fiordland Link Experience project. This time-distance diagram indicates the progress in both time (along the horizontal axis of the graph extending from 7.00am at the left hand end and through till about 10.45pm at the right hand side) and distance (along the vertical axis with Queenstown at the top and Milford Sound at the bottom). Each of the solid lines shown on the face of the graph represents a passenger trip; dashed lines indicate positioning or empty trips where the vehicles are relocated to either end of the leg in preparation for the start of a new trip.

The diagram is prepared on the basis of a number of key assumptions and estimates regarding travel speed and interchange times within each of the legs. Some of these considerations are given by way of notes on the diagram, however for the sake of clarity the major trip-related estimates are as follows:

- catamaran travel speed 24 knots, sector length 20km, trip time 27minutes;
- 10 minute interchange time between catamaran and ATV's at Mount Nicholas;
- ATV sector average two-way travel speed approximately 60km/h, sector length 43km; trip time 45 minutes;
- 10 minute interchange time between ATV's and monorail at Kiwi Burn;
- Monorail sector average travel speed 73 km/h, sector length 40km, trip time 33 minutes;
- 10 minute interchange time between monorail and coaches at Te Anau Downs.

By careful study of the diagram and with reference to the notes supporting the graph, it can be seen that the first Fiordland Link Experience trip might potentially deliver up to 160 passengers into Milford Sound should they choose to adopt this trip option, by approximately 10.20am in the morning. If visitors were then to undertake a standard scenic cruise on the Sound and choose to return to Queenstown shortly thereafter, the Fiordland Link Experience could deliver these people back to the Queenstown terminus shortly after 3.30pm that same day. This clearly demonstrates the real advantage that the proposal offers not only in dispersing the movement of visitors into and out of Milford Sound (which will be discussed in greater detail subsequently) but also in increasing the effective length of day available for visitors to undertake other activities within the various sections of the Queenstown – Te Anau – Milford Area.

8.3 Effect on Milford Sound

Riverstone Holdings Limited is conscious of the issues surrounding the daily and peak period visitor loading and intensity at Milford Sound. Due to the dominance of day-trip coach-based visitors to the Sound the tidal movement of coaches and other vehicles into and out of the Sound is pronounced. Currently the peak daily loading within Milford Sound is estimated to be approximately 2,000 - 3,000 visitors generally between 11.00am and 3.00pm. Recent projections of this figure rising to 4,000 day-visitors have been made to occur sometime within the next five to 10 years.

For the purposes of developing an assessment of the potential effect of the Fiordland Link Experience proposal on the Milford Sound "system", it is assumed that under current coach-based transport arrangements that a peak capacity day for Milford Sound is represented by some 40 coach loads (at an average of say 50 pax/coach) carrying some 2000 visitors leaving Queenstown between 7.00 and 8.00am, and then arriving at Milford Sound between about 11.30am and 1.00pm. The visitor arrival rate at Milford Sound is therefore approximately 1300 pax/hr. These visitors then partake in one of the various scenic cruise options available on the Sound, and will all probably leave Milford Sound between about 3.00 and 4.00pm, in order to arrive back in Queenstown by between 7.30pm and 9.00pm.

Under the Fiordland Link Experience proposal providing these visitors with another transport and scenic tour option along the way, the arrival pattern of monorail passengers in the start-up scenario would most likely involve 160 passengers arriving in perhaps three or four coaches every 90 minutes or so. The arrival rate in the start-up scenario would be approximately 106 pax/hr and able to continue this from the first trip arrival at around 10.25am through till the last trip of the day at about 5.30pm.

Figure 8 presents a graphical comparison between the current peak season arrival rate of visitors into the Milord Sound and the Fiordland Link Experience arrival rate considering that all visitors arriving at Te Anau Downs choose to visit Milford Sound. As can be seen, the Fiordland Link Experience would be capable of successfully spreading the visitor load through the course of each day. The equivalent hourly arrival rate able to delivered by the Fiordland Link Experience would be potentially less than 10% of the peak rates currently experienced at Milford Sound through the coach-based transport system. The patterns of arrival rates on this graph showing the "with Fiordland Link" scenarios continue to show some peaking of visitor arrivals at about the middle of each day due to the proportion of existing coach-based visitors not able to be catered for by the proposed Fiordland Link Experience. In any event, the significant reduction in peaking during the middle part of each and every day is clearly evident even if the proposal attracts only 40% of existing visitors to Milford Sound.

It is also anticipated that some of the visitors on the Fiordland Link Experience will be free independent travellers that would have otherwise travelled by car to Milford. It can reasonably be assumed that at least some of these visitors would have arrived at the same time as the peak period for coach arrivals, and that the transfer to the Fiordland Link Experience would further assist with spreading these existing peak arrivals across the day.

The Fiordland Link Experience infrastructure has been planned to be able to increase capacity of passenger movement by increasing the frequency of trip timing (and obviously increasing the number of transport vehicles within the critical legs). However, even at the assumed maximum capacity the delivery of 160 people to Milford Sound every hour or even 45minutes (say) for up to six or eight hours would represent a far more dispersed arrival patterns than currently exists or is predicted to exist is the future arising from visitor transport between Queenstown and Milford Sound

9. MONORAIL OPERATIONS

9.1 Communications

The monorail proposal would make use of the current state of the art monorail system developed by companies such as Bombadier Company. Riverstone Holdings have identified three possible suppliers each with suitable experience and expertise in rail systems suitable for the Fiordland Link Experience route. As these modern monorail systems include the latest mechanical and electronic controls for the operation of the monorail units, the development of a communication system to accompany the physical monorail system itself would be expected to proceed simply and readily. The operation of the monorail communication system would be expected to include modern radio and possibly Global Positioning System ("GPS") tracking and positioning controls to allow centralised control and management of the monorail units, with scheduling of the use of the proposed passing bays in accordance with set procedures. Riverstone Holdings is aware that the Bombardier Company in particular, has extensive experience in the set-up of complex scheduling systems within far more demanding urban environments. It is anticipated that the successful train manufacturer and Riverstone Holdings would work closely to develop the necessary primary and emergency communication systems suited to the constraints of the operating environment and local topography.

The development of a Safe Operating Plan is required by the Land Transport Safety Authority (LTSA) as part of the passenger services licensing process which will be needed prior to the LTSA approving a license for the Fiordland Link Experience to carry fare-paying passengers, and is therefore covered by the LTSA's requirements and does not need to be addressed as a specific part of this Concession Application process.

None-the-less, the issues of monorail safety operation have been considered essential in the development of the system planning and preliminary design undertaken. The safety requirements particularly considering the combination of link speeds of 70 – 80km/h and the single-lane with passing bays arrangement. The following are some of the issues already considered as forming key elements of not only the operation by also emergency management of the system during breakdown or unforeseen circumstances:

- there will be a manual, visual inspection of the monorail track prior to the first trip of every day;
- the track will be equipped with sensors to determine relevant atmospheric and climatic conditions which influence the safety and operation of monorail units on the track;
- preparation of emergency management plans and appropriate procedures for passenger management in the case of an emergency;
- the use of a "shunt" unit to assist with the emergency removal of a monorail unit(s);
- adoption of a monorail "driver" to provide manual control of monorail vehicle as necessary.

The identification of these various safety and operational issues indicate that the proponents of the Fiordland Link Experience project take these issues seriously and will be incorporating all necessary requirements within the Safe Operating Plan which is a necessary requirement for the LTSA's passenger service licensing process.

10. OPERATIONAL EFFECT ON EXISTING ROADS

10.1 Centre Hill Road

As previously described the Centre Hill Road link between SH94 Mossburn -Te Anau and Mavora Lakes Road would be used primarily as a construction access route during the 24 – 30 month construction period anticipated. The issues of construction-phase traffic generation and roading standards have been presented in the earlier parts of this report. Based on that assessment and consideration that once operational the Fiordland Link Experience project would contribute to less than about a dozen mainly vehicle movements along either Circle Hill Road or Mavora Lakes Road, it is considered that the long-term effect on Circle Hill Road would be no more than minor.

10.2 Mavora Lakes Road

10.2.1 SH94 – Kiwi Burn

The section of Mavora Lakes Road between SH94 and Kiwi Burn is used by an estimated average of approximately 50 vehicles per day comprising a combination of farming operations, residents of the valley, recreational trips to and from both the Kiwi Burn track and the Mavora Lakes to the north of the Kiwi Burn. Construction traffic effects on the section south of the proposed Kiwi Burn terminus have been assessed in an earlier section of this report. In terms of the future operation of this route once the proposal is operating, there is anticipated to be in the vicinity of 10 – 20 vehicles per day (vpd) movements trips (mostly light vehicles and passenger cars) made to or from the Kiwi Burn out to SH94. These trips are most likely associated with staffing of the terminus facility at Kiwi Burn and servicing of the terminus.

As previously stated in respect of construction traffic, the gravel road construction in this southern section is of a moderate to high standard providing a consistent gravel road formation width of 6.0 – 6.5m. At present due to the low traffic volumes using the route, the carriageway is typically arranged as a "three wheel track" form, however passing manoeuvres can be undertaken at appropriately safe speeds (60-70km/h). An increase in the two-way traffic movements from the current estimate of 50 vpd to perhaps in excess of 100 vpd would most likely be associated with a more consistent "four wheel track" use of the available width.

The potential increase in future traffic movement arising from the operational aspects of the Fiordland Link Experience project (10 – 20 vpd) on this road section south of Kiwi Burn are unlikely to perceptible to most users.

10.2.2 Kiwi Burn – Mavora Lakes Turnoff

In this 1.9km section of Mavora Lakes Road between Kiwi Burn and the Mavora Lakes Turnoff the existing gravel carriageway maintains its 6 – 6.5m formation width and ready ability for two vehicles to pass at speeds of 50 – 60km/h. At start-up the Fiordland Link Experience project would be generating up to four ATV's destined for Kiwi Burn every 90 minutes with a total of up to 10 return trips between Mt Nicholas and Kiwiburn each day. In this particular section the "platoon" of four ATV's would deliver up to 160 passengers to Kiwi Burn turn around and return either empty or with another up to 160 passengers passing through this 1.9km section between about 12 and 15 minutes later. While there are anticipated to be two sets of four ATV's in operation on the Mount Nicholas/Von Road section, it is not planned to have these ATV platoons pass each other in this section (this would occur at about 5km south of Mount Nicholas). Should future growth in passenger numbers dictate the passing of ATV platoons in this section, it is recommended that a minimum carriageway width of 6.5m be maintained to allow safe passage of these and other vehicles.

In this regard the 1.9km section of the Mavora Lakes Road where recreational traffic generated by the Mavora Lakes themselves is expected to carry additional traffic of up to 80 ATV movements per day over its existing 6 – 6.5m formation width. There is no expectation that this section would be required to accommodate multiple passing manoeuvres of two platoons of ATV's hence the current width and standard of route is considered to be entirely sufficient for the scale and nature of additional traffic movements proposed. This level of additional traffic set alongside existing daily volumes of around 50 vpd does not call for specific upgrading either in terms of gravel formation width or sealing. Some future upgrading may be required to ensure fully available and usable 6.5m carriageway widths where ATV platoons are expected to pass each other and other private vehicles.

10.3 Mount Nicholas Road/Von Road

From the Mavora Lakes Turnoff to the proposed access point into Mount Nicholas station is a distance of some 38.2km via public roads Von Road and Mount Nicholas Road. The route is to be used for the transport of Fiordland Link Experience passengers via ATV's between the catamaran wharf at Mount Nicholas and the Kiwi Burn. There would be at least two sets of four ATV's operating in platoon fashion delivering up to 160 passengers to and from the monorail terminus at Kiwi Burn.

It is anticipated that the northern section of the route particularly at the 5 km mark out from Mt Nicholas Station will be where the two sets of ATV's pass each other. The particular position of this passing point will however depend on the final arrangement of scheduling and actual operating experience. Currently the formation standard through this and most other sections of the Von/Mount Nicholas route provides only a single travel of traffic movement with a two wheel track pattern of use on the gravel surface. Passing opportunities would need to be improved over a several kilometre section so as to allow the platoons of ATV's to pass each other safely and without significantly disrupting their progress along the route. Trip and travel management procedures could also assist with the execution of this operation by radio (or if operating, GPS) communication to allow drivers to assess where the "other" platoon is and either wait at a known

passing point or proceed on if the opposing direction platoon is a sufficient distance away. For open road travel speeds of approximately 60 – 70km/h and a safety distance of an equivalent of at least four seconds between vehicles, the platoon of four ATV's would be approximately 300m in length.

It is recommended that the passing area for these platoons of ATV's provide a usable gravel carriageway width of a minimum of 6.5m, plus 0.5m "shoulders" to the edge of formation. Sight distance should be at least 150m throughout the passing section, which itself should be a minimum of 500m length.

Other areas along the route where upgrading and modification will be required include :

Von Gorge – this section of the route is situated approximately 14km south of Mount Nicholas and involves a 1 in 9.4 grade, 3.0m usable width running surface and limited forward visibility. The gorge section ascends/descends 180m vertically, so that the edge of road drop-off height is significant. Upgrading of this section to provide for the regular passage of ATV's as well as the ability for ATV's to pause at appropriate locations to allow other users of the road to pass. It is anticipated that this section would require widening to an absolute minimum usable lane width of 4.5m, additional corner widening to provide passing opportunities and installation of guard railing throughout much of the 2.4km section.

Fords – a number of stream crossings are currently provided via fords. These will require reconstruction to provide a concrete base for the form to withstand the regular passage of ATV's.

Bridges – three key bridge locations (Oreti River, Black Spur Creek and Bush Creek) have been identified as requiring improvement to their structure and carriageway surface to satisfactorily provide for the ATV operation along the route.

Cattlestops – several cattle-stops are located along the route, generally at boundary points between runs or between significant paddocks within a single property holding. Most of these features are between 3.5 and 4.5m in width. They are not considered to be a major impediment to the safe and efficient passage of ATV's through the route, and most are equipped with sufficient forward visibility on the approach to them as to limit the potential for having to Give Way to opposing traffic. No specific mitigation action is recommended in respect of the existing cattle-stops.

Stock Droving and Grazing – during inspection of the route the presence of noticeable numbers of cattle within the road reserve area was observed. This appeared to happen due to the absence of any fences along significant portions particularly Mount Nicholas Road between the Oreti and Black Spur Creek. Cattle and other stock grazing paddocks either side of the road reserve does pose a risk to the safe movement of all vehicles passing along the public road. In terms of the ATV use of the route it is unlikely to be feasible or economic to install fencing along all sections of the route where stock may be grazing. It is recommended that in order to mitigate the potential hazard of ATV's conflict with grazing stock that:

a) the ATV management plan to include appropriate controls and driving practices to avoid and eliminate potential conflict, e.g. if passing within say 100m of stock along the route, slowing to a speed appropriate for the situation,
b) development of a "protocol" or similar generalised agreement with affected land owners including the practises to be adopted by ATV drivers and suitable courses of action in circumstances where the landowners or stock managers have concern about the ATV operation along the route,
c) investigations into establishing stock droving races along those more heavily stocked sections, are done in consultation with the Mt Nicholas owners.

11. STATE HIGHWAY OPERATION

11.1 Vehicle Operating Costs and CO_2

11.1.1 State Highway Coach Travel

As a means of assessing the overall transportation context within which the Fiordland Link Experience proposal is set, an assessment was undertaken looking at the current vehicle operating costs associated with the various tour coaches travelling to and from Milford Sound from Queenstown each day. For this purpose the standard vehicle operating costs ("VOC") calculations specified in the Transfund NZ Project Evaluation Manual ("PEM") was adopted. The series of calculations uses speed, distance and vehicle type to define the total operating cost of transport operations. In this case the calculation focussed on an assumed annual average of 20 coach trips (40 coach movements) moving between Queenstown and Milford Sound via the State Highway network from Queenstown, Frankton, Five Rivers, Mossburn, Te Anau to Milford.

The relevant calculations are attached as Figure 9.

These show that for a total of 40 standard coach movements travelling the 209km route on a daily basis (taken as 350 days per year) the total vehicle operating cost as seen within the wider transport context of the country as a whole, is some $1,392,380 per year.

The PEM then goes on to allow the assessment of that portion of the VOC attributable to CO_2 emissions. Based on research both internationally and domestically it has found a good correlation between total VOC and the cost of CO_2 emissions, and has expressed this for the purposes of evaluating transportation projects as 5% of total VOC. In the case of the coaches travelling the route from Queenstown to Milford Sound and return each day, the total CO_2 component of cost in national economic terms is estimated to be approximately 5% of $1,392,380 or $69,296 per year.

If the Fiordland Link Experience project is successful in attracting as expected between about 40 and 70% of the existing coach-based visitors to Milford Sound, then there may be a reduction in the number of daily coach movements (at least between Queenstown and Te Anau

Downs) from an annual average daily total of 40 coach movements per day to around 24 or perhaps even as few as 12 coach movements per day. The associated annual CO_2 savings generated by the Fiordland Link Experience would then amount to between about $27,720 and $48,510 per year. As this calculation does not allow for continuation of the high growth in the coach sector between 2004 and the project start date of 2009, the estimated savings are conservatively low. As there would be no change in the total numbers of coaches between Te Anau Downs and Milford Sound (while there would be a significant dispersal of movements through the course of each day), the CO_2 performance of the project over this sector would be neutral.

11.1.2 State Highway Car Travel

Riverstone Holdings Limited further anticipate that the Fiordland Link Experience will also attract free independent travellers that currently undertake the trip from Queenstown to Milford Sound by car, thereby leading to CO_2 savings as a result of reduced car travel. Based on analysis of the available traffic count data it is conservatively estimated that about 40-60% of the current volume of cars on SH94 to Milford is making a return trip from Queenstown. This equates to a two-way volume of about 165-250 vehicle movements per day. Adopting the same methodology for calculation of vehicle operating costs and CO_2 emissions as that used for coach travel, it is calculated that the total vehicle operating cost of these vehicles is $1,965,170 to $2,947,750 per year, with a CO_2 cost of $97,900 to $146,850.

Assuming that about 40-60% of these free independent travellers transfer to the Fiordland Link Experience, then there will be CO_2 emission savings related to the removal of these vehicle movements. This equates to a CO_2 saving of between $38,920 and $87,870 per annum. Again, it is probable that such a saving will be significantly higher by the time the project starts.

11.1.3 ATV Sector (Mount Nicholas to Kiwi Burn Terminus)

Using a similar process to that described above, it has been possible to determine the potential CO_2 production arising from the ATV section of the Fiordland Link Experience over the section of unsealed sections of Mount Nicholas and Von Roads.

This sector is some 45km long generally described at flat topography, with approximately 2.4km associated with the Von Gorge traversing a gradient of some 11%. In this regard the PEM procedures were used to assess the total ATV traffic volume over the year. The average daily ATV volume over the 360 operational days is calculated as 62 bus-type vehicle movements. At its peak there will be 80 vehicle movements consisting of 10 return trips per day, each with a maximum of four ATV's per platoon, and some empty "positioning trips". During the shoulder season this will reduce to 64 vehicle movements and in the off-season there will be 32 vehicle movements. The total Vehicle Operating Cost of this activity in standard PEM terms was calculated as some $785,640 with the equivalent CO_2 cost (being calculated as 5% of the total VOC) being estimated as $39,280 per annum.

A summary of the cost of CO_2 production from the ATV's compared with the CO_2 cost savings from reduced coach and car travel, is outlined in Table 6 below.

TRAVEL ROUTE	LOWER BOUND (40% Coach Transfer, 40% Car Transfer)	UPPER BOUND (70% Coach Transfer, 60% Car Transfer)
CO_2 Production		
ATV Travel	-$39,280	-$39,280
CO_2 Savings		
Coach Travel	$27,720	$48,510
Car Travel	$38,920	$87,870
Benefit	**$27,360**	**$97,100**

Table 6 : CO_2 Benefits

As can be seen, the nett CO_2 benefit (or savings) from a combined consideration of these route sectors would therefore be between about $27,360 and $97,100 per annum. As noted previously, these savings represent consideration of existing travel into Milford, and are therefore anticipated to be conservative as they do not allow for the anticipated continued growth.

11.2 Te Anau Downs Terminus Intersection and Monorail Overbridge

The current proposal for the Te Anau Downs Terminal is included in Plan TM02 Rev D. The diagram indicates the general arrangement of the monorail platform, the turnaround areas for the monorail and on-road vehicles, and alignment of the monorail over-bridge across the highway. The connection of the on-site access road with the SH94 route is shown indicatively following either the "power line" approach indicated with the dashed red line on the diagram or the "airstrip" approach alignment indicated with the solid black line on the diagram. While these diagrams show the two possible monorail approach alignments, the connection of the terminal platform itself with SH94 for road traffic would most likely be situated south of the Te Anau Downs Best Western site. In broad terms, the positioning of this access point is anticipated as providing sufficient separation and hence driver visibility in respect of the curving highway alignment north of the proposed terminus site served by either of the monorail approach alignments.

The position of the monorail line crossing of the highway has yet to be confirmed however, in either of the positions indicated in TM02 the line would pass via an elevated over-bridge above the highway. The terminus building and its particular requirements have been discussed in an earlier section of this report, however from a State Highway perspective the key matters of relevance in its current assessment include the development of suitably laid out, signed and marked intersection with the State Highway approximately 250-300m south of the curve adjacent o the Best Western Hotel site. The intersection would require a separate marked right turn bay to safely separate turning and through traffic, especially considering the right turn movement of buses from the north into the proposed site. The details of this intersection, its construction and operation would be the subject of future, detailed negotiation and agreement with Transit NZ.

In a similar manner the proposed over-bridge taking the monorail line from the eastern to the western sides of the highway would be subject to Transit NZ's bridge and structures requirements. It is expected that a minimum vertical clearance from the existing SH94 road surface to the underside of the over-bridge structure would be 6.0m, and that the location of supporting structural columns would need to be placed sufficiently clear of the edge of the roadway to maintain safety.

11.3 Safety Implications of Reduced Coach Volume

The Fiordland Link Experience is expected to attract between about 40 and 70% of the existing tour coach visitors currently travelling between Queenstown and Te Anau Downs, and on to Milford Sound leading to reductions of the existing coach travel within the current on-road travel routes. This may translate to reductions in the annual average daily coach travel between Queenstown and Te Anau Downs of between 18 and 28 coach movements per day. During the peak summer visitor periods this reduction could rise to around 30 – 50 fewer coach movements per day.

Based on the researched safety records of the State Highway route adopted for coach travel between Queenstown and Te Anau Downs the prevalence of coach involvement in serious injury crashes is relatively low. As previously described in Section 4 of this report, of the 246 injury crashes reported along SH6A, SH6, SH97 and SH94 between central Queenstown and Te Anau over the five year period between 1999 and 2003 inclusive, some 15 accidents or 6% involved coaches. Given that the annual average number of coach movements per day would be say 40 vpd and with each coach travelling approximately 209km each way between Queenstown and Te Anau Downs, the mid-block or non-intersection injury accident rate for coaches translates into some 65.5 coach related injury accidents per hundred million vehicle kilometres (ax/10^8 veh.km).

If the Fiordland Link Experience is successful in reducing coach movements along the State Highway routes between Queenstown and Te Anau, then there would be the potential for a saving of around six injury accidents involving coaches over a five year period or 1.2 accidents per year. Using standard accident costs of $890,000 per reported injury accident, this could translate to annual accident savings along the State Highway routes of up to $1,068,000 pa. Should the Fiordland Link Experience reduce coach movements along the highway routes by up to 70% then the savings could be 2.1 injury accidents saved per year or accident cost savings of up to $1,869,000 pa.

Riverstone Holdings Limited further anticipate that the Fiordland Link Experience would be attractive to existing free independent travellers many of whom would be foreign drivers and generally unfamiliar with the roads between Queenstown and Milford Sound. There are therefore expected to be positive safety gains from the possibility of these drivers adopting the Fordland Link Experience rather than adopting to drive themselves.

12. CONCLUSION

The Applicant Riverstone Holdings Ltd proposes to establish and operate a new tourism experience to be known as the Fiordland Link Experience. It would offer visitors to the Fiordland area the opportunity to see a large part of the Fiordland area not otherwise able to be seen via the more usual State Highway travel routes commonly adopted by tourist to the region. The Fiordland Link Experience would involve a high-speed catamaran across Lake Wakatipu from Queenstown to Mount Nicholas on the western shore of the lake, All Terrain Vehicles for the road sector from Mount Nicholas to a terminus facility to be built adjacent to the Kiwi Burn some 28km east of the SH94 route and some 45km from Mount Nicholas. From the Kiwi Burn a monorail is proposed through the Snowdon Forest Park terminating at Te Anau Downs some 29km to the north of Te Anau.

From a traffic engineering perspective the key issues arising from consideration of the proposal relate to the way in which the roading and traffic facilities proposed to serve the project can accommodate the expected scale and frequency of movements; both of vehicles and passengers themselves. For the most part the existing public roading links within the Von and Mount Nicholas Valleys will be adopted in their current form with minor modification to facilitate the construction of the monorail line itself and the associated termini facilities. On-going activity along Mavora Lakes Road and Von Road/Mount Nicholas Road can be adequately accommodated by the existing road formations. Recommendations have been made in respect of particular features of the road particularly the Von Gorge section of the Von Road route to ensure the safety of the ATV's moving up and down this section of road on a frequent basis.

This assessment has also identified particular advantages and benefits potentially arising from:

- reduced CO_2 emissions from coaches and cars currently travelling the State Highway route from Queenstown to Milford Sound, only partially offset by the increased CO_2 emissions resulting from the proposed ATV travel sector;
- potential reduction in coach-related accidents along the State Highway routes as a result of the reduced number, frequency and distances travelled by coaches between Queenstown and the Te Anau Downs terminus; and
- significant reductions in the intensity of visitor and coach movements into and out of Milford Sound as a result of the dispersion of daily visitor patterns likely to be generated by the project.

Overall then and from the perspective of the requested concession to establish and operate within the Department of Conservation's land there are no particular or general matters of a traffic or transportation nature that would prevent the necessary approvals from being given.

Traffic Design Group Ltd
August 2004