

Marshall Day Acoustics Limited  
Level 3, 69 Cambridge Terrace  
PO Box 4071, Christchurch  
New Zealand  
Telephone: 64 3 365 8455  
Facsimile: 64 3 365 8477  
[www.marshallday.com](http://www.marshallday.com)


**Date:** 23<sup>rd</sup> June 2004

**Prepared for:**

Riverstone Holding Ltd  
% John Edmonds & Associates  
PO Box 95  
Queenstown

**Attention: Katherine Hume**

**FIORDLAND EXPERIENCE  
ASSESSMENT OF NOISE EFFECTS**

  
\_\_\_\_\_  
**Stuart Camp**  
Director

## **1.0 Introduction**

The proposed Fiordland Link Experience is a project which aims to create a tourism experience. It will also provide an alternative route from Queenstown to Te Anau and Milford Sound. The experience will involve travel by boat, ATV, and Monorail through a range of scenic areas.

Marshall Day Acoustics have been engaged to assess the effects of noise from this project. This report has been prepared as part of an application for a concession from the Department of Conservation to operate the monorail component of the Fiordland Link Experience across the Department's land. As such, although overall noise effects are discussed, emphasis has been given to effects of noise on users of Conservation land.

## **2.0 Methodology**

Our assessment has been based on a visit to the Kiwi Burn end of the monorail route, including walking from the swingbridge to the Kiwi Burn hut and back. We have also attended a detailed briefing on the engineering and design of the proposed Fiordland Link Experience, and carefully reviewed route maps, drawings, and a description of the project.

## **3.0 Existing Noise Environment**

From a noise perspective, the overall experience can be broken up into several different noise environments;

### **3.1. Lake Wakatipu**

Lake Wakatipu is already a popular recreational area, with jet-boating, fishing, lake cruises, and other watersports already common. Coupled with helicopter and aircraft flyovers, the Lake is not a particularly quiet environment. In addition, residents who might be affected by noise from lake activities are only close to the source of noise when that particular activity is close to shore.

### **3.2. ATV route**

The proposed ATV route from Mount Nicholas to Kiwi Burn follows existing roads. Although existing traffic flows on these roads are quite low, the small number of houses in the area already experience some traffic noise, and are therefore unlikely to be particularly sensitive to additional vehicles.

### **3.3. Monorail route**

This section of the experience is undoubtedly the most sensitive receiving environment on the entire journey. Other than occasional aircraft noise, users of this area are currently unaware of man-made noise sources.

The existing noise environment on the route varies considerably. A number of sections of the route follow or cross existing streams. In these areas, existing noise levels from flowing water are quite high—our initial visit suggests levels of 40 – 50 dBA ( $L_{95}$ ) are common. In areas well away from streams, background noise levels during the day are likely to be less than 30 dBA ( $L_{95}$ ). To put these levels into context, 50 dBA is typical of the background noise level in a city such as Christchurch during the day, while 30 dBA is about as quiet as a residential suburb would expect to get in the middle of the night.

Much of the monorail route (km 0 to 31) is on conservation land, as are both of the terminus buildings.

The Fiordland Link Experience will deliver tourists to the Te Anau area from Queenstown more quickly than is currently possible by bus. Hence, buses to Te Anau and Milford Sound will be spread over a greater period of the day, thereby reducing the congestion which currently occurs in the area. However, the overall numbers of vehicles using the area around the Te Anau downs terminus is unlikely to change significantly from current levels.

## **4.0 Proposed Noise Criteria**

### 4.1 Residential Dwellings

At various points along the proposed route, the Monorail will pass existing farms and/or houses. There is therefore the potential for some noise effects at these locations.

Most District Plans contain noise rules for residential and rural environments. Typically, these follow the guidance given in New Zealand Standard 6802, and are in the order of 50 dBA  $L_{eq}$  during the day. In rare instances where a maximum level is specified during daytime, the rule is 75 dBA  $L_{max}$  or greater.

Whilst these limits are appropriate in many areas of New Zealand, they are arguably not stringent enough for remote areas such as this. To ensure that the effects of noise on these properties are minor, we consider it appropriate to adopt daytime criteria which are consistent with night-time rules in many parts of the country; 40 dBA  $L_{eq}$  and 65 dBA  $L_{max}$ .

### 4.2 Recreational Activities

For the purposes of this report, we have confined our discussion of noise effects to those on recreational users in the Monorail area.

#### Tramping

From an acoustic perspective, many trampers spend time in the outdoors for the ability to "get away from it all" and experience what is sometimes termed the natural quiet of nature. This doesn't necessarily mean that the bush is always quiet, rather that trampers expect to hear natural noises, not man-made ones. Hence, while it would be possible to

go tramping in almost any noise environment—assuming there is no danger to health or safety—intrusive noise is unlikely to be well accepted.

As an example of this, research into the effects of aircraft noise in the Milford Track area<sup>1</sup> concluded that "...guideline levels [ $L_{eq}$ ] for managing noise levels in National Parks [would need to be] in the region of 30 to 45 dBA...". This is somewhat less than typical daytime noise controls in rural areas, which as already discussed, tend to be around 50 dBA.

Another interesting study reported in 1998<sup>2</sup> showed that only 16% of visitors using the glacier walks were annoyed by aircraft noise, whereas a much greater 43% of bush walkers were annoyed by essentially the same noise. This suggests that the peace and quiet of the bush is a key factor in the enjoyment of tramping, and that intrusive noise is often unacceptable.

A third study, in the United States<sup>3</sup> showed that up to 25% of visitors were annoyed by aircraft noise even when it existed at very low levels and for very short periods of time. The example quoted showed that 5% of visitors were annoyed even when the aircraft were only audible for 1% of the time.

In concept, we believe that to avoid potential complaints, the aim should be to ensure that walkers in this area are generally unaware of noise from the monorail. This will require a careful comparison of the noise produced by the monorail with the existing noise environment in the area. At this stage, we propose to use the night-time rural noise rule discussed in section 4.0 as a guide for tramping areas. As part of the Resource Consent process, we propose to undertake detailed measurements of the ambient sound levels along the monorail alignment to ensure that this is appropriate. It is possible that more stringent criteria are required in some areas.

Some walkers may choose to walk on tracks which take them close to the monorail alignment at times, because they are interested in seeing the monorail go past. This will not pose any risk of hearing damage, and as such, we do not see any problem allowing this to happen, provided it is made clear to all users that the track they are about to walk may be affected by noise from the monorail. Signage should also clearly direct trampers to an alternative quieter route.

### Fishing

As with tramping, pastimes such as fishing are often enjoyed for the pleasure of the peace and quiet as much as for the fishing experience.

---

<sup>1</sup> Malcolm Hunt, "Management of Environmental Noise Effects from Sightseeing Aircraft In the Milford Sound Area", New Zealand Acoustics Vol 14 No 3, Sept 2001.

<sup>2</sup> S.T. Sutton, "Aircraft Noise Impacts: A Case Study in the Glacier Region of the West Coast of New Zealand", International Recreational Noise Symposium proceedings, Queenstown November 1998.

<sup>3</sup> Nicholas P Miller, "The Effects of Aircraft Overflights on Visitors to U.S. National Parks", ", International Recreational Noise Symposium proceedings, Queenstown November 1998.

It is common for people undertaking this type of recreation to suggest that "any noise" would have a detrimental effect on their leisure time. However, there is always some level of ambient noise, even in the relatively quiet environment within which the Monorail will travel. As noted in section 3.3, typical background noise levels in this area range from less than 30 dBA ( $L_{95}$ ) to about 50 dBA ( $L_{95}$ ). Fisherman are inevitably very close to the river, where noise levels will tend to be higher than many parts of this area because of water noise. Levels of 60 dBA or greater would be very common at the edge of rivers or streams.

It would perhaps be more correct to say that "any readily identifiable noise" has the potential to be annoying to some quiet recreational activities. In this context, we believe that fishing could take place without any noticeable effects in areas where the Monorail noise is less than existing background noise levels. In other words, as long as the Monorail noise is less than about 60 dBA, most fisherman would generally be unaware of its noise.

### Sleeping

The only recreational hut in the conservation area in the vicinity of the monorail alignment is the Kiwi Burn hut. Other than in the case of unexpected bad weather, huts in bush areas such as this are generally used solely for somewhere to sleep overnight as part of long tramping expeditions. They provide basic facilities which are adequate for trampers, but unlikely to attract long term visitors. As a result, we believe that the only significant risk of effects from noise at huts is sleep disturbance at night.

The application proposes that the Fiordland Link Experience will be predominantly limited to daylight hours. Even in Summer, the draft timetable proposes a first departure from Queenstown at 7am, with a final return to Queenstown of 10.44pm. Given the predicted travel times for the ATV sector and the lake crossing, this means that the first Monorail departure will be around 8.30am, and the last will conclude by 9.45pm. Even allowing for an inspection of the monorail track each morning, it is unlikely that there will be any noise within typical night-time hours of 10pm to 7am.

## **5.0 Predicted Noise Levels**

### 5.1. Monorail Noise

It is somewhat difficult at this stage to provide an accurate prediction of noise levels from the proposed monorail. Whilst there are several equivalent monorails already operational in the world, they are located in busy areas and have large numbers of trains. For example, the Seattle monorail project scheduled to open in 2007 will provide commuter transportation using trains operating every 4 to 6 minutes. As a result, the assessments of effects undertaken for those projects have been able to present noise data as an overall day-night average noise level ( $L_{dn}$ ). We do not consider this sufficient on this project because of the small number of train movements. We believe that it is also necessary to assess the maximum noise level ( $L_{max}$ ) during a single train pass.

In the absence of any other currently available data, we have undertaken noise measurements on the existing monorail in Sydney. This monorail is much older technology running on a steel rail, and hence almost certainly somewhat noisier, than the model which will be employed on this project, which will incorporate rubber wheels running on a concrete track. Hence, we believe that our measured noise levels represent an over-estimate, and as such should only be used to give a general indication of noise from this project.

Our measurements of the Sydney monorail can be summarised as;

- $L_{max}$  72 dBA at 50 metres
- SEL<sup>4</sup> of 1 train pass 82 dBA at 50 metres

As an example of what these numbers mean, our calculations show that to achieve our recommended rule of 40 dBA ( $L_{eq}$ ) and 65 dBA ( $L_{max}$ ), with an initial frequency of 1 train every 1hr 40 minutes in each direction, a buffer distance of about 200m would be required over flat open land. Through bush or hills, this buffer would reduce to less than one hundred metres. At the maximum frequency of 1 train in each direction every 30 minutes, the required buffer distance would increase to about 1km over flat land, reducing to a few hundred metres through bush or hills.

## 5.2. Terminus Buildings

Within the terminus building at each end of the monorail, there are a number of potential noise sources. In particular, there is likely to be some air-conditioning equipment and other mechanical services such as exhaust fans. An emergency generator is proposed for the Te Anau terminus. This will operate infrequently for testing and in emergencies.

While mechanical equipment can produce high levels of noise, there are well established methods for controlling noise from these sources.

As an example of this, we have recently undertaken commissioning noise measurements on a diesel generator installation which successfully achieved compliance with a night time residential noise rule of 40 dBA at a distance of 15m from the building.

Provided there are appropriate criteria specified, and an experienced acoustic consultant is responsible for ensuring that the design achieves those criteria, we therefore believe that the effects of noise from these sources will be minor.

---

<sup>4</sup> SEL is short for Sound Exposure Level. It is a measure of the total sound energy of a sound event, and can be used to calculate the average ( $L_{eq}$ ) level for a given number of events within a specified timeframe.

### 5.3. Vehicle noise

The two terminus locations are acoustically quite different.

The Te Anau terminus is in an area which already has a lot of vehicle activity—both road traffic and recreational users of the lake and surrounding areas. As already discussed in section 3.0, the number of vehicles using this area is unlikely to change as a result of this project, but they will be spread over a greater portion of the day. Hence, we expect the effects of vehicle noise around this terminus to be negligible. However, a detailed analysis will be required during the resource consent process to ensure there are no localised noise effects on specific properties.

In marked contrast, the Kiwi Burn terminus is near a road which has very low traffic flows, and other than typical farming related noises, is a quiet area. However, the Experience will be setup in such a way that it will not be possible to join it at the Kiwi Burn terminus. Hence, the ATV's will make up the majority of the vehicles at this location, with the number of private cars being very small. In addition, the nearest house is about 1km from the proposed terminus. At this distance, we expect noise from manoeuvring of vehicles around the terminus building to be minor.

Of greater potential concern is the possibility that vehicle noise might detract from the proposed bush walk around this terminus. Because this is part of the proposed tourism experience, it will be important to quantify and control such effects by careful placement and screening of parking areas. Based on our experience on other projects, we are confident that this can be achieved, but a more detailed analysis of this will be required as part of the Resource Consent Process.

### 5.4. Maintenance workshop

A maintenance workshop will be constructed close to the Te Anau terminus building to allow for regular servicing and maintenance on the monorail trains.

Most of the work undertaken in this workshop will be regular servicing which generally only involves quiet activities. However, there will be occasions when a major overhaul of a train will be required, and such activity will generate noise.

As with mechanical equipment associated with the terminus buildings, workshop noise will be restricted to within the workshop building. As such, noise can be readily controlled by appropriate design of the building. A noise management plan may be required for the workshop to ensure that large external doors are closed when any noisy work is undertaken. We propose to address these issues in detail during the Resource Consent process.

## 5.5. Construction Noise

Although construction noise is perhaps the noisiest of all sources on this project, it will only exist in any one area for a relatively short period of time.

As already discussed, a buffer distance of about 1km will be required between the monorail and any walking track to achieve an appropriate level of noise from the monorail operations. Given the terrain in the area, this will almost always result in a large hill between the train and the walking track. As such, noise levels will be reduced further because of the screening effect of the hill.

We recommend that a similar buffer distance is maintained for construction noise. Hence, any realignment or replacement of walking tracks should be undertaken prior to construction on any given section of the monorail track. This will ensure that construction noise levels are very low on any walking track.

## 6.0 Assessment of Effects

### 6.1. Existing facilities

#### Tramping

Noise levels from the monorail operation will generally be unacceptable to trampers on tracks which are currently close to the train alignment—simply because man-made noises detract from the wilderness experience which the bush offers, rather than because the train is particularly noisy.

On this basis, it will be necessary to relocate walking tracks, or upgrade existing alternative routes to ensure that trampers have viable options which are not affected by monorail noise. This relocation has always been acknowledged as being a necessary part of this project, and the application has been developed accordingly.

#### Fishing

Fishing activities will be much less affected because of the reasonably high levels of water noise near the river. However, it is possible that a short section of the river near the Kiwi Burn Terminus receive levels of noise which are sufficient to detract from the natural quiet of the area. If the detailed design shows that this will happen, it may be necessary to provide access to an alternative section of river. Our initial analysis suggests that a buffer zone of around 200m would be appropriate between the monorail and a fishing area.

#### Residential Dwellings

The nearest dwellings to the proposed monorail are in the order of 1km away. Our preliminary assessment shows that the effects of noise from the monorail operations on

existing dwellings in the area will be less than minor because of this large separation distance.

## 6.2. Proposed bush walk around Terminus

As already discussed, the proposed bush walk around the Kiwi Burn Terminus could be affected by vehicle noise because of its close proximity to parking areas. However, there are two self-mitigating factors relating to this;

- This short bush walk will primarily be used by people who have just arrived by ATV as part of the Fiordland Link Experience, with a small number arriving by private car specifically to undertake this walk. As such, the walk users will already have a connection with vehicles, and hence their expectations with respect to noise are unlikely to be as demanding as we would expect for trampers in more remote areas.
- The success of this bush walk will in part be a result of the ability to control issues such as noise to acceptable levels. The detailed design of the terminus area will therefore need to carefully consider the location of parking and access routes relative to the bush walk to minimise effects.

On this basis, we believe that the effects of noise on the proposed bush walk will be minor.

## 7.0 Mitigation

To ensure that the effects of noise from the proposed Monorail are minor, some relocation or realignment of walking tracks will be required. Final details of this process will need to be developed and discussed during the Resource Consent phase of the project. However, in concept, we recommend that a buffer distance of around 1km is maintained in areas where there is flat open ground. In hilly bush covered areas, an intervening hill would enable this buffer to be reduced to a few hundred metres.

As part of the Resource Consent process, we recommend that a detailed noise management plan is developed to minimise other possible noise effects. This plan should address specific noise issues relating to the operation of the facilities, such as;

- The speed of ATV's near the terminus buildings.
- Management of workshop noise.
- Testing of the standby generator.
- Control of noise from public address systems.
- Response time for maintenance.

As the project progresses we will obtain noise measurements on an operational monorail equivalent to the one proposed for this project. The newer technology which will be employed means it is very likely to be considerably quieter than the Sydney monorail upon which this assessment of effects is based.

## **8.0 Monitoring**

As already discussed, the aim is to ensure that recreational users are generally unaware of noise from the Monorail. We believe that it will be possible to achieve this by providing alternative walking tracks well away from the monorail alignment, and possibly by providing access to a stretch of river away from the Kiwi Burn Terminus for fishing.

With these mitigation measures in place, we believe that the effects of noise will be negligible, and as such we do not consider regular monitoring of noise to be required. Instead, we recommend that noise monitoring is only undertaken in response to complaints about noise. It would be appropriate to have a detailed complaints protocol in place to ensure that noise monitoring can be undertaken in the section of track which prompted the complaint. It is possible that small additional changes to walking tracks may be required to deal with such issues.