

**BEFORE CANTERBURY REGIONAL COUNCIL
AND THE ASHBURTON DISTRICT COUNCIL**

IN THE MATTER of the Resource Management Act
1991

AND

IN THE MATTER of resource consent applications by
Rangitata Diversion Race
Management Limited to the
Canterbury Regional Council and
Ashburton District Council for
resource consents for the
construction, operation and
maintenance of the Klondyke
Water Storage Facility, its
associated water takes from and
discharges to the Rangitata River,
and all associated activities

STATEMENT OF NEVIL IAN HEGLEY

DATED 27 MARCH 2018

1. INTRODUCTION

Qualifications and experience

1.1 My name is Nevil Ian Hegley. I am the Principal of Hegley Acoustic Consultants. I have the following experience and qualifications relevant to the evidence I shall give:

- (a) I have more than 40 years' experience in civil engineering and for the last 35 years I have specialised in acoustics;
- (b) I have an MSc from Southampton University where I undertook research in acoustics in 1975/76;

- (c) I am a Member of the Institution of Professional Engineers New Zealand, the Institution of Civil Engineers London and the Acoustical Society of America;
- (d) I have been on the majority of the Standards sub-committees dealing with sound issues since 1977 and I was the Chairman of both of the sub-committees that approved the 1984 and 1999 versions of the Construction Noise Standard NZS6803;
- (e) In 2010, I was awarded the Meritorious Award by Standards New Zealand for outstanding commitment to the development of New Zealand Acoustic Standards; and
- (f) I have been involved in many large scale earthworks projects, such as cleanfill sites and mine overburden areas such as will be undertaken for this project.

- 1.2 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's 2014 Practice Note. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Involvement in Project

- 1.3 I first visited the site in September 2012 and have been involved with the development of the proposal since that date. My involvement from that time has included advising on any potential noise effects from the development of the project and how the effects should be managed to ensure there will not be any adverse effects from noise for the neighbours and advising on the proposed noise conditions.

The Project

- 1.4 This evidence considers the noise aspects of the proposal by Rangitata Diversion Race Management Limited (RDRML) to develop a water storage facility, fish screen and associated facilities (the proposal). The assessment addresses the noisiest phases of the proposed work rather than any given stage of the proposed development. By controlling the noisiest phase of the work to within the design limits all other stages of work will also satisfy the noise (and vibration) limits.
- 1.5 This evidence considers how the project will be managed so that noise will be controlled to within a reasonable level for the residents. The noise assessment has been based on the expected equipment to be used for construction and where options are available the larger (noisier) equipment has been adopted in the analysis. That is, the assessment is the worst case scenario and provides a conservative result.

2. DISTRICT PLAN REQUIREMENTS

- 2.1 The site is located in a Rural Zone in the Ashburton District Council Plan and is shown on Figure 1.

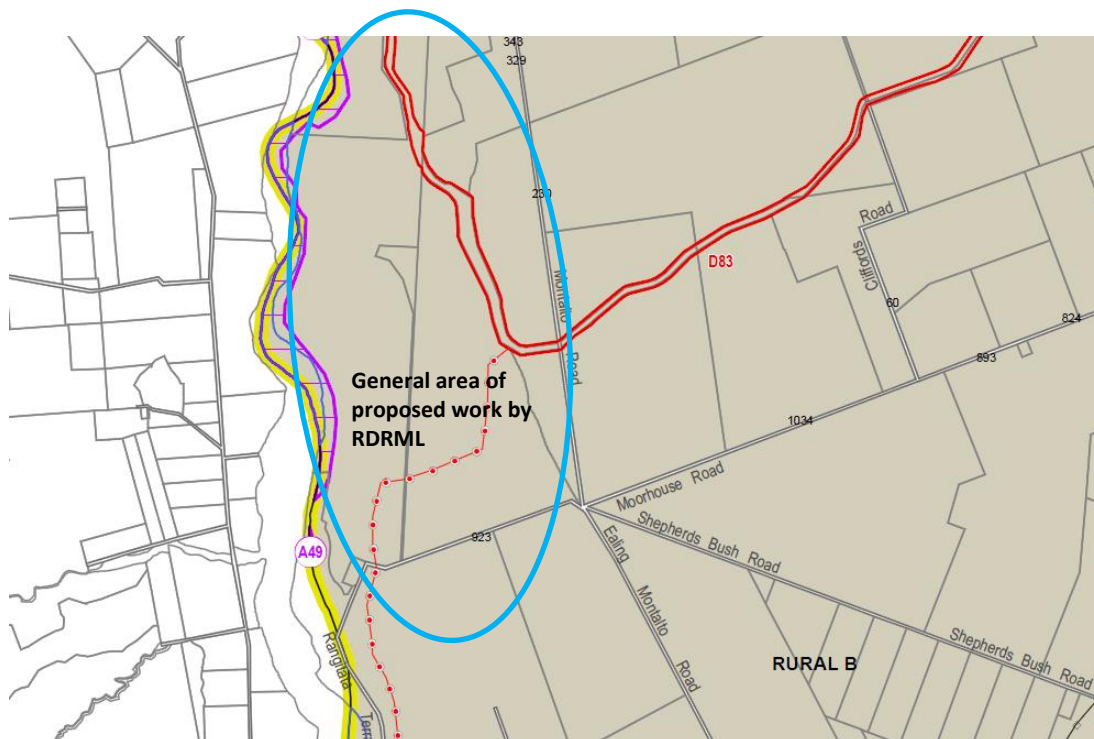


Figure 1. Site Zoning, Ashburton District Plan

Source: District Plan Map R62

2.2 As shown on Figure 1 the site is located in a Rural B Zone where Rule 11.8.1 Noise Standards for zones sets the following relevant limits:

- a) *The noise level from activities within any other site shall not exceed the limits set out in Table 11-1 below:*

Table 11-1: Noise Limits

	Daytime (0700-2200 inclusive)		Night-time (All other times)	
	<i>L_{Aeq}(1hr)</i>	<i>L_{AF,max}</i>	<i>L_{Aeq}(1hr)</i>	<i>L_{AF,max}</i>
<i>When measured at or within the boundary of any other site zoned:</i>				
<i>Rural A and B</i>	<i>65dB</i>	<i>85dB</i>	<i>45dB</i>	<i>75dB</i>
<i>When measured at the notional boundary of any residential unit on an adjoining site zoned:</i>				
<i>Rural A and B</i>	<i>50dB</i>	<i>75dB</i>	<i>40dB</i>	<i>65dB</i>

Notes:

- a) *Where there are buildings close to or on a site boundary, compliance with the noise limits shall be assessed 1 metre from any accessible façade of those buildings.*
- b) *Where a fence or other noise control structure is erected on a site boundary, compliance assessment shall consider the effect of such a structure.*
- c) *When applying the notional boundary provision, the notional boundary is a line 20 metres from any residential unit on any neighbouring site, as defined in NZS6802:2008 Acoustics-Environmental Noise.*
- d) *The daytime noise limits are intended to provide amenity for outdoor activities. Night-time noise limits are intended to allow for sleep amenity.*
- e) *The noise rule that is applicable to a site is based on the zoning of the site receiving the noise and not the site that is generating the noise.*

2.3 For construction work District Plan Rule 11.8.3 Construction Noise states:

- a) *Construction noise shall comply with NZS 6803:1999 Acoustics – Construction Noise.*

2.4 Given the size of this project the long term duration noise levels (works exceeding 20 weeks) will apply to this project. Table 2 of NZS6803 sets the following noise requirements for any long term construction work at:

**Recommended Upper Limits for Construction Noise Received
in Residential Zones and Dwellings in Rural Areas**

<i>Time of week</i>	<i>Time period</i>	L_{eq}	L_{max}
<i>Weekdays</i>	0630-0730	55	75
	0730-1800	70	85
	1800-2000	65	80
	2000-0630	45	75
<i>Saturdays</i>	0630-0730	45	75
	0730-1800	70	85
	1800-2000	45	75
	2000-0630	45	75
<i>Sundays and public holidays</i>	0630-0730	45	75
	0730-1800	55	85
	1800-2000	45	75
	2000-0630	45	75

- 2.5 Dwellings to the west of the Rangitata River are located in the Timaru District and while the cross boundary noise controls applicable are those as set out in the Ashburton District Council Plan, the noise limits of the Timaru District Plan have also been considered. As shown on Figure 2 the land to the west of the Rangitata River is zoned Rural 1 in the Timaru District Plan.

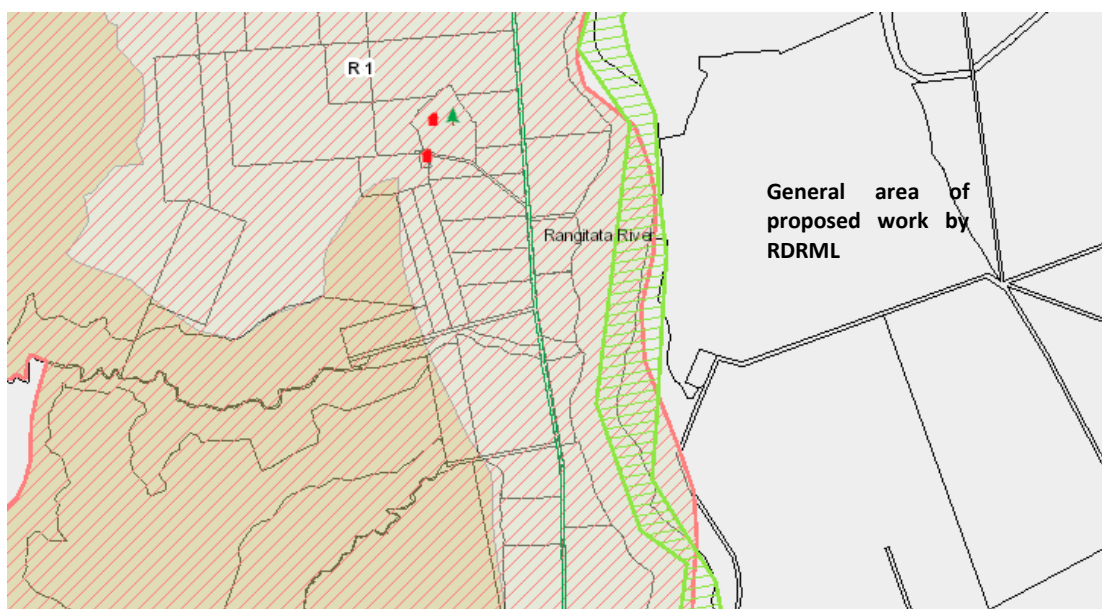


Figure 2. Land Use Zoning, Timaru District Plan

Source: Timaru District Plan

- 2.6 Part D1-Rural Zones, Rule 5.22 of the Timaru District Plan sets the following relevant noise limits for a rural zone:

... all activities shall be designed and conducted so that noise levels shall not exceed 50dBA L_{10} at the notional boundary of the nearest household unit on any other site between 7.00am and 10.00pm on any day, and 40dBA L_{10} and 70dBA L_{max} at all other times.

- 2.7 General Rule 6.21 requires:

6.21.2.1 MEASUREMENT AND ASSESSMENT OF GENERAL ENVIRONMENTAL NOISE

Except where expressly provided elsewhere in this Plan, noise shall be measured in accordance with the provisions of New Zealand Standard 6801:1991 Measurement of sound and assessed in accordance with the provisions of New Zealand Standard 6802:1991 Assessment of environmental sound.

6.21.2.3 CONSTRUCTION NOISE RULES - ALL ZONES

Construction noise in any zone shall not exceed the recommended limits in and shall be measured and assessed in accordance with the provisions of New Zealand Standard 6803P:1984. The measurement and assessment of noise from construction, maintenance, and demolition work. Discretionary adjustments provided in clause 6.1 of the Standard shall be mandatory within the District.

- 2.8 Except for the L_{max} levels the operational noise rules are the same as set out in the Ashburton District Plan, albeit L_{Aeq} is used in the Ashburton District Plan and L_{10} in the Timaru District Plan and the 2008 versions of NZS6801 and NZS6802 replace the 1991 versions used in the Timaru District Plan. It is noted the L_{max} is not a controlling factor with noise compliance so the issue of any cross boundary differences in the noise control will not cause a problem for either Council. Similarly, the small difference (typically 2dB) between the L_{Aeq} and L_{10} will not have a noticeable difference on the noise received. There are no rural site boundary noise limits in the Timaru District Plan.

- 2.9 For construction work the Timaru District Plan adopts the Provisional Standard NZS6803P:1984 *The Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work* while the Ashburton District Plan adopts the more recent version of NZS 6803:1999 *Acoustics – Construction Noise*. The use of the 1999 version of NZS6803 is recommended, as it removes the ambiguities in the 1984 Provisional Standard. In this case, compliance with the 1999 version of the

Standard will ensure compliance with the 1984 Provisional Standard so is adopted in this report, regardless of any cross boundary effects.

- 2.10 For both the construction and operational noise the requirement of section 16 of the Resource Management Act 1991 (the Act) to ensure that the best practicable option must be adopted to ensure that the emission of noise does not exceed a reasonable level has been taken into account. Having considered section 16 of the Act and the expected noise emissions from the Proposal, I conclude that the proposal will not cause unreasonable noise to be emitted.

3. THE PROPOSAL

- 3.1 As set out in the evidence of others¹ the proposal is to construct a water storage facility of approximately 53 million cubic metres downstream of the scheme intake in the Klondyke area using a ring of elevated embankments that will retain the water up to 30.5m above the existing ground level. There will also be a white water course located at the south western corner of the water storage facility and a fish screen.
- 3.2 The earthworks plant expected to be used during the construction of the proposal is set out in Table 1. It is noted that the plant in Table 1 will vary from contractor to contractor depending on their preference and availability of plant at the time of construction, so it is given only as an indication of the likely make-up. However, the plant shown in Table 1 represents both the maximum size of plant expected to be used and the maximum amount of plant on site at any one time so representing the maximum noise likely to be generated from the site.
- 3.3 The earthworks are likely to be carried out using a combination of scrapers and dozers and/or dump trucks and excavators. The scraper-dozer combination tends to be more economical for haul distances of less than 600m, while the truck-excavator combination tends to be more efficient over longer distances. Whether the contractor uses one or the other or a combination of both, the total number and size of plant will be similar. For the noise assessment, where there is an option the

¹ Steve Woods (regarding the pond infrastructure and Shepherds Bush Road relocation), Rob Greenaway (regarding the potential effects on recreation), Mark Sanders (regarding the ecological refuge), Andrew Metherell (regarding the transportation effects), Paul Morgan (regarding the engineering aspects of the white water course, canal modifications, and the fish screen) and Bryan Peters (regarding the pond and Shepherds Bush Road relocation - construction)

analysis has been undertaken based on 70% of both options being used. This will provide a good factor of safety with the analysis.

Plant Type	Noise Level (each) L_{WA}	Number on Site
35t Scrapers (Cat 637) and/or 35t Dump Trucks (Cat 769c)	111dB 112dB	Combined total of 21
Dozers (D6) and/or Excavator (Cat 336e)	113dB 110dB	Combined total of 6
Graders (Cat 14)	102dB	6
Water Cart (Cat 725)	112dB	6
Vibrating Roller Compactor (12 t)	107dB	6
Combined Total Plant Number		45

Table 1. Typical Plant Expected on Site

- 3.4 In addition to the earthmoving plant a concrete batching plant may be employed on site. The noise from this plant has been based on field measurements of an existing batching plant that had a sound power level of 115dB L_{WA} . As there are two potential sites where the batching plant may be located, one to the south and one to the east of the pond, both sites have been included in the analysis and this will provide a further factor of safety in the predictions.

4. EXISTING NOISE ENVIRONMENT

- 4.1 The existing noise environment has been assessed based on a series of short term noise measurements I undertook during April 2015 for the mid-morning to afternoon period. The weather during the measurement period was calm to light winds, fine and mild. The location of the noise monitoring was on the road boundary opposite House 4 in Montalto Road, House 5 in Moorhouse Lane and House 8 in Shepherds Bush Road as shown on Figure 7.
- 4.2 The equipment used for the measurements was a Brüel & Kjær 2250 Hand-held Analyser platform with Sound Level Meter Software BZ 7222, Frequency Analysis Software BZ 7223, Logging Software BZ 7224 and Sound Recording Software BZ 7226. All measurements were undertaken in accordance with the requirements of NZS6801:2008 *Acoustics – Environmental Noise*.
- 4.3 The noise in the area, at and in the area around the proposed site, was controlled by farm animals, distant river noise and the effects of wind in the trees. The amount of

noise from the Rangitata River was dependent on the distance from the river and will be further controlled by the amount of water flowing.

- 4.4 For the average water flows the river noise does not control the background sound at the dwellings and with minimal wind at ground level and a 2 – 3m/s wind in the tree tops the background sound (L_{A90}) was typically $36 \pm 2\text{dB}$. This level is expected to drop to approximately 32dB on a still day. As the wind increases the level will rise quickly to 40 – 45dB with a 5 – 6m/s wind blowing.
- 4.5 As there is no specific activity in the area the noise environment is reasonably constant in the area. The main influence on the noise is any change in the weather conditions, such as wind effects, so monitoring in calm condition provides a representative sample of the noise and a good indication of the long term noise level. Although the original noise monitoring was undertaken three years ago (April 2015) there is no reason to suggest the existing noise environment will have changed at all so the above may be taken as representative of the current conditions.
- 4.6 These levels do not include the effects from farm animals, farm machinery or passing traffic which will vary from time to time. In general, these levels reflect what is expected in a typical rural environment and while the proposed construction works will have an effect on these levels, once operating, there will not be any change to the existing noise environment for the residents.

5. **PREDICTED NOISE**

- 5.1 From the above the noise effects have been modelled using the Brüel & Kjær Predictor v11.0 programme. This is a powerful environmental noise software package that uses a digital terrain model for the calculations. The calculations have been undertaken in accordance with the requirements of ISO 9613-1/2 Acoustics – Attenuation of Sound during Propagation Outdoors. For this project, a grid varying between 20m – 50m has been adopted in a digital terrain model with the ground contours at 2m intervals. The noise from the earthworks activities has been calculated at each grid point from which the noise contours have been determined. All calculations have been undertaken assuming a positive meteorological effect (which provides a higher level than for neutral conditions) with 0.5 ground absorption. This is considered to be representative of hard ground in the summer

and wet ground during the winter. A receiver height of 1.5m has been adopted for the analysis.

- 5.2 In order to predict the noise from the proposed construction at the water storage facility all of the above noise sources have been located at the existing ground level, which is representative of the initial earthworks, and then at the top of the pond wall, which is representative of construction work with the maximum noise exposure to the neighbours. The construction plant was located in the northern part of the site and then in the southern part of the site to represent the closest points where the plant will come to the dwellings in the area.
- 5.3 Construction work for the white water course is further from the closest dwelling and at a lower level than the most exposed pond wall construction so will be below the predicted bund construction at all dwellings. Noise from the canal work, including the fish screen, has been assessed separately for the one dwelling that the canal comes relatively close to.
- 5.4 Figure 3 shows the construction noise contours with the plant operating at the existing ground level in the northern part of the construction site for the white water course and the water storage facility. Figure 4 shows the noise contours with the plant operating in the same area but at the top of the pond wall.

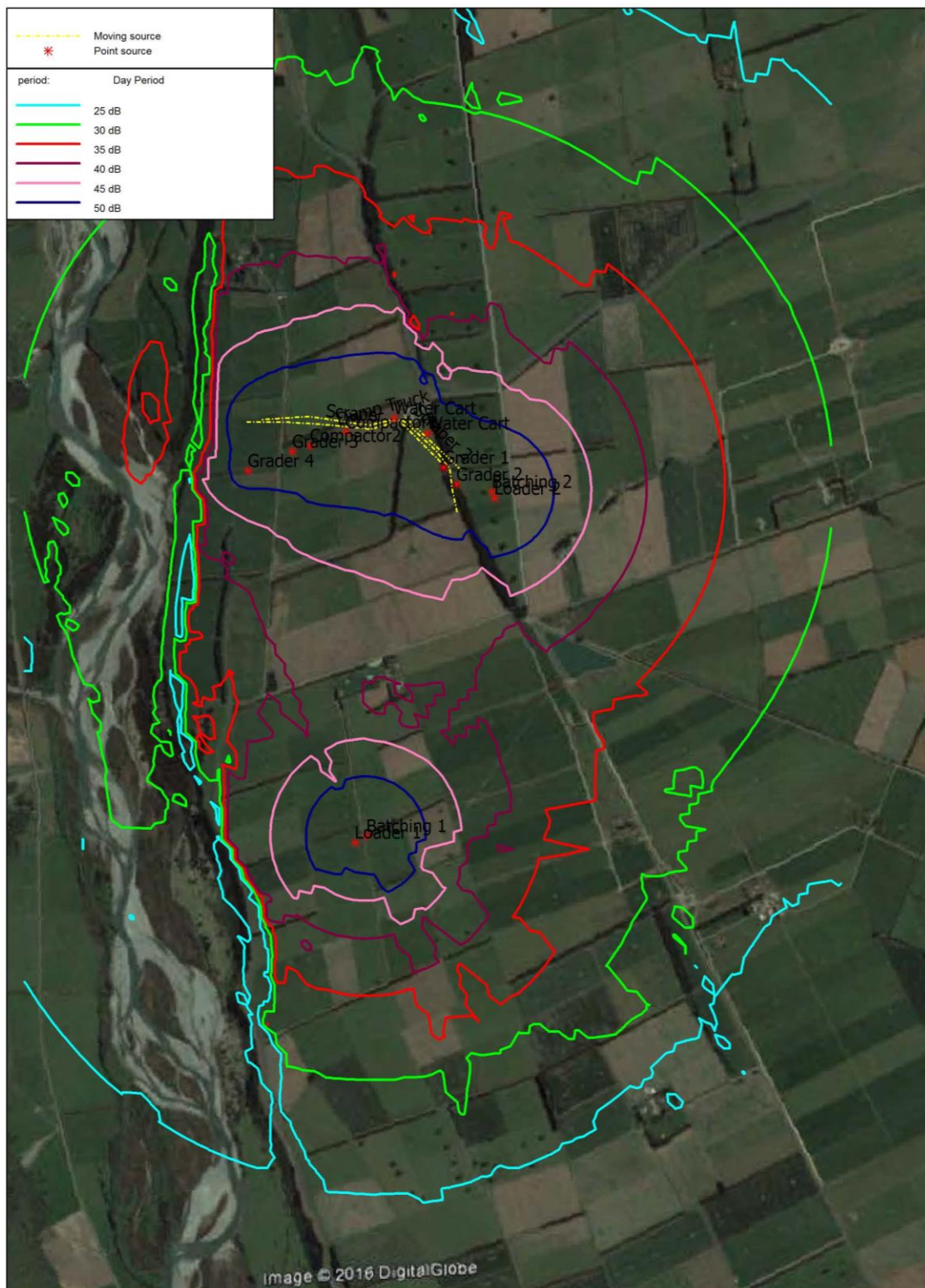


Figure 3. Bund Construction at Ground Level to the North, dB LAeq

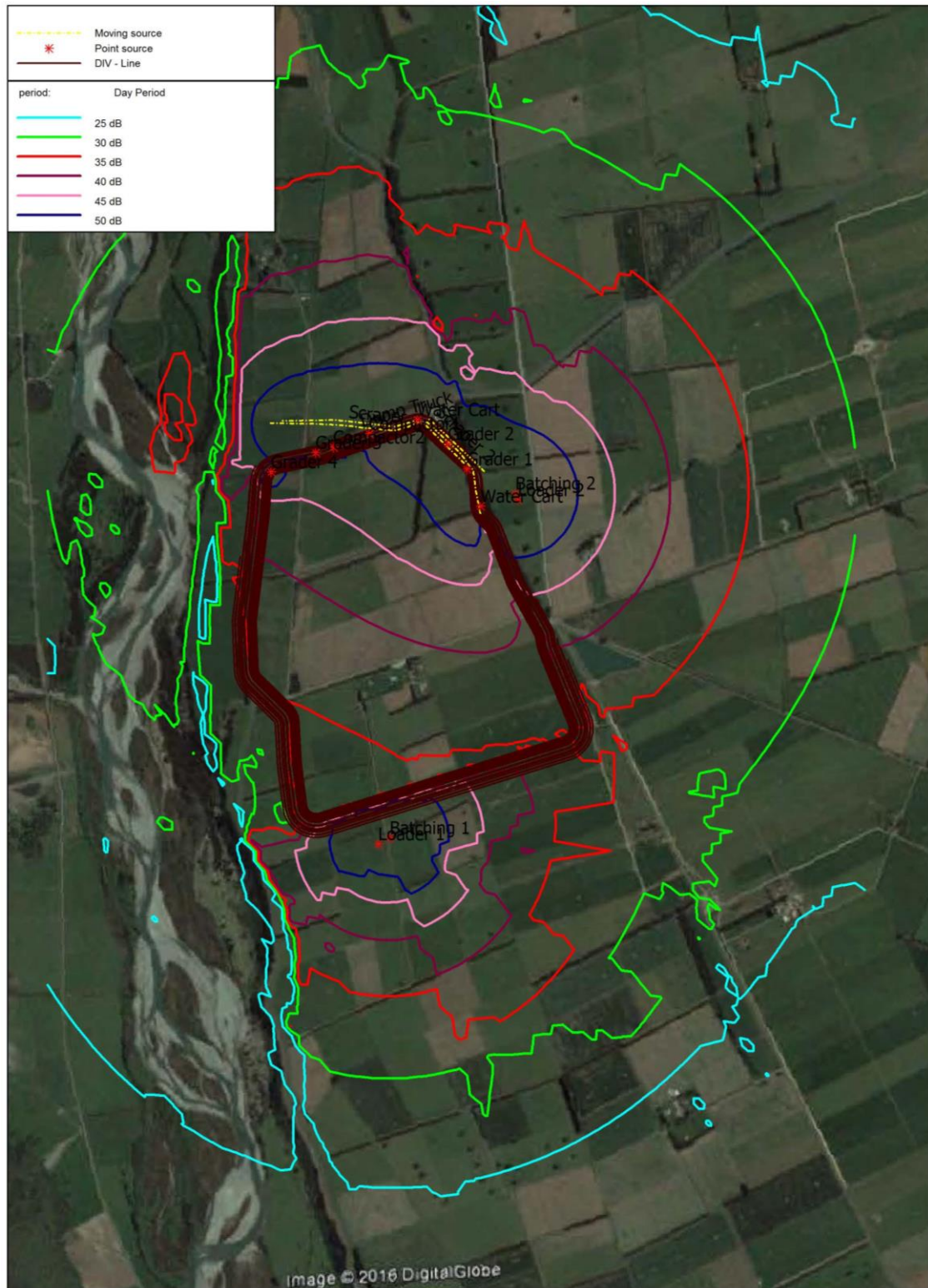


Figure 4. Bund Construction at the Top of the Bund to the North, dB L_{Aeq}

5.5 Figure 5 shows the noise contours with the construction plant operating at the existing ground level in the southern part of the site

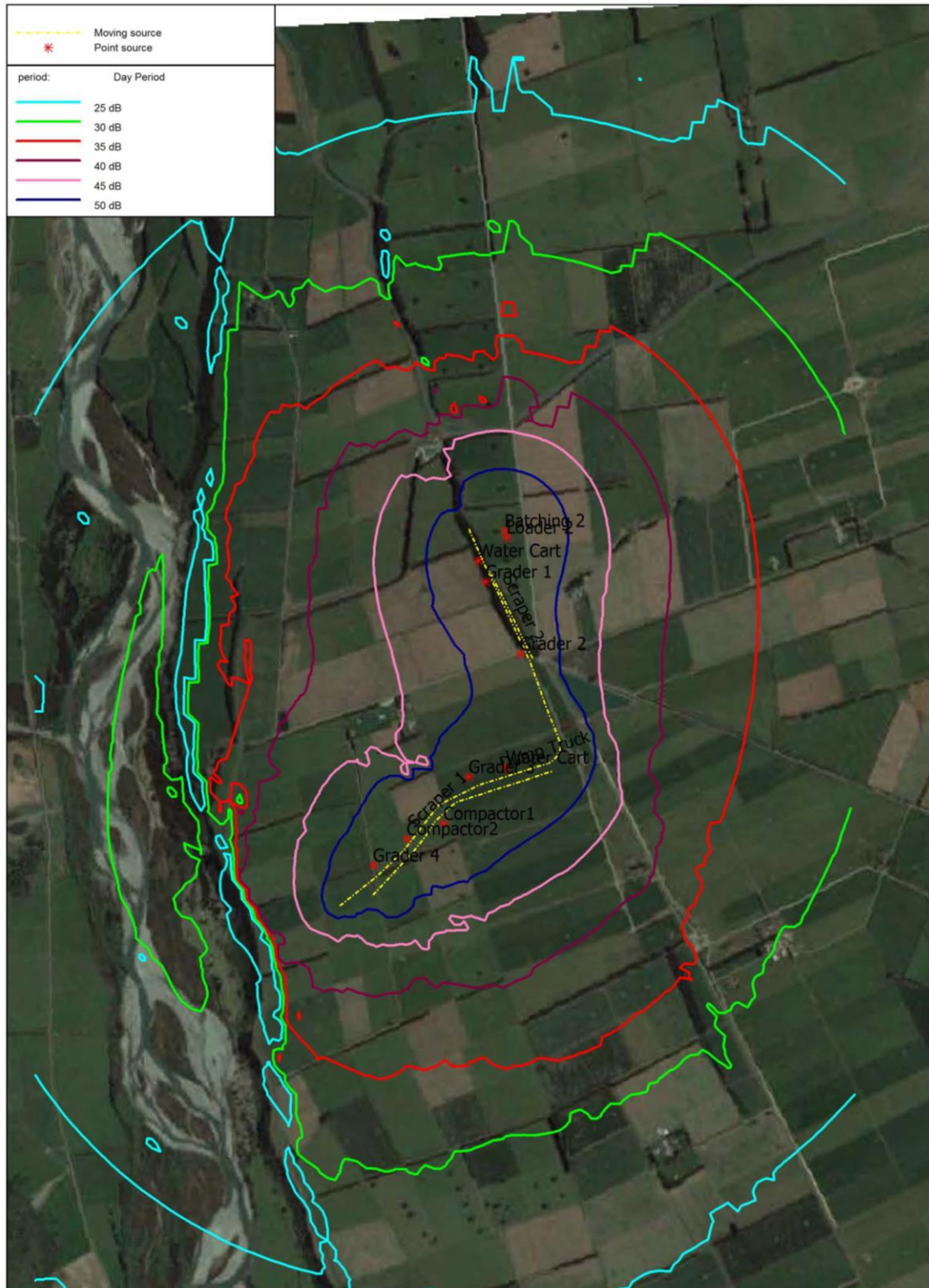


Figure 5. Bund Construction at Ground Level to the South, dB L_{Aeq}

- 5.6 Figure 6 shows the noise contours for the southern part of the site with the plant operating at the top of the bund so the construction activities are at the maximum exposure to the neighbours.



Figure 6. Bund Construction at the Top of the Bund to the South, dB L_{Aeq}

- 5.7 In addition to the noise contours the noise has been predicted at the notional boundary of each of the closer dwellings as shown on Figure 7. The results are set out in Table 2.

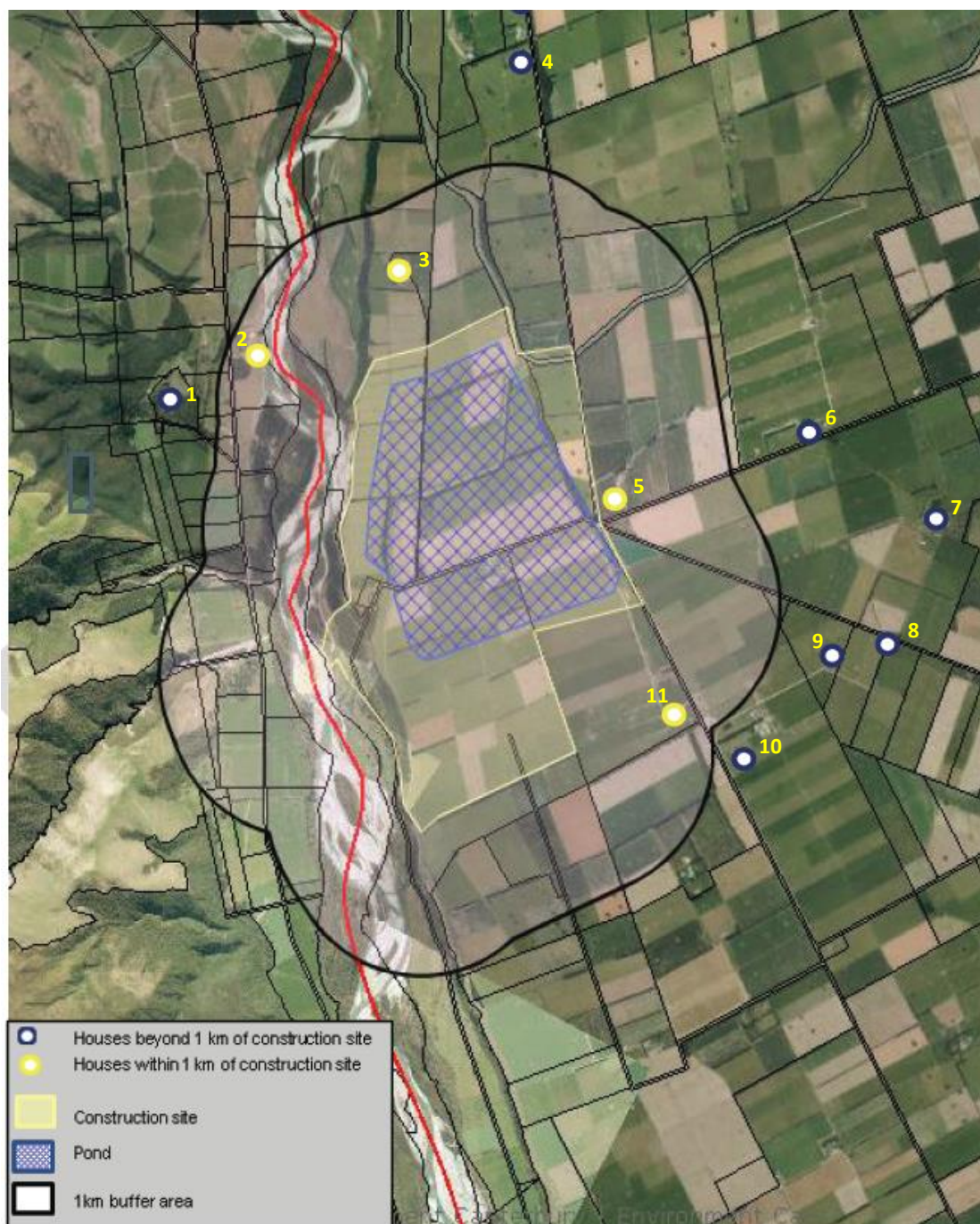


Figure 7. Location of Spot Noise Predictions

Source: BCHF Air Discharge Report

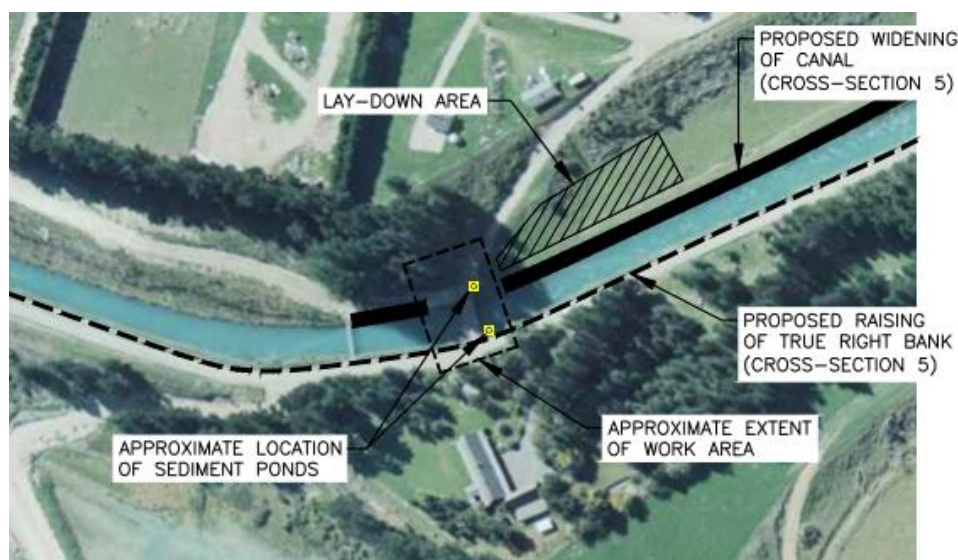
Site*	Figure 3	Figure 4	Figure 5	Figure 6
1	16	16	18	19
2	30	30	25	25
3	42	41	32	29
4	4	3	1	1
5	47	47	50	51
6	31	31	32	33
7	18	19	19	22
8	12	13	12	15
9	2	2	6	2
10	26	26	31	34
11	34	34	42	43

* See Figure 7 for the location of each site

Table 2. Predicted Pond Construction Noise Levels (dB L_{Aeq})

5.8 As shown on Figures 3 – 6 and Table 2 the highest noise level at 1m from the façade of any dwelling in the area is 51dB L_{Aeq} . This is well within the level of 70dB L_{Aeq} as required by NZS 6803:1999 Acoustics – Construction Noise. Although the construction of the proposed pond is classed as construction work the levels for the closer neighbours do, in fact, fall within the requirement of 50dB L_{Aeq} as set out in Rule 11.8.1 of the District Plan for an ongoing permitted activity when taking into account the averaging provisions of NZS6802. Averaging is not permitted by the Construction Standard NZS6803. In addition, for operational noise the assessment point is the notional boundary of the dwellings compared to a point 1m from the façade for construction noise. From field measurements undertaken of the type of construction equipment to be used at this site, if the L_{Aeq} level is complied with the L_{AFmax} level will also be complied with.

5.9 There are two areas where dwellings are relatively close to the proposed canal upgrade, one approximately 1km south of Bridge 3 and a group of dwellings adjacent to the Bridge 3 site as shown on Figure 8.



- 5.10 The canal upgrade will be undertaken using truck and trailers and an excavator, such as a Cat 320D, which has a measured sound power (L_{WA}) of 105dB. For the bridge construction the main noise is expected to be a drill for the piles and a concrete truck. Based on measurements of drilling piles this work will have a sound power of 105dB (generated mainly from the clearing of the drill). The concrete truck discharging the concrete has a measured sound power of 106dB.
- 5.11 For the dwelling to the south of Bridge 3 the earthworks construction noise will be up to 57dB L_{Aeq} as the work passes at its closest point to the dwelling.
- 5.12 For the dwellings adjacent to the Bridge 3 site the noise from the canal upgrade will be up to 66dB L_{Aeq} .
- 5.13 The proposal is to use sheet piles and these piles will be driven around the abutments for Bridge 3 to isolate them from the canal water to provide a dry working area. These piles will be installed using a vibro-hammer. Field measurements of an 80t crane with a power pack and a 5t vibro hammer gave measured levels of between 74 – 76dB L_{Aeq} at 20m, the exact level being dependent on the side of the piling that was measured; the sides being quieter than the front and back.
- 5.14 The design will use standard rotary bored piles potentially using driven (vibro-hammer) steel casings and this method is assumed for the purposes of the construction methodology although other methods (including driven steel 'H' piles, continuous flight auger, or other such pile installation methods) could be adopted. Field measurements of a Geax EK110 multi-purpose piling rig and an EK90 Drilling Rig gave sound power levels of up to 105dB L_{WA} .
- 5.15 For driving sheet piles the noise at the closest dwelling, which is to the south west of the bridge site, will be up to 72dB L_{Aeq} when assuming the highest noise from the piling. For the drilling of piles the highest noise at the closest dwelling will be 67dB L_{Aeq} . During the concrete pouring the noise at the closest dwelling will be up to 66dB L_{Aeq} . These levels are all well within the 75dB L_{Aeq} requirement of NZS 6803 and hence the effects are reasonable. As a guide, a reduction of 10dB is an apparent halving of the perceived noise level. By complying with L_{Aeq} levels the maximum level (L_{Amax}) will also be complied with.

- 5.16 The fish screens are located just over 2km from the closest dwellings to the south so neither the construction of the screens nor the operation of the fish screens will be heard at the closest dwelling.

6. **TRAFFIC NOISE**

- 6.1 Noise from traffic generated by the proposed facility has been assessed. There is no traffic noise requirement in the District Plan or in any other legislation with respect to traffic noise related to the proposal. The only guideline is NZS6806:2010 *Acoustics - Road-traffic Noise - New and Altered Roads* and as the title suggests this Standard sets design criteria for new and altered roads, not a change to the traffic flow due to any given activity.
- 6.2 If NZS 6806 is considered, the lowest level set is 57dB $L_{Aeq(24hr)}$ as measured at the dwelling façade for a new road with a traffic volume of 2,000 to 75,000 AADT. However, the Standard also states that it does not apply to new and altered roads predicted to carry less than 2,000 AADT at the design year.
- 6.3 As set out in the original noise assessment the traffic flows have been adopted from the traffic engineer's Transportation Assessment Report as discussed in the evidence of Mr Andrew Metherell.
- 6.4 Based on these traffic flows the total number of vehicles per day remains well below 2,000vpd for the roads near the proposed storage facility so, in terms of the requirements of NZS 6806 the traffic noise will be well within a reasonable level. However, there will be a large increase in the existing traffic flow during the construction period and as such the noise from individual vehicles will be heard by those residents living close to the road.

- 6.5 As shown on Figure 9 the main routes are along Moorhouse Road and Ealing Montalto Road.

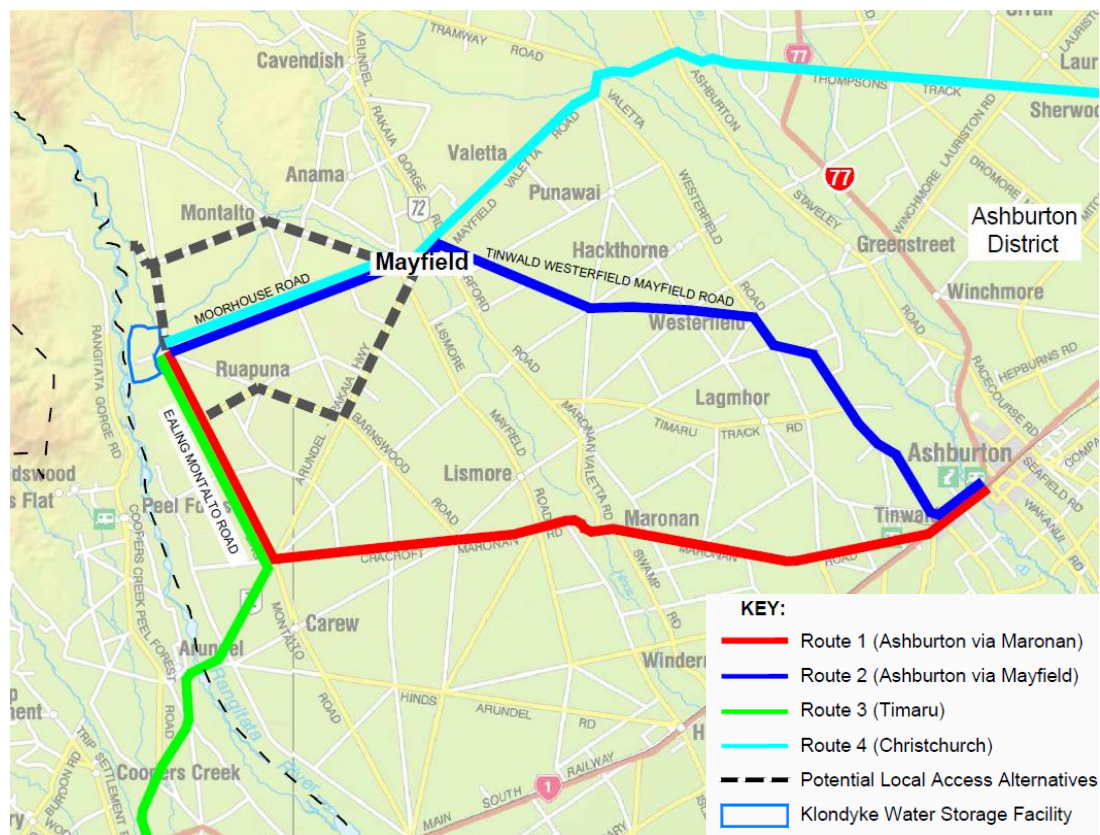


Figure 9. Primary Transport Routes

Source: TDG Dwg 13256_C2A

- 6.6 There are approximately six dwellings within 6km of the proposed storage facility varying from 20m to 550m from the road. Even with the maximum number of trucks on Moorhouse Road the noise at the closest house (20m from the road) will be below 47 - 49dB $L_{Aeq(24hr)}$. As I have set out previously, the noise from individual trucks will be clearly audible and there will be more events than occur at the moment.
- 6.7 However, when taking into account the only guidelines available (NZS 6806 as set out above) noise will be well below the level normally considered reasonable from traffic, and other than the potential of a concrete pour extending into the night time period there will not be any additional vehicle movements at night time. Truck noise will only occur for short periods for the duration of the construction work.
- 6.8 The closest house on Ealing Montalto Road that is within 6km of the storage facility site is approximately 25m from the road. Although there is the potential of more

traffic on Ealing Montalto Road than Moorhouse Road, due to potential truck movements to Timaru, the closest house is well clear of the road so the resulting noise will be approximately 48 – 49dB $L_{Aeq(24hr)}$ and well within a reasonable level.

- 6.9 Construction traffic associated with the fish screens also passes within approximately 25m of the closest house. This traffic will be heard but in terms of traffic noise the level is not expected to exceed 48dB $L_{Aeq(24hr)}$, well within a reasonable level for any temporary increase in the traffic flow.
- 6.10 As for the houses on Moorhouse Road the construction traffic noise will not occur at night time and the truck noise will only occur for the duration of the construction period. This will be guaranteed by the inclusion of proposed Ashburton District Council condition 8(a), which requires *Construction work / activity shall only occur between 0630 (6.30am) to 2000 (8pm) hours daily*. This will ensure the effects are less than minor and well within an acceptable level for all neighbours.
- 6.11 Once operational, and with the exception of any additional recreational traffic generated by the white water course, in my opinion there will be an insignificant change in the existing traffic noise and as such no change to the existing traffic noise for neighbours.

7. **VIBRATION**

- 7.1 When taking into account the type of work proposed, the ground conditions and the distances involved to the closer house from the construction of the water storage facility, the proposed fish screen, the proposed white water course, the modifications (aside from one bridge which I discuss shortly) to the RDR, and the relocated alignment of Shepherds Bush Road there is not expected to be any vibration effects at all for neighbours.
- 7.2 However, piling is proposed for Bridge 3 (shown on Figure 8) so there is the potential of vibration effect from this work. Although an initial assessment shows any vibration from the proposed piling will be minimal, to protect the neighbours it a condition has been, on my recommendation, included in the proposed conditions of consent to set specific limits.

8. PROPOSED CONDITIONS

- 8.1 In order to provide certainty noise will be controlled at all times a number of noise conditions have been proposed. I have provided input to the proposed conditions that are introduced by Mr Greaves (and attached as an appendix to his evidence) and believe they will provide the noise protection for residents that they can reasonably expect.
- 8.2 Condition 9 of the proposed Ashburton District Council conditions adopts the long term duration noise requirements of the Construction Standard with an additional condition 8 that limits the hours any construction work may be undertaken to the daytime period. Condition 8(b) prohibits construction work on Sundays and public holidays.
- 8.3 These proposed conditions will minimise construction noise for the neighbours and control construction noise within an acceptable level in accordance with the requirements of the District Plan and NZS 6803:1999 *Acoustics – Construction Noise*.
- 8.4 No noise levels are proposed for the operation of the facility as there is no noise generated. Regardless, the standard noise requirements of the District Plan (Rule 11.8.1) will be applicable.
- 8.5 Vibration limits are set in proposed condition 9.1 plus via the Vibration Management Plan (I assisted with its preparation) as required by proposed condition 9.1.2. When taking into account the proposed work, the material being worked with and the distance to the closest houses there will not be any vibration effects from the construction of the any part of the proposal on the neighbouring properties.
- 8.6 The only potential of any vibration is from any piling that may occur around the abutments for the Bridge as set out above. Taking into account the distance to the closest dwelling (Figure 8), the various types of pipe that may be driven (vibro-hammer or driven) and the ground conditions there is not expected there will be any adverse effects from ground vibration. Again, the approach advanced in the Vibration Management Plan will, in my opinion, ensure that this is the case.
- 8.7 The only reference to vibration in the District Plan relates to trains. Although there is not expected to be any noticeable vibration effects from the proposal the normal

method to assess any vibration effects is with the German Standard DIN 4150 Part 3: 1986.

- 8.8 To ensure vibration does not cause any unreasonable effect for the adjacent neighbours, I recommended the following vibration limits be adopted and incorporated into the Vibration Management Plan. As you can see from the version of the management plan that is appended to my evidence, these limits form part of the approach that is proposed.

Construction activities must be controlled to ensure any resulting vibration does not exceed:

- (a) the limits set out in German Industrial Standard DIN 4150-3 (1999): Structural vibration – Part 3 Effects of vibration on structures when measured in accordance with that Standard on any structure not on the same site or where there is no written approval; and
- (b) The limits in Table 1 Vibration limits in buildings in any axis when measured within 500mm of ground level at the foundation of a single storey building.

Table 1 Vibration Limits in Dwellings

Receiver	Period	Peak Particle Velocity Limit
Occupied activity sensitive to noise	7am to 10pm	2mm/s
	10pm - 7am	0.3mm/s

9. SUBMISSIONS

- 9.1 Submissions 31200 and 31203² both do not think heavy machinery noise will be able to be restricted to just the site during the construction phase. This is correct; construction noise will be heard off site. The aim is not to eliminate noise but to control the noise to a reasonable level at all times and as set out above guidance on a reasonable level has been taken from the District Plan, which adopts the Construction Standard (NZS6803). The noise from the construction works has been predicted and shown to be well within a level that I consider reasonable. I am also of the opinion that any noise emission will have a minimum noise effect for these submitters.

² Donald Lake at 53 Lakes Road and Andrew and Dianne Lake at 122 Lakes Road

- 9.2 Submission 31248³ is concerned about the effects of noise from construction works. As set out above, the noise will be well within the District Plan limits and well within what I consider to be a reasonable level for construction works.
- 9.3 Submission 31256⁴ acknowledges the noise predictions are for *“the ‘worst-case’ scenario in terms of noise impacts on the Trust’s dwellings. Although these noise levels are not excessive, they are still high for a rural environment, particularly as they will occur each day for up to 5 years without much respite. Mitigation is not proposed on the basis that noise exposure is reasonable.”*
- 9.4 The worst case scenario is just that, the worst case. For the majority of the time the noise level will be significantly less. As set out above, the highest noise level for any neighbour will be 51dB L_{Aeq} and generally the noise will be significantly lower. I note that construction noise cannot be averaged over the day although general noise from any activity may be averaged. If taking averaging into account the noise would be below the level anticipated by the District Plan for a permitted activity. That is, if the construction work was undertaken in terms of the noise rules in the District Plan for an ongoing activity it would be a permitted activity with respect to noise. I have considered the noise levels set within the District Plan and am comfortable that they are appropriate and will protect the noise environment that currently exists. With this in mind the construction noise will, in my opinion, be well within a reasonable level for even the closest neighbour.
- 9.5 The Trust has questioned if my assessment adequately accounts for the fact that the guideline I applied for construction work of 'long-term' duration, is reasonable for construction noise that they have suggested could last for up to 260 weeks.
- 9.6 As already pointed out, the noise levels predicted are for the worst case and will not occur for the duration of the project. Further, the noise experienced from construction work will be below the level envisaged by the District Plan for a permitted activity that may last forever.
- 9.7 The submission states the noise assessment does not appear to consider noise exposure for farm workers operating in an outdoor environment on paddocks

³ David and Rebecca Whillans at 362 Shepherds Bush Road

⁴ Early Family Trust

immediately adjoining construction work. The Construction Standard has been developed to protect people when they are indoors, such as dwellings, not people working in the field. This is also the case for any ongoing permitted activity.

9.8 A farm worker driving a tractor or undertaking fencing work or similar is expected to generate more noise for the worker than the proposed development would create. Regardless, noise from the proposed development will not exceed approximately 60dB L_{Aeq} for the most exposed location on the adjacent farmland, which is well within a level normally considered reasonable for a business activity such as farming.

9.9 Submissions 31254 and 31255⁵ both are concerned about the construction noise. As set out above, the noise will be controlled to well within a reasonable level for all neighbours.

10. OFFICER'S REPORTS

10.1 I have reviewed paragraphs 144 to 154 of the Ashburton District Council Officer's Report where he addresses noise and vibration. I agree with each of his findings

10.2 I have reviewed the Ashburton District Council's recommended conditions and note they vary slightly to those originally proposed by the applicant. I accept the Ashburton District Council's recommended conditions without any changes as being reasonable as they will provide good noise and vibration protection for the residential neighbours and reflect current good practice to minimise any adverse effects for neighbours.

10.3 On Friday 16 March 2018 I undertook conferencing with Mr Gary Walton, acoustic consultant acting for Ashburton District Council. In our joint statement (signed on 23 March 2018 and attached as Annexure A) we set out our agreed position and recorded there were no noise or vibration issues that we disagreed about.

11. CONCLUSIONS

11.1 Field measurements of the noise from earthmoving machinery and the concrete batching plant have been undertaken at existing construction sites. From these measurements the noise to the environment has been predicted at the closer

⁵ JT & JL Doyle and Doyle Farms Ltd, both at 2179 Ealing Mantalto Road

existing dwellings to reflect the upper level of noise ever likely to be experienced by the neighbours. For much of the time the equipment will be further from the neighbours and hence there will be less noise at the receiver positions. However, to ensure there will be compliance with the predicted noise levels the noisiest scenarios have been modelled.

- 11.2 During the construction of the storage facility and assuming the maximum plant will be operating at the maximum height on the pond wall, the noise level will not be above 43dB L_{Aeq} and generally below 35dB. The District Plan sets a level of 70dB L_{Aeq} for construction noise and 50dB L_{Aeq} for any ongoing permitted activity.
- 11.3 As a guide, a level of 45dB L_{Aeq} is considered to be a reasonable level as measured outside a dwelling with open windows to allow undisturbed sleep⁶. Thus, with a level of up to 43dB during the daytime the noise effects for the neighbours for much of the time will be at or below the existing background sound in the area and as a result they will be negligible.
- 11.4 Similarly, when taking into account the distances from the construction works to the closer residences, there will not be any vibration effect beyond the site boundary.
- 11.5 Construction of the white water course will be quieter for the residents than construction work on the storage facility itself so there will not be any adverse noise effects from this phase of the construction work.
- 11.6 During the upgrading of the canal the equipment will be within approximately 35m of the closest dwellings so in this case, and for the short period it will take for the canal works to pass, the noise level will be up to 57dB L_{Aeq} . Although the noise from this work will be clearly audible the level will be well within the 75dB limit of NZS 6803. When taking into account the expected noise level of up to 57dB and the duration of the work (2 - 3 weeks) the noise will be well within a reasonable level for the residents. Vibration from this work is not expected to be noticeable so there will not be any effects on the residents from vibration during the canal reconstruction.
- 11.7 Any piling that may be required for the bridges is clear of noise sensitive activities and will not cause noise or vibration problems for the neighbours. Bridge 3 is the

⁶ World Health Organization Guidelines For Community Noise Edited by Birgitta Berglund Thomas Lindvall/Dietrich H Schwela, 1999

closest to any dwelling and to further minimise any noise or vibration issues at these dwellings it is currently proposed to drill these piles. As a result, both noise and vibration from piling will be well within the design criteria and there will not be any adverse effects for the closest neighbours.

- 11.8 There will not be any noticeable noise from either the construction or subsequent use of the fish screens for the closest residential neighbour.
- 11.9 There are no traffic noise limits in the District Plan or in any other legislation that is applicable to this application. If the lowest limit set out in NZS 6806:2010 *Acoustics-Road-traffic Noise - New and Altered Roads* is adopted, the noise level will be reasonable. Taking this into account and as the construction work will only occur for the duration of the project, and other than potential concrete pours extending into the night time period, there will not be any change to the night time noise, traffic noise will be reasonable and will not cause an adverse effect for the neighbours.
- 11.10 When considering the above the requirements of the District Plan and the requirements of the Resource Management Act, the development proposed by RDRML can be managed so the noise and vibration effects for the neighbours will be negligible (which I note equates to less than minor for the purposes of Mr Greave's planning assessment).

Nevil Hegley
27 March 2018

Annexure A

Joint Witness Statement

IN THE MATTER OF: The Resource Management Act 1991

AND

IN THE MATTER OF: resource consent applications by Rangitata Diversion Race Management Limited (**RDRML**) to the Canterbury Regional Council and Ashburton District Council for resource consents for the construction, operation and maintenance of the Klondyke Water Storage Facility, its associated water takes from and discharges to the Rangitata River, and all associated activities

**JOINT WITNESS STATEMENT OF NEVIL HEGLEY (RDRML)
AND GARY WALTON (ASHBURTON DISTRICT COUNCIL)**

Noise

Dated: 23 March 2018

INTRODUCTION

1. This Joint Witness Statement is prepared in accordance with section 7 and Appendix 3 of the Environment Court's Practice Note 2014.
2. This Joint Witness Statement relates to expert conferencing on the topic of noise.
3. The conference was held on Friday 16 March 2018.
4. Attendees at the conference were:
 - (a) Nevil Hegley for RDRML.
 - (b) Gary Walton for Ashburton District Council.

AGENDA

5. The parties agreed the following issues should be discussed at caucusing:
 - (a) Appropriate design limits;
 - (b) The effects of construction noise;
 - (c) Vibration limits and how vibration will be controlled; and
 - (d) Noise from traffic on public roads once operational.

OUTCOMES

6. Issues that are agreed between the experts:
 - (a) Construction noise should be assessed in accordance with the requirements of New Zealand Standard NZS 6803: 1999 "Acoustics - Construction Noise". This requirement is offered in the Proposed Conditions of Consent, Part B: Ashburton District Council Condition 9.0.
 - (b) Although there is some discrepancy in our approaches, it is agreed that noise from additional local road traffic during construction will be acceptable, providing that there will not generally be any additional heavy traffic on the roads at night (other than for unplanned/infrequent heavy vehicle movements, such as concrete pours).
 - (c) Operational noise will comply with the requirements of the Ashburton District Plan and the Timaru District Plan. That is 50dB/40dB L_{Aeq} during the day/night and, taking the more stringent of the two Plans, a level of 65dB L_{Amax} at night time.
 - (d) It is agreed construction noise levels will comfortably achieve the noise criteria as set out in Condition 9.0.
 - (e) The concrete batching plant is a fixed noise source that is expected to be in place and operational for a number of years. For this reason compliance with the District Plan operational noise standards (50/40dB L_{Aeq} day/night) is more appropriate than the construction noise criteria for temporary activities. The design and construction of the plant will be undertaken to ensure compliance with these levels. It is not planned to operate the batching plant at night, other than if problems occur during a pour that result in it being necessary to continue into the night time period. The plant will be designed to achieve 40dB L_{Aeq} to provide for such emergencies.

- (f) There are no local or national standards concerning vibration from construction activities. In the Proposed Conditions of Consent, Part B: Ashburton District Council Condition 9D.0 it is proposed to adopt the requirements of the German Industrial Standard DIN 4150-3 (1999): Structural vibration – Part 3. It is agreed this will provide an appropriate vibration control for dwellings.
- (g) The Vibration Management Plan (VMP) has additional provisions relating to human comfort/occupier annoyance and we agree the guideline levels in the VMP are appropriate for this purpose.

7. Issues upon which the experts cannot agree and the reasons for their disagreement:

- (a) There are no noise or vibration issues that we disagree about.

CODE OF CONDUCT

8. We confirm that in producing this Joint Witness Statement, we have all complied with the Code of Conduct for Expert Witnesses.



.....
Nevil Hegley



.....
Gary Walton