



Simplicity Ladies Mile, Queenstown: Acoustic Assessment for
Fast Track Resource Consent Referral

Project No. 26004
Date: 28/07/2026
Client: Simplicity Living
Revision: 2.1

Author:

Matthew Bronka MASNZ

Reviewer:

Paul Hazard BE(Hons) MASNZ

Contents

1. Qualification and Experience.....	3
2. Introduction.....	4
2.1. Site and surrounds.....	4
2.2. Infrastructure Upgrade Works – Waste/Supply Water.....	5
2.3. Receivers.....	5
3. District Plan Rules.....	6
3.1. QLDC – Proposed District Plan.....	6
3.2. NZS 6803: 1999 – Construction Noise.....	6
3.3. Construction Vibration, Building Damage, DIN-4150-3.....	7
3.4. Construction Vibration, Human Amenity.....	7
3.5. Resource Management Act – Section 16.....	7
4. Reverse Sensitivity.....	8
4.1. SH6 – Reverse Sensitivity.....	8
4.2. Commercial Activities – Reverse Sensitivity.....	9
5. Operational Noise Emissions.....	9
5.1. Building services.....	9
5.2. Parking and Vehicle Noise.....	10
6. Construction Noise and Vibration.....	11
6.1. Construction Noise.....	11
6.2. Construction Vibration.....	13
6.3. Construction Mitigation and Management Methods.....	13
7. Assessment of Effects.....	13
8. Recommendations.....	15
9. Conclusion.....	15
Appendix A. Site layout.....	16
Appendix B. 3D Noise Model – SH6.....	17
Appendix C – Infrastructure Upgrade Works – Waste/Supply Water.....	18

Copyright and Disclaimer

The information within this document is the property of Bladon Bronka Acoustics Ltd. Reproduction of this document in full or in part is strictly prohibited without written consent from Bladon Bronka Acoustics Ltd and constitutes an infringement of copyright. The information within this document has been prepared by Bladon Bronka Acoustics Ltd for the client and may not be suitable for uses other than the original intent. The information within this report has been prepared based on a specific scope of works with conditions and limitations.

1. Qualification and Experience

1. My name is Matthew Bronka. I am the director and a principal acoustic consultant at Bladon Bronka Acoustics Ltd (BBA). I have had 18 years' experience in the field of Acoustics
2. I obtained a Diploma in Acoustics and Noise Control in 2010 (Institute of Acoustics, UK) and a BA (Hons) in Creative Music and Audio Technology in 2008 (Brunel University).
3. I am a member of the Acoustic Society of New Zealand and the company representative of BBA's membership to the Association of Australasian Acoustical Consultants.
4. I have provided many acoustic assessments for Resource Consent applications across New Zealand, including the prediction, measurement and assessment of noise and vibration effects for a wide range of sectors.
5. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing this report. Other than when I state I am relying on the advice of another person, this report is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. Introduction

Bladon Bronka Acoustics Ltd (BBA) has been appointed by Simplicity Living to provide an assessment of the proposed mixed-use development at Ladies mile, Queenstown in support of its application for approvals under the Fast Track Approvals Act.

The development will comprise forty residential buildings, comprising walk up terrace units and apartment blocks ranging from three to eight storeys, with a mix of one-, two- or three-bedroom layouts to support a diverse resident community. Four communal pavilion buildings are located throughout the site in addition to two car parks of four storeys each. The subdivision of the site will also introduce a retail area and park with café. Upgrade works to the SH6 road network and the waste/supply water infrastructure are also included within the application.

This report assesses the proposal against the Queenstown Lakes District Council, Proposed District Plan (QLDC-PDP) noise rules and considers potential effects. The key acoustic considerations include:

- Operational noise emissions (predominantly vehicle noise)
- Reverse Sensitivity noise effects due to SH6
- Reverse Sensitivity noise effects due to commercial activities on site
- Construction Noise and Vibration from either:
 - The development site
 - SH6 upgrade works
 - Infrastructure upgrade works for new supply/waste water

2.1. Site and surrounds

The site extents include 12 & 14 Lower Shotover Road located to the north of State Highway 6 and is surrounded by residential and rural activities as shown in the general site layout in Figure 1 below. A cemetery / memorial park is also located to the west of the site.



Figure 1. General Development Site extents (orange outline) and surrounding area

The general layout of the proposed development is presented in Appendix A, it should be noted that the existing SH6 roundabout to the south of the site will be redeveloped to incorporate traffic lights. The QLDC-PDP zoning for the site and surrounding area is presented in Figure 2 below, with the separate Precincts maps shown in Figure 3.

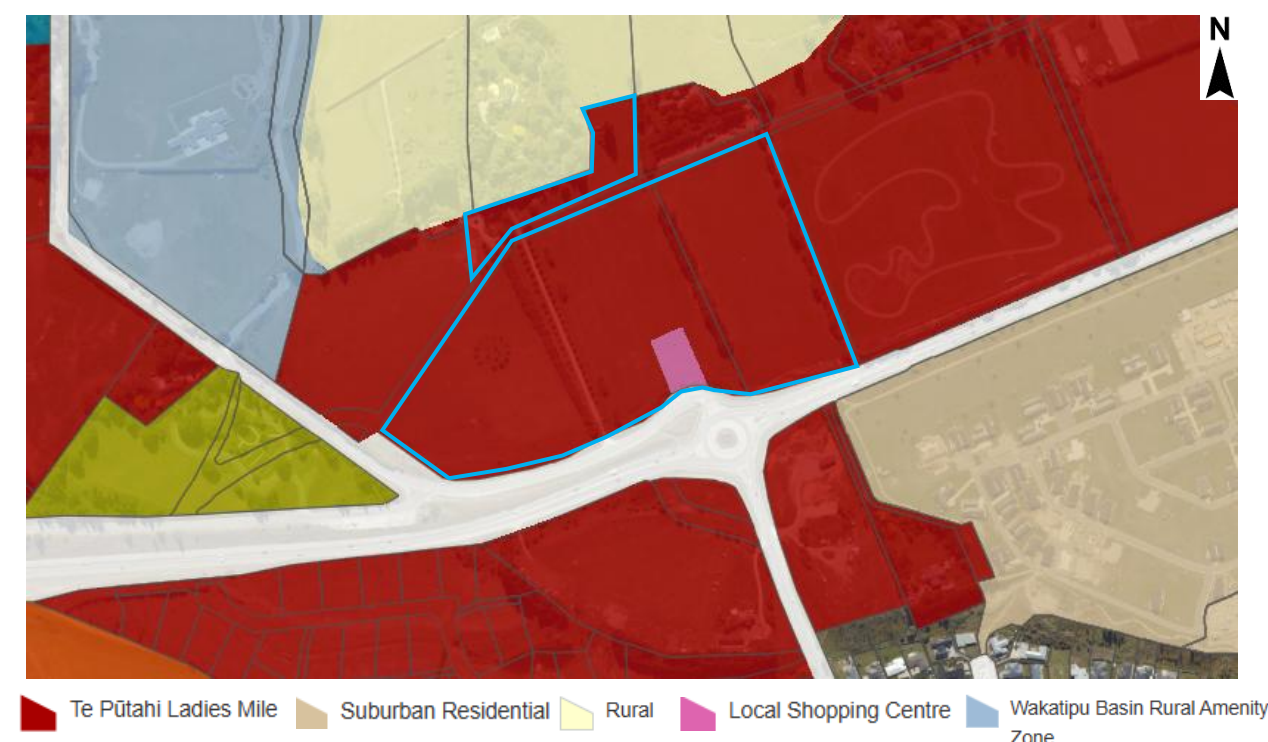


Figure 2. Site (blue outline) and surrounding area zoning (QLDC-PDP)



Figure 3. Site (blue outline) and precincts map

2.2. Infrastructure Upgrade Works – Waste/Supply Water

A map showing the proposed areas of the infrastructure upgrade works including waste/supply water pipework is presented in Appendix C.

2.3. Receivers

The closest potentially affected receivers in relation to the development site or road upgrade works are listed below, with site references corresponding to the map shown in Figure 4.

Table 1. Closest receiver surrounding the site

Site Ref as per Figure 4	Address	Activity	Zone	Precinct
1	28 Springbank Grove	Residential	Rural Zone	N/A
2	399 Frankton-Ladies Mile Hwy	Residential	Te Pūtahi Ladies Mile Zone	Te Pūtahi Ladies Mile – Medium Density Residential
3	429 Frankton-Ladies Mile Hwy	Cemetery	Te Pūtahi Ladies Mile Zone	Community Purpose – Cemetery Subzone
4	2, 4 Fifth Avenue, 38, 40, 42, 44 First Avenue 18 First Avenue	Residential	Suburban Residential Zone	N/A
5	12 Stalker Road	Residential	Te Pūtahi Ladies Mile Zone	Te Pūtahi Ladies Mile – Low Density Residential
6	1 Tarata Way, 14, 16, 18, 20, 22, 24 Kahiwi Drive	Future residential	Te Pūtahi Ladies Mile Zone	Te Pūtahi Ladies Mile – Low Density Residential
7	33 Lower Shotover Road	Residential	Te Pūtahi Ladies Mile Zone	Te Pūtahi Ladies Mile – Medium Density Residential
8	70 Lower Shotover Road	Residential	Wakatipu Basin Rural Amenity Zone	N/A

The additional receivers that are potentially affected by the infrastructure supply/waste water upgrade works beyond the development site / road are listed in the maps shown in Appendix C.



Figure 4. Site (blue outline) and surrounding receivers potentially affected by development and road works

3. District Plan Rules

3.1. QLDC – Proposed District Plan

Rule 36.5 of the QLDC-PDP includes the permitted noise limits for each of the zones surrounding the proposed development site, as shown below (red outline for applicable zones). All noise sensitive sites surrounding the development include limits of 50dB LAeq during the daytime periods of 0800 to 2000hrs and 40dB LAeq during the night time period of 2000 to 0800hrs, however the assessment location of site boundary or notional boundary is different between zones.

36.5 Rules- Standards

Table 2: General Standards

Rule Number	General Standards				Non-compliance Status
	Zone sound is received in	Assessment location	Time	Noise Limits	
36.5.1	Wakatipu Basin Rural Amenity Zone	Any point within the notional boundary of a residential unit.	0800h to 2000h	50 dBA LAeq(15 min)	NC
	Rural Zone (Note: refer 36.5.14 for noise received in the Rural Zone from the Airport Zone - Queenstown).		2000h to 0800h	40 dBA LAeq(15 min)	NC
	Gibbston Character Zone			75 dBA LAmax	
	Airport Zone – Wānaka				
36.5.2	Gibbston Valley Resort Zone - AA1, AA2, AA4, AA7, PL, LMA and OSR Activity Areas	Any point within any site.			
	Wakatipu Basin Lifestyle Precinct		0800h to 2000h	50 dBA LAeq(15 min)	NC
	Hills Resort Zone (Note: for noise received in the Hills Resort Zone, the noise limits specified do not apply to noise from activities within the Hills Resort Zone)				
	Hogans Gully Resort Zone (Note: for noise received in the Hogans Gully Resort Zone, the noise limits specified do not apply to noise from activities within the Hogans Gully Resort Zone)				
	Suburban, Medium Density, Medium Density A, High Density, High Density A and Large Lot Residential Zones (Note: refer 36.5.14 for noise received in the Residential Zones from the Airport Zone - Queenstown).				
	Arrowtown Residential Historic Management Zone				
	Settlement Zone				
	Rural Residential Zone		2000h to 0800h	40 dBA LAeq(15 min)	NC
	Rural Lifestyle Zone				
	Waterfall Park Zone				
	Millbrook Resort Zone - Residential Activity Areas only				
	Jacks Point Zone- Residential Activity Areas only				
	Open Space and Recreation Zones,				
	Gibbston Valley Resort Zone – AA3, AA5, AA6 and AA8.				
36.5.6	Rural Visitor Zone	Any point within any other site in the Commercial and Glenpanel Precincts	0800h to 2000h	60 dBA LAeq(15 min)	NC
	Te Pūtahī Ladies Mile Zone – Low, Medium and High Density Residential Precincts				
	Te Pūtahī Ladies Mile Zone – Commercial and Glenpanel Precincts				
	Note: Sound from activities which is received in another zone or Precinct shall comply with the noise limits for that zone or Precinct.		2000h to 0800h	50 dBA LAeq(15 min)	
...					
36.5.10	Vibration	On any structures or buildings on any other site.	Refer to relevant standard	Refer to relevant standard	NC
	Vibration from any activity shall not exceed the guideline values given in DIN 4150-3:1999 Effects of vibration on structures at any buildings on any other site.				

...

36.5.13	Construction Noise	At any point within any other site.	Refer to relevant standard	Refer to relevant standard	D
	Construction sound must be measured and assessed in accordance with NZS 6803:1999 Acoustics - Construction Noise. Construction sound must comply with the recommended upper limits in Tables 2 and 3 of NZS 6803. Construction sound must be managed in accordance with NZS 6803.				

...

Table 3	Standards for activities located in the Medium Density Residential Precinct and the High Density Residential Precinct	Non-compliance status
49.5.38	Road noise – State Highway 6 Any new residential buildings or buildings containing Activities Sensitive to Road Noise, located within: a. 80m of the boundary of State Highway 6 where the speed limit is 70kmph or greater; or b. 40m of the boundary of State Highway 6 where the speed limit is less than 70kmph shall be designed and constructed to ensure that the internal noise levels do not exceed 40dB LAeq(24h) for habitable spaces.	NC

3.2. NZS 6803: 1999 – Construction Noise

The construction noise limits within NZS 6803: 1999 are presented below.

For this project, construction of the development site, road upgrade and water infrastructure will each be “long term” exceeding 20 weeks in total duration and occur between 07:30am to 6pm on weekdays.

Construction noise levels are applicable at the façade of the occupied receiver building (inclusive of a +3dBA façade reflection).

Table 2. NZS 6803: 1999 (Table 2, Residential Areas) – Construction Noise Limits

Time of week	Time period	Duration of work					
		Typical duration dBA		Short term duration dBA		Long term duration dBA	
		Leq	Lmax	Leq	Lmax	Leq	Lmax
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75

Time of week	Time period	Duration of work					
		Typical duration dBA		Short term duration dBA		Long term duration dBA	
		L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
	0630-0730	45	75	45	75	45	75
Sundays and public holidays	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

3.3. Construction Vibration, Building Damage, DIN-4150-3

The QLDC- Proposed District Plan rule 36.5.10 refers to the German Industrial Standard DIN 4150-3 (1999): *Structural Vibration – Part 3 Effects of Vibration on Structures*, however doesn't specify if this is applicable to operational or construction activities.

These limits are designed to prevent building damage, which is most commonly applicable to construction. The surrounding buildings are predominantly residential structures and the Line 2 vibration limits of DIN 4150-3 are therefore applicable, reproduced in Table 3 below.

Table 3. Summary of DIN 4150-3(1999) building damage vibration criteria

Line	Type of Structure	Vibration Peak Particle Velocity (mm/s)			
		Vibration at the foundation at a frequency of			Vibration at horizontal plane of highest floor at all frequencies
		1 – 10Hz	10 – 50Hz	50 – 100Hz*	
1	Commercial	20	20 to 40	40 to 50	40
2	Residential	5	5-15	15-20	15
3	Heritage / Very Sensitive	3	3-8	8-10	8

* For frequencies above 100Hz, at least the values specified in this column shall be applied

3.4. Construction Vibration, Human Amenities

The QLDC-PDP does not provide a human amenity limit for construction vibration. A recommended guideline to protect human amenity from construction vibration is shown below (based on other NZ district plans):

- A vibration limit of 2mm/s PPV applies to occupied buildings as measured within 500mm of ground level, on the foundations of the building of interest, or internally in the corner of the floor of interest for multi-storey buildings;

3.5. Resource Management Act – Section 16

In addition to the QLDC-PDP noise rules, noise from the proposed development must be compliant with the overarching requirement of Section 16 of the Resource Management Act, stated as follows:

Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.

4. Reverse Sensitivity

4.1. SH6 – Reverse Sensitivity

4.1.1. Traffic Noise Prediction

Rule 49.5.38 of the QLDC-PDP is designed to control reverse sensitivity effects to NZTA / Waka Kotahi.

In order to predict the maximum potential traffic noise levels at façade of the proposed development, a 3D noise model has been created using internationally recognised 3D noise modelling software CadnaA (Computer Aided Noise Abatement). The software calculates noise propagation in accordance with *ISO 9613-2: Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation and Calculation of Road Traffic Noise (UK)* with corrections for NZ road surfaces.

Calculation settings for the software include $C_0 = 0$ for slightly enhanced meteorological noise propagation, $G = 0$ for reflective ground on asphalt/paved surfaces/roads, $G = 1$ for soft ground and the inclusion of building reflections. Input data for the surrounding area has been sourced from the LINZ data portal and latest project site data (Simplicity / Brewer Davidson 31/3/2026).

SH6 currently has a combination of 80km/hr speed limit to the west of the Lower Shotover Road roundabout, increasing to 100km/hr to the east of the roundabout, all currently incorporating chipseal Grade 3/5.

The proposed development will include the replacement of the roundabout to a traffic light system and repaving SH6. The traffic engineer for the project has confirmed the following changes to SH6 that are relevant to the traffic noise incident on the site:

- Reduced speed of 60km/hr at approximately 80m to the east of the junction
- Upgraded asphalt road surface
- The areas are indicated in the site masterplan in Figure 6 of Appendix A

The above information has been taken into account when using the following traffic inputs for the 3D noise model:

- Road ID: 811, Cw ID: 8628, App Region: All SH March 2026
- 2024 (Est) AADT: 19284, 4% Heavy Goods
- 15-year, 3% non-compounding growth AADT: 29119
- East of junction: Chipseal Grade 3/5 / 100km/hr
- West of junction: Asphalt SMA14, 60km/hr

The results of the 3D noise modelling for future SH6 traffic noise across the development site is presented in Appendix B showing noise reaching up to 71dB $L_{Aeq(24hr)}$ from future highway noise, or significantly lower at greater separation distances, or if screened from other buildings.

4.1.2. Proposed Constructions

We understand that all habitable rooms across the development will incorporate mechanical ventilation and air conditioning. This will allow windows to remain closed should the tenants require respite.

The proposed façade constructions without any specific upgrades will be as follows:

- External walls of ≥ 200 mm concrete with brick veneer cladding, internal strapping and lining with 10mm Standard GIB: $R_w + C_{tr} \geq 63$ dB
- Roofs of profiled metal on timber truss, on ~ 150 mm concrete composite steel decks with 10mm standard GIB fixed to timber battens $R_w + C_{tr} \geq 51$ dB
- Bedrooms:
 - Volumes of ~ 20 - $25m^3$ with windows of $\sim 4m^2$
 - 6mm glass / 12mm airspace / 4mm glass double glazing as standard - $R_w + C_{tr}$ 30 dB
- Kitchen/living rooms:
 - Volumes of $\sim 70m^3$ with external windows/doors of $\sim 7m^2$
 - 6mm glass / 12mm airspace / 4mm glass double glazing as standard - $R_w + C_{tr} \geq 30$ dB
- The glazing acoustic performance is dependent on the glass, frame and seals as a whole system which should be verified by the manufacturer. Sliding doors have an inherently weaker sound insulation performance due to the lack of compression seals. Where the acoustic performance of glazed sliders cannot be demonstrated, it is recommended to incorporate bifold doors with compressible seals.

The high mass masonry external façade constructions provide a high sound insulation performance at low frequencies. On this basis, the sound insulation performance of the glazing will be the main determining factor when assessing the overall sound insulation of the façade.

A calculation of the noise break-in assuming the highest traffic noise prediction of 71dB $L_{Aeq(24hr)}$ has been carried out using the following traffic noise spectrum as measured by BBA (containing significant low frequency noise).

Table 4. Maximum dB $L_{Aeq(24hr)}$ Traffic Noise Spectrum

Octave band centre frequency, dB L_{eq}								dB
63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	$L_{Aeq(24hr)}$
75	71	67	67	69	61	54	50	71

Based on the proposed constructions and maximum future traffic noise prediction of 71dB $L_{Aeq(24hr)}$ the predicted internal noise levels will be as follows:

- Bedroom: 40dB $L_{Aeq(24hr)}$
- Living room: 39dB $L_{Aeq(24hr)}$

For habitable rooms at greater separation distances to the highway, or those benefitting from screening from other buildings, internal noise levels will be significantly lower.

Based on the above, the internal noise levels will meet 40dB $L_{Aeq(24hr)}$ minimum requirement as per QLDC-PDP Rule 49.5.38 and control reverse sensitivity effects to NZTA / Waka Kotahi.

To ensure this is implemented, the following measures are recommended for conditions of consent:

- Demonstration that the final external building envelope design achieves the internal noise requirements of Rule 49.5.38, prior to occupation for all dwellings located within 80m of the SH6 carriageway

4.2. Commercial Activities – Reverse Sensitivity

The site will contain two main commercial activities including the retail block on the north-west corner of the site and the café.



Figure 5 Retail Block (left hand side) and Café / Lease Office (right)

Noise from the café is not expected to generate significant levels of noise on the basis that no external amplified music occurs (i.e. for outside seating areas).

The exact retail activities are not currently specified. Different retail activities can have a wide range of noise generation levels or sensitivities, for example a gym or bar can generate high level of amplified music levels compared to a grocery store.

Applying the noise limits for the zone and precincts at all receivers surrounding the site and the dwellings on the project site will protect the retail block from reverse sensitivity effects for the vast majority of typical retail activities.

Further, the apartments in the project site that are closest to the retail block have the Te Pūtahi Ladies Mile – Medium Density Residential Precinct noise limits. These limits are sufficiently low as to allow for open windows (providing a -15dBA reduction of external noise) to meet recommended internal noise criteria of 40dB L_{Aeq} in living rooms and 35dB L_{Aeq} in bedrooms (AS/NZS 2107: 2016). As

all apartments will incorporate HVAC systems allowing windows to remain closed, this provides an additional level of protection from potential reverse sensitivity effects.

If the retail block contains activities generating amplified music however, this still has the potential to cause a disturbance during the evening or night time periods due to the low frequency and impulsive character (even if limits are achieved). To ensure this potential for disturbance is controlled, additional low frequency noise limits of 60dB L_{eq} at 63Hz and 55dB L_{eq} 125Hz are recommended during the night time periods.

The following conditions of consent should be considered to control reverse sensitivity effects:

- Noise from any commercial activity on the site must not exceed the permitted limits of QLDC-PDP Rule 3.6.5 at any receiver for each respective zone or precinct (inclusive of receivers surrounding the project site and on the project site)
- Any amplified music from the commercial activities between 8pm to 8am must not exceed 60dB L_{eq} at 63Hz and 55dB L_{eq} 125Hz at the notional boundary or façade of any noise sensitive receiver (existing receiver and apartments on the project site).

5. Operational Noise Emissions

5.1. Building services

Final building services design and equipment selection are not currently available for the proposal; however the following schemes are proposed:

- All apartments will incorporate individual ventilation and AC systems, located in ceiling cavities and external balconies. Apartment blocks will not incorporate large centralised plant serving the whole building.
- Typical noise emissions from smaller HVAC systems serving each apartment are considerably quieter and generate no significant noise to nearby receivers (the design inherently controls noise to a reasonable level to each apartment)
- The retail block and Café may incorporate larger, centralised HVAC systems. Any plant will be located at separation distances of ~10m from the retail block to the nearest apartments in Block R, or ~60m from the café to the nearest apartment Block V. Other receivers surrounding the site are located at considerably larger distances
- With these separation distances and typical HVAC attenuation measures such as noise barriers and attenuators etc, the permitted limits of the QLDC-PDP can be readily achieved.

5.2. Parking and Vehicle Noise

The predominant use of vehicles on the site will be due to residential parking. Residential parking and manoeuvres from the site are also expected to be relatively constant throughout the daytime periods. During the night time (after 8pm) vehicle use will be significantly reduced.

The following vehicle peak 1hr and total manoeuvres have been advised by the project traffic engineer (Bartlett Consulting):

Daytime between 8am to 8pm:

- Peak 1 hr of 1000 vehicles
- Total of 9000-10000
- On-site vehicle speed limit of 40km/hr
- No adjustment for averaging in accordance with NZS 6802: 2008

Night time between 8pm and 8am:

- Peak 1 hr of 200 vehicles
- Total of 2000 vehicles
- On-site vehicle speed limit of 40km/hr
- No adjustment for averaging in accordance with NZS 6802: 2008

The vehicles entering and exiting the site on the main access roads have been modelled based on a sound power of L_w^1 46dBA per metre as a line source for a single movement at 40km/hr over a 1hr period. This has been approximated for each road assuming 30% of the total from Road 01, 02 and 03. Cars on the main road to the north of the site have not been assessed as this is a public road.

For car parking at the retail block or café parking areas, these have been modelled as an area source. A sound power of L_w^3 69dBA for a single parking manoeuvre (enter or exit parking area, door open / close) has been logarithmically adjusted based on the following peak volumes:

Daytime between 8am to 8pm:

- Retail car park – all 21 spaces being used within a 1-hour period
- Cafe car park - all 20 spaces being used within a 1-hour period
- -5dBA adjustment for averaging in accordance with NZS 6802: 2008

Night time between 8pm and 8am:

- Retail car park – 30% of the total 21 spaces being used within a 1-hour period
- Cafe car park -30% of total 20 spaces being used within a 1-hour period
- No adjustment for averaging in accordance with NZS 6802: 2008

The predicted noise levels from the use of vehicles on the site either entering/exiting or using the car parks has been predicted using the 3D model to the closest receivers surrounding the site, and the apartments on the site, as shown in Table 5 below.

Table 5. Predicted noise rating from vehicles on the project site

Receiver / Apartment Block	Daytime Noise Limits, dB L_{Aeq}	Daytime Noise Rating, dB L_{Aeq}	Night time Noise Limits, dB L_{Aeq}	Night time Noise Rating, dB L_{Aeq}
33 Lower Shotover Road	50	33	40	26
70 Lower Shotover Road	50	33	40	26
28 Springbank Grove	50	46	40	35
399 Frankton-Ladies Mile Hwy	50	49	40	39
Apartment Block T (adjacent to retail and access road)	N/A	50	N/A	43 -7
Apartment Block T2 (adjacent to café and access road)	N/A	54	N/A	42 -12

As shown above, the predicted traffic noise levels achieve the day and night time noise limits for all receivers surrounding the site.

For apartments located on the site, the highest predicted noise rating due to traffic within the site is 54dB L_{Aeq} . As all apartments will incorporate HVAC systems to allow windows and doors to remain closed the proposed facades constructions will provide ~31dBA reduction of traffic noise. This would result in internal noise levels of 23dB L_{Aeq} from traffic noise during the daytime and 11dB L_{Aeq} during the night time from vehicle use on the site. This comfortably meets the AS/NZS 2107: 2016 internal noise recommendations of 40dB L_{Aeq} in habitable rooms and 35dB L_{Aeq} in bedrooms. On this basis, reverse sensitivity effects from vehicles on the site will be controlled.

¹ BayLfU parking noise study – Cars entering/existing car park or parking manoeuvres reference noise levels

6. Construction Noise and Vibration

The construction of the proposed site will comprise significant earthworks down to design levels, with installation of utility services, building foundation of concrete pads and concrete piles (rotary bored) followed by erection of the concrete superstructures. Road resurfacing is expected to require grading and asphalt surfacing.

Construction phases will be as follows for each element of the application:

Residential Development

- Earthworks: excavation to remove / move topsoil to design levels, dozers and loaders into trucks, vibratory rollers for site compaction
- Piling using rotary bored piling rigs
- Pouring of concrete foundations and superstructure
- Asphalt paving of roads
- Erection of building superstructure using cranes and handheld tools

Highway Upgrades

- Asphalt upgrading of existing roads using graders, pavers and vibratory rollers
- Excavators and trucks to remove / move soil to design levels
- Compaction of soft ground to design levels using vibratory roller

Infrastructure upgrades (supply/waste water)

- Small/medium excavator for earthmoving/fill
- Hydrovac for excavation around existing services
- Hiab crane for lifting of pipes
- Trucks
- Vibratory rollers

6.1. Construction Noise

Typical construction plant for a project of this size are summarised in Table 6. The estimated duration of use and location on site for each plant item is also shown. In order to predict the construction noise levels at the nearest receivers, source noise data of representative construction plant has been selected from NZS 6803: 1999 which makes reference to the British noise standard BS 5228-1: 1997. Where appropriate, noise levels have been selected from the updated BS 5228-1: 2009 version of the standard, or based on previous measurement data.

Table 6. Construction plant / activities source reference levels

Construction activity	Noise level ref.	Sound Pressure Level at 10m	Expected location on site
Development site			
23t Excavator – site excavation	BBA Measurement Database	71	Whole development site extents
20t Dozer	BS 5228: 2009 C2 1	75	
20t Loader	BS 5228: 2009 C2 28	76	
18t Asphalt paver and tipper lorry	BS 5228: 2009 C5 31	77	Roads on and around development site
Concrete pump and mixer, discharging to top floors	BS 5228: 2009 C4 25	75	~20m from site boundary
35t Auger piling rig	BS 5228: 2009 C3 21	79	Building extents only
Mobile crane	BS 5228: 2009 C3 30	70	~20m from site boundary
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	~20m from site boundary
12t Vibratory Roller	BS 5228: 2009 C5 20	75	Site extents and roads on and around development site
Highway Upgrades			
18t Asphalt paver and tipper lorry	BS 5228: 2009 C5 31	77	Highway extents (as per Appendix A) ~20m from site boundary Site extents and roads on and around development site
23t Excavator – site excavation	BBA Measurement Database	71	
Grader moving at 5-10km/hr	BS 5228: 2009 C6 31 (inclusive of moving source)	70	
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	
12t Vibratory Roller	BS 5228: 2009 C5 20	75	

Construction activity	Noise level ref.	Sound Pressure Level at 10m	Expected location on site
Infrastructure Supply/Waste Water			
23t Excavator – site excavation	BBA Measurement Database	71	Within 2-3m either side of pipes as shown in Appendix C ~20m from site boundary Site extents and roads on and around development site
Hydro-vac	BBA Measurement Database	76	
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	
12t Vibratory Roller	BS 5228: 2009 C5 20	75	

Construction activities will occur between the hours of 07:30am to 6pm on weekdays for which the permitted limit of 70dB L_{Aeq} / 85dB L_{Amax} are applicable. The distance as which these limits are achieved are presented in Table 7 below assuming no screening, or if a construction noise barrier is introduced (providing 8dBA reduction of noise where the line of sight is blocked).

Table 7. Construction Noise – Compliance Distances

Construction activity	Noise level ref.	Sound Pressure Level at 10m	Compliance Distance with 70dB L _{Aeq} / 85dB L _{Amax} Metres	
			No noise barrier	With noise barrier providing 8dBA reduction
Development Site				
23t Excavator – site excavation	BBA Measurement Database	71	16	6
20t Dozer	BS 5228: 2009 C2 1	75	25	10
20t Loader	BS 5228: 2009 C2 28	76	28	11
18t Asphalt paver and tipper lorry	BS 5228: 2009 C5 31	77	32	13
Concrete pump and mixer, discharging to top floors	BS 5228: 2009 C4 25	75	25	10
35t Auger piling rig	BS 5228: 2009 C3 21	79	40	16

Construction activity	Noise level ref.	Sound Pressure Level at 10m	Compliance Distance with 70dB L _{Aeq} / 85dB L _{Amax} Metres	
			No noise barrier	With noise barrier providing 8dBA reduction
Mobile crane	BS 5228: 2009 C3 30	70	14	6
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	4	1
12t Vibratory Roller	BS 5228: 2009 C5 20	75	25	10

Highway Upgrades				
18t Asphalt paver and tipper lorry	BS 5228: 2009 C5 31	77	32	13
23t Excavator – site excavation	BBA Measurement Database	71	16	6
Grader moving at 5-10km/hr	BS 5228: 2009 C6 31 (inclusive of moving source)	70	14	6
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	4	1
12t Vibratory Roller	BS 5228: 2009 C5 20	75	25	10

Infrastructure Supply/Waste Water				
23t Excavator – site excavation	BBA Measurement Database	71	16	6
Hydro-vac	BBA Measurement Database	76	28	11
Truck removing / bringing material to site – single manoeuvre over 15 mins	BayLfU Study	58	4	1
12t Vibratory Roller	BS 5228: 2009 C5 20	75	25	10

Development Site Works

As shown above, the long-term construction noise limit of 70dB L_{Aeq} / 85dB L_{Amax} between the daytime hours of 730am to 6pm on weekdays will be achieved with no screening at separation distances of 40m or less.

All existing receivers surrounding the site are at separation distances of 50m or more, which provides adequate reduction of construction noise to ensure the permitted limits are achieved.

Highway Upgrade Works

For potential new dwellings located to the south of SH6, Kahiwi Drive and Tarata Way with boundaries located at approx. 10m from the state highway, the expected road surfacing activities will not include piling and will mainly comprise asphalt works. These generate significantly lower levels of noise. It is also not expected that the facades of these dwellings are located directly on the boundary and will be at greater distances (min 20m to meet Highway setback requirements), achieving compliance without screening. Regardless, all compliance distances with or without screening will be included within a CNVMP.

Infrastructure Supply/Wastewater Works

The Infrastructure works requiring trenching and laying of new pipes can meet the permitted limits of 70dB L_{Aeq} / 85dB L_{Aeq} at distances of 11m or less from any receiver façade with the inclusion of a 1.8m high noise barrier. Without a noise barrier, the compliance distances can be achieved at distances of 28m from a receiver façade.

General

As the development site, highway and infrastructure works will experience a large number of activities occurring simultaneously with noise generation for ongoing periods, this has the potential to result in increased annoyance to receivers. With written advice of the works provided prior to commencing construction on site for all receivers within 50m of the works detailed and managed as per the Construction Noise and Vibration Management Plan (CNVMP), the overall noise effects are not expected to exceed a reasonable level. The CNVMP will detail the best methods for community liaison, noise mitigation methods, compliance distances and a complaints procedure.

6.2. Construction Vibration

Over the construction period, vibration from the majority of construction activities will not be perceptible due to the significant distances of ~50m or more to receivers. However, vibratory rollers have the potential to generate noticeable vibration when in proximity to buildings, depending on the ground conditions. The distances at which these activities comply with the recommended limit of PPV 2mm/s amenity limit are presented below:

- 12t Vibratory Roller - PPV 2mm/s at 13m

Due to the large separation distances of ~50m or more to the closest existing receiver building (399 Frankton Ladies Mile Hwy) to the development site, the recommended 2mm/s PPV amenity limit and the DIN 4150 building damage limits are predicted to be achieved with a factor of safety.

For potential new dwellings to the south of SH6, Kahiwi Drive and Tarata Way, new buildings are expected to be located at separation distances of 25m or more from road works, achieving compliance with the recommended amenity limit and the building damage limits. Compliance distances with or without screening will be addressed within the CNVMP.

For the infrastructure supply/waste water works, all receiver dwellings are shown to be located at distances of 15m or more from the proposed works, meeting the recommended amenity limits. These distances will also ensure the DIN 4150 building damage limits are achieved with a large factor of safety.

Written advice with details of the works for all receivers within 50m, detailed and managed within a CNVMP will assist in managing potential complaints regarding construction vibration.

6.3. Construction Mitigation and Management Methods

The following mitigation and management methods are recommended as conditions of consent in order to minimise potential construction noise and vibration effects on the nearest receivers as far as practicable:

1. All potentially affected receivers immediately adjacent to the site will be kept informed of construction timeframes and the expected duration of noise and vibration-generating activities. Contact details for the project community liaison manager will be provided to the occupants of these dwellings for any complaints.
2. In the event of a reasonable noise/vibration complaint, monitoring will be carried out at the complainant's location if requested. Corrective action will be taken to reduce noise/vibration levels if they are found to exceed the consented limits.
3. A Construction Noise and Vibration Management Plan (CNVMP) will be prepared prior to commencing works. This will be implemented and maintained throughout the duration of the project. The CNVMP will detail the site-specific physical mitigation methods to be implemented as well as other general mitigation methods, including how construction activities/equipment are to be operated and selected with consideration to reducing noise disturbance to neighbouring receivers as far as practicable. It will also outline the process for community liaison and procedures for the handling of any complaints.

7. Assessment of Effects

The potential acoustic effects to be considered from the proposed residential development at Ladies Mile, Queenstown are summarised below:

Reverse Sensitivity – NZTA / Waka Kotahi

- Predicted noise from SH6 has been modelled to the facades of the proposed apartments, including the reduced speed of 60km/hr and asphalt road resurfacing. This demonstrates traffic noise levels up to 71dB $L_{Aeq(24hr)}$

- The proposed apartments will incorporate HVAC systems to allow windows to remain closed and high mass facades. The proposed glazing specification of R_w+C_{tr} 30dB demonstrates adequate reduction of traffic noise to meet the internal noise requirement of 40dB $L_{Aeq(24hr)}$ in accordance with QLDC-PDP Rule 49.5.38.
- With the proposed constructions, reverse sensitivity noise effects to NZTA / Waka Kotahi will be adequately controlled.
- A condition of consent is recommended to demonstrate that final building envelope constructions meet this requirement.

Reverse Sensitivity – Commercial Activities and Traffic

- Commercial activity noise can vary depending on the activity (i.e. bar/gym vs a retail store) and the potential reverse sensitivity effects are dependent on the noise being generated. If commercial activities are required to meet the permitted limits of the QLDC-PDP, effects are expected to be managed with a factor of safety for the vast majority of commercial activities due to the high level of sound insulation proposed in the apartment building envelopes.
- This does not include the potential for amplified music which can still cause a disturbance even if achieving the QLDC-PDP limits due to the increased annoyance from tonality and impulsivity, especially sensitive during the night time periods. On this basis, additional low frequency night time noise limits are recommended which will protect residential acoustic amenity during the night time periods.
- Predicted vehicle noise on site is also adequately low that with the apartment building envelope contractions, internal noise levels will meet recommended levels for amenity.
- With the above restriction on amplified music and the proposed building envelope constructions, reverse sensitivity effects due to commercial and vehicle noise will not exceed a reasonable level.

Operational Noise Emissions- HVAC and Traffic

- With individual HVAC systems for each apartment (non-centralised plant) noise emissions from the apartment blocks will be significantly low at all receivers surrounding the site, expected to be inaudible.
- HVAC noise from the commercial sites is expected to be higher, but with adequate mitigation and acoustic design can meet the permitted limits at the closest apartment building on the site. The noise limits at all receivers will be achieved with a factor of safety and is expected to be inaudible due to the significant separation distances.
- Traffic noise emission from the proposed site is expected to be the main source of operational noise experienced by existing receivers surrounding the site. Traffic noise on the site will be occasionally audible for most receivers, however similar in nature to existing SH6 traffic noise. As traffic noise is broadband and gradually fluctuates over longer time periods, no adverse impact on typical residential acoustic amenity is expected.

Construction Noise and Vibration

- Development Site: The site benefits from significant separation distances to existing receivers surrounding the site, demonstrating compliance with the permitted limits of 70dB L_{Aeq} / 85dB L_{Aeq} between the expected construction hours of 7:30am – 6:00pm, Monday to Friday
- Highway and Infrastructure Works: The permitted limits can be achieved with implementation of a CNVMP which provides setback distances from receiver buildings for screened or unscreened works using a 1.8m high noise barrier
- Vibration levels are also expected to achieve the Building Damage limits with a large factor of safety and barely perceptible for works on the development site. For the highway or Infrastructure works the receivers are located at adequate separation distances to meet the recommended amenity limits, also meeting the DIN-4150 building damage limits with a factor of safety
- With construction noise up to the permitted limits of 70dB L_{Aeq} / 85dB L_{Aeq} and closed windows, internal noise levels are expected to reach 42dB L_{Aeq} . The AAAC Guideline for interpreting and applying NZS6803:1999 provides the following approximate indications of potential noise effects on occupants (below).

< 45 dB L_{Aeq}	Unlikely to interfere with daily residential and commercial activities.
45 – 50 dB L_{Aeq}	May be audible within the building if quiet activities are occurring. Concentration may be affected.
50 – 55 dB L_{Aeq}	Annoyance for some occupants. Concentration may be affected but residential and office activities can generally continue. Sound levels for television, radio, and phone conversations would need to be slightly raised.
55 – 60 dB L_{Aeq}	Concentration likely to be affected and phone conversations may become difficult. Television, and radio levels would need to be raised. If noise continues for extended periods, people are likely to seek respite by moving to another room.
≥ 60 dB L_{Aeq}	Untenable for residential and most commercial environments.

- Based on the above and the inclusion of the following management methods, the overall construction noise and vibration effects are not expected to exceed a reasonable level:
 - A Construction Noise and vibration Management Plan
 - Notification to receivers of the proposed works, duration and contact details
 - Complaints procedure and monitoring and corrective actions to ensure compliant levels are achieved.

8. Recommendations

To ensure the potential adverse noise and vibration effects from construction and operation of the Project are managed, and reverse sensitivity effects on the state highway, the following conditions of consent are recommended

Reverse Sensitivity

1. A suitably qualified/experienced acoustic consultant must provide certification that the final external building envelope of all apartments located within 80m of SH6 are designed to meet the internal noise requirements of QLDC-PDP Rule 49.5.38 based on the predicted traffic noise levels shown in Figure 7 Appendix B of the BBA acoustic report dated 21/5/2026.

Operational Noise Emissions

2. Any amplified music from the commercial activities on the site must not exceed 60dB L_{eq} at 63Hz and 55dB L_{eq} at 125Hz between the hours of 2000 to 0800hrs at the notional boundary or façade of any noise-sensitive receiver (including apartments on the project site).
3. Prior to the operation of any commercial activity on the site, a suitably qualified/experienced acoustic consultant must demonstrate that the cumulative noise from the commercial activity meets the noise limits of the QLDC-PDP in accordance with consent condition 2.

Construction Noise and Vibration

4. A Construction Noise and Vibration Management Plan (CNVMP) shall be prepared and submitted to council prior to commencing works on site. The CNVMP shall be prepared in accordance with Annex E of NZS 6803:1999 and shall be kept up-to-date throughout the duration of the project. The CNVMP shall detail the site-specific physical mitigation methods to be implemented, including how construction activities/equipment are to be operated and selected with consideration to reducing noise disturbance to neighbouring receivers as far as practicable. This must also consider the noise compliance and management of potential night works. It must also outline the process for community liaison, monitoring and procedures for the handling of any complaints.
5. At least 5 working days prior to construction activities commencing on site, the occupiers of all dwellings within a 100m radius of the project site boundary must be advised in writing of the proposed construction works including days/times when noisy construction activities are expected to take place, the project construction timeframes and an email address and phone number to receive any complaints.
6. In the event of a reasonable noise/vibration complaint, construction noise or vibration monitoring must be carried out by a suitably qualified/experienced acoustic consultant at the complainant's location if requested. Where exceedances of the construction noise limits specified within QLDC-PDP rule 36.5.13, corrective actions to ensure compliance must be adopted.

9. Conclusion

BBA has carried out an assessment of the proposed residential development at Ladies Mile, Queenstown in support of the Fast Track Referral for Resource Consent. The large development comprises 40 apartment blocks including multi-storey car parks, retail / café block and a park.

This report identifies the QLDC-PDP noise rules applicable to operational noise emissions, reverse sensitivity and construction noise and vibration.

The proposed apartments will be constructed of high mass building envelopes and HVAC systems, adequately controlling future SH6 traffic noise to meet the internal noise requirement.

Noise from the proposed retail developments is not expected to exceed the permitted limits at all receivers. The potential effects from commercial activity noise are also not expected to cause a disturbance to nearby apartments on the basis that the HVAC systems are adequately designed and low-frequency noise from amplified music is limited.

HVAC noise from apartments will be considerably low and inaudible at all receivers surrounding the site due to the non-centralised plant (contained within each apartment). An assessment of noise from traffic on the site is expected to meet the permitted limits at all receivers.

An assessment of construction noise and vibration demonstrates that the permitted limits will be achieved at all receivers due to the large separation distances for works on the development site. Highway and Infrastructure works will also be able to meet the limits with a 1.8m high construction noise barrier for works within the unscreened compliance distances. Minimal to no vibration is expected to be perceived by neighbouring receivers. With a CNVMP implemented, potential effects from construction noise will be adequately managed and controlled.

Recommended conditions of consent have been suggested to ensure reverse sensitivity, operational and construction noise and vibration levels are controlled and do not exceed a reasonable level in terms of Section 16 of the RMA.

Appendix A. Site layout



Figure 6. Masterplan Site layout, SH6 road speed and surface areas

Appendix B. 3D Noise Model – SH6



Figure 7. 3D Noise model, SH6 Traffic, dB LAeq(24hr)

Appendix C – Infrastructure Upgrade Works – Waste/Supply Water

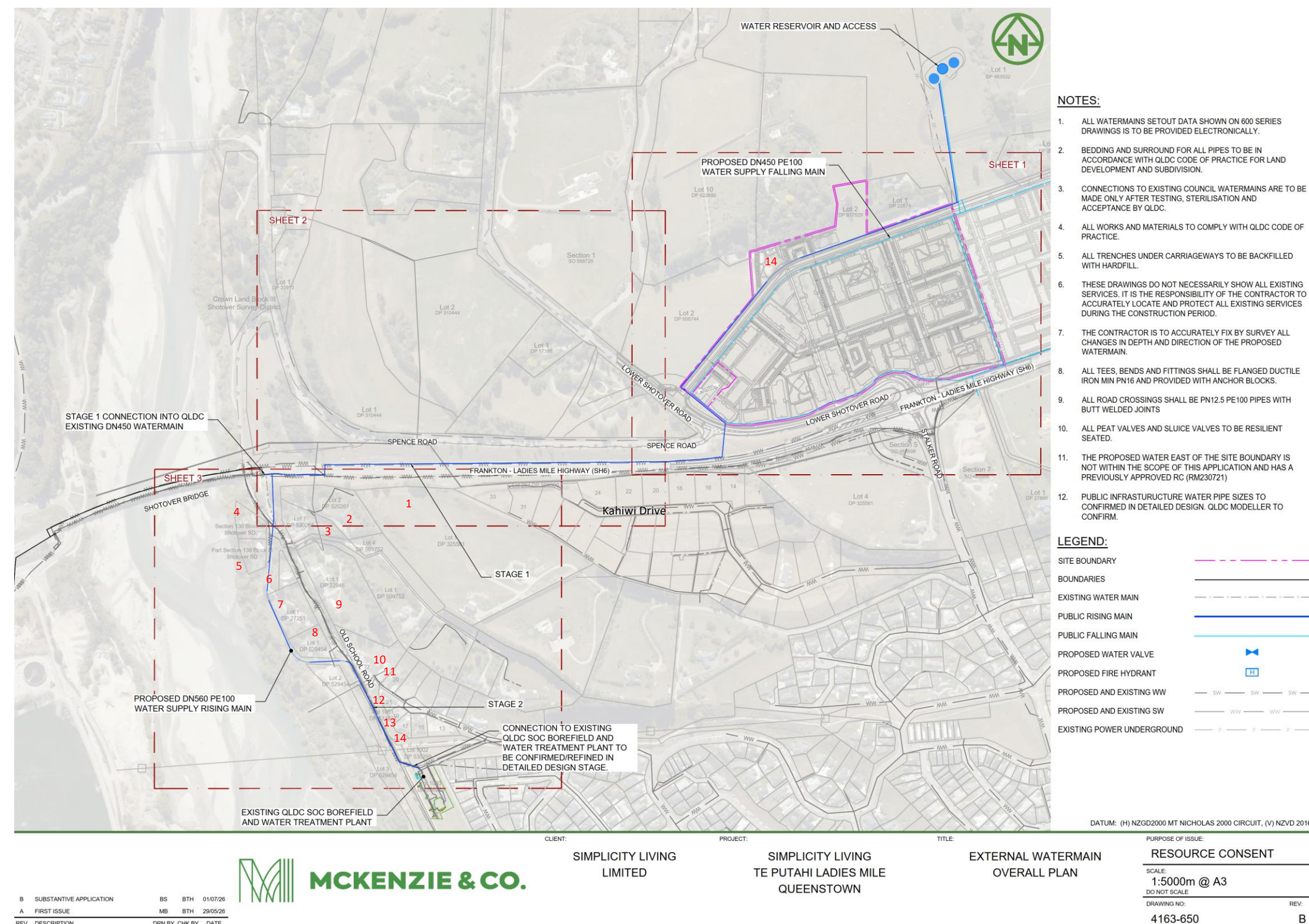
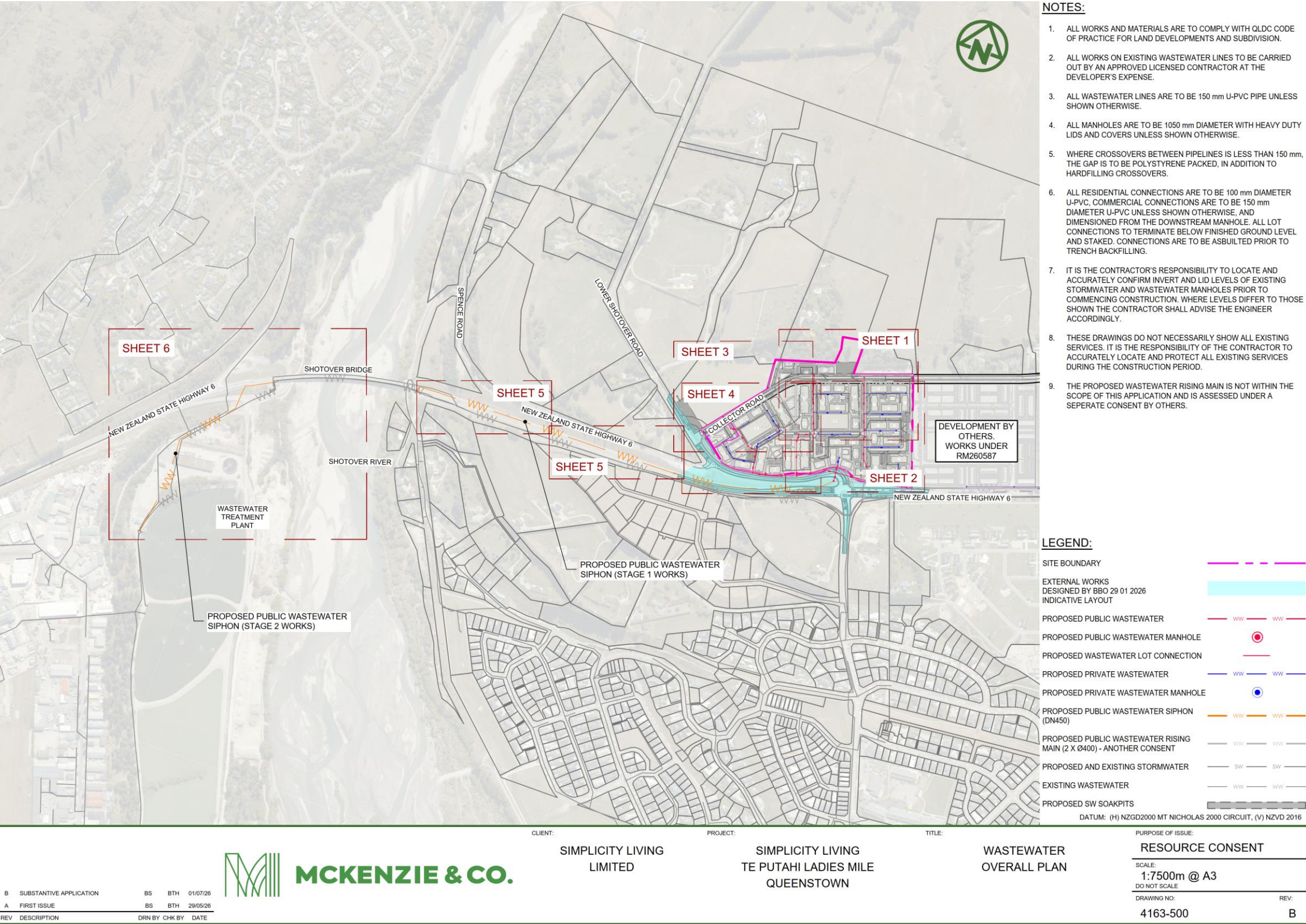


Figure 8. Proposed Water Supply Upgrade Works Plan (blue line shows extent of supply water works outside of project site)



All receivers are located at distances greater than 20m from works

(see Table 1 in main body of report for receivers adjacent to SH6, these houses have setbacks of 25m from roadside edge)

Figure 9. Proposed Water Supply Upgrade Works Plan (orange line shows extent of waste-water works outside of project site)