

401-403 PARNELL ROAD, AUCKLAND CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

Project No. 20032

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1. Introduction

Bladon Bronka Acoustics Ltd (BBA) has been engaged by The Building Innovation Group to undertake a Construction Noise and Vibration assessment for the proposed mixed-use development at 401-403 Parnell Road, Auckland.

Construction activities for the development have been assessed against the Auckland Unitary Plan – Operative in Part (AUP-OP) noise and vibration limits in accordance with the relevant New Zealand and International standards. Where noise and vibration levels have been predicted to exceed the AUP-OP permitted limits, an assessment of effects has been undertaken and the Best Practical Option (BPO) to control or mitigate noise and vibration to the nearest receivers has been identified.

This assessment should be read in conjunction with the Building Innovation Group’s “Construction Management Plan PARN 401”.

2. Proposed site and surrounding areas

The proposed site is located in the Business – Town Centre Zone (BTCZ), with the closest sites also within this zone and the Residential – Terrace Housing and Apartment Building Zone (RTHABZ) to the south-west. Figure 1 displays the AUP-OP zoning for the site and surrounding area.

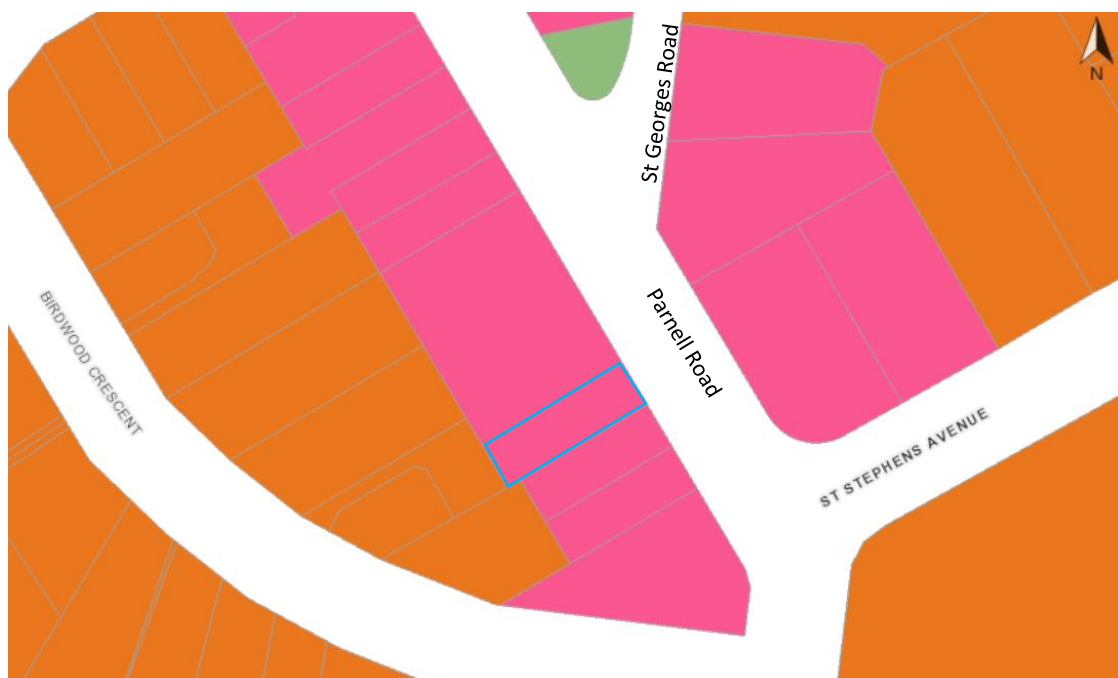


Figure 1. AUP-OP zoning of site (blue outline) and surrounding area

An aerial view of the site and surrounds is presented below in Figure 2 below.



Figure 2. Aerial view of site (yellow outline) and surrounding area

The proposed building will be 6 storeys high with apartments on the upper floors, and car parking and a small retail store on the ground floors. The site covers ~300m² with a width of 10m. The historic 1920's building frontage of the existing building will be retained.

The entrance/loading zone for the site will be on Parnell Road, in front of the site, with potential restrictions on usage times to limit impact to local traffic and pedestrian routes. The construction methodology will generally require the use of non-heavy machinery wherever possible due to the access restrictions into the site.

The identified neighbouring receivers, their respective zone and activity are listed below:

1. 1 St Georges Road	BTCZ	Residential
2. 400 Parnell Road	BTCZ	Residential
3. 405-409 Parnell Road	BTCZ	Commercial
4. 16 Birdwood Crescent	RTHABZ	Residential
5. 14/14a Birdwood Crescent	RTHABZ	Residential
6. 12c Birdwood Crescent	TTHABZ	Residential
7. 389 Parnell Road (ground floor)	BTCZ	Commercial
8. 389 Parnell Road (upper floor)	BTCZ	Residential

A number of receivers will benefit from screening provided by the retained existing building frontage (described below) or from other existing buildings. At the rear of the site, a number of receivers are raised above the ground level and will have windows that look down onto the building site, where a noise screen will not be able to block the line of site from construction activities during excavation/demolition/foundation stages.

2.1. Construction methodology

The Building Innovation Group's Construction Management Plan states the following construction times will be followed:

Due to the specific conditions set by the location of the property, the protection of the façade and the potential effect on the traffic and pedestrian movements on Parnell Road. The unloading and loading of materials onto and from the site will need to take place at very specific planned timeframes.

It is anticipated therefore that the following construction times will be followed:

Monday to Saturday

- *5.45am rubbish collection*
- *6.00am to 7.00am: Deliveries to the project site involving the use of the loading zone portion.*
- *9.30am to 2.30pm: Concrete deliveries involving concrete trucks using the loading zone portion*
- *7.00am to 6pm: General construction work*
- *6pm to 8pm: work can continue, but no noisy work (e.g. hammering, excavation).*
- *To avoid working at heights over and in close proximity to the road and pedestrian carriageway during the establishment and disestablishment of the façade protection works will be undertaken in the evening up to 10.00pm. This works will be to undertake the erection and disestablishment of the elevated platform and façade protection that will be required during the construction works. These works should be able to be completed over a total of six(6) nights. Three(3) to erect the protection tower and three(3) to disassemble the tower.*

Sunday and public holidays

No noisy construction is planned with the exception of two(2) Sundays during the demolition and excavation phases. In order to remove the existing building and

excavation material from the site whilst maintaining the integrity of the façade we will need to use 4-wheeler 5 tonne trucks for the removal of the existing concrete structure and for the excavated material for the machine room. As these trucks will have to exit the building almost entirely before beginning their turn onto Parnell Road it has been recommended that this work is undertaken under traffic management when Parnell Road is at its least busy. It is proposed that the trucks can remove all the material in one Sunday and that we reserve the following Sunday should removal take longer than expected.

There is no immediate intention to work on Public Holidays.

Demolition will be completed in two general stages, the first being the removal of the building interior and roof structure, leaving the existing masonry walls and concrete car parking areas at the rear.

Access to the site will be via the using the existing shop frontage (to be retained) openings as shown in Figure 3 below.



Figure 3. Existing frontage to be retained, access via openings

The loading zone for the site will be on Parnell Road, in front of the site, with potential restrictions on usage times to not impact local traffic and pedestrian routes.

After the first demolition stage, a platform mounted crane will be installed at the site entrance, used for the erection of the steel structure on lower levels, this is illustrated below in Figure 4.



Figure 4. Platform mounted crane in front of the site entrance

Once the platform is constructed, during off-peak times, structural strengthening works will be completed for the existing historic building frontage.

The second stage of demolition will then remove the rear portion of the existing site concrete walls and floors using an 8-ton excavator, stockpiling materials for removal via 5-tonne, 4 wheeled trucks. This will also be used for general excavation of the ground where necessary.

A 3.5m high concrete wall (made from Dincell PVC formwork) will be constructed at the rear which will also act as a noise barrier to the lower neighbouring sites to the rear. Once the excavation is complete, new foundations and concrete flooring will be constructed. The location of the Dincell wall, foundations and floor structure is presented in Figure 5 below.

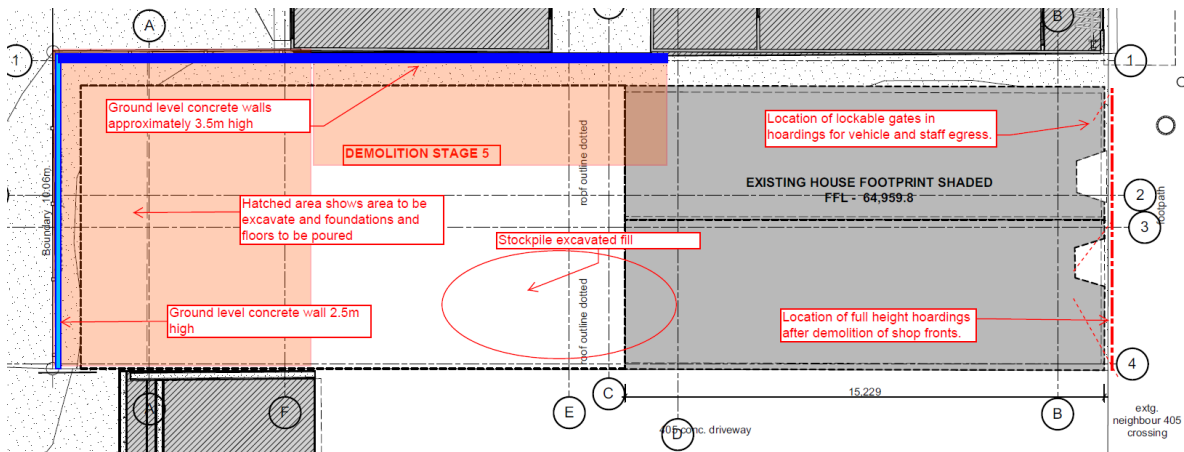


Figure 5. demolition of the rear portion of site, Dincell wall and foundation floor

Once demolition, excavation and foundation works are complete, construction of the ground floor walls to form the superstructure of the building will begin. This will involve the crane lifting the steel structure into place, installation of Traydec composite floors and additional Dincel walls for each level.

The construction methodology, once the foundations are in place, will generally utilise non-heavy machinery wherever possible due to the access restrictions into the site.

3. Project Criteria

The AUP-OP construction noise and vibration criteria and Resource Management Act 1991 obligations for the project are summarised below.

3.1. AUP-OP Construction Noise Criteria

AUP-OP Rule E25.6.27 (1) provides construction noise limits applicable to noise-sensitive sites (i.e. residential) within the Business – Town Centre and Residential - Terrace Housing and Apartment Building Zones, for projects lasting longer than 20 weeks. These are shown below.

Table 1. AUP-OP E25.6.27 (1) Construction noise limits for noise sensitive receivers, projects lasting more than 20 weeks

<i>Time of week</i>	<i>Time Period</i>	<i>Maximum noise level(dBA)</i>	
		<i>L_{eq}</i>	<i>L_{max}</i>
<i>Weekdays</i>	<i>6:30am – 7:30am</i>	55	70
	<i>7:30am - 6:00pm</i>	70	85
	<i>6:00pm – 8:00pm</i>	65	80
	<i>8:00pm – 6:30am</i>	40	70
<i>Saturdays</i>	<i>6:30am – 7:30am</i>	40	70
	<i>7:30am - 6:00pm</i>	70	85
	<i>6:00pm – 8:00pm</i>	40	70
	<i>8:00pm – 6:30am</i>	40	70
<i>Sundays and public holidays</i>	<i>6:30am – 7:30am</i>	40	70
	<i>7:30am - 6:00pm</i>	50	80
	<i>6:00pm – 8:00pm</i>	40	70
	<i>8:00pm – 6:30am</i>	40	70

For non-noise sensitive receivers (i.e. commercial use), the construction noise limits stated within AUP-OP rule E25.6.27 (2) apply. These are reproduced below.

Table 2. AUP-OP E25.6.27 (2) Construction noise limits for noise non-noise sensitive receivers, projects lasting more than 20 weeks

<i>Time Period</i>	<i>L_{eq}</i>
<i>7:30am - 6:00pm</i>	75
<i>6:00pm – 7:30am</i>	80

Noise limits shown above are applicable at 1m from the façade of any occupied building in accordance with NZS6803: 1999.

3.2. AUP-OP Construction Vibration Criteria

The project must comply with the vibration limits outlined in standard E25.6.30 of the AUP-OP. Part (1)(a) deals with the vibration limits to prevent building damage while part (1)(b) deals with the limits for human comfort in occupied buildings.

Building Damage Criteria

E25.6.30 (1)(a) refers to the German Industrial Standard DIN 4150-3 (1999): *Structural Vibration – Part 3 Effects of Vibration on Structures*. These limits are designed to prevent building damage. Line 1 (commercial buildings to the north-west and south-east) and Line 2 (residential buildings to the south-west) vibration limits of DIN 4150-3 apply to the neighbouring sites, these have been reproduced below in Table 3.

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	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15

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

Human Comfort Criteria

E25.6.30 1(b) of the AUP-OP sets out the construction vibration criteria for occupied buildings on other sites and is summarised below:

- 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, at all times;
- Works generating vibration for up to three days between 7am – 6pm may exceed the above limit up to a PPV of 5mm/s at the foundations providing:
 - (i) All occupied buildings within 50m are advised in writing at least three days prior. The written advice must include the location and duration of the works, a phone number for complaints and the site managers name.

3.3. Resource Management Act 1991

The Resource Management Act 1991 (RMA) is the principal legislation regarding land use. Section 16 (1) of the RMA describes the underlying noise requirements as follows:

16. Duty to avoid unreasonable noise

(1) 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. Construction Activities

Typical construction plant/activities with the highest potential to exceed the noise and vibration limits for the project are summarised in Table 4. The operation times and durations have been proposed by The Building Intelligence Group.

Table 4. Typical construction activities and duration of use

Construction activity	Estimated duration of use / operation times	Approx. location on site
Demolition and site excavation		
8-ton excavator for demolition, site levelling, and for loading cut material	1 month duration / Monday to Saturday 7pm-6pm	Extent of the existing project site
4-Wheeler Truck, 5 ton	2 days (low traffic days) / Monday to Saturday 7pm-6pm	Extent of the existing project site
Plate compactor, 400kg	2 days / Monday to Saturday 7pm-6pm	Extent of site
Piling and foundations		
8-ton Excavator with drilling rig for pile excavation	5 days / Monday to Saturday 7pm-6pm	Extent of site
Concrete pump and mixer, 10 ton	5 months / Monday to Saturday 7pm-6pm	Site entrance
Electric spider crane on pneumatic tyres	8 months / Monday to Saturday 7pm-6pm OR up to 10pm for six evenings only	Predominately front and middle of site
General construction activities		
Welding and general construction	8 months / Monday to Saturday 7pm-6pm	Extent of site

All construction plant is expected to be operated intermittently during the project and will be used in various locations unless specified.

5. Construction Noise

5.1. Predicted Noise Levels

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 manufacturers data for the electric spider crane.

Source noise levels for the construction plant to be used for the project are displayed in Table 5 below.

Table 5. Construction plant/activity noise levels

Construction activity	BS 5228: 2009 Noise level ref/description	SPL Noise level dB LAeq at 10m
8-ton Excavator - demolition	C1 17	82
8-ton Excavator – ground excavation	C2 25	69
8-ton Excavator mounted mini piling rig (rotary bored)	C3 20	68
5-ton, 4-wheeler truck	C4 8	56
400kg Plate compactor	C2 41	80
10 ton Concrete Mixer & pump	C4 24	67
Electric spider Crane on pneumatic tyres	<i>Manufacturers data: FURUKAWA UNIC URW094</i>	67

A full set of noise level predictions for each receiver has been presented in Appendix A. The predictions take into account the following:

- A 15dBA reduction is applied where line of sight is blocked by the existing building frontage (to be retained) or the building edge of existing neighbouring buildings;
- Noise levels have been predicted at the closest receivers facades, considering a worst-case scenario where no noise barrier can be used to block the line of sight to the construction activity;

- Note that the predicted levels are for the worst-case location of each plant i.e. closest position to the receiver and on average throughout the operational time, machinery will be further away;

5.2. Mitigation Methods

The following mitigation methods are proposed to reduce noise effects on the surrounding receivers:

- The 3.5m high Dintel masonry wall at the rear of the site will act as an acoustically effective barrier when blocking the line of sight to any neighbouring receiver. This will be constructed for each level as the building progresses. Should the wall incorporate openings for windows, these shall be boarded closed with a lining of 10kg/m², such as 18mm plywood or similar with all holes and gaps closed;
- Where the excavator is used for demolition of masonry structures, a noise attenuating breaker attachment (e.g. Duraflex Hushtec) shall be installed where practicable. This will reduce noise levels by up to 8dBA;
- The use of a localised noise screen shrouding the construction activity should be utilised where practicable to reduce noise levels to neighbouring receivers where a boundary noise screen is ineffective;
- Where noise levels are predicted to exceed the AUP-OP limits (identified in Appendix A), or for any works outside of daytime assessment hours, receivers should be kept informed of construction timeframes and the expected duration of noisy activities. Contact details for the site manager should be provided for any complaints.
- Staff shall be trained on-site to minimise noise levels at all times with particular attention to works carried out during evening periods;
- In the event of a reasonable complaint, noise monitoring should be carried out in accordance with NZS 6803:1999 at the complainant's location if requested. Corrective action should be taken to reduce noise levels if they are found to exceed the predicted noise levels.
- A Construction Noise and Vibration Management Plan should be prepared prior to commencing construction and implemented throughout the duration of the project.

6. Construction Vibration

The assessment of construction vibration is applicable to both human comfort and building damage. It should be noted that ground-borne vibration is highly variable and dependant on the type of construction plant, ground conditions and the response of neighbouring buildings.

Construction activities with the highest potential to exceed the AUP-OP limits for human comfort and building damage at the nearest receivers include:

- Excavator use;
- Vibratory compaction;

Typical levels of vibration for the highest vibration generating activities are shown in Table 6.

Table 6. Typical construction vibration levels

Activity	Reference	Measurement Distance, m	PPV mm/s
General Excavator use	NZTA Research Report 485, Table 4.1 Komatsu PC60, 6ton, Ash soil	10	1.8
Bored Piling	BS 5228-2: 2009 A1: 2014 D.6 105 600mm auger rotary bored piling, sand/over chalk	3.5	0.23
Plate Compactor	Czech & Gosk 2019 DPU6055 710kg, natural clay soil, building foundation	10	0.8

6.1. Vibration to Neighbouring Buildings

All construction activities are expected to comply with the DIN 4150-3:1999 Line 1 and 2 vibration limits for residential buildings when the demolition and excavation works are carried out on structures that are disconnected to neighbouring sites.

Where demolition or excavation works occur on structures that are connected to neighbouring sites, such as via shared foundation or concrete elements, it is recommended that building inspections are carried out before and after construction. It is also recommended that in these instances, vibration monitoring is carried out during the construction activity to ensure no building damage occurs.

6.2. Vibration to Neighbouring Occupants

Standard E25.6.30(1)(b) of the AUP-OP states that the general vibration limit for occupied buildings is 2mm/s PPV during the daytime hours of 7 am – 10 pm. It should be noted that this criterion does not state whether transient or continuous vibration is applicable or provide any indication of a dose value over a set period as with Vibration Dose Value (VDV). The impulsiveness, duration and dosage of vibration can have a large effect on the human response i.e. instances of short-term, infrequent exposure will be much less severe than continuous exposure over a longer period. This approach is reflected in Standard E25.6.30 1(b) of the AUP-OP where a vibration limit of 5mm/s PPV applies for works causing vibration for up to three days in duration.

Use of excavators and the plate compactor are the activities with the highest potential to cause vibration that approaches the 2mm/s PPV limit for human comfort when operating within approximately 5m of a building. However, any exceedance of the 2mm/s vibration limit is expected to be minimal (not greater than 5mm/s PPV) and infrequent. In any case, for the majority of the civil and site works, excavators and plate compaction will take place at distances of much greater than 5m.

All other construction activities are expected to comply with the 2mm/s limit.

6.3. Mitigation Methods

The following mitigation methods are proposed to reduce vibration effects on the surrounding receivers:

- For the demolition of existing site elements connected to neighbouring sites via rigid structures, pre and post construction building inspections should be carried out to demonstrate that no building damage has occurred. Vibration monitoring should also be carried out when the excavator is in use within 5m of neighbouring connected buildings;
- In the event of a reasonable complaint or if deemed necessary by the site manager, vibration monitoring should be undertaken in accordance with DIN 4150-3 at the location of the complainant.
- A Construction Noise and Vibration Management Plan should be prepared prior to commencing construction and implemented throughout the duration of the project.

7. Assessment of Effects

7.1. Construction Noise Effects

The predicted noise levels provided in this assessment are for the worst-case plant locations for each noise receiver. Consideration should be given to the fact that for the majority of the construction period, the plant will not be operating in the worst-case position and noise levels will generally be lower. In addition, the majority of construction activities will only take place during the daytime periods, and it is reasonable to expect that the majority of residential neighbours will not be at home from Monday – Friday when most construction is taking place.

It should be noted that in accordance with NZS 6803: 1999, the predicted external levels in this assessment include a +3dBA correction to account for the façade reflection that would be present if noise levels were measured at 1m from the façade for the purposes of determining compliance with the limits. In reality, internal noise levels are only influenced by the incident noise level, i.e. noise levels 3dBA lower than the reported levels.

The highest predicted noise levels are from the use of the 8-ton excavator during the demolition stage. This activity is expected to have the highest exceedance of the AUP-OP limits (approx. 88-91dB L_{Aeq}) for upper floor residential receivers overlooking the site that will not benefit from a boundary noise screen. The exceedances will be intermittent throughout the daytime periods i.e. 30-50% of the daytime periods, spread over a month. Note that there will be periods of respite between exceedances. This will result in internal noise levels of approx. 66-71dB L_{Aeq} within habitable spaces in worst case positions overlooking the site. Although intermittent in nature, this noise level has the potential to interfere with activities such as resting and relaxation, conversations between groups or talking on the phone if residential occupants are home. It should be noted that when neighbouring occupants are not home, there are no noise effects and it is reasonable to expect that the majority of residential receivers will not be at home during working hours.

To minimise the potential noise effects on these receivers, it is recommended that a localised noise screen around the excavator is used, with a noise attenuating breaker attachment used for demolition of concrete wherever possible. To minimise the potential for noise disturbances, the excavator use should be restricted between 9am and 6pm on weekdays only. It is also recommended that close community liaison is implemented via notification prior to these activities commencing so occupants may use rooms with facades located away from the works or arrange to not be home during the high noise construction activities. This approach is more manageable during the demolition and excavation stages due to its shorter overall duration.

No noise-generating plant is proposed on Sundays. It is proposed to incorporate two Sundays for loading of the truck with demolition/excavated fill with the truck parked at the site entrance and the engine off. Other than occasional noise from the material being loaded, no significant noise effects are expected on these Sundays.

It is proposed to use the electric spider crane on a platform at the front of the site during evening periods between 6pm and 10pm on weekdays only in addition to daytime hours. This is due to restricted access on to the site and the need to construct the steel structure outside of busy traffic hours, requiring trucks to park at the front of the site. Once the floor structure is built at upper levels (up to the height of the proposed platform) the crane will be moved from the platform onto the floor itself, resulting in reduced noise levels to some receivers due to screening from the buildings. As residential receivers are more likely to be at home during evening periods, it is recommended that close community liaison is implemented with an offer of compensation for occupants to leave their homes during the works (such as cinema, shopping, restaurant vouchers etc).

Once demolition, excavation and piling stages are completed within approx. 1 month, the remaining building construction is expected to create much lower noise levels due to the Dintel external walls acting as a noise barrier (which will be more effective as the building heights increase) and the use of low powered or hand-powered construction tools.

Construction noise of similar sites within inner-city business zones commonly exceed the AUP-OP noise limits at neighbouring receivers during excavation/demolition/foundation stage due to their close proximity or incorporation of high-level facades overlooking construction sites. The effects of construction noise are highly dependable on the community liaison with receivers and are significantly reduced when their overall duration is limited. The implementation of a CNVMP detailing the mitigation methods, community liaison, restricted hours of specified activities, noise monitoring methods and complaints procedure are vital in managing noise effects to neighbouring receivers.

Taking into account the magnitude and duration of noise level exceedances, it is our assessment that the noise levels arising from construction activities will not exceed a reasonable level in terms of s16 of the RMA and that the mitigation methods proposed form part of the best practicable option to reduce noise effects.

7.2. Construction Vibration Effects

Construction activities are not predicted to exceed the DIN 4150-3 Line 1 and 2 vibration limits at any of the nearest receivers when completed on structures separated from neighbouring sites.

Should it be found that demolition is required for structures that are connected to neighbouring buildings, pre and post building inspections should be completed as a demonstration that no building damage occurs. It is also recommended that vibration monitoring is carried out for all excavator demolition of masonry structures within 5m of neighbouring connected buildings.

Excavator use and plate compaction within 5m of the nearest receiver have the greatest potential to exceed the 2mm/s PPV limit for human comfort. However, any exceedance is likely to be minimal (<5mm/s), infrequent and only over the short period when operating closest to the neighbouring sites. We do not consider that any construction activities taking place on-site will result in any significant effects on the occupants of the nearest receivers, should they be occupied.

It is our assessment that vibration levels arising from construction activities will not exceed a reasonable level in terms of s16 of the RMA and that the mitigation methods proposed form part of the best practicable option to reduce vibration effects.

8. Recommendations

If consent is granted, the following are recommended as conditions of consent:

1. Noise from the construction of the development will comply with the limits specified within the AUP-OP Rule E25.6.27(2) for all non-noise sensitive receivers, and E25.6.27 (4) for all noise-sensitive receivers, as far practicable. Noise levels must be measured and assessed in accordance with NZS 6903: 1999;
2. The use of the electric spider crane during evening periods is limited to up to 6 days in total, between the hours of 6pm until 10pm Monday to Friday only;
3. The use of all excavator, plate compaction and piling activities are restricted to Monday to Friday 9am to 6pm only;
4. Works on Sunday are permitted for up to two days only, for loading of trucks parked at the site entrance with demolition or excavated material only, no mechanical plant may be used on these days. Work on Sundays are permitted between 10am and 5pm only;
5. Where practicable, a localised noise screen shall be used to surround the excavator, plate compactor or piling rig when in use. The localised noise screen must have a minimum surface mass of 10kg/m² (such as 18mm plywood or similar) or via the use of an effective proprietary construction noise barrier (Duraflex, Echobarrier etc). When the external masonry walls are constructed, any holes or gaps must be fully closed using a noise screen of the same material;

6. The receivers where noise levels are predicted to exceed the AUP-OP construction noise limits must be notified at least 10 days prior to all excavator, plate compactor and piling works, or any evening works;
7. Vibration arising from construction must not exceed the vibration limits set out in the German Standard DIN 4150-3:1999 Structural vibration – Effects of vibration on structures when measured from any surrounding building in accordance with the Standard;
8. Should demolition of connected (to buildings on another site) masonry elements be required, a pre and post condition inspection must be carried out for all connected neighbouring buildings. If demolition is required for connected masonry structures within 5m of the neighbouring building, vibration monitoring should be carried out to ensure the vibration limits specified within DIN 4150-3 Line 1 (commercial) or Line 2(residential) are not exceeded. Vibration monitoring must be carried out by a suitably qualified/experienced acoustic consultant;
9. Prior to commencing construction works, a Construction Noise and Vibration Management Plan (CNVMP) shall be prepared and submitted to Auckland Council detailing the noise and vibration mitigation methods to be implemented. The CNVMP must address the points in Annex E of NZS 6803:1999 at a minimum and must be implemented on-site / kept updated throughout the project;

9. Conclusion

BBA has been engaged by the Building Innovation Group to prepare a construction noise and vibration assessment for the mixed-use development at 401-403 Parnell Road, Auckland. Construction activities for the development have been assessed against the Auckland Unitary Plan – Operative in Part (AUP-OP) noise and vibration limits using relevant New Zealand and International standards.

Due to the requirement to retain the historic existing building frontage, site access is limited for larger construction plant and the construction will rely on low powered machinery or hand-powered methods. This will also require the erection of a steel platform at the front of the site, with truck deliveries or crane operations on a limited number of evenings. Once demolition/excavation/foundation works are completed masonry Dintel external walls will be constructed, acting as a noise barrier when blocking line of sight to neighbouring receivers.

The highest level of construction noise is predicted from the use of the excavator during demolition, excavation and piling works. Upper floor residential receivers at the rear of the site are the most exposed to noise due to their close proximity and lack of noise screening. The exceedances of the AUP-OP noise limits are expected intermittently over a month long period during excavator activities. As these activities are expected during daytime periods,

residential receivers are less likely to be occupied during these periods. Noise mitigation is recommended using localised noise screening where possible, the use of a noise attenuating breaker attachment and close community liaison. These activities should only be carried out during weekday, daytime periods only.

It is also proposed to use an electric spider crane on the site during evening periods for up to 6 days in total due to site access restrictions and the need to use Parnell Road for parking on non-peak traffic hours. It is recommended that close community liaison is implemented for evening works with the offer of compensation should occupants wish to not be present during these times.

Vibration levels arising from construction activities are not predicted to exceed the DIN 4250:3 Line 1/2 limits designed to prevent cosmetic building damage for all works on building structures disconnected from neighbouring sites. Should demolition be required on masonry elements connected to neighbouring sites, a pre and post building inspection is recommended in addition to vibration monitoring. Excavator use and plate compaction are the activities with the highest potential to approach the 2mm/s PPV vibration limit for human comfort. However, in the event that vibration levels exceed 2mm/s PPV, any exceedance is likely to be minimal and infrequent. We do not consider that this will result in any significant effects on the occupants should they be home.

The recommended construction noise and vibration mitigation measures have been suggested as consent conditions and should be implemented within a CNVMP to ensure effects to neighbouring sites are controlled.

It is our assessment that, if the proposed mitigation methods are implemented, noise and vibration arising from construction activities will not exceed a reasonable level in terms of s16 of the RMA.

Appendix A– Construction Noise Predictions

Construction activity	SPL @ 10m	Location	SPL Noise level at 1m from Façade dB LAeq / LAmax							
			1 St Georges Road	400 Parnell road	405/409 Parnell Road	16 Birdwood Crescent	14/14a Birdwood Crescent	12c Birdwood Crescent	389 Parnell Road (commercial)	389 Parnell Road (upper floor apartments)
8-ton Excavator – Demolition	82	Site boundary	61 / 76*	60 / 75*	91 / 106	87 / 102	91 / 106	80 / 95	95 / 110	88 / 103
8-ton Excavator – Ground excavation	69	Site boundary	48 / 63*	47 / 62*	78 / 93	74 / 89	78 / 93	67 / 82	82 / 97	75 / 90
8-ton excavator – mini piling rig	68	Site boundary	47 / 62*	46 / 61*	77 / 92	73 / 88	77 / 92	66 / 81	81 / 96	74 / 89
5-ton, 4-wheeler truck	56	Site Entrance	51 / 66	50 / 65	61 / 76	33 / 48*	33 / 48*	32 / 47*	62 / 77	62 / 77
Plate compactor, 400kg	80	Site boundary	59 / 74*	58 / 73*	89 / 104	85 / 100	89 / 104	78 / 93	93 / 108	86 / 101
10-ton concrete mixer and pump	67	Site boundary	62 / 77	58 / 73	72 / 87	57 / 72*	61 / 76*	50 / 65*	73 / 88	73 / 88
Electric spider crane	67	Entrance	62 / 77	61 / 76	76 / 91	72 / 87	76 / 91	65 / 80	73 / 88	73 / 88

* 15dBA reduction applied for blocking line of sight from existing building frontage of building screening