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Tuesday 5 February 2019

Beckhart Pty Ltd
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Our Reference 160787-02-03L-DD Rev04

For the attention of Mr David Tolson

Acoustic Review (Amended Development Application)
Modified Operations, Mushroom Farm
521 The Northern Road, Londonderry

1.0 BACKGROUND

A construction and operational noise assessment for a proposed Mushroom Farm at Londonderry was prepared in 2010 by Atkins Acoustics with the results and findings of that assessment presented in the *'Construction and Operational Noise Impact Assessment – Mushroom Growing Facility – Londonderry'* Report No. 40.6411.R2:CFCD4 Rev07 dated June 2010 and submitted with the Environmental Assessment (EA).

The development was approved by the Department of Planning (DoP) on 11 January 2012 (Application No. 08_0255) and included specific conditions relating to noise emissions from the development.

Due to advances in technology and procedures for growing, picking and processing mushrooms, the Applicant (Elf Mushrooms) sought to amend the approved Mushroom Growing Facility at Londonderry (Application No. 08_0255) to bring the facility into the best available technologies practices. The growing facility was to be conducted on one (1) level rather than multi level growing rooms, accordingly the 'foot print' of the buildings expanded across the southern and western portions of the site (*Appendices 1 and 2*).

A review of the proposed amended operations was prepared by Atkins Acoustics on 5 April 2016 (*Acoustic Review – Modified Operations – Mushroom Farm, Londonderry, Reference No. 46.6981.L1.Rev02:GA/DT/2016*) and submitted to the Department of Planning (DoP) and Environment Protection Authority (EPA). This review provided a number of noise control options including mounding, acoustic walls, enclosure of working areas, site management and negotiated agreement or purchase of properties.

In August 2016 Elf Mushrooms requested an acoustic review to utilise mains powered electric moving floor trailers for the supply and filling of growing rooms with substrate rather than the previously proposed air cooled reciprocating engines. Acoustic Consulting Engineers Pty Ltd was engaged by Elf Mushrooms to provide a review and assessment of noise from the modified operations for the approved mushroom growing farm at Londonderry and use of mains powered moving floor trailers.

The results of that review were presented in the *Acoustic Review (Amended Development Application). Modified Operations, Mushroom Farm. 521 The Northern Road Londonderry, Reference No. 160787-02-02L-CF* dated Friday 14 October 2016 addressed the potential acoustic benefits of utilising mains powered electric moving floor trailers for the supply and filling of growing rooms with substrate and clarified the steps required for the development in order to address any outstanding noise exceedances at existing reference residential receivers.

In January 2018 Elf Mushrooms confirmed that they were seeking further amendments to the building design (*Appendix 2*) and operational procedures to align the development with best management practises. The principle changes are:

- Additional smaller growing rooms on northern side of the building;
- All substrate filling of growing rooms internally within northern and central enclosed corridors;
- Revaluate the use of air cooled reciprocating engines for moving floor trailers considering filling activities are now located internally;
- Winching/'tip out' of spent substrate to occur externally on southern hardstand apron; and
- Increased offset of southern hardstand apron to site boundary.

This acoustic review serves as supplementary information and addresses the potential acoustic benefits of the proposed changes. The review also addresses project noise trigger levels as outlined in the EPA, NSW Noise Policy for Industry dated October 2017.

Notwithstanding the proposed modifications, the assumptions and recommendations contained in the (*Construction and Operational Noise Impact Assessment – Mushroom Growing Facility, Londonderry, Report No. 40.6411.R2:CFCD4 Rev07* dated June 2010) prepared by Atkins Acoustics would still apply for the referenced existing residential receivers.

2.0 ASSESSMENT METHODOLOGY

The findings and recommendations presented in this acoustic review are based on background information, data, noise modelling outputs, findings and recommendations outlined in the "*Construction and Operational Noise Impact Assessment – Mushroom Growing Facility, Londonderry, Report No. 40.6411.R2:CFCD4 Rev07* dated June 2010", *"Acoustic Review – Modified Operations – Mushroom Farm, Londonderry, Reference No. 46.6981.L1.Rev02:GA/DT/2016 dated 5 April 2016"* prepared by Atkins Acoustics and *Modified Operations, Mushroom Farm – 521 The Northern Road Londonderry, Reference No. 160787-02-02L-CF* dated Friday 14 October 2016 prepared by Acoustic Consulting Engineers Pty Ltd.

The methodology adopted for the noise assessment is as follows:

- confirm residential receivers potentially affected by noise from the use of the site;
- review of previously measured noise levels, project goals, predicted noise levels, findings and conceptual noise control recommendations;
- review of project noise limits outlined in Department of Planning Application No. 08_0255;
- review current EPA, NSW Noise Policy for Industry (NPfI) with respect to project noise trigger levels;
- update noise model to incorporate project, building, operational and plant/ equipment changes;
- predict and assess noise from the modified operations and use of the development with respect to Department of Planning Application No. 08_0255, project noise goals (INP) and project noise trigger levels (NSW Noise Policy for Industry); and
- recommend possible mitigation measures to manage and reduce operational noise impacts (if required).

The proposed changes to building and site operational management will not have impact on noise from construction activities and road traffic noise generated by the development.

Construction and road traffic noise assessments have been addressed in Atkins Acoustics' *Report No. 40.6411.R2:CFCD4 Rev07* and *46.6981.L1.Rev02:GA/DT/2016* and are not the subject of this review.

3.0 RECEIVER LOCATIONS

The nearest potentially affected existing residential dwellings are located to the north (493, 503, 505 and 509 The Northern Road), south (1 Thomas Road *unformed*) and west (2-6, 8-16, 18-24 and 26-32 Timothy Road) of the development. The closest existing residential dwellings are located to the north (approximately 160m to the main building); adjacent to the southern site boundary (approximately 70m to main building); and to the west (approximately 350m to the main building).

Figure 1 identifies the receiver locations selected to represent the closest dwelling within each of the receiver 'areas'.

R1	503 The Northern Road	North (address was misidentified as 493 The Northern Road in previous reports)
R2	509 The Northern Road	North
R3	1 Thomas Road	South
R4	8-16 Timothy Road	West

Figure 1 Reference Assessment Locations

4.0 OPERATIONAL NOISE ASSESSMENT OBJECTIVES

4.1 Consent Noise Limits

The development was approved by the Department of Planning and Infrastructure (11 January 2012) under Application No. 08_0255 and Conditions of Consent imposed for the Mushroom Farm Site. In terms of specific operational noise limits, *Condition 16* states:

> *The Proponent shall ensure that the operational noise generated by the Mushroom Farm site does not exceed the criteria in Table 5.*

Table 5 Operational Noise Impact Assessment Criteria, dB(A)

Receiver / Location	***Shoulder period (5-7am)*** $L_{Aeq,15min}$	***Day*** $L_{Aeq,15min}$	***Evening/ Night*** $L_{Aeq,15min}$	***Sleep disturbance*** $L_{A1,1min}$	
				Night	***Shoulder period (5-7am)***
Receiver 1 – 503 The Northern Road, Londonderry	*44*	*35*	*35*	*45*	*48*
Receiver 2 – 509 The Northern Road, Londonderry	*40*	*35*	*35*	*45*	*46*
Receiver 3 – 1 Thomas Road, Londonderry	*44*	*45*	*37*	*49*	*51*
Receiver 4 – 8-16 Timothy Road, Londonderry	*38*	*39*	*35*	*45*	*41*

Notes: Noise generated by the Project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

4.2 Project Specific Noise Goals

The operational noise criteria imposed by DoP utilised predicted levels from the Atkins Acoustics' noise assessment of the original design proposal and information available at that time, rather than the project specific noise goals (PSNG), determined accordance the EPA Industrial Noise Policy (INP).

Furthermore, it was noted in the Atkins Acoustics' review (Reference No. 46.6981.L1.Rev02:GA/DT/2016) that there was an assumption that all head filling/ winching activities would be conducted solely between 5.00am to 7.00am, however these activities may occur from 5.00am up to 10.00pm and accordingly could occur during the fringe morning, day and evening hours.

The Atkins Acoustics' review acknowledged that predicted noise level contributions will increase for the day assessment period to take into account normal operating procedures, whilst noise levels may change as a result of final plant and equipment selections associated with the amended site configuration and operational parameters.

Table 1 presents a summary of the Operational Noise Criteria for the project design development, extracted from Atkins Acoustics' reports (Report No. 40.6411.R2: CFCD4 Rev07 and 46.6981.L1.Rev02:GA/DT/2016).

Table 1 Operational Noise Criteria (EPA, INP)

Receiver/ Location	***Shoulder period (5-7am)*** $L_{Aeq,15min}$	***Day*** $L_{Aeq,15min}$	***Evening*** $L_{Aeq,15min}$	***Night*** $L_{Aeq,15min}$	***Sleep disturbance*** $L_{A1,1min}$	
					Night	***Shoulder period (5-7am)***
Receiver 1 – 503 The Northern Road.	*44*	*44*	*44*	*38*	*48*	*54*
Receiver 2 – 509 The Northern Road	*47*	*48*	*48*	*38*	*48*	*57*
Receiver 3 – 1 Thomas Road	*47*	*48*	*48*	*38*	*48*	*57*
Receiver 4 – 8-16 Timothy Road,	*40*	*40*	*40*	*38*	*48*	*50*

Notes: Noise generated by the Project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

4.3 NSW Noise Policy for Industry

The Environment Protection Authority (EPA) Industrial Noise Policy (INP, January 2000) has been replaced by the recently released Noise Policy for Industry (NPfI, October 2017).

The EPA:NPfI is not intended for use as a mandatory requirement. Rather, it is designed to establish project noise trigger levels as a benchmark for assessing and managing noise from large industrial and agricultural sources.

The project noise trigger level is not a noise limit, but a trigger level above which feasible and reasonable mitigation measure should be identified.

In the event that feasible and reasonable mitigation measure cannot reduce noise from the development under consideration to within the project noise trigger level, the residual noise level (noise level above the trigger level) should be assessed and reported.

The EPA:NPfI recommends the:

- $L_{Aeq,15min}$ noise levels from operation of mechanical plant or use of a facility not to exceed the day/evening/night rating background L_{A90} noise levels by more than 5dB at the residential receivers; and
- $L_{Aeq,period}$ noise levels (period being entire day/evening/night) from operation of mechanical plant or use of a facility to be at least 5dB below the recommended amenity noise levels from existing and/or future industrial sources for the particular receiver areas.*

Where a development has the potential to generate noise during the night-time assessment period, a detailed assessment is required if noise exceeds the following trigger levels at the residential receivers:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing rating background L_{A90} noise levels plus 5dB, whichever is greater; and/or
- $L_{AF,max}$ 52dB(A) or the prevailing rating background L_{A90} noise levels plus 15dB, whichever is greater.

Due to different averaging periods, the intrusiveness noise level (determined over 15-minute period) and amenity noise level (determined over an assessment period (day/evening/night)) may lead to situations where the same numerical value does not necessarily represent the same amount of noise for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI assumes a default correction of +3dB to convert the $L_{Aeq,period}$ to $L_{Aeq,15min}$ noise level.

Table 2 presents a summary of the $L_{Aeq,15min}$ and $L_{AF,max}$ Project Noise Trigger Levels for the proposed facility, established from the measured background noise levels presented Report No. 40.6411.R2:CFCD4 Rev07 and the procedures of the EPA:NPfI guideline. The recommended amenity noise levels are based on Suburban (Receivers R1, R2 and R3) and Rural (R4) residential areas. It is noted that the existing residential receiver locations are not presently impacted by industrial noise sources.

Table 2 Project Noise Trigger Levels (NSW Noise Policy for Industry)

Receiver/ Location	*Shoulder period* (5-7am)* $L_{Aeq,15min}$	*Day* $L_{Aeq,15min}$	*Evening* $L_{Ae,,15min}$	*Night* $L_{Aeq,15min}$	*Sleep disturbance* $L_{AF,max}$	
					Night	*Shoulder period (5-7am)*
Receiver 1 – 503 The Northern Road.	*44*	*44*	*44*	*38*	*52*	*54*
Receiver 2 – 509 The Northern Road	*47*	*48*	*45*	*38*	*52*	*57*
Receiver 3 – 1 Thomas Road	*47*	*48*	*45*	*38*	*52*	*57*
Receiver 4 – 8-16 Timothy Road,	*40*	*40*	*40*	*38*	*52*	*52*

Notes: Noise generated by the Project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry.

** 'shoulder period' noise trigger level should not exceed Day, Evening noise trigger level should not exceed should not exceed Day*

5.0 NOISE MODELLING

The review and assessment was based on information provided by Atkins Acoustics.

The noise modelling was previously updated to account for the lower source sound power levels of mains powered electric moving floor trailers (Lw98) for the supply and filling of growing rooms with substrate compared to that from air cooled reciprocating engines (Lw103). Due to filling activities now proposed to be conducted indoors within the northern and central corridors, the use of air cooled reciprocating engines for moving floor trailers has been reconsidered. It is noted that winching/'tip out' activities of spent substrate generate an operational sound power level of (Lw98dB(A)). For modelling purposes air cooled reciprocating engines for moving floor trailers were utilised in northern corridor and winching/'tip out' activities of spent substrate on southern apron as they represent the worse case operating scenarios. Filling activities within the central corridor would have greater distance separation and acoustic shielding to all existing residential receiver locations.

Tables 3 to *5* present the predicted $L_{Aeq,15min}$ noise levels and project noise trigger levels (PNTL) at the assessment locations for the various fringe 5am-7am/day/evening/night operational scenarios and meteorological conditions.

The modelling scenarios represent a range of activities, situations and noise levels likely to be emitted from the site. The modelling has assumed plant and equipment operating simultaneously and typical operations consistent for 5am-7am morning fringe period, day, evening and night operations. Whilst these situations would not occur all of the time, the

noise modelling represents the likely worst-case operating scenarios. For refrigerated truck movements on site, the assessment adopted a single event level (SEL) of 108dB(A) and one (1) movement within a fifteen (15) minute assessment period.

The ENM computer model takes account of noise attenuation due to increase in distance, ground effect, atmospheric absorption, shielding from intervening structures and topography. Atmospheric conditions assumed for the noise modelling included calm conditions with 15°C air temperature and 70% relative humidity. Additional weather conditions considered in the noise assessment included:

- North-north-east wind (Day): 22.5º at 3m/s
- South-west wind (Evening): 225.5º at 3m/s
- South-south-west wind (Night): 202.5º at 3m/s
- North-east wind (Night): 45º at 3m/s

Table 6 presents the predicted $L_{AF,max}$ noise levels at the assessment locations from night-time intermittent activities.

Table 3 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Operational Noise – Calm (Winching SE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	47/48	√
R3	1 Thomas Road	50	47/48	+3
R4	8-16 Timothy Road	32	40	√
Operational Noise – Calm (Winching SC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	47/48	√
R3	1 Thomas Road	45	47/48	√
R4	8-16 Timothy Road	33	40	√
Operational Noise – Calm (Winching SW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	47/48	√
R3	1 Thomas Road	41	47/48	√
R4	8-16 Timothy Road	34	40	√

Table 3 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Operational Noise – Calm (Headfilling NW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	28	44	√
R2	509 The Northern Road	27	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	32	40	√
Operational Noise – Calm (Headfilling NC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	30	44	√
R2	509 The Northern Road	28	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	32	40	√
Operational Noise – Calm (Headfilling NE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	31	44	√
R2	509 The Northern Road	29	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	32	40	√
Operational Noise – NNE Wind (Winching SE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	24	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	51	47/48	+4
R4	8-16 Timothy Road	35	40	√
Operational Noise – NNE Wind (Winching SC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	23	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	46	47/48	√
R4	8-16 Timothy Road	35	40	√
Operational Noise – NNE Wind (Winching SW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	23	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	42	47/48	√
R4	8-16 Timothy Road	36	40	√

Table 3 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Operational Noise – NNE Wind (Headfilling NW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	25	44	√
R2	509 The Northern Road	25	47/48	√
R3	1 Thomas Road	40	47/48	√
R4	8-16 Timothy Road	34	40	√
Operational Noise – NNE Wind (Headfilling NC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	25	47/48	√
R3	1 Thomas Road	40	47/48	√
R4	8-16 Timothy Road	34	40	√
Operational Noise – NNE Wind (Headfilling NE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	28	44	√
R2	509 The Northern Road	27	47/48	√
R3	1 Thomas Road	40	47/48	√
R4	8-16 Timothy Road	34	40	√
Operational Noise – NE Wind (Winching SE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	24	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	50	47/48	+3
R4	8-16 Timothy Road	40	40	√
Operational Noise – NE Wind (Winching SC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	24	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	45	47/48	√
R4	8-16 Timothy Road	40	40	√
Operational Noise – NE Wind (Winching SW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	24	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	41	47/48	√
R4	8-16 Timothy Road	40	40	√

Table 3 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Operational Noise – NE Wind (Headfilling NW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	25	44	√
R2	509 The Northern Road	24	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	40	40	√
Operational Noise – NE Wind (Headfilling NC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	25	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	40	40	√
Operational Noise – NE Wind (Headfilling NE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	29	44	√
R2	509 The Northern Road	26	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	40	40	√
Operational Noise – SSW Wind (Winching SE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	35	44	√
R2	509 The Northern Road	32	47/48	√
R3	1 Thomas Road	48	47/48	√
R4	8-16 Timothy Road	31	40	√
Operational Noise – SSW Wind (Winching SC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	35	44	√
R2	509 The Northern Road	32	47/48	√
R3	1 Thomas Road	43	47/48	√
R4	8-16 Timothy Road	31	40	√
Operational Noise – SSW Wind (Winching SW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	35	44	√
R2	509 The Northern Road	32	47/48	√
R3	1 Thomas Road	39	47/48	√
R4	8-16 Timothy Road	32	40	√

Table 3 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Operational Noise – SSW Wind (Headfilling NW + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	36	44	√
R2	509 The Northern Road	33	47/48	√
R3	1 Thomas Road	37	47/48	√
R4	8-16 Timothy Road	30	40	√
Operational Noise – SSW Wind (Headfilling NC + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	36	44	√
R2	509 The Northern Road	33	47/48	√
R3	1 Thomas Road	37	47/48	√
R4	8-16 Timothy Road	30	40	√
Operational Noise – SSW Wind (Headfilling NE + Fixed + Trucks + FEL (Day) at spent substrate)				
R1	503 The Northern Road	37	44	√
R2	509 The Northern Road	34	47/48	√
R3	1 Thomas Road	37	47/48	√
R4	8-16 Timothy Road	30	40	√

Table 4 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Evening)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (Evening) $L_{Aeq,15min}$	Compliance
Operational Noise – Calm (Winching SE + Fixed + Trucks)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	45	√
R3	1 Thomas Road	50	45	+5
R4	8-16 Timothy Road	29	40	√
Operational Noise – Calm (Winching SC + Fixed + Trucks)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	45	√
R3	1 Thomas Road	45	45	√
R4	8-16 Timothy Road	30	40	√

Table 4 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Evening) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (Evening) $L_{Aeq,15min}$	Compliance
Operational Noise – Calm (Winching SW + Fixed + Trucks)				
R1	503 The Northern Road	27	44	√
R2	509 The Northern Road	27	45	√
R3	1 Thomas Road	41	45	√
R4	8-16 Timothy Road	31	40	√
Operational Noise – Calm (Headfilling NW + Fixed + Trucks)				
R1	503 The Northern Road	28	44	√
R2	509 The Northern Road	27	45	√
R3	1 Thomas Road	39	45	√
R4	8-16 Timothy Road	28	40	√
Operational Noise – Calm (Headfilling NC + Fixed + Trucks)				
R1	503 The Northern Road	30	44	√
R2	509 The Northern Road	28	45	√
R3	1 Thomas Road	39	45	√
R4	8-16 Timothy Road	28	40	√
Operational Noise – Calm (Headfilling NE + Fixed + Trucks)				
R1	503 The Northern Road	31	44	√
R2	509 The Northern Road	29	45	√
R3	1 Thomas Road	39	45	√
R4	8-16 Timothy Road	27	40	√
Operational Noise – SW Wind (Winching SE + Fixed + Trucks)				
R1	503 The Northern Road	33	44	√
R2	509 The Northern Road	32	45	√
R3	1 Thomas Road	48	45	+3
R4	8-16 Timothy Road	26	40	√
Operational Noise – SW Wind (Winching SC + Fixed + Trucks)				
R1	503 The Northern Road	33	44	√
R2	509 The Northern Road	32	45	√
R3	1 Thomas Road	43	45	√
R4	8-16 Timothy Road	27	40	√
Operational Noise – SW Wind (Winching SW + Fixed + Trucks)				
R1	503 The Northern Road	33	44	√
R2	509 The Northern Road	31	45	√
R3	1 Thomas Road	39	45	√
R4	8-16 Timothy Road	29	40	√

Table 4 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Evening) (contd.)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (Evening) $L_{Aeq,15min}$	Compliance
Operational Noise – SW Wind (Headfilling NW + Fixed + Trucks)				
R1	503 The Northern Road	33	44	√
R2	509 The Northern Road	32	45	√
R3	1 Thomas Road	37	45	√
R4	8-16 Timothy Road	25	40	√
Operational Noise – SW Wind (Headfilling NC + Fixed + Trucks)				
R1	503 The Northern Road	34	44	√
R2	509 The Northern Road	32	45	√
R3	1 Thomas Road	37	45	√
R4	8-16 Timothy Road	25	40	√
Operational Noise – SW Wind (Headfilling NE + Fixed + Trucks)				
R1	503 The Northern Road	35	44	√
R2	509 The Northern Road	33	45	√
R3	1 Thomas Road	37	45	√
R4	8-16 Timothy Road	24	40	√

Table 5 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Night)

Reference Location	Description	Predicted Noise Level ($L_{Aeq,15min}$)	PNTL (Night) $L_{Aeq,15min}$	Compliance
Operational Noise – Calm (Truck Movement, Refrigerated Truck + Fixed Plant)				
R1	503 The Northern Road	27	38	√
R2	509 The Northern Road	27	38	√
R3	1 Thomas Road	39	38	+1
R4	8-16 Timothy Road	27	38	√
Operational Noise – NE Wind (Truck Movement, Refrigerated Truck + Fixed Plant)				
R1	503 The Northern Road	23	38	√
R2	509 The Northern Road	23	38	√
R3	1 Thomas Road	39	38	+1
R4	8-16 Timothy Road	33	38	√
Operational Noise – SSW Wind (Truck Movement, Refrigerated Truck + Fixed Plant)				
R1	503 The Northern Road	35	38	√
R2	509 The Northern Road	32	38	√
R3	1 Thomas Road	37	38	√
R4	8-16 Timothy Road	25	38	√

Table 6 Predicted $L_{AF,max}$ Intermittent Noise Levels (Night)

Reference Location	Description	Predicted $L_{AF,max}$ Noise Level	PNTL (Night) $L_{AF,max}$	Compliance
Intermittent Noise – 5am to 7am along northern and southern side of main building				
R1	503 The Northern Road	50	52	√
R2	509 The Northern Road	46		√
R3	1 Thomas Road	63		+11
R4	8-16 Timothy Road	46		√
Intermittent Noise – 10pm to 5am for loading dock				
R1	503 The Northern Road	36	52	√
R2	509 The Northern Road	33		√
R3	1 Thomas Road	60		+8
R4	8-16 Timothy Road	38		√

6.0 ASSESSMENT

6.1 Operational Noise (Steady State)

The modelling results show that the predicted $L_{Aeq,15min}$ operational noise levels at the reference receiver locations:

- R1, R2 and R4 achieve the PNTL under calm and adverse meteorological conditions; and
- R3 (1 Thomas Road) exceed the assessment objectives by up to 5dB as a result of cumulative noise from winching/'tip out' activities and truck movements for growing rooms on the south-east portion of building (east of loading dock area) without additional noise controls.

The noise prediction has adopted a 3.5m high acoustic mound or wall on the western side of the spent substrate and the front end loader (FEL) working area (day only) as depicted in *Appendix 2*.

Mitigation measures will be required to control operational noise levels at the reference receiver R3 (1 Thomas Road).

6.2 Transient Noise

Intermittent noise from night-time transient activities principally relates to truck movements along the northern and southern sides of building and air brake release at the loading area. The predicted $L_{AF,max}$ noise levels from transient activities:

- satisfy the NPfI project noise target levels at reference receiver locations R1, R2 and R4 for trucks utilising the loading dock area and truck movements on northern, western and southern aprons; and

- exceed the NPfI project noise target levels at reference receiver location R3 (1 Thomas Road) by up to 11dB for truck pass-by and airbrake release in loading dock.

6.3 Consideration of Further Measures

A number of possible options were considered for the control of the $L_{Aeq,15min}$ and $L_{AF,max}$ operational noise levels at the reference receiver location R3 (1 Thomas Road). These include:

- restricted operations on southern side of building;
- re-routing of site vehicles during night-time hours;
- additional noise controls to site vehicles;
- construction of acoustic walls;
- partially enclosing of the southern apron;
- acquisition of 1 Thomas Road;
- negotiation with owner of 1 Thomas Road for a restriction on the title in respect to the noise levels generated by the mushroom farm; and
- provision of acoustic treatments the dwelling at 1 Thomas Road.

Acoustic Consulting Engineers Pty Ltd was advised by Elf Mushrooms that the:

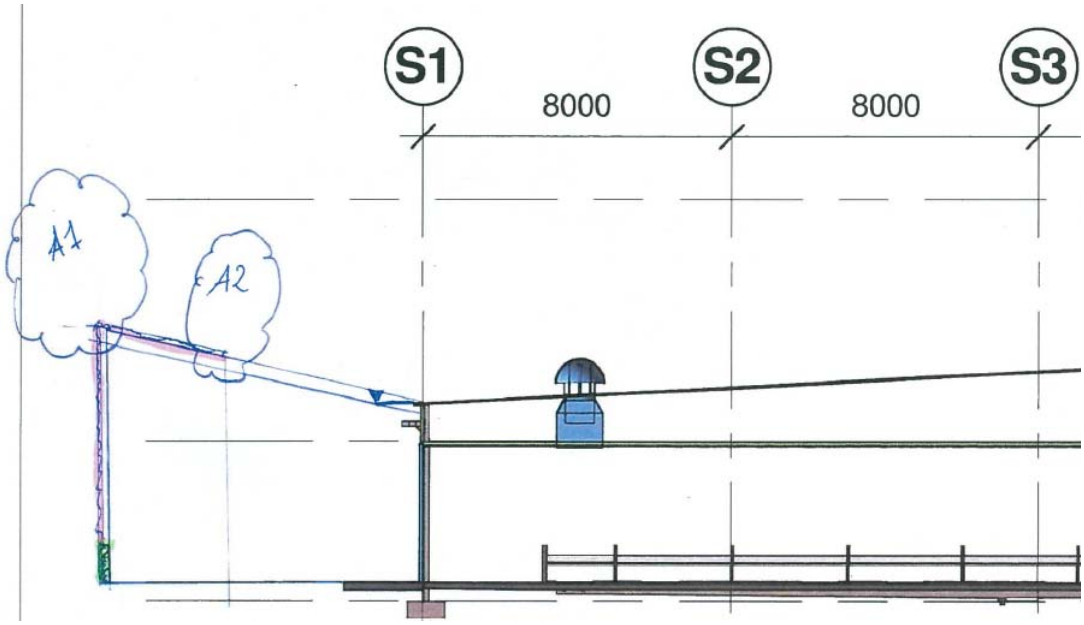
- Department of Planning does not consider excessive restriction of operating hours and using truck routes inside the building(s) during night-time to be a practical solution; and
- owner of 1 Thomas Road (currently a car wrecking yard with a residence) has no objection with the proposed development as currently proposed.

Section 7.0 outlines the recommendations including site operational management measures in order to satisfy the PNTL for all existing reference receiver locations.

To allow operational flexibility for the proposed facility, Elf Mushrooms also considers to partially enclose the southern apron at a later time in the event that the owner of 1 Thomas Road requires.

Figure 2 provide a cross section of the partial enclosure that could be considered along the southern apron.

Figure 2 Cross Section of Partial Enclosure along the Southern Apron



7.0 RECOMMENDATION

To mitigate potential noise impacts from the Mushroom Farm at Londonderry, the control measures below should be considered in the detailed design of the facility. Prior to construction all noise control measures should be reviewed and assessed by a qualified acoustic engineer and in accordance with Development Approval Conditions.

- Site layout generally in accordance with *Appendix 2 - Amended Operations;*
- Finished site levels approximately RL38.20 with main growing building height of approximately 4.2m to 9.9m above the finished hardstand level;
- Earth mounds of not less than 2.5m along part of the northern site boundary and 2m along parts of the northern and eastern site boundaries, constructed above the finished floor level of the building (*Appendix 2*);
- Partial enclosure constructed along the southern edge of apron (refer to *Figure 2* and *Appendix 2*). The upper portion (from 1.5m above the hardstand apron level) of the inner wall and underside of the ceiling shall incorporate absorptive treatment. Final details subject to acoustic review;
- Acoustic wall constructed to a height of not less than 3.5m above the finished floor level of building on southern edge of loading dock and part of the southern apron (west of loading dock) (*Appendix 2*). The inner side (development side) of the wall shall incorporate absorptive treatment on upper portion from 1.5m above hardstand apron level. Final details subject to acoustic review. Any overhanging awning or soffit above loading dock to incorporate absorptive treatment;

- Acoustic mound or wall constructed to a height of not less than 3.5m above the finished floor level of building along the western side (*Appendix 2*). If constructed as a wall, absorptive treatment to be incorporated on upper portion from 1.5m above hardstand apron level to eastern face. Final details subject to acoustic review;
- Chillers, condensers, boiler, pumps and all other fixed and mobile mechanical plant selected to satisfy the referenced acoustic performance (*EA Noise Assessment Table 10*) and the PNTL's);
- Growing rooms fans to comply with the specifications and design assumptions presented in this acoustic review and previous assessments (Lw63dB(A) each at intake);
- Front end loader (FEL) serving spent substrate to be selected on acoustic performance with an Lw102dB(A) or lower and utilised during day hours only;
- Wash down and sewer water treatment plant and equipment to be selected on acoustic performance. Final details subject to detailed acoustic review prior to final specification to ensure project noise goals are achieved;
- Details of all mechanical plant and equipment subject to detailed review by Acoustic Consultant prior to final specification;
- Walls and roof of plantroom to provide a minimum acoustic performance of R_w45 and R_w36 respectively. Final details subject to review prior to final specification;
- Intake and discharge shafts for plantroom shall incorporate noise attenuation to achieve the acoustic performance referenced in *EA Noise Assessment Table 10*. Final details subject to review prior to final specification;
- Plantroom to incorporate absorptive treatment (min NRC 0.70). Plantroom will require acoustic input prior to final specification;
- Building roof cladding consisting of sheet metal (min. 0.42BMT) over fibreglass building blanket and medium duty thermofoil or similar AND insulated colorbond sandwich panel (ceiling) for growing rooms providing a nominal installed noise reduction in the order of 28dB (R_w34 or greater). Final details subject to detailed review by Acoustic Consultant prior to final specification;
- Roof and external walls to enclosed northern apron and central corridor to comprise cladding consisting of sheet metal (min. 0.42BMT) over fibreglass building blanket and medium duty thermofoil or similar and doors providing a nominal installed noise reduction in the order of 18dB (R_w24 or greater). Ceiling/soffit to corridors to incorporate absorptive treatment (min NRC 0.70). Final details subject to detailed review by Acoustic Consultant prior to final specification;
- All substrate filling of growing rooms internally within northern and central enclosed corridors;

- Moving floor substrate trucks can utilise air cooled reciprocating engines for moving floor trailers with a combined (moving floor trailer, head filling machine, conveyor and peat loading) of Lw103dB(A) or lower;
- All filling activities to be conducted internally within the enclosed northern and central corridors;
- Winching/'tip out' of spent substrate shall utilise plant and equipment that results in an operational sound power level $L_{Aeq,15min}$ of Lw98dB(A) or lower;
- Airbrake release discharge noise levels reduced to Lw115dB(A) or less;
- Truck speed on the site access roads less than 20kph;
- Refrigerated trucks utilised on site to switch off refrigeration units when docked at Loading Docks and utilise internal building refrigeration systems to keep trailer cool;
- Mobile plant and plant alarms fitted with low level or broadband 'quacker' alarms or equivalent in lieu of sirens/reversing beepers.

Tables 7 to *10* provides the predicted $L_{Aeq,15min}$ operation levels for day, evening and night and $L_{AF,max}$ night-time transient noise levels at reference receiver R3 with the implementation of the mitigation measures recommended in this report.

It can be seen that with the implementation of the recommended mitigation measures, the predicted $L_{Aeq,15min}$ and $L_{AF,max}$ noise levels comply with the assessment objectives.

Table 7 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) at Receiver R3 (1 Thomas Road)

Weather Condition	Operational Activity	Predicted Noise Level $L_{Aeq,15min}$	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
Calm	Winching SE, Trucks and FEL (Day) at spent substrate	40	47/48	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	40		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	37		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√

Table 7 Predicted $L_{Aeq,15min}$ Operational Noise Levels (5am-7am and Day) at Receiver R3 (1 Thomas Road) (contd.)

Weather Condition	Operational Activity	Predicted Noise Level $L_{Aeq,15min}$	PNTL (5am-7am/Day) $L_{Aeq,15min}$	Compliance
NNE Wind	Winching SE, Trucks and FEL (Day) at spent substrate	42	47/48	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	41		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	38		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
NE Wind	Winching SE, Trucks and FEL (Day) at spent substrate	41	47/48	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	40		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	37		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	32		√
SSW Wind	Winching SE, Trucks and FEL (Day) at spent substrate	38	47/48	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	38		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	35		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	28		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	28		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	28		√

Table 8 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Evening) at Receiver R3 (1 Thomas Road)

Weather Condition	Operational Activity	Predicted Noise Level $L_{Aeq,15min}$	PNTL (Evening) $L_{Aeq,15min}$	Compliance
Calm	Winching SE, Trucks and FEL (Day) at spent substrate	40	45	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	40		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	37		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	30		√
SW Wind	Winching SE, Trucks and FEL (Day) at spent substrate	39	45	√
	Winching SC, Fixed Plant, Trucks and FEL (Day) at spent substrate	38		√
	Winching SW, Fixed Plant, Trucks and FEL (Day) at spent substrate	35		√
	Winching NW, Fixed Plant, Trucks and FEL (Day) at spent substrate	29		√
	Winching NC, Fixed Plant, Trucks and FEL (Day) at spent substrate	29		√
	Winching NE, Fixed Plant, Trucks and FEL (Day) at spent substrate	29		√

Table 9 Predicted $L_{Aeq,15min}$ Operational Noise Levels (Night) at Receiver R3 (1 Thomas Road)

Weather Condition	Operational Activity	Predicted Noise Level $L_{Aeq,15min}$	PNTL (Night) $L_{Aeq,15min}$	Compliance
Calm	Fixed Plant, Truck Movement and Refrigerated Truck	32	38	√
NE Wind		32		√
SSW Wind		27		√

Table 10 Predicted $L_{AF,max}$ Night-time Intermittent Noise Levels at Receiver R3 (1 Thomas Road)

Operational Activity	Predicted $L_{AF,max}$ Noise Level	PNTL (Night) $L_{AF,max}$	Compliance
Truck pass-by along northern and southern sides of main building	48	52	√
Truck exhaust brake at loading area	50		√

8.0 SUMMARY

A construction and operational noise assessment for a proposed Mushroom Farm at Londonderry was prepared in 2010 by Atkins Acoustics with the results and findings of that assessment were presented in *'Construction and Operational. Noise Impact Assessment. Mushroom Growing Facility. Londonderry'* Report No. 40.6411.R2:CFCD4 Rev07 dated June 2010 and submitted with the Environmental Assessment (EA).

The development was approved by the Department of Planning (DoP) on 11 January 2012 (Application No. 08_0255) and included specific conditions relating to noise emissions from the development.

Due to advances in technology and procedures for growing, picking and processing mushrooms, the Applicant (Elf Mushrooms) sought to amend the approved Mushroom Growing Facility at Londonderry (Application No. 08_0255) to bring the facility into the best available technologies practices. The growing facility was to be conducted on one (1) level rather than multi level growing rooms, accordingly the 'foot print' of the buildings expanded across the southern and western portions of the site (*Appendixes 1* and *2*).

A review of the proposed amended operations was prepared by Atkins Acoustics on 5 April 2016 (*Acoustic Review – Modified Operations – Mushroom Farm, Londonderry, Reference No. 46.6981.L1.Rev02:GA/DT/2016*) and submitted to the Department of Planning (DoP) and Environment Protection Authority (EPA). This review provided a number of noise control options including mounding, acoustic walls, enclosure of working areas, site management and partially enclosing the southern apron.

In August 2016 Elf Mushrooms requested an acoustic review of mains powered electric moving floor trailers for the supply and filling of growing rooms with substrate rather than the previously proposed air cooled reciprocating engines. Acoustic Consulting Engineers Pty Ltd was engaged by Elf Mushrooms to provide a review and assessment of noise from the modified operations for the approved mushroom growing farm at Londonderry and use of mains powered moving floor trailers.

The results of that review were presented in *Acoustic Review (Amended Development Application). Modified Operations, Mushroom Farm. 521 The Northern Road Londonderry, Reference No. 160787-02-02L-CF* dated Friday 14 October 2016 addressed the potential acoustic benefits of utilising mains powered electric moving floor trailers for the supply and filling of growing rooms with substrate and clarified the steps required for

the development in order to address any outstanding noise exceedances for existing residential receiver locations.

In January 2018 Elf Mushrooms confirmed that they were seeking further amendments to the building design (*Appendix 2*) and operational procedures to align the development with best management practises. The principle changes are:

- Additional smaller growing rooms on northern side of building;
- All filling of growing rooms internally within northern enclosed corridor and central corridor;
- Revaluate the use of air cooled reciprocating engines for moving floor trailers considering filling activities are now located internally;
- Winching of spent substrate to occur externally on southern hardstand apron; and
- Increased offset of southern hardstand apron to boundary.

This acoustic review serves as supplementary information and addresses the potential acoustic benefits of the proposed changes. The review also addresses project noise trigger levels and procedures in the recently published EPA, NSW Noise Policy for Industry dated October 2017.

The assessment of the amended building design and operational management has demonstrated that cumulative $L_{Aeq,15min}$ noise levels achieve compliance with the project noise trigger levels (PNTL) at reference receivers R1, R2 and R4 is predicted. In the absence of control measures, the predicted $L_{Aeq,15min}$ (evening) and $L_{AF,max}$ (night) noise levels exceed the PNTL at receiver R3 (1 Thomas Road).

In order to address the noise exceedances, *Section 7.0* outlines noise control measures, specifications and site operational management measures in order to satisfy the PNTL for all reference receiver locations. Although the owner of receiver R3 (1 Thomas Road, currently a car wrecking yard with a residence) has no objection with the current proposed development, acoustic barriers and partially enclosure along the southern apron have been investigated in the event that the owner of 1 Thomas Road requires the noise controls at a later time.

It is recommended that as part of the design development, plant/equipment selections, operational scenarios, facility management, building design and noise attenuation requirements be reviewed to address the PNTL's and pending amended conditions proposed as part of the Consent.

In light of the amended building design and operational management and the recently published EPA, NSW Noise Policy for Industry dated October 2017, it is recommended that the DoP review the Noise Limits imposed on the development to reflect current assessment procedures.

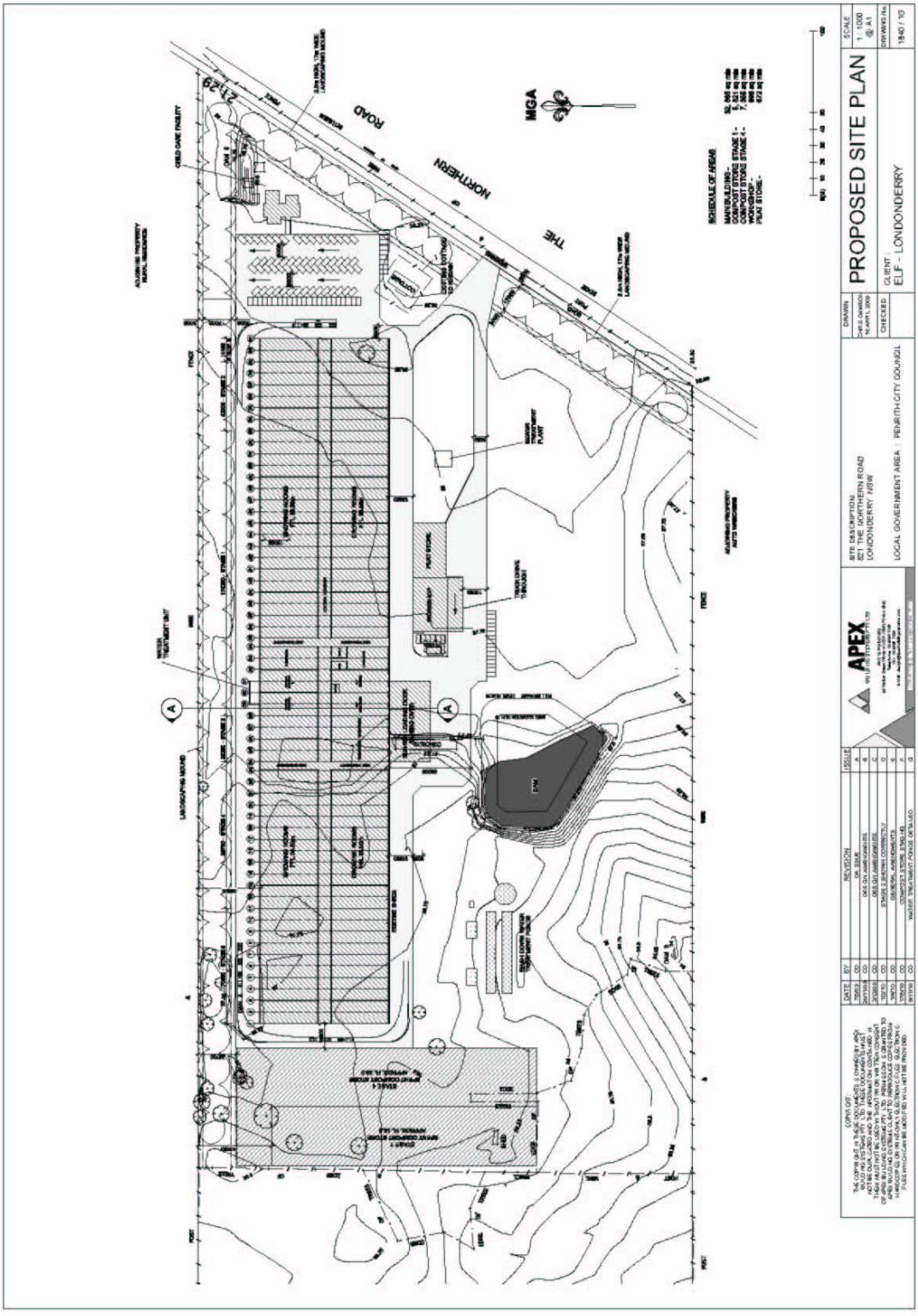
We trust the information in this noise assessment is satisfactory. Please do not hesitate to contact our office should further information or clarification be required.

Yours sincerely,

Dan Dang
Principal Acoustic Engineer
Acoustic Consulting Engineers Pty Ltd

Appendix 1

APPROVED SITE LAYOUT



Appendix 2

AMENDED SITE LAYOUT