LUCID CONSULTING AUSTRALIA

MEMORANDUM

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL
Approval no: DEV2017/874
Date: 1 AUGUST 2018

To:	Economic Development Queensland	Date:	30 May 2018
Attention:	Whom it May Concern	Pages:	2 + Appendix
From:	Melvin Ee	Reference:	10315-136b (Revision 2)
Project:	SCC Maroochydore AWCS	Subject:	Noise Emissions Technical Report Revision 2

This Noise Emissions Technical Report has been prepared on behalf of Envac Australia to support the Development Application for an Automated Waste Collection System (AWCS) Collection Station at the Maroochydore City Centre Priority Development Area (PDA).

Background

The AWCS is a utility service comprising an underground pipe network connecting field waste Public Realm Inlets (PRI) and private residences to a central Collection Station. Waste is transported through the pipe network via a vacuum system to the centralised Collection Station.

The purpose of the Collection Station is to house plant and equipment required to operate the site wide AWCS and effectively contain waste aggregated from the system prior to removal from site. The Collection Station will reside along an as yet unconstructed road, branching from the existing Carnaby street into the PDA. Heavy machinery including waste cyclones, compactors and exhausters will be operational within the facility.

Review of the system and existing acoustic data from similar facilities internationally has identified that control measures will be required at the site to ensure the facility is compliant with relevant state legislation.

Legislation and Regulation Compliance

Acceptable controls shall be designed and implemented to reduce noise generation from the Collection Station to comply with the following: -

- Environmental Protection Act 1994 (QLD)
- Environmental Protection Regulation 2008 (QLD)
- Environmental Protection (Noise) Policy 2008 (QLD)

Noise Monitoring and Reporting

Noise monitoring shall be conducted to ascertain compliance to the Environmental Protection (Noise) Policy 2008 (QLD). Noise monitoring of pre-existing site conditions has been conducted (refer Appendix A).

Noise monitoring and reporting shall occur regularly during the initial commissioning, tuning and full operation phase of the Collection Station to confirm operational compliance with the abovementioned state legislation and regulations.

Once in regular operation, noise monitoring and reporting shall occur annually to ensure compliance is maintained.

Mitigation Measures

As outlined in the Environmental Protection (Noise) Policy 2008 (QLD), noise must be dealt with in the following order of preference: -

- Avoid
- Minimise
- Manage

As such, the following mitigation measures and engineering controls shall be implemented to ensure noise generation is compliant with state legislation and regulation: -

- A specialist Acoustic Engineer, Resonate Acoustics, has been engaged to review potential noise outbreak and design suitable engineering controls to ensure sound generation from the site is compliant with the abovementioned legislation and regulation (refer Appendix A). Preliminary review has indicated the following engineering controls shall be implemented: -
    - Acoustic insulation within rooms containing equipment capable of generating excessive noise.
    - Designated minimum acoustic performance criteria for specified access doors, roof, and wall construction.
    - Sound attenuators within intake and discharge pipes.
    - Limited louvre free area and penetrations to building fabric.
    - Penetrations to building fabric to be acoustically treated.
    - Screening around equipment external and operations at the facility.

  The proposed methods to limit noise outbreak is anticipated to be further refined as the detailed design is further developed.
- Standard operational hours of the facility shall be restricted to the following 8:00am to 5:00pm with the exception of critical circumstances in which system may be expected to operate occasssionally.
- Roller doors shall be kept closed during operation of the waste compactor and exhauster.

Additional details on the Environmental Noise Impact Assessment prepared by Resonate Acoustics can be found in Appendix A.

We trust the above is satisfactory for your immediate purposes. Please contact the undersigned should you wish to discuss the outcome of this investigation further.

Regards,

LUCID CONSULTING AUSTRALIA

MELVIN EE
Mechanical Engineer

APPENDIX A – RESONATE ACOUSTIC – ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ENVAC Automated Waste Collection System at Maroochydoore

Environmental Noise Impact Assessment

Report Date: Wednesday, 18 April 2018
Reference: P16196RP1, Revision 5

Document Information

Project	ENVAC Automated Waste Collection System at Maroochydoore	
Client	Lucid Consulting Engineers (WA) Pty Ltd	
Report title	Environmental Noise Impact Assessment	
Project Number	P16196	
Author	James Leader Acoustic Consultant p+61 8 9468 7888 m+61 449 165 803 james.leader@resonateacoustics.com	
Reviewed by	Martti Warpenius	

Revision Table

Report revision	Date	Comments
0	30 June 2017	Draft issued to client
1	28 August 2017	Issued to client
2	25 October 2017	Value engineering design update
3	14 December 2017	Truck loading dock redesign
4	18 December 2017	Minor revisions
5	18 April 2018	Updated construction materials

Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	Units of the A-weighted sound level.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L_{10}	Noise level exceeded for 10 % of the measurement time. The L_{10} level represents the typical upper noise level and is often used to represent traffic or music noise.
L_1	Noise level exceeded for 1 % of the measurement time. The L_1 level represents mostly short duration, high level sound events.
L_{max}	The maximum instantaneous noise level.
R_W	Weighted Sound Reduction Index—A laboratory measured value of the acoustic separation provided by a single building element (such as a partition). The higher the R_W the better the noise isolation provided by a building element.
$R_W + C_{tr}$	A measure of the sound insulation performance of a building element with a C_{tr} spectrum adaptation term placing greater emphasis on the low frequency performance.

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1 Introduction

Resonate Acoustics has been commissioned to conduct a noise impact assessment for an Automated Waste Collection System (AWCS) proposed by ENVAC for the new City Centre development in Maroochydore QLD.

No similar system is currently installed and operational in Australia. As such no simple noise measurements can be conducted to assess the noise emission and noise generation from similar units.

The principle sources of environmental noise from the site are truck arrivals/departures, as well as fixed plant associated with the system including compactors, compressors, vacuum pumps, exhausters and ancillary plant.

To conduct the noise impact assessment, an ambient noise survey has been conducted in conjunction with the calculation of noise emission limits for the site, and forecast noise emission levels calculated based on estimates of similar plant and manufacturer supplied data.

The site and surrounds are shown in Figure 1-3, with the collection station marked A and the nearest sensitive receivers marked 1-3.

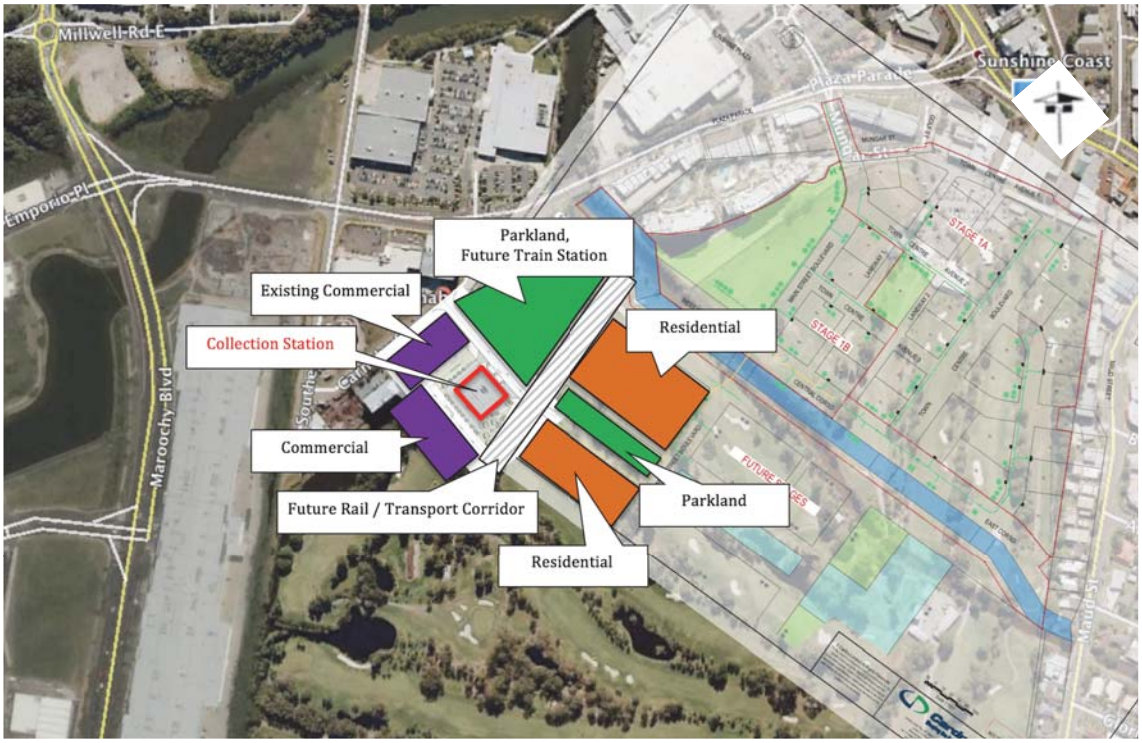


Figure 1: Maroochydore City Centre development with collection station location and nearby receivers labelled

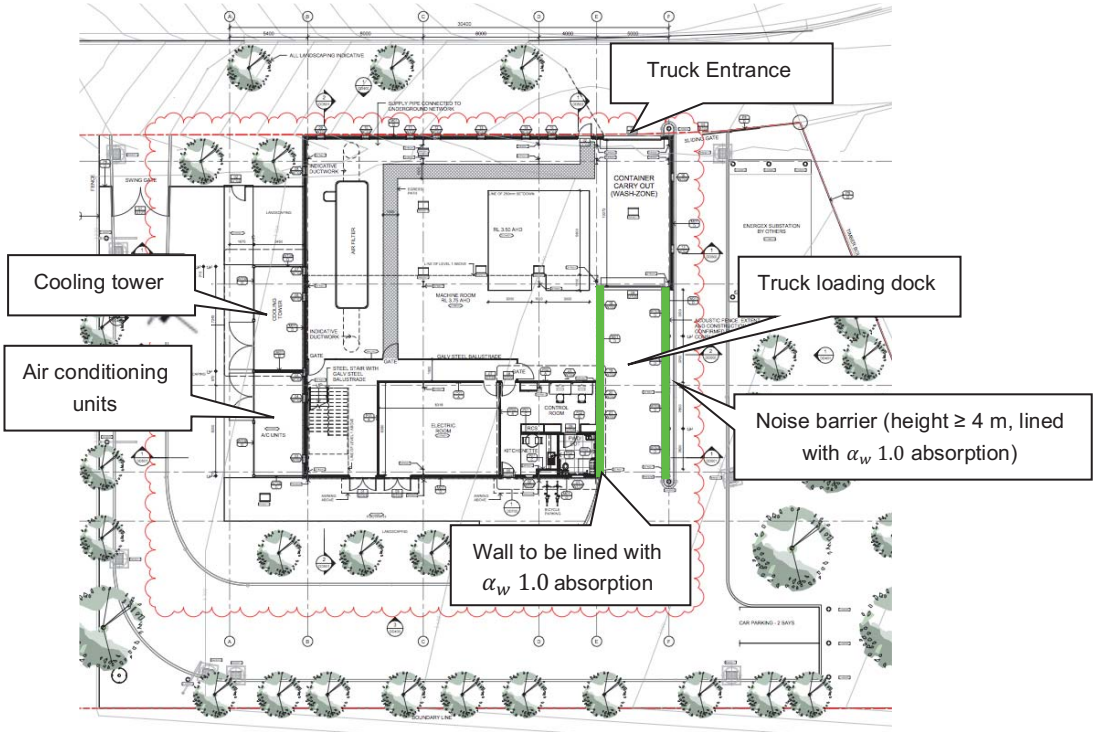


Figure 2: Site detail of collection station lot

2 Noise Emission Limits

The maximum acceptable noise emission at a site is normally derived by reference to the current ambient and background noise levels in the local area. These levels have been considered in Section 2.2 below. It is noted however that at the time of monitoring, the site is undeveloped being a disused golf course. Based on the future plans for the area, and the considerable development, it is considered that the current ambient noise levels in the area are low, and the use of such levels would develop uncharacteristically low noise emission criteria for the proposed developed.

In these circumstances reference is drawn to the Acoustic Quality Objectives, in Environment Protection (Noise) Policy 2008, as outlined in Section 2.1 below. These objectives more-accurately describe the current circumstances, and their use can provide realistic noise emission criteria.

2.1 Acoustic quality objectives

Relevant noise emission criteria have been developed for this project based on Schedule 1 of the Environmental Protection (Noise) Policy 2008: Acoustic quality objectives.

The night-time limits for Dwelling (outdoors) have been derived based on the indoor Acoustic Quality Objectives. These indoor objectives can be related to the equivalent outdoor requirement by applying the same 15-20 dB reduction through glazing that has been provided for day-time limits. The most stringent requirement would occur where open windows allow the noise to enter dwellings directly. In these circumstances, a reduction of 5-10 dB is forecast through open windows. The corresponding minimum outdoor noise criteria are presented in Table 1.

The Acoustic Quality Objective does not require a specific noise criterion for new parkland areas such as that near the subject site. It has a reference which requires the amenity of an existing parkland to be maintained. The AQO does however, have a specific reference to acceptable noise levels in a “school or play area”. It is this criterion of L_{Aeq} 55 dB which we recommend also be applied to these new parkland areas.

The criteria established above are outlined in Table 1 below.

Table 1: Acoustic quality objectives (Maximum noise emission limits under normal operation)

Receiver Land Use	Day / evening (07:00 – 22:00)			Night (22:00 – 07:00)		
	$L_{Aeq,adj,1hr}$	$L_{AF10,adj,1hr}$	$L_{AF1,adj,1hr}$	$L_{Aeq,adj,1hr}$	$L_{AF10,adj,1hr}$	$L_{AF1,adj,1hr}$
Dwelling (outdoors)	50	55	65	45	50	60
Park land	55	-	-	55	-	-
Commercial (outdoors)	60	-	-	60	-	-

For a steady noise source, the L_{Aeq} is the controlling assessment parameter.

2.2 Change in ambient levels

Additional noise data has been collected on site to determine the current ambient noise levels, prior to the development of the new City Centre. These measurements allowed for contributions from nearby roads.

Two noise loggers were deployed over a period of 5 days from Friday 26 August to Tuesday 30 August 2016. Simultaneous attended measurements were taken at various locations around the site, as identified in Figure 3. At the time of noise logging, the site was a disused golf course with minimal residual activity affecting the ambient noise. In that state, it is expected to have an ambient noise environment quieter than the final developed site.

The logged data is presented in Appendix A, with the day-time (07:00 – 18:00) L_{A10} found to be 51 dB at Noise Logger 1 and 52 dB at Noise Logger 2. This is consistent with the attended measurements across the site. The L_{A1} was found to be 58 dB at Noise Logger 1 and 56 dB at Noise Logger 2. This data shows that the chosen noise emission limits are higher than the current ambient level, however this is to be expected given the proposed change of land use.

Figure 3: Measurement locations - noise loggers and attended measurements (L_{A10}/L_{A90} marked in gold) taken whilst the site was a disused golf course.

3 Noise Sources and Attenuators

The supplier has provided overall L_{Aeq} radiated sound pressure levels for the indoor equipment. Based on these data we have nominated maximum acceptable sound power levels for each exhauster and compactor in Table 2. The compactor sound power includes contributions from all other connected equipment. The corresponding insertion loss performance of the attenuators will be no less than Table 3.

Maximum sound power levels have been provided for outdoor noise sources in Table 4.

Table 2: Maximum acceptable Sound Power Level (dB)

Noise Source	63	125	250	500	1K	2K	4K	8K
Exhauster – in duct	136	134	131	129	127	124	121	118
Exhauster – radiated (110 dB(A) @ 1 m)	126	124	121	119	117	114	111	108
Compactor – radiated (90 dB(A) @ 1 m)	106	104	101	99	97	94	91	88

Table 3: Required minimum attenuator, Insertion Loss (dB)

Attenuator	63	125	250	500	1K	2K	4K	8K
Exhauster inlet	6	9	13	25	29	26	20	14
Exhauster discharge	6	9	13	25	29	26	20	14
Waste bin air intake	5	7	11	19	26	23	18	16

Table 4: Maximum acceptable Sound Power Level – outdoor equipment

Noise Source	L_{WAeq} (dB)
PAC-1, PAC-2	72
Cooling tower	90
OAF-1	90
AC Units	75
Pumps CWP-1, CWP-2	66

The sound power level of other plant is not to exceed 80 dB(A).

4 Forecast Noise Impact

4.1 Collection Station

We are advised that the collection station will operate for 8 hours per day and will evacuate each inlet twice daily – once in the morning and once in the evening, with the possibility of emergency operation at night. Each evacuation operation takes approximately 10 seconds, and a maximum of 4 exhausters will be in operation at any time.

The following treatments are recommended:

- Acoustic absorption (Flex shield V100, α_w 1.0) is required to line at least 90% of the wall and ceiling surfaces in the exhauster room. The outside of the exhauster room is to have two sheets of 9 mm FC glued/screwed to the $R_w + C_{tr}$ 30 rated V100 panel.
- The external wall of the exhauster room is to be core-filled 190 mm masonry block work ($R_w + C_{tr}$ 49). Plasterboard must not be adhesively fixed to this wall.
- The main area which contains the compactors is to have a Ritek Ecotek 250 mm roof panel with a ceiling as described as 'System 7' in the PKA consulting test report 207141, dated April 2008 (to achieve $R_w + C_{tr}$ 42). This system has:
    - a 13 mm sound rated plasterboard ceiling mounted on resilient mounts beneath the roof panelling, with
    - a minimum 100 mm cavity and 105 mm Bradford Comfortseal glasswool insulation or equivalent 90 mm 14 kg/m3 glasswool as advised by Ritek Roof Systems
- The main area external walls facing North are as follows:
    - 50 mm thick KS1000 AWP panel and 3 x 13 mm fire rated plasterboard on the external leaf
    - 150 mm Z Girt and 13 mm resilient rail with 75 mm 18 kg/m3 glasswool insulation
    - 1 x 13 mm sound rated plasterboard on the internal leaf
- The remaining main area external walls are to be as follows:
    - 50 mm thick KS1000 AWP panel and 1 x 13 mm sound rated plasterboard on the external leaf (the plasterboard may optionally be changed to 9 mm CFC)
    - 150 mm Z Girt and 13 mm resilient rail with 75 mm 18 kg/m3 glasswool insulation
    - 2 x 13 mm sound rated plasterboard on the internal leaf
- All surfaces in the main area are to be lined with acoustic absorption (75 mm 32 kg/m^3), totalling an area no less than 100 m^2.
- The total louvered area of the main room for ventilation is no more than 22.5 m^2. All louvers are to be Acran 200 acoustic louvers.
- Access doors, including those to the control room and exhauster room, are to be solid core with acoustic seals to achieve a performance of no less than R_w 30.
- A length of at least 6 m of the exhaust stack is required to have 100 mm 48 kg/m^3 internal acoustic insulation.
- The intake and discharge lines from the exhausters are each required to acoustic attenuators with an insertion loss performance no less than that indicated in Table 3.
- No untreated penetrations permitted in the roof or walls. This requires the roof lift panel in place and roller doors closed.
- Roller doors are to have an acoustic performance no less than R_w 20, and a provision is to be made to upgrade the doors or install acoustic curtains if the noise target is not met.

- Glazing in the façade wall of the main area is to be 10.38 mm laminated. The extent of glazing is as shown in Drawings DD500, DD501, DD502 Rev E.
- The mechanical plant enclosure is to have a solid gap-free barrier to block line of sight to the parkland. The other faces of the enclosure are not required to be gap-free.
- Duct penetrations are to be treated as per Figure 4.

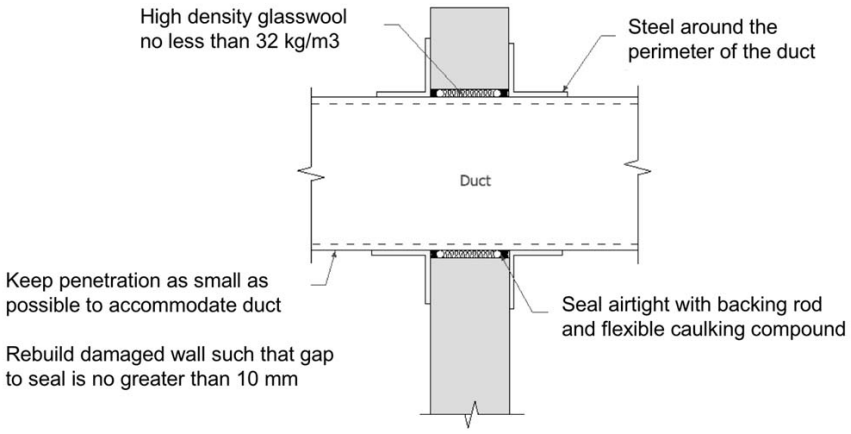


Figure 4: Duct penetration detail

Where acoustic absorption is required on the walls, the lining may be protected by a 0.5 mm steel mesh with a minimum of 11% open area. Thicker materials require a larger percentage open area.

Once these treatments have been implemented, the noise emission from the collection station is forecast to meet the quality objectives. Details of the acoustic modelling are provided in Appendix B.

4.2 AWCS Pipework Bridge Crossing

The AWCS pipework is generally buried below ground level. The exception to this is at the bridge crossing. This crossing is to be more than 10 m from nearby sensitive areas. In this area there is a risk that noises generated by the pipework may be distracting or annoying. The following treatments are therefore recommended:

- The pipes are to be boxed in with minimum 9 mm compressed fibrous cement sheet mounted isolated from the pipe with a minimum 100 mm cavity. Cavity to be filled with 50 mm acoustic insulation inside.

4.3 Truck Loading Bay

Trucks are to collect bins from the waste collection station by loading them using a lift mechanism whilst located in the truck loading bay outside the roller door. The following treatments are recommended:

- Trucks are to attend site only during the day-time period
- An R_w 20 gap-free noise barrier is required to extend to a height of at least 4 m along the length of the building as shown in Figure 3, and the truck must be parked with a buffer of at least 2 m from the exit of the loading bay.
- Weatherproof acoustic lining (Flex shield V100, α_w 1.0) is required on the side of the building and the full face of the noise screen at the loading point.
- Maximum permitted sound power emission from the truck loading activity is 105 dB(A)

5 Conclusion

A noise impact assessment has been conducted for the Collection Station of the Automated Waste Collection System (AWCS) proposed by ENVAC for a new development in Maroochydore QLD.

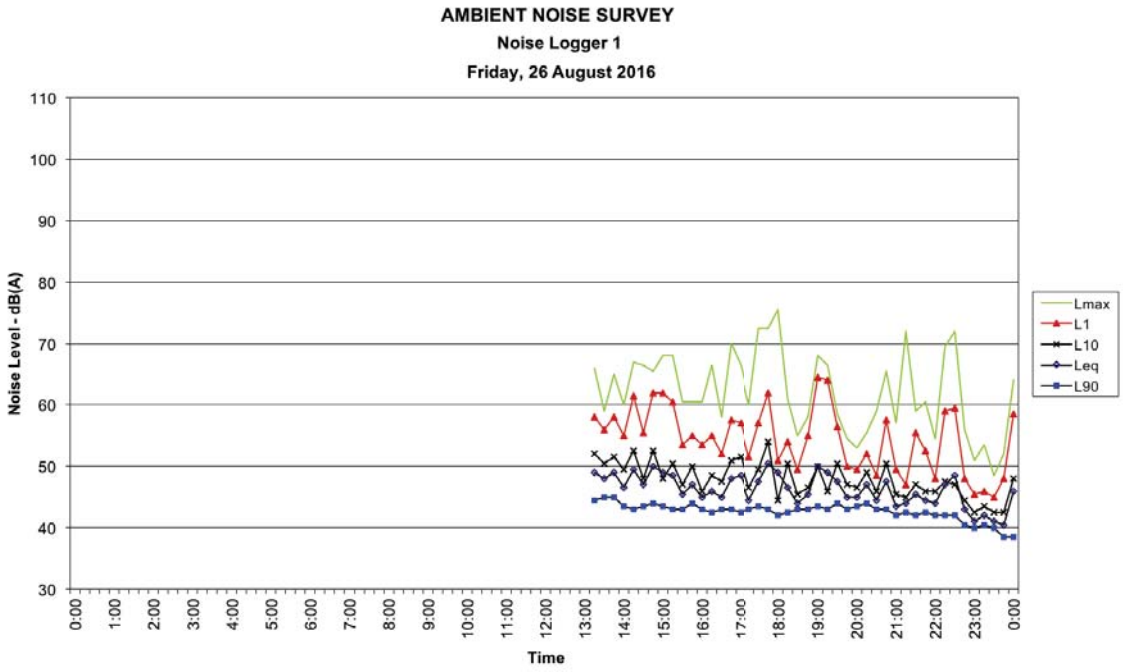
Noise limits have been derived based on acoustic quality objectives in the context of previously recorded ambient noise levels and the nature of the new central development.

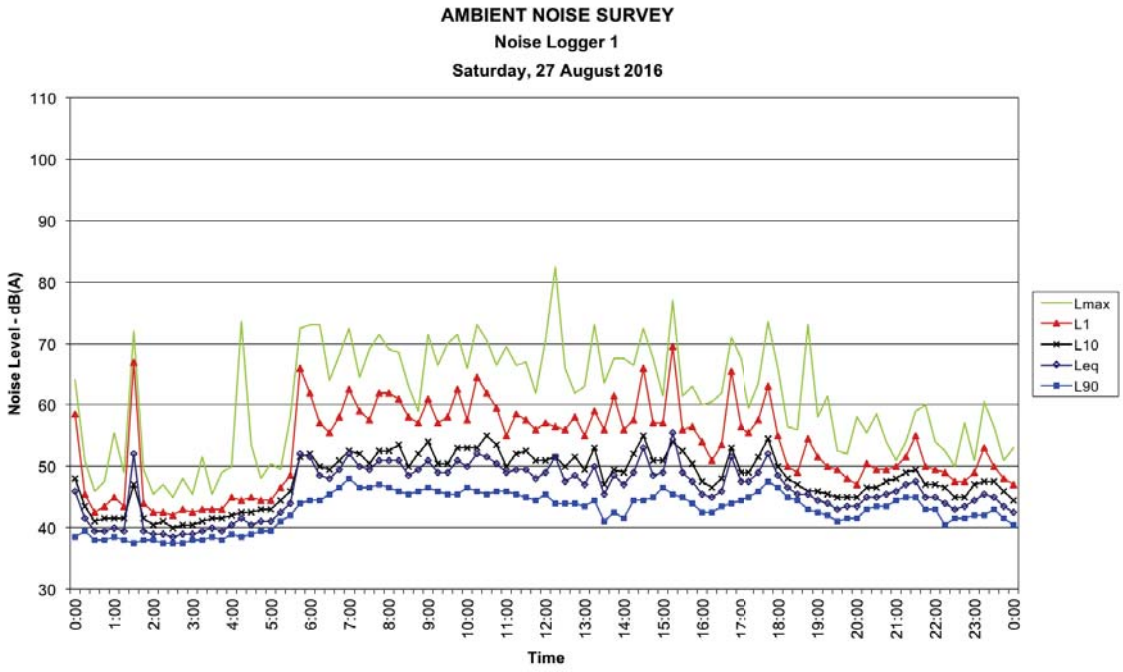
Compliance with the noise limits for the Collection Station is forecast, provided that the treatments outlined in this report are implemented.

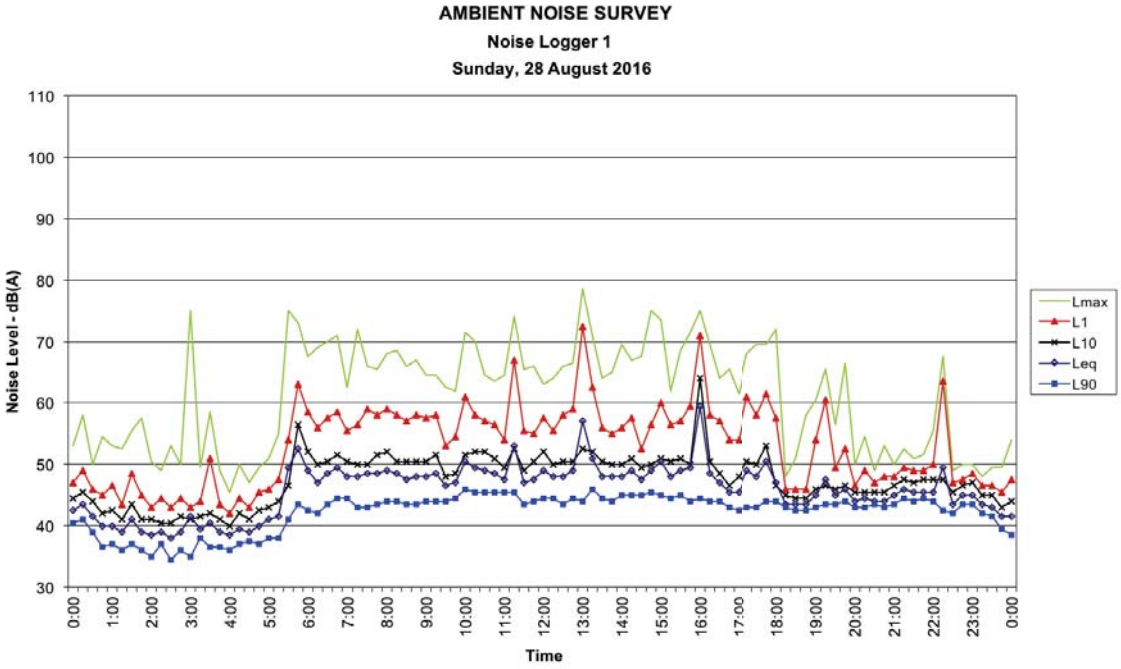
The impact at sensitive receivers near the street bins during the evacuation process has not been considered here, as this DA report only covers the Collection Station building. Additional treatments will be required to meet the acoustic quality objectives near the street bins.

Appendix A: Noise Logger Data

Noise Logger 1



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Noise Logger 1
Sunday, 28 August 2016
Noise Level - dB(A)
110
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0:00
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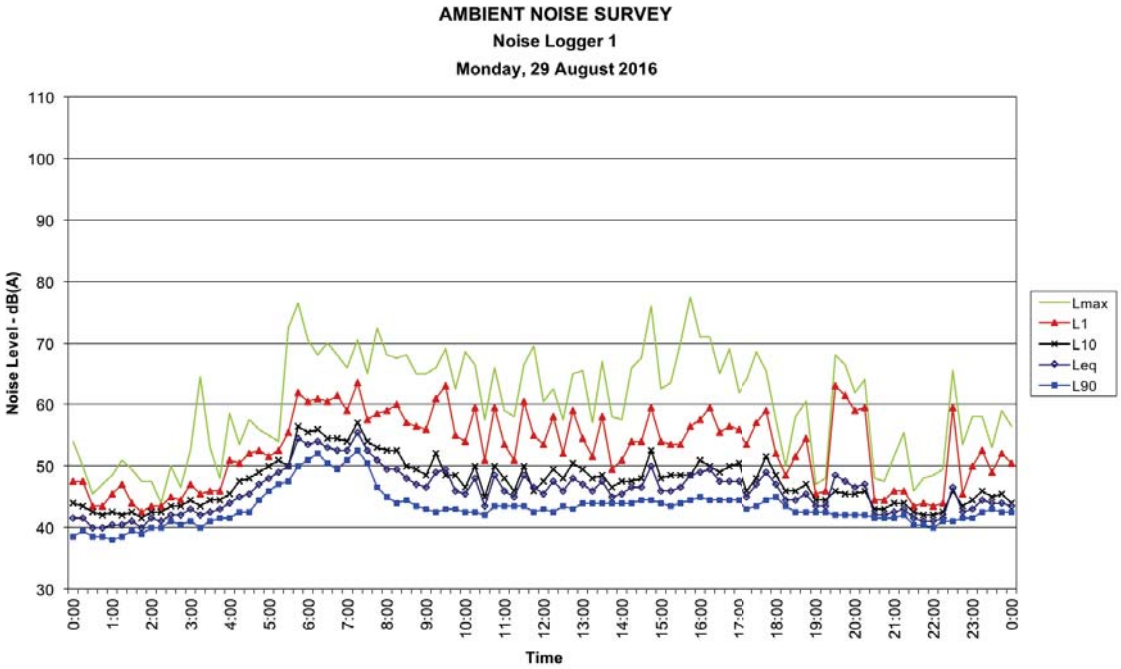
AMBIENT NOISE SURVEY
Noise Logger 1
Monday, 29 August 2016
Noise Level - dB(A)
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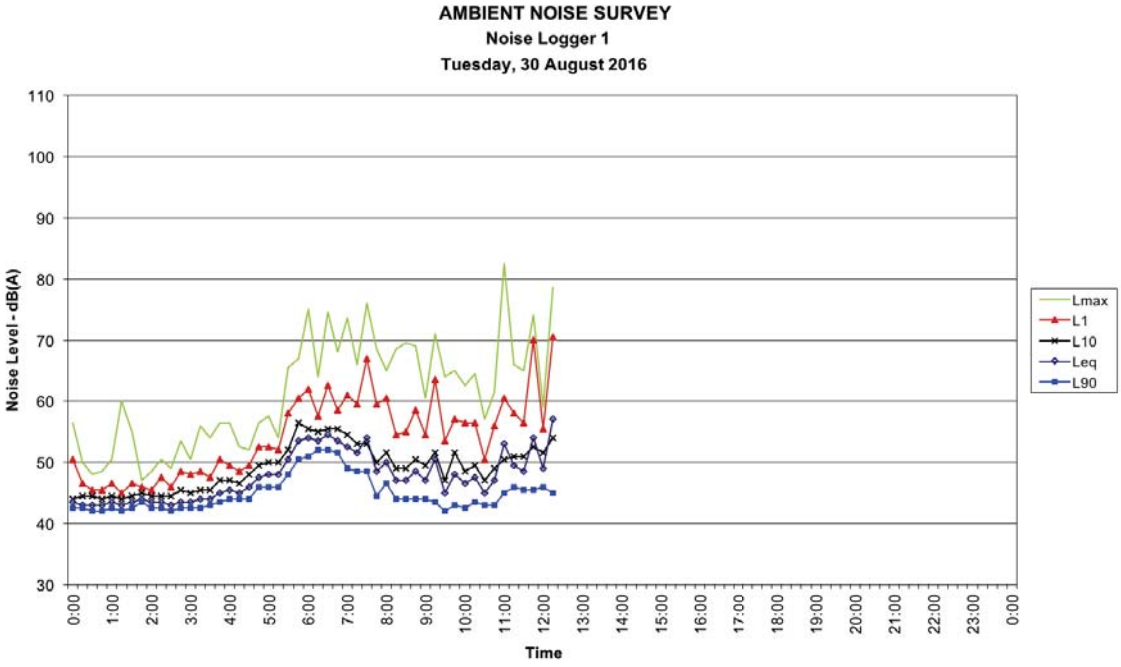
AMBIENT NOISE SURVEY
Noise Logger 1
Tuesday, 30 August 2016
Noise Level - dB(A)
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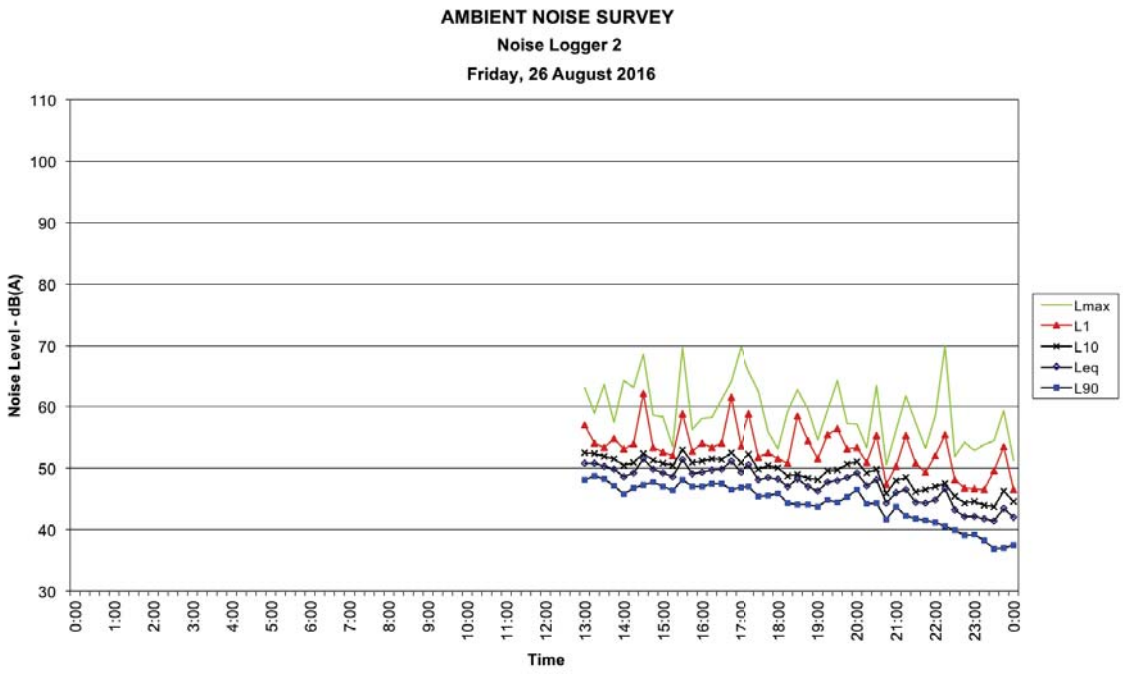
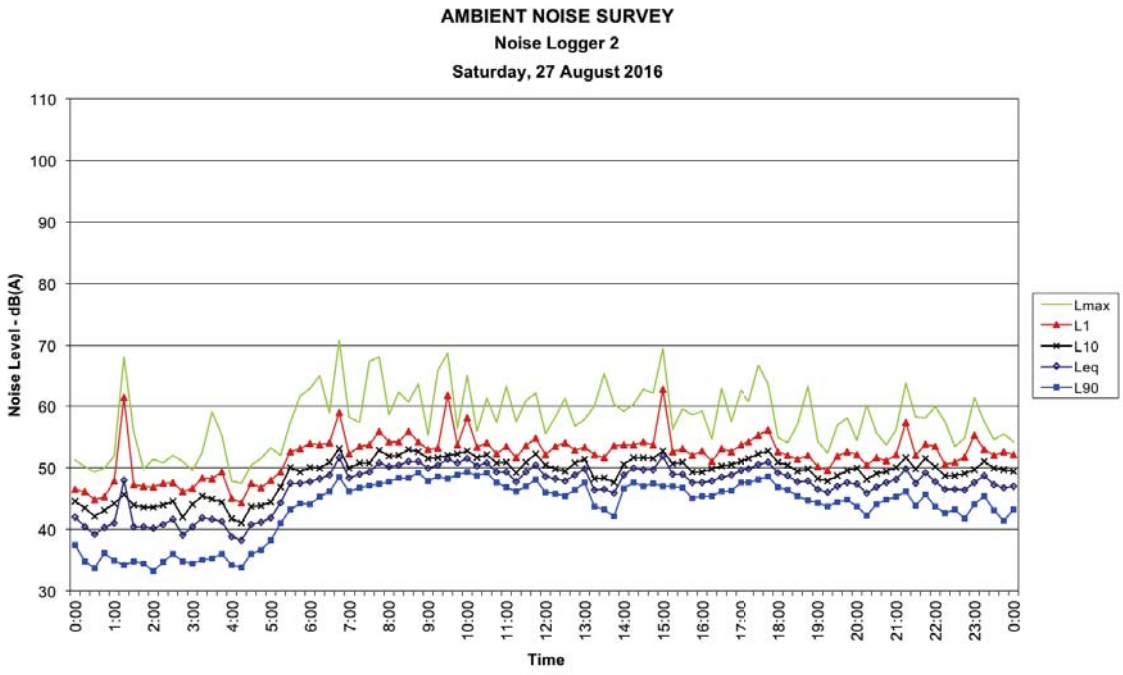
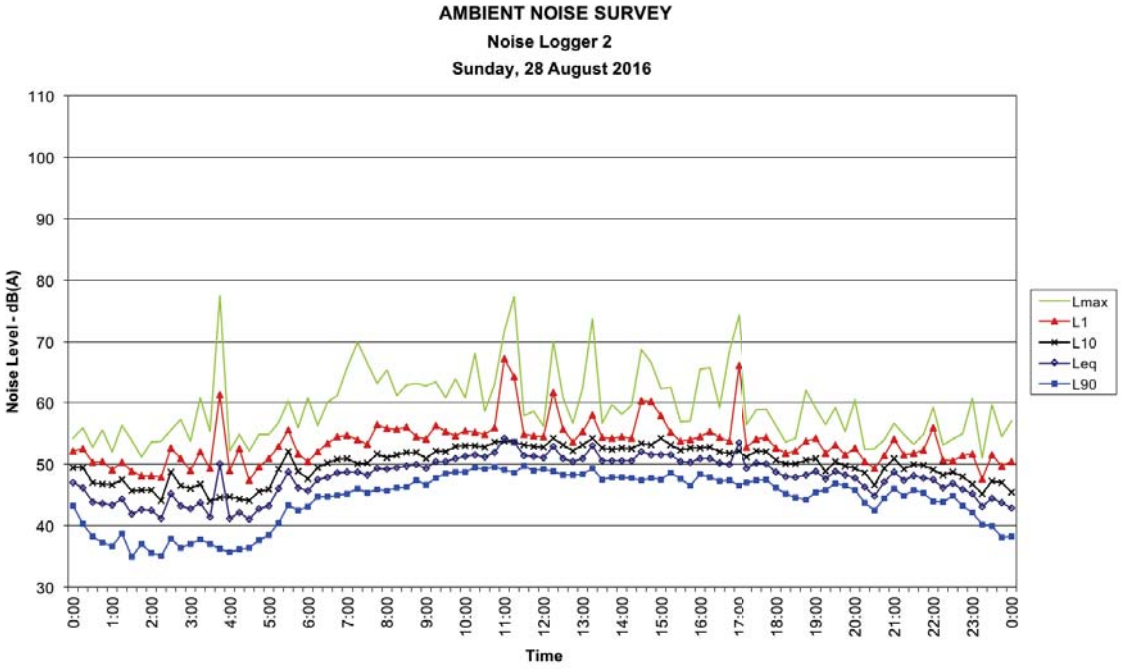
Noise Logger 2



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Noise Level - dB(A)
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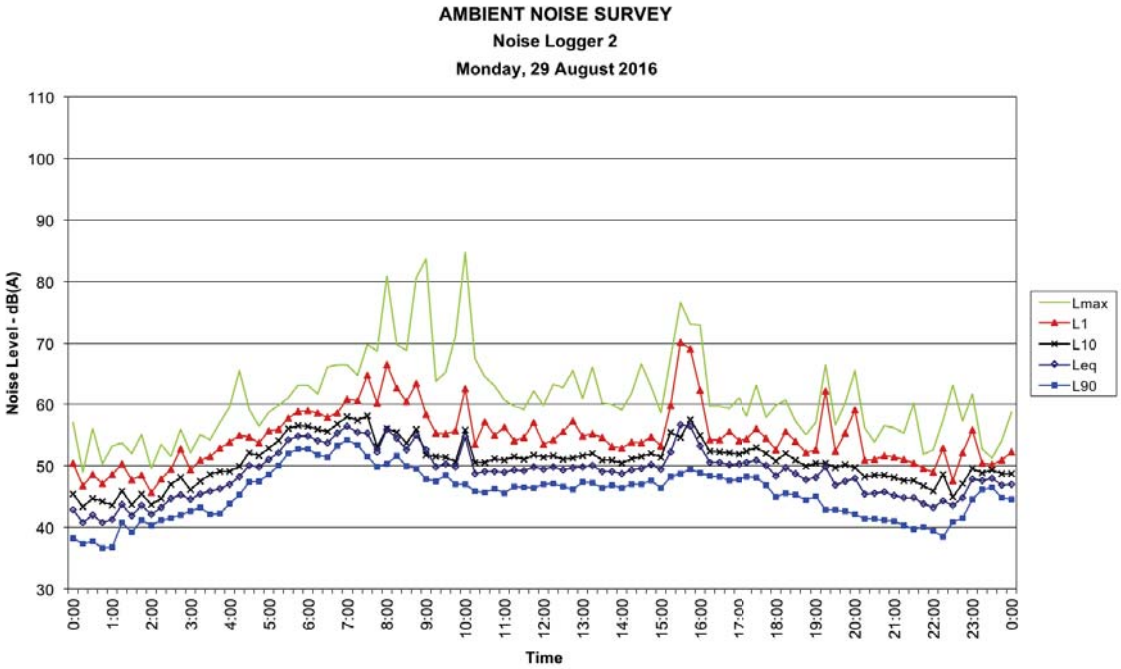
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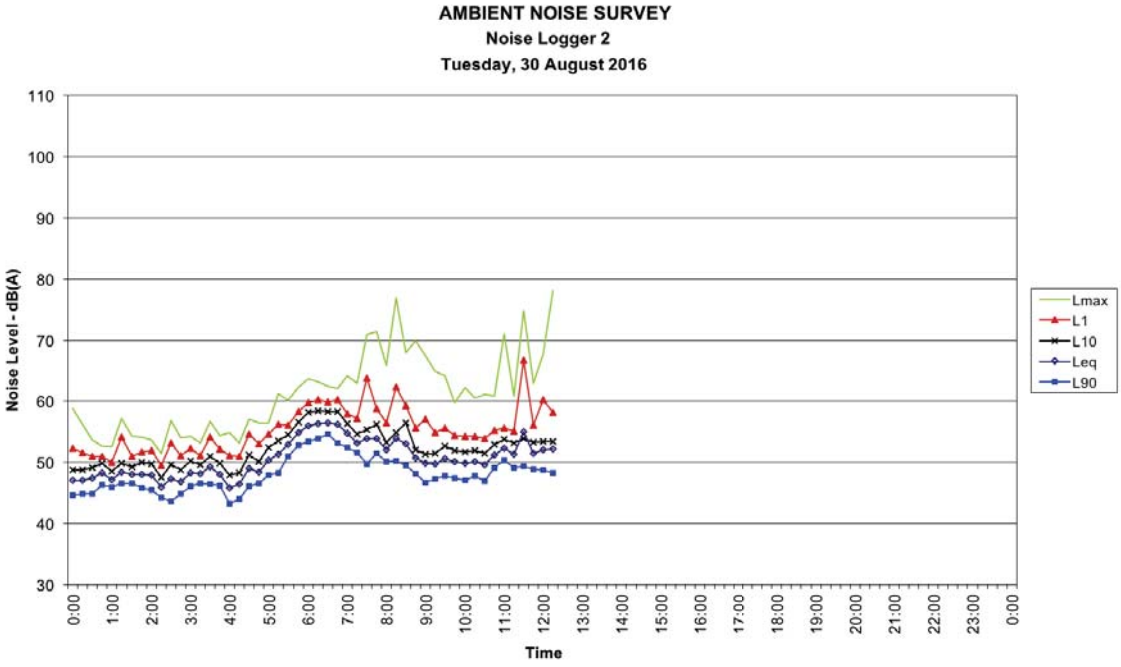
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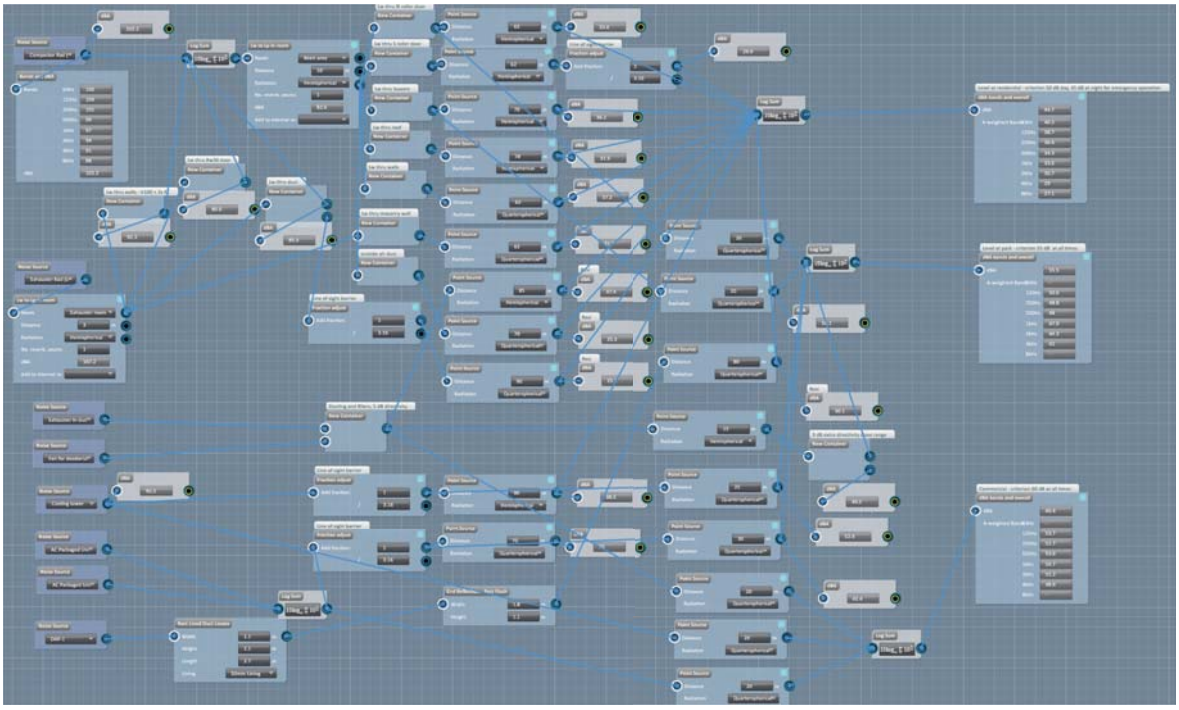
Appendix B: Acoustic model

Overall flow diagram, Collection Station:



Sub-elements:

Element “Ducting and filters, 5 dB directivity”: