



AIRTIGHT & NOISECHECK LIMITED

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NOISE IMPACT ASSESSMENT FOR

THE BLACKBURN PARTNERSHIP

175 LONDON ROAD

WATERLOOVILLE

HAMPSHIRE

PO7 7RJ

SITE ADDRESS

PROPOSED ROOF EXTENSION

FERNWOOD HOUSE

45 LONDON ROAD

COWPLAIN

WATERLOOVILLE

HAMPSHIRE

PO8 8DH

REPORT DATE – 18TH SEPTEMBER 2020

Acoustic Engineer:



Date: 18th September 2020

Michael Vine

AIRTIGHT & NOISECHECK BUILDING ACOUSTIC TESTING

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Raw Data can be sent upon request

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Customer Name:

Date: 18th September 2020

The Blackburn Partnership
175 London Road
Waterlooville
Hampshire
PO7 7RJ

Site Address:

Proposed Roof Extension
Fernwood House
45 London Road
Cowplain
Waterlooville
Hampshire
PO8 8DH

Acoustic Engineer:

Mr. Michael Vine

Equipment used:

Norsonic Environmental Analyser 121 – Serial No 29809 Calibration due July 2019

Analyser complies with the following standards:

IEC 60651 type 1
IEC 60804 type 1
IEC 61260 class 1
IEC 225
ANSI S1.4-1985 type 1
ANSI 1.43 -1997 type 1
ANSI S1.11-1986 order 3 type 1D
DIN 45 657
Norsonic Production Standard set for the Nor121

Measurement Microphones (Gras 40AF) – Serial No 51465 & Nor 1225 – serial No 72933, - Calibration due July 2019

Acoustic Calibrator - (Type 1251) – Serial No 31652, Calibration due July 2019

Measurement Procedure:

This assessment uses data already taken at the same site address in June 2019. This data represents the required levels that need to be mitigated against to ensure a suitable acoustic criterion can be achieved. The application for 8 x dwellings at 1st floor level was granted earlier this year.

As part of the original assessment, the external ambient noise levels were recorded for a 24-hour period in two external locations between Friday 14th to Saturday 15th June 2019 to measure the existing noise levels at the Western & Eastern boundaries of the proposed site. These are the façades that faces the commercial plant (Western) and road traffic (Eastern). The only commercial activity is the roof top plant located to the rear of the building, it is a single extract duct that terminates into free field above the roof line. All other plant that served that buildings have been either removed or switched off. The only piece of plant in operation is the extraction system serving Koop & Craft restaurant.

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Executive Summary:

Airtight & Noisecheck Ltd were instructed by The Blackburn Partnership Ltd to undertake a detailed desktop Noise Impact Assessment (NIA) at Fernwood House, 45 London Road, Cowplain. A planning application has been made to erect 8 x purpose-built dwellings at 2nd floor level. This assessment will use the data collated from a granted scheme at 1st floor level in early 2020. The necessary reductions and acoustic feature corrections will be applied for the extra distance from the noise source & screening that will be offered by the building.

The noise levels of the original assessment were measured for a 24hour period at the front (Eastern) and rear (Western) boundaries of the site. They were measured over a weekend period due to the restaurant being in operation and the road network operating at normal levels.

The external noise levels were measured at the Western & Eastern façades in order to assess the vehicular traffic using London Road & the commercial plant to the rear of the development. These noise sources were applied to the proposed scheme as the proposals will be built above the approved scheme.

The noise levels & calculations (using the data from the original assessment) indicate that if the mitigation measures are implemented then there is no reason to suggest that the future residents of the proposed dwellings will be adversely affected by the noise emissions created by the commercial external sources. The mitigation measures will have to be implemented to the glazing and ventilation of the proposed development and they show that the criteria for internal noise can be met. The noise levels have been measured at all noise sensitive facades.

There is no reason to suggest that the future residents of the proposed residential development will be adversely affected by the noise emissions providing the mitigation measures are implemented to the noise sensitive rooms. The detailed mitigation measures are listed within this report.

The final ventilation scheme has not been decided so a variety of options have been included within the report. The roof top plant will be set back from the façade line and thus screened from the road noise a little more. In addition, the client has indicated the measures that they will implement to the scheme to reduce the noise break in and ensure a suitable acoustic & thermal comfort for the residents.

The external noise levels are higher at the front of the site for obvious reasons, the rear aspect is screened from the vehicular traffic and any street level activity. The plant is located at the rear of the building and it is clear that, even with the addition of acoustic feature corrections, suitable mitigation measures will be able to protect the future residents of the proposed scheme. The road traffic noise was also measured to ensure this could be mitigated accordingly from the other external noise sources.

Discussions with the local authority have indicated that they were under the impression that there were multiple sources of plant in operation. This is not the case. The only plant in operation at the site now is:

1. Single extraction duct serving Koop & Craft restaurant.
2. All other plant has either been removed or switched off
3. There are no other restaurants or take away venues at the site location any longer

The client has also taken measures to reduce the impact of the plant on the proposed dwellings at 2nd floor level, these include:

1. Enclosing the extraction unit with sound reduction material – see site plan for location & specification
2. Relocating the stairs and corridor at the Northern end of the proposed building to screen the dwellings
3. No windows will be located on the rear elevation facing the plant

All of the above measures will ensure the plant will not have an adverse impact on the proposed dwellings at 2nd floor level.

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Acoustic Design Statement:

It is clear that the site is situated near to a busy area with a variety of activity to the front & side of the building and will be exposed to higher external noise levels, however the client will take steps and implement robust mitigation measures to ensure the impact of the external & internal noise should not have an adverse impact on the future residential dwellings. These steps include:

1. Careful configuration of dwellings – façade set back from existing façade and thus screened from road noise
2. A MVHR or alternative ventilation system to ventilate the dwellings thus maintaining the integrity of the façade & glazing
3. Install a robust glazing system to the building to protect the residents from the external noise emissions
4. Install integral blinds to rooms facing the Western façade
5. Shading offered by overhanging roof line
6. No windows facing the plant noise to rear
7. Plant motor located internally at ground floor level
8. Mitigation measures applied to the extraction unit
9. Orientation of dwellings away from the plant to reduce impact even further

The above measures are a clear indication of the steps taken by the client to reduce the potential impact of the noise sources in operation. The initial risk assessment has indicated that both the day time & night time noise levels to the front fall into the low to medium category, the rear levels fall into the negligible to low category for the day time & the night time $L_{Aeq, 8\text{hour}}$ value for the rear falls into the low risk category. This indicates that a good acoustic design process should ensure that the internal criteria can be achieved. If the mitigation measures are implemented, then there is no reason to suggest that the future occupants of the scheme cannot be adequately protected from the external noise emissions.

The client has taken steps to reduce the impact of the noise on the proposed dwellings.

It is the opinion of the author that based on the location of the plant, screening offered by the building and mitigation measures adopted to the plant that the main noise source in operation is the road traffic noise. No windows will face the rear elevation where the plant is located, but the majority of dwellings will face the road network. The dwellings located to the rear will be located further South and thus be screened from the plant noise to an extent that it will be inaudible at the receptor location.

The sound reduction measures, including the acoustic feature corrections applied to the noise levels will ensure a suitable level of sound reduction is applied to all dwellings.

The local authority required a cumulative assessment for all plant located to the rear, but as explained earlier in the report the majority of the previous plant has been removed or switched off due to a change of the business in operation at ground floor level. The only piece of plant in operation will be the extraction system serving Koop & Craft and based on the points listed above it is clear that this noise should not have an adverse impact on the proposed dwellings at 2nd floor level.

Based on the relatively high noise levels at the front of the site, knowledge of the local area and the road networks being busy during the assessment period it is apparent that the 24hour assessment was a fair reflection of the typical noise levels in this location.

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Assessment Criteria:

The NPPF came into effect in March 2012 and was updated in February 2019. It replaced other documents such as PPG24. The NPPF provides a number of objectives and aims that are directed towards avoiding significant adverse impacts and reducing others on quality of life and health. This document states that:

The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.

The NPSE (Noise Policy Statement for England) states the following aims with respect to noise policy:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of the Government policy on sustainable development:

*avoid significant adverse impacts on health and quality of life;
mitigate and minimise adverse impacts on health and quality of life; and
where possible, contribute to the improvement of health and quality of life.*

BS8233: 2014 'Guidance of Sound Insulation and Noise Reduction for Buildings' defines a range of ambient noise levels for design purposes, in order that appropriate conditions are achieved in certain internal environments. These internal requirements are listed in the table below.

BS8233: Table 5 – Indoor Ambient noise levels in spaces when they are unoccupied.

Activity	Location	0700-2300	2300-0700
Resting	Living Rooms	35dB LAeq,16hour	-
Dining	Dining Room/Area	40dB LAeq,16hour	-
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hour	30dB LAeq,8hour

Night time noise events can have a significant impact on sleep disturbance. There is no specific guidance presented in BS8233 regarding a noise limit to maximum night time noise ($L_{Amax, F}$). As part of this assessment the number of night time noise events will be considered in a qualitative manner with an internal $L_{Amax, F}$ of 45dB used as an initial screening tool to identify night-time noise events that may be of significance to sleeping conditions in bedrooms.

For the purposes of this report the relevant noise sources are those associated with the plant located at the rear of the building and the road traffic noise located to the front of the building, which was the dominant noise source.

Pro PG: Planning & Noise 2017 (Professional Practice Guidance on Planning & Noise) issued by ANC/IOA/CIEH has also been referenced. This document came into effect in May 2017. This document is a guidance document and not a Code of Practice or British Standard.

This document states that there is a staged approach to such schemes, with the first phase being a risk assessment undertaken at the site, followed by a detailed assessment taking into account the recommended internal values by measuring the external noise levels.

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1 Objective:

1.1 To use the measured noise levels from a previous, granted application associated over a 24hour period at the proposed facades of the development. The noise levels associated with all facades were measured to ensure that the future residents of the proposed scheme will not be adversely affected by the noise emissions created in the immediate area. The site currently comprises of the recently converted residential dwellings at first floor level with a restaurant at ground floor. A planning application has been submitted to erect 8 x purpose-built residential dwellings at 2nd floor with the dwellings at 1st floor and restaurant at ground floor level.

1.2 The data was used from the previous assessment as this has recently been approved by the Local Authority. The same mitigation measures will be applied to the proposed dwellings even though the impact will be less due to the extra distance between the dwellings and the noise source and screening offered at 2nd floor from the existing building facade.

2 Calibration:

2.1 The measurement microphones were calibrated before and after testing in each measurement location and there were no drifts recorded during the assessments.

3 Site Layout & Microphone Position:

3.1 The proposed site is located on the corner of London Road to the East & Kings Road to the North, with London Road being a main through fare for traffic in Cowplain. It is a very busy road network with numerous mixed-use buildings apparent. The majority of the buildings located at ground floor are shops rather than restaurants and take away venues. The only business with plant associated is Koop & Craft, this has a single extract system located at the rear of the building. This will be the only plant in operation and will have severe mitigation measures installed to it. The motor is located internally with only the extraction duct located externally.

3.2 The ground floor is currently used as a restaurant, the anticipated noise levels within such a venue would be between 75dBA. The plant associated with the building is located to the rear of the site. The area is very busy with high levels of people and vehicles using the immediate area. The immediate area is predominantly of mixed-use buildings, although the dominant noise source in this location is the high levels of vehicular traffic using the local road network. A recently submitted and granted application for 8 x residential dwellings at 1st floor level has been implemented to the building.

3.3 The proposed residential layout is shown later in the report. The microphones were located:

- 1- Western façade (rear) of the site with the microphone approximately 6metres from ground floor level. It was positioned circa 1m from the façade so a -3dB reduction has been applied for reflection.
- 2- Eastern façade (side) of the building with the microphone approximately 6m from the ground. It was circa 1m from the building façade so a -3dB correction has been applied for reflection.

4 Weather Conditions:

4.1 The weather was predominantly dry during the measurement procedures, the temperatures ranged between 4 - 10degrees. There was no wind and a little rain during the measurement procedure.

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5.1 The purpose of this measurement procedure was to calculate the noise levels apparent at the noise sensitive facades and ensure suitable mitigation measures are implemented so that the requirements of BS8233 & WHO can be met. The night time L_{Amax} values have also been derived so that they can be mitigated against.

Table 1 - L_{Aeq} & L_{Amax} Values – Front & Rear of building:

Mic Location	L_{Aeq} 16hour Value	Reduction needed for BS8233 compliance	L_{Aeq} 8hour Value	Reduction for BS8233 compliance	L_{Amax} value – night time	Reduction for WHO compliance
ML 1 – Western Façade – Rear	56dBA	21dB	51dBA	21dB	69dBA	24dBA
ML 2 – Eastern Façade - Front	62dBA	27dB	54dBA	24dB	70dBA	25dBA

Further to the reduction applied for the reflection values (as listed in report for 1st floor application) a further -2dB have been applied to the levels for the extra distance from the road (line source) and a further -3dB (for the Eastern façade only) has been applied to take the screening offered by the building façade into account (2nd floor will be set back from existing façade). Therefore a -5dB correction has been applied for the front façade.

6 Results Conclusion:

6.1 The levels of reduction apparent for the road traffic noise & plant noise is listed in the table above.

6.2 The WHO guidelines for community noise - 2000 state that the internal L_{Amax} level (night time) should not exceed 45dB(A). If it exceeds this level on a regular basis then sleep disturbance may be caused. This is the internal level that should be achieved. The Pro PG document states that the internal level of 45dB should not be exceeded more than 10 times a night. This is the value listed above.

6.3 The plant noise was measured whilst in operation and thus the levels are a fair representation of the apparent noise at each façade, however the following acoustic feature corrections will be applied to the levels.

6.4 Section G1 of BS8233 allows for a +5dB correction to the L_{Aeq} values to take into account the possible errors in simple calculation methods. Therefore if we apply these values to the L_{Aeq} values listed above the required sound reduction is **26dB during the day for the Western façade, 32dBA for the Eastern facade & 26dB during the night for the Western façade and 29dB for the Eastern facade therefore this level of sound reduction can be applied to all relevant facades/glazing.**

6.5 Due to the measures taken by the client (orientation of dwellings & mitigation measures to extraction) it is anticipated that the above sound reduction values will adequately mitigate against the plant noise. Some bespoke measurements are shown later in the report.

6.6 The levels were measured over a Friday evening when the ground floor restaurant/bar is open. The hours of operation for the restaurant is Monday – Closed, Tuesday to Thursday – 1700hrs to 2230hrs, Friday & Saturday – 1700hrs to 2330hrs and Sunday – 1200hrs to 2000hrs. These hours were used as part of the plant assessment to determine the rating level of the plant even though the plant is not the dominant noise source.

6.7 The above measures can be implemented to the proposed dwellings at roof top level, the client has stated the robust measures to which they are prepared to install to ensure a suitable acoustic criteria for the future residents.

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7.1 Some possible building specifications are listed below, including, façade, glazing, roof & ventilation. Due to the status of the building the final ventilation scheme is unknown so various options have been included.

7.2 All of the rooms can be ventilated either by using an MVHR whole house system, such a system could ventilate the rooms accordingly. The unit can be stored in a suitable location and vented through the roof/facade at the rear as this is not exposed to high levels of noise, then a duct is run into each room to ensure that the rooms can be adequately ventilated without having to open a window and thus diminishing the integrity of the facade/glazing specification.

7.3 The detailed calculations for each façade are listed later in this report and these calculations may show a slightly different sound reduction value is applicable due to the variety of specifications.

Make	Model	Type
Vent-Axia	Sentinel Kinetic Plus	Whole House Ventilation

7.4 If an MVHR system is to be installed then it will have to be located in a location that will not impact on the noise sensitive bedrooms. It could be located in the loft area above a communal staircase for instance. It will need regular maintenance, so an access panel will be required. It is recommended that the system is located away from the noise sensitive bedrooms and situated above or inside a purpose-built area within the communal area.

7.5 There are alternative solutions, and these could include a Passive Stack Ventilation system, a natural ventilation heat recovery (NVHR) system or one of the products listed below.

Location	Product	Sound Reduction - open	Sound reduction - closed
All windows	RW Simon Acoustic EHA trickle vent	36dB	38dB
All windows	RW Simon Acoustic EHAS trickle vent	38dB	41dB

8 Façade Detail – The proposed façade is believed to be something similar to: - cavity brick wall construction. This system should achieve a sound reduction of between 50-52dB $D_{nT,w} + C_{tr}$ 'Code of Practice BS8233: 2014, Page 60 – Table E.1B – Airborne sound insulation of walls and partitions'.

9 Roof Detail – The proposed roof detail is believed to be similar to: Flat roof construction, with a minimum of 150mm insulation placed on top of rafters, an independent internal plasterboard ceiling. Such a systems should achieve a sound reduction in excess of 45dB 'Table 8 – The sound insulation of roofs, Page 41 – BS8233: 2014'

10 Windows - The proposed windows to be used is unknown. The specifications listed below should ensure a suitable levels of sound reduction for this scheme.

Possible Units	Thickness	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	Overall reduction ($D_{nT,w} + C_{tr}$)
SG 6-12-10	28mm	27	26	33	39	39	47	36-3=33dB
SG solaglass 4-6-8.4	18.4mm	27	26	29	39	45	46	36-4=32dB

10.1 This glazing specification could easily be installed throughout the site. There are many other suitable products and the client will have to show compliance for the windows before installation, the manufacturer will have the acoustic data for the windows.

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11 Results Summary - External:

11.1 This report has used data from a previous, approved application at the same site. It includes suitable mitigation measures that can be applied to the dwellings to ensure a suitable acoustic environment. In addition, it is essential to strike a balance between the thermal comfort of the dwellings and the acoustic criteria. The measures listed within the report offers a suitable way of doing that. It is apparent that the dwellings can be purged ventilated via opening of windows, increasing the internal noise levels but only for a short period of time, which is ideal.

11.2 Based on the measured and calculated levels, the dwellings to the rear will still be within the reasonable standard of living with windows open. An open window offers a sound reduction of 15dB, therefore indicating the levels to the rear with windows open of 41dBA for the day time and 36dBA for the night time. Section 2.30 on page 14 of the ProPG document refers to Note 7 of BS8233: 2014 and a relaxation of 5dB to the recommended internal values as being a suitable internal criteria. This relaxed level of +5dB above the values listed within this report can be achieved to the rear aspect of this development. The robust mitigation measures can ensure the dwellings to the front can also achieve good levels of thermal comfort and noise levels combined.

11.3 The mitigation measures listed within this report are very robust and comprehensive. If they are implemented throughout the site then the future residents should be able to enjoy a reasonable standard of living. Upon implementation of the comprehensive mitigation measures, the internal criteria of BS8233: 2014 should be met within the noise sensitive bedrooms at the proposed development.

11.4 It is clear that the noise emissions associated with the front & side of the development is the dominant noise source. However, if the necessary mitigation measures are implemented to the building fabric then there is no reason to suggest that the future residents will be adversely affected by the external noise emissions. It is also clear to see that the noise emissions to the rear of the building are a lot less than those at the front, however suitable acoustic feature corrections have been applied to the rear façade also.

11.5 Planning Pro PG states that a good acoustic design process is a vital part of new developments. The client has taken great steps to ensure that the future occupants are protected from the dominant noise source, these steps include:

1. Careful configuration of dwellings – façade set back from existing façade and thus screened from road noise
2. A MVHR or alternative ventilation system to ventilate the dwellings thus maintaining the integrity of the façade & glazing
3. Install a robust glazing system to the building to protect the residents from the external noise emissions
4. Install integral blinds to rooms facing the Western façade
5. Shading offered by overhanging roof line
6. No windows facing the plant noise to rear
7. Plant motor located internally at ground floor level
8. Mitigation measures applied to the extraction unit
9. Orientation of dwellings away from the plant to reduce impact even further

11.6 The above-named document also states that the internal L_{Amax} value of 45dB should not be exceeded more than 10 times per night, and this criterion has been used for the site.

11.7 Careful implementation of this scheme and control of the site should ensure that the future residents of the proposed scheme will be adequately protected from the external noise sources in operation at the front and rear of the site.

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12 Measures taken by the client:

12.1 The dwellings screened from the plant by the stairs & corridor thus reducing the impact on the dwellings. The ducting will be completely screened from the dwellings.

12.2 No windows in Northern elevation. No dwelling will have a window facing West, they will be facing North, South & East

12.3 MVHR units with summer bypass installed:

A Vent-Axia Sentinel Kinetic Plus system will be installed to all required units, these units will be fitted with summer bypass mode to help with cooling in the summer months. MVHR units are an effective measure to ensure the dwellings can be adequately ventilated without having to open the windows.

12.4 Internal Window Blinds fitted to all required windows:

The client has stated that blinds will be fitted to all necessary windows and will form an integral part of the ventilation strategy. These will ensure the dwellings can remain shaded during the summer months and reduce the amount of sunlight penetrating the dwellings.

12.5 Glazing Installed:

The client will install a suitable glazing system that will meet the requirements for the L_{Aeq} & L_{Amax} values as shown in the noise assessment. The literature for the glazing can be supplied directly by the client for the glazing.

12.6 External ducting acoustically encased:

All external ducting will be encased to reduce the noise breakout of these elements. It must be stated that the glazing was listed to ensure protection from the noise emissions of the plant so this will also help to ensure it will not have an adverse impact on the proposed dwellings. It is recommended that the following detail be used.

- Fix 70-100mm timber frame to building using anti-vibration mounts (similar to EP anti-vibration wall mounts from Custom Audio Designs).
- Place RW3 mineral wool between timber studs
- Fix sinitat weatherboard (or similar) to the timber studs
- Fix Tecsound SY50 membrane to boards
- Apply cladding to match existing to the outer layer of the system

12.7 Acoustic sealant can be applied to each layer during the installation and great care must be taken when fixing the above system. It is anticipated that the extraction system will require regular maintenance and cleaning so this needs to be factored into the design.

12.8 Reduction in glazing surface area:

The client has specifically kept the glazing surface area as low as possible to try and reduce the solar inlet through the glazed element. This in conjunction with the internal blinds & shading offered by the soffit will help to reduce overheating.

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13 Plant Noise Levels:

13.1 The plant is in operation until 2330hrs on Friday and Saturday. Looking at the data it is clear that the noise levels only drop off at circa 0100hrs therefore indicating that the plant is not the dominant noise source. The tables below and trying to establish the rating levels of the plant and the reduction needed by the plant to ensue the lowest LA90 can be achieved.

13.2 It can be seen that the LAeq levels are relatively steady until 2330hrs, they then reduce slightly which would be in line with the plant switching off, but the larger decrease comes at circa 0100hrs, indicating other dominant noise sources in operation. If we compare the LAeq values with the LA90 values to see what level of reduction will be required. It would not be fair to compare the rating level with the lowest LA90 15min value throughout the night time period as there are other noise sources in operation so it is fairer to compare it to the lowest LA90 value at 0100hrs. This level is shown below. The lowest LA90 15minute value was 25dBA at 0330hrs.

Night Time LA90 – 1hour 2330-0100
30dB(A)

Results		Commentary
Ambient Sound Level	Sound Pressure Level = 81dBA	Measured at receptor
Residual Sound Level	53dBA	Measured at receptor
Specific Sound Level	58dB	
Acoustic Feature Correction	0	Negligible at receptor
Reductions due to screening of building & distance to window	-10dB for building screening -32dB for glazing attenuation	The dwellings are completely screened from the plant.
Rating Level	16dBA	External level of plant at window
Background Sound level	30dBA	Lowest LA90 at 0100hrs
Excess of rating over background	(16-30) = -14dB	
Assessment indicates no impact at receptor		The figures shown have tried to show the internal level with a window closed.

13.3 The above table shows that the plant should not have an adverse impact inside the nearest residential dwellings with a window closed. In addition, the lowest LA90 value was 25dBA and therefore the plant noise would still be -9dB below this value.

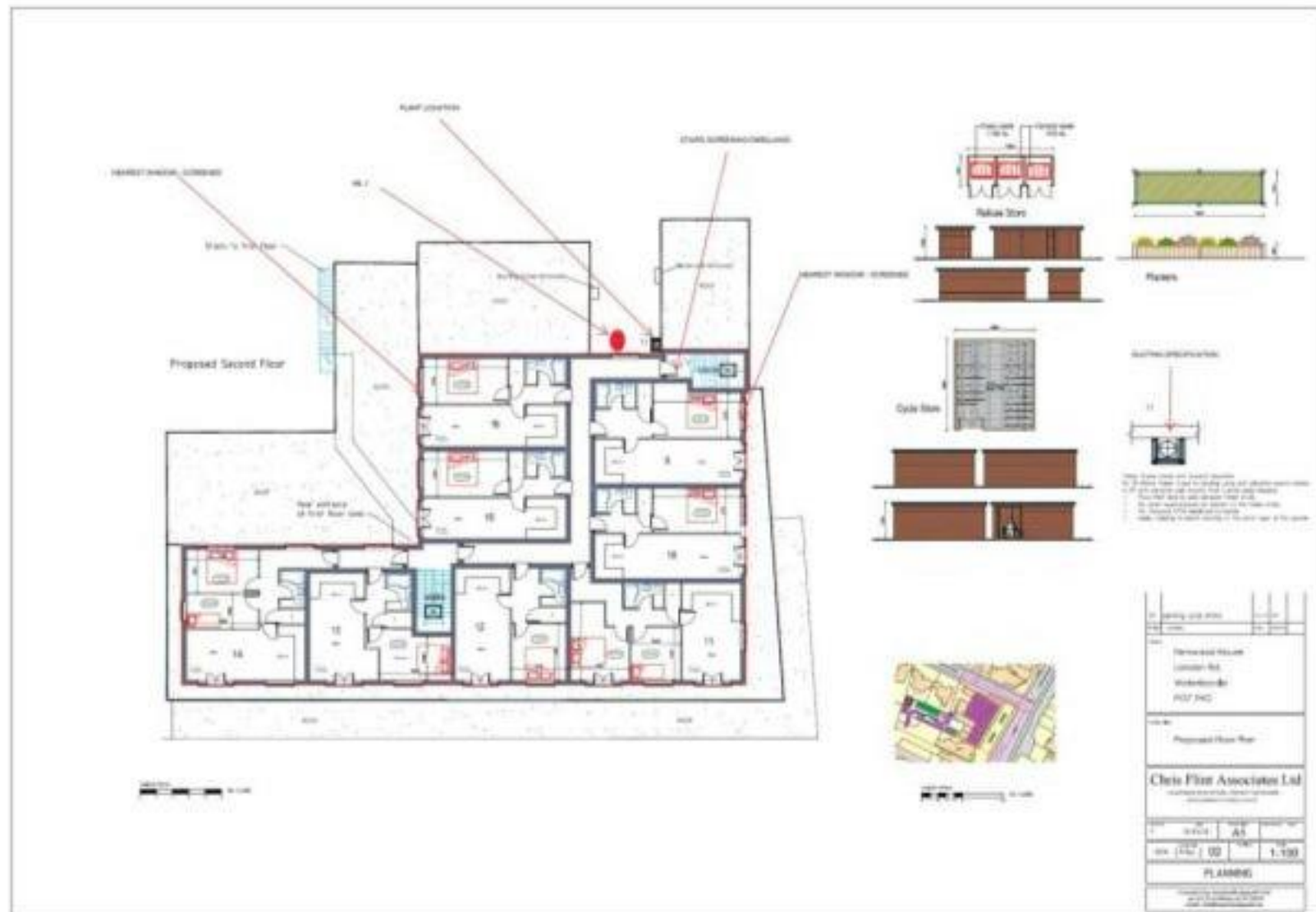
13.4 Further calculations show that the external levels from the plant would be 40dBA at the nearest window, this is determined using:

$$\begin{aligned}
 &58\text{dBA at } 2\text{m} \\
 &\text{Dwelling is at least } 5\text{m} \\
 &\text{Therefore } -8\text{dB for a point source propagation} \\
 &\quad -10\text{dB for building screening} \\
 &\quad = 40\text{dBA at the façade.}
 \end{aligned}$$

13.5 The level of 40dBA is clearly below the values shown for the night time period, again indicating that the plant will not be the dominant noise source in this location and that there are other noise sources that will be. The mitigation measures listed in this report will ensure the noise from the plant does not have an adverse impact on the proposed residential dwellings at 2nd floor level. An open window offers a sound reduction of -15dB and therefore it is clear that this would satisfy the sound reduction required from the plant at the nearest receptor location. All dwellings will be completely screened from the plant as part of the scheme.

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14 Site Plans:



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APPENDIX

Continuous equivalent noise level, LAeq — The steady noise level (usually in dBA) which, over the period of time under consideration, contains the same amount of sound energy as the time varying noise.

LAm_{ax} - The maximum value that the A-weighted sound pressure level reaches during a measurement period.

dB (A) — The A-weighted sound pressure level.

Decibel (dB) — A unit used for many acoustic qualities to indicate the level of sound with respect to a reference level.

A-weighting — A frequency weighting that relates to the response of the human ear.

Background noise level — Prevailing noise level in a specified environment measured in the absence of the noise being studied.

Habitable Room – A room used for sleeping or recreation/relaxation

D_{ne,w} Weighted element normalised level difference – A single-number quantity which characterises the airborne sound insulation of a small building elements.

EPU – Environmental Protection Unit

R_w Weighted sound reduction index – A single-number quantity which characterises the airborne sound insulation of a material or building element measured in the laboratory.

LA₁₀ – The A-weighted noise level exceeded for 10% of the measurement duration.

LA₉₀ - The A-weighted noise level exceeded for 90% of the measurement duration.

British Standards & associated documents:

Code of Practice: BS8233: 2014 - Sound Insulation and noise reduction for buildings.

World Health Organization (WHO) - Guidelines for Community Noise.

ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise

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15 Google Earth:

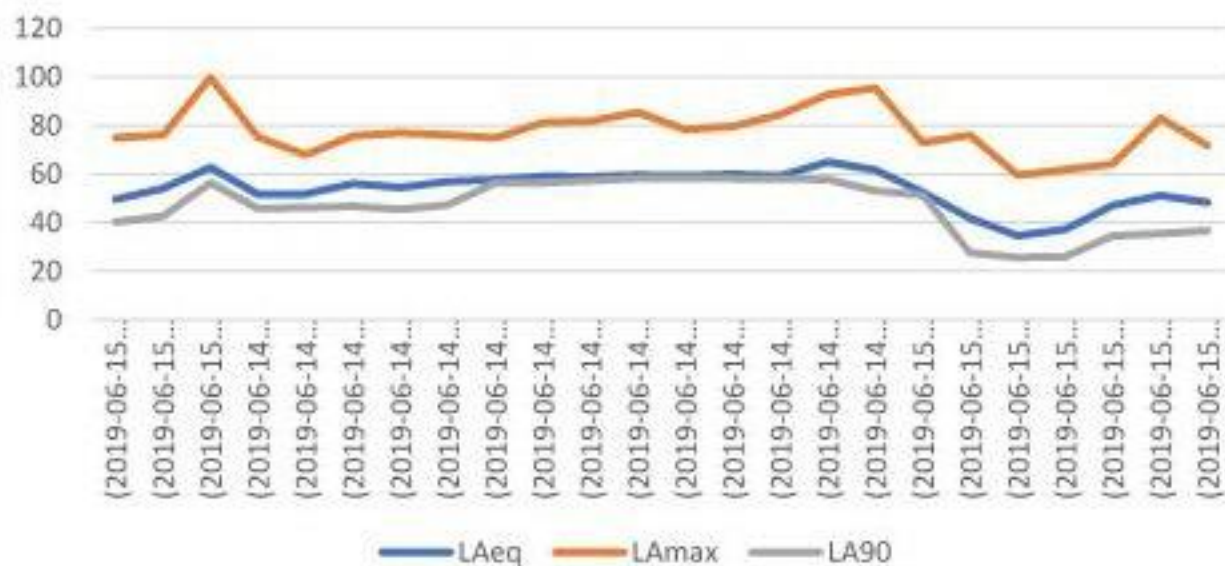


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1hour values in ML 1

Column1	LAeq	LAmx	LA90
(2019-06-15 07:00:01.060)	49.6	74.9	40.3
(2019-06-15 08:00:01.060)	54.1	76.1	42.8
(2019-06-15 09:00:01.060)	62.7	99.7	56.4
(2019-06-14 10:00:01.060)	51.7	75.2	45.9
(2019-06-14 11:00:01.060)	51.9	68	46.2
(2019-06-14 12:00:01.060)	56.1	75.7	46.8
(2019-06-14 13:00:01.060)	54.4	77	45.5
(2019-06-14 14:00:01.060)	57	76.1	47.3
(2019-06-14 15:00:01.060)	57.7	74.8	56.5
(2019-06-14 16:00:01.060)	59	81.2	56.5
(2019-06-14 17:00:01.060)	58.8	81.7	57.3
(2019-06-14 18:00:01.060)	59.6	85.3	58.2
(2019-06-14 19:00:01.060)	59.2	78.4	58.3
(2019-06-14 20:00:01.060)	60	79.6	58.2
(2019-06-14 21:00:01.060)	59.3	84.5	58
(2019-06-14 22:00:01.060)	65	92.7	57.9
(2019-06-14 23:00:01.060)	61.7	95.4	53
(2019-06-15 00:00:01.060)	52.5	72.9	51.4
(2019-06-15 01:00:01.060)	41.9	76	27.7
(2019-06-15 02:00:01.060)	34.6	59.5	25.7
(2019-06-15 03:00:01.060)	37.3	61.8	26.1
(2019-06-15 04:00:01.060)	47.1	64.1	34.7
(2019-06-15 05:00:01.060)	51.2	83.1	35.5
(2019-06-15 06:00:01.060)	48.4	71.7	36.7

A graph showing the LAeq, LAmx & LA90 1hour values in ML 1

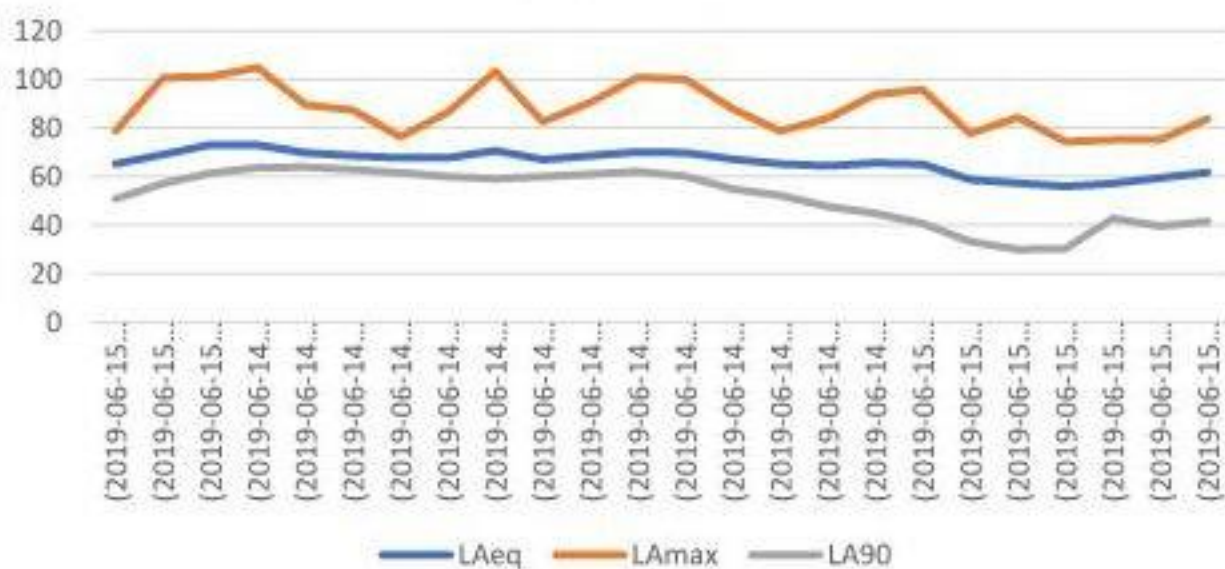


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15minute values in ML 1

Time Period	LAeq	LAmix	LA90
(2019-06-15 07:00:01.060)	65.4	78.9	50.9
(2019-06-15 08:00:01.060)	69.1	100.8	57.2
(2019-06-15 09:00:01.060)	73.2	101.4	61.5
(2019-06-14 10:00:01.060)	73.1	104.9	63.8
(2019-06-14 11:00:01.060)	69.8	89.5	64
(2019-06-14 12:00:01.060)	68.7	87.4	63.1
(2019-06-14 13:00:01.060)	67.7	76.4	61.6
(2019-06-14 14:00:01.060)	67.7	86.6	60.1
(2019-06-14 15:00:01.060)	70.7	103.5	59.1
(2019-06-14 16:00:01.060)	67	82.7	60
(2019-06-14 17:00:01.060)	68.7	90.6	61.1
(2019-06-14 18:00:01.060)	70.3	100.9	62.1
(2019-06-14 19:00:01.060)	69.9	100.1	60.2
(2019-06-14 20:00:01.060)	67.2	88	54.9
(2019-06-14 21:00:01.060)	65.3	78.8	52.4
(2019-06-14 22:00:01.060)	64.5	84.1	47.7
(2019-06-14 23:00:01.060)	65.6	94	44.9
(2019-06-15 00:00:01.060)	65.1	95.8	40.7
(2019-06-15 01:00:01.060)	58.9	77.8	33.4
(2019-06-15 02:00:01.060)	57.5	84.4	30.1
(2019-06-15 03:00:01.060)	56	74.5	30.3
(2019-06-15 04:00:01.060)	57.2	75.1	42.8
(2019-06-15 05:00:01.060)	59.5	75.4	39.7
(2019-06-15 06:00:01.060)	61.8	83.9	41.7

A graph showing the LAeq, LAmix & LA90 1hour values in ML 2



AIRTIGHT & NOISECHECK LIMITED ACOUSTICS TESTING

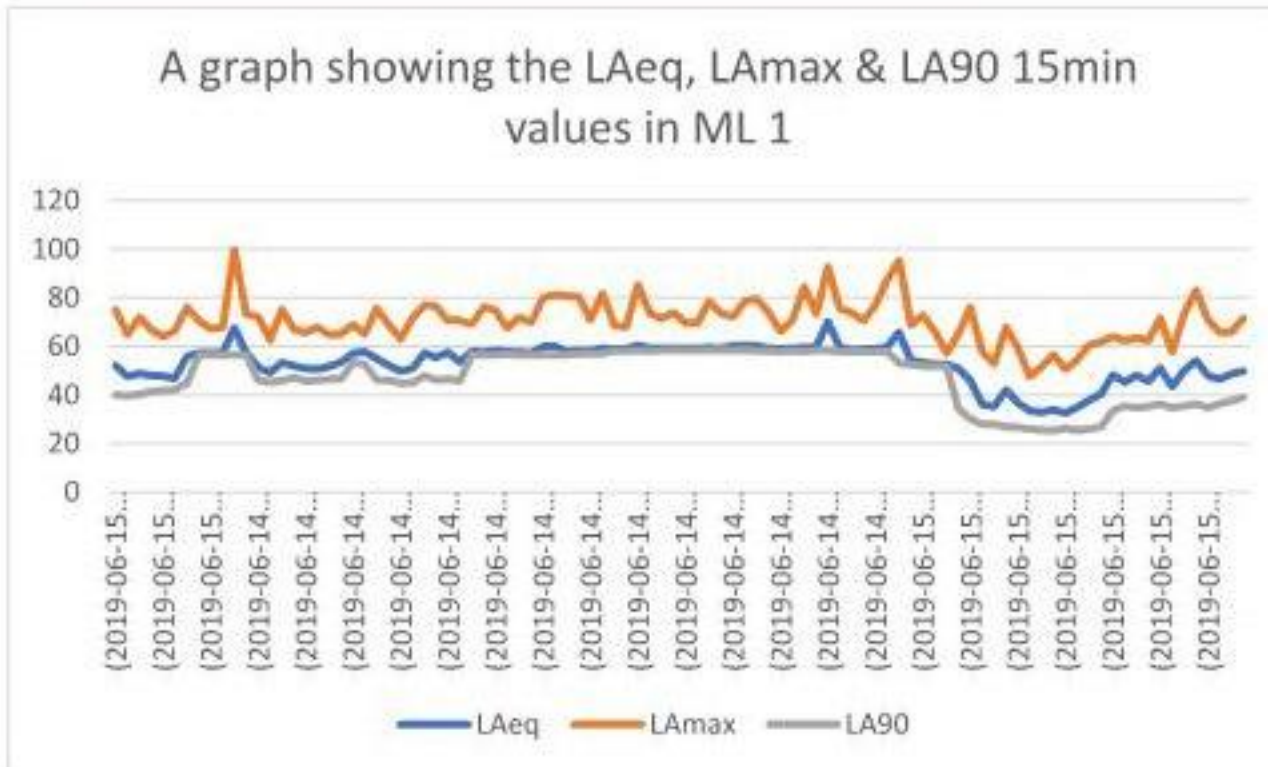
15minute values in ML 1

Time Period	LAeq	LAmx	LA90
(2019-06-15 07:00:01.060)	52.2	74.9	40.1
(2019-06-15 07:15:01.060)	47.6	65	39.6
(2019-06-15 07:30:01.060)	48.8	72	40.2
(2019-06-15 07:45:01.060)	48.1	66.7	41.5
(2019-06-15 08:00:01.060)	47.8	64	41.7
(2019-06-15 08:15:01.060)	46.8	66.3	42.2
(2019-06-15 08:30:01.060)	55.9	76.1	45
(2019-06-15 08:45:01.060)	57.2	70.5	56.4
(2019-06-15 09:00:01.060)	57.2	67.3	56.3
(2019-06-15 09:15:01.060)	57.2	67.9	56.4
(2019-06-15 09:30:01.060)	67.6	99.7	56.4
(2019-06-15 09:45:01.060)	57.4	73.3	56.4
(2019-06-14 10:00:01.060)	51.4	72.1	45.9
(2019-06-14 10:15:01.060)	49.2	62.5	45.2
(2019-06-14 10:30:01.060)	53.3	75.2	45.8
(2019-06-14 10:45:01.060)	52	67	47.3
(2019-06-14 11:00:01.060)	50.9	65.6	45.8
(2019-06-14 11:15:01.060)	50.6	68	46
(2019-06-14 11:30:01.060)	51.8	64.7	46.6
(2019-06-14 11:45:01.060)	53.5	65.1	46.7
(2019-06-14 12:00:01.060)	57.3	69	53.4
(2019-06-14 12:15:01.060)	57.8	65.1	52.7
(2019-06-14 12:30:01.060)	54.9	75.7	46.1
(2019-06-14 12:45:01.060)	52.2	69	46
(2019-06-14 13:00:01.060)	49.8	63	44.9
(2019-06-14 13:15:01.060)	50.9	71.6	45
(2019-06-14 13:30:01.060)	57.3	77	47.9
(2019-06-14 13:45:01.060)	55.4	76.6	46.1
(2019-06-14 14:00:01.060)	57.6	70.6	46.5
(2019-06-14 14:15:01.060)	53.6	70.5	45.8
(2019-06-14 14:30:01.060)	57.9	69.1	56.7
(2019-06-14 14:45:01.060)	57.6	76.1	56.4
(2019-06-14 15:00:01.060)	58.3	74.8	56.5
(2019-06-14 15:15:01.060)	57.8	67.6	56.7
(2019-06-14 15:30:01.060)	57.5	71.9	56.6
(2019-06-14 15:45:01.060)	57.2	69.7	56.5
(2019-06-14 16:00:01.060)	59.8	80.1	56.6
(2019-06-14 16:15:01.060)	60	81.2	56.3
(2019-06-14 16:30:01.060)	57.8	80.7	56.6
(2019-06-14 16:45:01.060)	58.2	80.6	56.9
(2019-06-14 17:00:01.060)	58.1	70.9	57.1
(2019-06-14 17:15:01.060)	59.2	81.7	57.1

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(2019-06-14 17:30:01.060)	59	68.7	58.2
(2019-06-14 17:45:01.060)	58.9	68	58.1
(2019-06-14 18:00:01.060)	60.3	85.3	58.2
(2019-06-14 18:15:01.060)	59.2	73.5	58.1
(2019-06-14 18:30:01.060)	59.2	71.4	58.2
(2019-06-14 18:45:01.060)	59.4	73.9	58.2
(2019-06-14 19:00:01.060)	59.1	69.5	58.2
(2019-06-14 19:15:01.060)	59.2	69.6	58.3
(2019-06-14 19:30:01.060)	59.5	78.4	58.4
(2019-06-14 19:45:01.060)	59.2	73.5	58.3
(2019-06-14 20:00:01.060)	60.2	72.1	58.4
(2019-06-14 20:15:01.060)	60.3	78.6	58.5
(2019-06-14 20:30:01.060)	60.2	79.6	58.1
(2019-06-14 20:45:01.060)	59.2	74.1	58.1
(2019-06-14 21:00:01.060)	58.9	66.2	58
(2019-06-14 21:15:01.060)	59.1	70.7	58.1
(2019-06-14 21:30:01.060)	59.5	84.5	58
(2019-06-14 21:45:01.060)	59.7	73.3	58.2
(2019-06-14 22:00:01.060)	70.1	92.7	58.3
(2019-06-14 22:15:01.060)	59.6	75.6	58
(2019-06-14 22:30:01.060)	58.5	73.8	57.7
(2019-06-14 22:45:01.060)	58.8	70.6	57.8
(2019-06-14 23:00:01.060)	59	77.1	57.8
(2019-06-14 23:15:01.060)	59.6	87.4	57.8
(2019-06-14 23:30:01.060)	65.9	95.4	53.2
(2019-06-14 23:45:01.060)	54.3	68.8	52.4
(2019-06-15 00:00:01.060)	53.3	72.9	51.9
(2019-06-15 00:15:01.060)	52.6	66	51.8
(2019-06-15 00:30:01.060)	52.6	57.3	51.8
(2019-06-15 00:45:01.060)	50.9	65.1	34.4
(2019-06-15 01:00:01.060)	45.9	76	30.1
(2019-06-15 01:15:01.060)	35.9	57.8	27.9
(2019-06-15 01:30:01.060)	35.3	52.9	28.1
(2019-06-15 01:45:01.060)	42.1	68	26.6
(2019-06-15 02:00:01.060)	36.8	59.5	26.6
(2019-06-15 02:15:01.060)	33.6	47.6	25.9
(2019-06-15 02:30:01.060)	32.9	51.6	25.6
(2019-06-15 02:45:01.060)	33.9	56.7	25.3
(2019-06-15 03:00:01.060)	32.6	50.5	26.4
(2019-06-15 03:15:01.060)	35	54.6	25.4
(2019-06-15 03:30:01.060)	37.8	60.5	25.9
(2019-06-15 03:45:01.060)	40.3	61.8	26.8
(2019-06-15 04:00:01.060)	48.3	64.1	33.5
(2019-06-15 04:15:01.060)	45.3	62.4	35.5
(2019-06-15 04:30:01.060)	48.1	63.5	34.7
(2019-06-15 04:45:01.060)	45.7	62.3	35.3

(2019-06-15 05:00:01.060)	51.1	71.7	36.4
(2019-06-15 05:15:01.060)	43.3	57.8	34.7
(2019-06-15 05:30:01.060)	50.1	73.3	35.4
(2019-06-15 05:45:01.060)	54.3	83.1	36.4
(2019-06-15 06:00:01.060)	48	70.9	34.7
(2019-06-15 06:15:01.060)	46.6	65.9	36.3
(2019-06-15 06:30:01.060)	48.6	65.8	37.6
(2019-06-15 06:45:01.060)	49.8	71.7	39



15minute values for ML 2

Time:	LAeq	LAmx	LA90
(2019-06-15 07:00:01.060)	63.8	72.7	48.4
(2019-06-15 07:15:01.060)	64.3	74.3	50.4
(2019-06-15 07:30:01.060)	66.3	78.9	53.5
(2019-06-15 07:45:01.060)	66.7	76	51.9
(2019-06-15 08:00:01.060)	66.5	76	55.3
(2019-06-15 08:15:01.060)	67.1	78.4	57.8
(2019-06-15 08:30:01.060)	67.2	79.2	56.3
(2019-06-15 08:45:01.060)	72.5	100.8	61.2
(2019-06-15 09:00:01.060)	67.9	78.3	59.5
(2019-06-15 09:15:01.060)	68.3	77.8	60.6
(2019-06-15 09:30:01.060)	78	101.4	62.7
(2019-06-15 09:45:01.060)	68.5	74.3	63.6
(2019-06-14 10:00:01.060)	77.3	104.9	64.5
(2019-06-14 10:15:01.060)	69.1	80.4	61.8
(2019-06-14 10:30:01.060)	69.6	79	63.3
(2019-06-14 10:45:01.060)	70.3	76.5	65.2
(2019-06-14 11:00:01.060)	69.8	77.2	64.4
(2019-06-14 11:15:01.060)	69.5	76	64
(2019-06-14 11:30:01.060)	70.6	89.5	63.4

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(2019-06-14 11:45:01.060)	69.1	76.8	64.3
(2019-06-14 12:00:01.060)	68.3	76.7	62.9
(2019-06-14 12:15:01.060)	68.9	84.8	63.5
(2019-06-14 12:30:01.060)	68.9	79.8	62.7
(2019-06-14 12:45:01.060)	68.6	87.4	63
(2019-06-14 13:00:01.060)	67.3	73.5	61.5
(2019-06-14 13:15:01.060)	68.3	76.4	61.5
(2019-06-14 13:30:01.060)	68.3	74.5	63
(2019-06-14 13:45:01.060)	66.9	73.4	61
(2019-06-14 14:00:01.060)	67.7	86.3	59.9
(2019-06-14 14:15:01.060)	68.9	84.8	62.7
(2019-06-14 14:30:01.060)	66.9	77.2	59.4
(2019-06-14 14:45:01.060)	67.2	86.6	59.6
(2019-06-14 15:00:01.060)	75.4	103.5	62.4
(2019-06-14 15:15:01.060)	67	78	60.5
(2019-06-14 15:30:01.060)	65.7	77.7	57.8
(2019-06-14 15:45:01.060)	66.1	83.2	58
(2019-06-14 16:00:01.060)	66.2	82.7	58.3
(2019-06-14 16:15:01.060)	66.6	80.5	60
(2019-06-14 16:30:01.060)	67.6	81.8	61.3
(2019-06-14 16:45:01.060)	67.6	74.5	61.9
(2019-06-14 17:00:01.060)	67.9	82.8	62.1
(2019-06-14 17:15:01.060)	67	80.2	59.2
(2019-06-14 17:30:01.060)	69.7	90.6	62.1
(2019-06-14 17:45:01.060)	69.5	86.7	61.8
(2019-06-14 18:00:01.060)	67.2	77.8	60.6
(2019-06-14 18:15:01.060)	73.7	100.9	63.8
(2019-06-14 18:30:01.060)	68.5	86	62.8
(2019-06-14 18:45:01.060)	68.1	75.6	62.1
(2019-06-14 19:00:01.060)	73.3	100.1	61.1
(2019-06-14 19:15:01.060)	68.1	83.3	61.4
(2019-06-14 19:30:01.060)	67.8	82.5	60
(2019-06-14 19:45:01.060)	67	79.6	57.9
(2019-06-14 20:00:01.060)	68	85.3	56.7
(2019-06-14 20:15:01.060)	66.5	77.4	55.3
(2019-06-14 20:30:01.060)	67.5	88	53.7
(2019-06-14 20:45:01.060)	66.7	87.6	54.4
(2019-06-14 21:00:01.060)	64.9	75.4	51.5
(2019-06-14 21:15:01.060)	65.4	75.6	53.6
(2019-06-14 21:30:01.060)	65.6	74.8	53.6
(2019-06-14 21:45:01.060)	65.3	78.8	51
(2019-06-14 22:00:01.060)	63.4	73.6	48.2
(2019-06-14 22:15:01.060)	65.8	84.1	50.8
(2019-06-14 22:30:01.060)	64.5	80.4	45.9
(2019-06-14 22:45:01.060)	64	83.4	47.3
(2019-06-14 23:00:01.060)	63.9	75.1	47.6

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(2019-06-14 23:15:01.060)	63.9	74.1	43.7
(2019-06-14 23:30:01.060)	62.5	74.8	44
(2019-06-14 23:45:01.060)	68.9	94	44.5
(2019-06-15 00:00:01.060)	69.2	95.8	43.7
(2019-06-15 00:15:01.060)	62.5	74.7	41.3
(2019-06-15 00:30:01.060)	61.9	80.4	40.7
(2019-06-15 00:45:01.060)	61.1	76.4	37.5
(2019-06-15 01:00:01.060)	60	74.5	38.1
(2019-06-15 01:15:01.060)	57.6	72.9	33.3
(2019-06-15 01:30:01.060)	58.8	72.7	33.1
(2019-06-15 01:45:01.060)	59	77.8	31.9
(2019-06-15 02:00:01.060)	56.8	73	30.7
(2019-06-15 02:15:01.060)	58.4	75.6	30.7
(2019-06-15 02:30:01.060)	57.3	78.7	30
(2019-06-15 02:45:01.060)	57.3	84.4	29.1
(2019-06-15 03:00:01.060)	55.4	74.2	30.7
(2019-06-15 03:15:01.060)	56.6	71.6	29.9
(2019-06-15 03:30:01.060)	56.3	73.9	30
(2019-06-15 03:45:01.060)	55.8	74.5	31.8
(2019-06-15 04:00:01.060)	55.9	72.9	44.1
(2019-06-15 04:15:01.060)	58.2	73.5	45.6
(2019-06-15 04:30:01.060)	59.1	75.1	43.3
(2019-06-15 04:45:01.060)	53.8	73.1	40.2
(2019-06-15 05:00:01.060)	57.9	74.1	39.5
(2019-06-15 05:15:01.060)	58.6	73.9	39.4
(2019-06-15 05:30:01.060)	60.8	75.4	40.3
(2019-06-15 05:45:01.060)	60	75.1	40
(2019-06-15 06:00:01.060)	58.4	74.2	39.9
(2019-06-15 06:15:01.060)	61.1	83.9	40.9
(2019-06-15 06:30:01.060)	62.5	78.6	43.3
(2019-06-15 06:45:01.060)	63.7	78.7	45.5

A graph showing the LAeq, LAmx & LA90
15minute values in ML 2

