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Acoustic Technical Briefing Note

Review of Noise Reports for Proposed fixed plant at the Utopia Village Development
With Addendum Following Applicant's Submission of Updated Noise Assessment Report.

For: Mr Simon Todd

Report Reference: B5539 2023-04-25 TBN V2

1. Introduction

1.1. This report describes the conclusions drawn from a review of the Environmental and Plant noise assessments prepared by Noico Noise Control for the proposed redevelopment at Utopia Village (Camden Council application reference: 2023/4757/P)

1.2. The purpose of the review was to establish whether the identified noise control criteria are appropriate and whether the proposed plant noise control measures are likely to be able to achieve the reduction necessary to achieve those criteria.

1.3. Acoustical Control Consultants (ACC) is an independent acoustic consultancy company. All of our acoustic consultants are qualified and experienced practitioners and are either Associate or Corporate members of the Institute of Acoustics. Acoustical Control Engineers Limited is our associated company specialising in engineered solutions to acoustic problems.

2. Scope

2.1. Review:

- Noico Noise Control Report No. 2301061-3_v1 Utopia Village Environmental Noise Report 10/2/2023
- Noico Noise Control Report No. 2301061-3 Rev C Utopia Plant Noise Assessment Report 3/11/2023

2.2. In particular

- Review the survey methodology, data, and locations chosen for the environmental noise survey.
- Review the application of local authority criteria.
- Review the assessment locations (façade of receptor) and the appropriateness of omitting calculations to garden receptors.
- Review the propagation calculations for the proposed external plant area and intake/exhaust locations at the most sensitive receptors.
- Review the attenuation requirements and the technical feasibility of the reductions required.
- Present the results of the review in the form of a technical briefing note.

3. Definitions

3.1. Acoustic assessments use various terms when describing different ways to evaluate sounds so some terms have much more specific meanings in the context of an acoustic assessment than they would in general language. For the purposes of this review the important terms are:

- Ambient sound level, $L_{Aeq,T}$ dB - defined in the standard as the time averaged totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far when present. The ambient sound can comprise the residual sound and the specific sound from the source being assessed.
- Specific sound level Ls = $L_{Aeq,T}$ - the average sound pressure level at the assessment location due solely to the operation of the specific source (or sources) under assessment
- Rating level L_{Ar} dB – the specific sound level corrected by the addition of penalties to reflect the increase in impact resulting from certain audible characteristics, such as tonality, impulsivity and modulation.
- Residual sound level, L_r = $L_{Aeq,T}$ - the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound'. The sources that contribute to the residual sound level are called the residual sound sources.
- Background sound level, $L_{AF90,T}$ dB - defined in the standard as the A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval T, quoted to the nearest whole number of decibels'. The sources that contribute to the background sound level are called the background sound sources.

3.2. The background and residual sound sources may be the same or different. To have an influence on the background sound level a source needs to be present for more than 90% of the time so even if a source is present for 89% of the time it may have no effect on the background sound level. Sources of any duration can influence the residual sound level depending. For example, cars passing close to the measurement location every few minutes in an otherwise quiet area could make a significant contribution to the residual sound level but no contribution to the background sound level.

4. Site description

4.1. Utopia Village is located in a residential area of Primrose Hill, it is an existing complex of buildings surrounded on all sides by established three and four storey homes.

4.2. Figure 1 shows the general area with the parts of Utopia Village understood to be the subject of the planning application highlighted in red. The figure also shows the measurement locations used in the Noico survey (1, 2 and 3) and the plant noise assessment locations used in the Noico plant noise report (A, B and C).

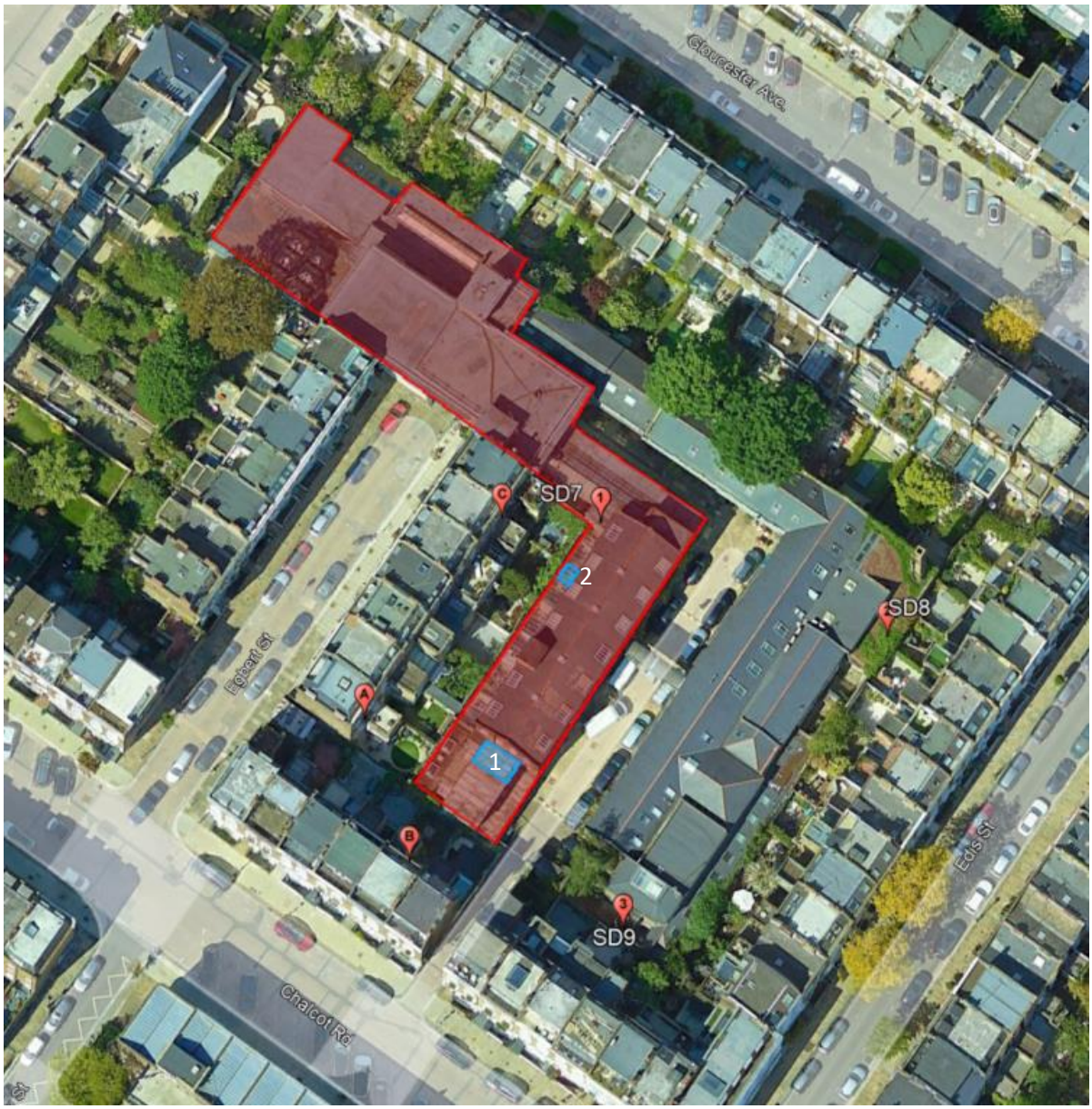

Figure 1 The area surrounding Utopia Village

4.3. The proposals involve the installation of several large HVAC plant items in two separate locations. In the reports these are identified as Plant Area 1 and Plant Area 2, these are identified in blue on Figure 1. The houses on the eastern side of Egbert Street are immediately to the west of plant areas 1 and 2. The houses on the northern side of Chalcot Road are immediately to the south of plant area 1.

4.4. Figure 2 shows plant area 1 as viewed from a rear window of one of the houses on Chalcot Road. It is understood that the plant will be located inside the sloping roofed space with a discharge vent roughly in the location shown be the grey sketched addition and an inlet grille in the area marked in purple.

Figure 2 The location of Plant Area 1 as seen from Chalcot Road

5. Observations on Environmental Noise Report

5.1. The environmental noise report describes an unattended background and residual noise survey undertaken at the site in January 2022 and the derivation of environmental noise limit criteria for the plant to be installed as part of the proposals. The criteria were derived from the results of the survey and a Camden Council requirement quoted from Appendix 3 of the local plan.

5.2. The council requirement is quoted as:

"it is expected that BS4142:2014 'Methods for rating and assessing commercial and industrial noise' will be used. For such cases a 'rating level' of 10dB below the background noise level (15dB if tonal elements are present) should be considered as the design criteria."

5.3. In general, the report is very thin on detail and does not meet the requirements of the "Information to be Reported" section of BS 4142:2014+A1:2019. This makes it difficult to fully assess the meaning and validity of the results presented. In addition to this general shortfall in detail there a several specific concerns which are set out below. Some of the points raised may appear pedantic but do add up to an overall concern about the conclusions reached.

Sections 1 and 2

5.4. No comments

Section 3

5.5. The selected measurement locations appear suitable for determining the background and residual sound levels incident on the rear facades of the first floors and above of the homes on Egbert Street and Chalcot Road. For assessment of night time sound this would be reasonable but amenity must also be protected during the daytime, particularly in garden areas. Many of the gardens of the houses close to the plant areas are at ground level and very well screened from background and residual sound sources. As a result, measurements made at garden level would be likely to result in lower levels than those measured.

5.6. Para 3.4 does not contain any information to support its claim that the weather conditions were suitable. The standard requires actual weather data to be provided. It not clear what the windspeed "*….was considered to be less than 5 m/s*" actually means. In a location like this ambient temperature and wind direction can have very significant effects on the propagation of sound from background and residual sources, particularly in the winter. This information is not presented.

5.7. Para 3.5 makes it clear that the survey was unattended. The standard requires that the nature of the sources background and residual sound is observed and described. The report sates '*it is expected that the ambient noise level was characterized by…*" and that no other significant sources were identified "*during the site visits"*. When exactly these visits where, other than presumably at the beginning and end of the survey, is not stated. Visits made during the day cannot be used to judge what sources are significant at night. The information on sources of sound is therefore insufficient to meet the requirements of the standard or make a judgment on the acoustic context of the location, particularly at night.

5.8. The results of the survey are only presented in the report in the form of a graph in Appendix 2.

5.9. No detailed description or explanation of these results is given in the report. For example, it is not explained why the measurements at location 2 (SD8 orange line) continue for a full day longer than those at location 1 (SD7 blue line). After around 07:00 on 28th January the results for location 3 (SD9 green line) appear to change very significantly with a significant increase and an apparent intermittency with a period of around an hour. No mention is made of this in the report and it is not stated whether this data was included in the statistical analysis.

Section 4

5.10. Paras 4.3 and 4.4 present results based upon a statistical analysis of the survey data (several days of unattended 15 minute measurements). The full results of the survey are only presented in the report in the form of a graph in Appendix 2 so it is not possible to verify the results of the statistical analysis.

5.11. A simple statistical analysis of all measurements during a period such as the day time will tend to be skewed towards the higher sound levels prevalent for the majority of the period and ignore the lower levels measured during the quieter, potentially more sensitive times such as early morning or evening.

5.12. No detailed description or explanation of the results is given in the report. Figure 3 shows a section of the graph in Appendix 2 of the report The solid lines are the measured 15-minute background sound levels and the dotted lines the measured 15 minute residual sound levels. It is not explained in the report why the measurements at location 2 (SD8 orange line) continue for a full day longer than those at location 1 (SD7 blue line).

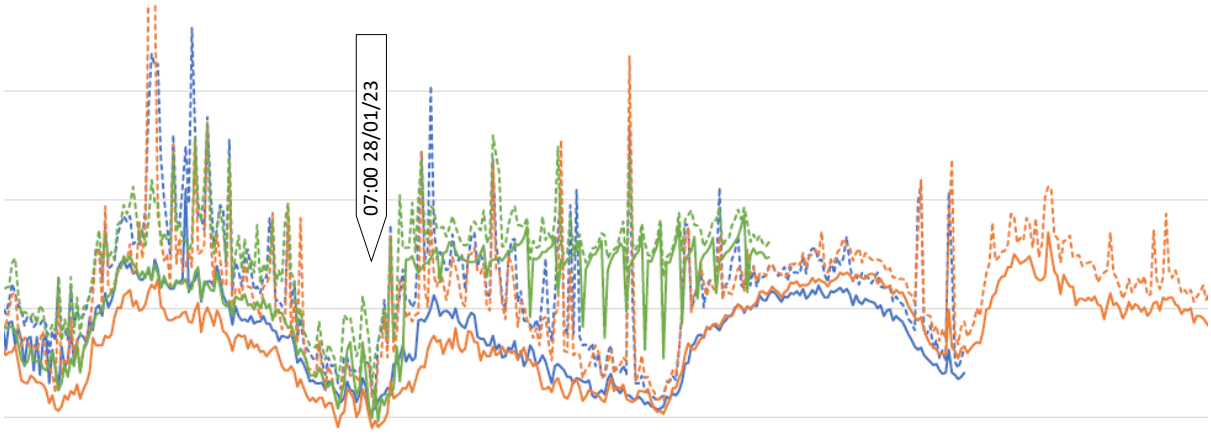

Figure 3 Section of Appendix 2 results graph

5.13. Also, after around 07:00 on 28th January (a Sunday) the results for location 3 (SD9 green line) appear to change very significantly with a large increase and an apparent intermittency with a period of around an hour. This could be due to a significant intermittent sound source or a malfunction of the sound level meter. No mention is made of this in the report, and it is not stated whether this data was included in the statistical analysis.

5.14. Table-2 of the report gives 'typical' and 'minimum' background sound levels derived from the histograms on the following pages. I have reviewed the histogram and broadly agree with the numbers in table-2 as far as they represent a correct analysis of the data. I do still have concerns about the data itself, as described above.

5.15. In general, the results suggest that the area around Utopia Village would be considered quiet in the context of an urban area. This is a reflection of the residential nature of the area and the fact that the area around Utopia Village is protected from the sound of vehicles on the nearby roads by the houses along them.

Section 5

5.16. Para 5.2 quotes the local authority blanket requirement. This requirement is typical for a London Borough and would be considered to go further than is strictly necessary to suitably protect amenity. By requiring the rating level to be more than ten 10 dB below background the policy effectively specifies that new plant should be inaudible at the receptors. This approach ignores the discussion of context that is central to the BS 4142 methodology.

5.17. Para 5.3 takes the council requirement and the survey results (as presented) to derive criteria for two receptor locations, the rear faces of Egbert Street and Chalcot Road. One minor point is that, in the note to the tables, these criteria are incorrectly defined "*as measured at 1 metre from the window*", they should be free-field levels at the location of the window.

5.18. The combined effect of the two comments above is that the criteria derived from the survey results are probably lower than strictly necessary to protect amenity. If the sound from the plant achieves the criteria the character of the sound is unlikely to be an issue as the background sources will provide masking.

5.19. In the note to the tables, it is stated that the criteria must be achieved cumulatively with all plant operating. This is correct.

6. Observations on Plant Noise Report

6.1. The plant noise report makes predictions of the sound expected to be emitted by the proposed plant and compares it with the criteria derived in the environmental report. These comparisons are used to derive sound attenuation requirements for each plant item. Outline details are given about how these requirements will be achieved.

6.2. As with the environmental report, the plant report is very light on detail, which again makes it difficult to fully assess the meaning and validity of the results presented. The key omission is sufficient detail of the proposed plant installations and the way in which the outlined mitigation measures are to be applied.

Section 1

6.3. Selection of assessment locations ignores daytime and evening amenity in gardens.

6.4. Para 1.3 makes a comment about plant associated with the '*eastern end of the site*'. The comment mentions that this plant had been decommissioned prior to the survey and appears to claim that this means that the survey underrepresented the background sound levels in the area. This is wrong for several reasons. Building services plant is often intermittent in operation and therefore has little impact on the background sound level, even if it does contribute to the residual sound level. The old plant may have been in different locations and hence impact different receptors (no details are given). Regardless of that, the residents have a reasonable expectation that the levels they have experienced for at least a year from the background that they have come to expect.

6.5. In fact what the presence of other plant (or the possibility of it) on the Utopia site means that the sound from the new plant should be assessed cumulatively with the existing plant against the absolute background not separately from it or using it as part of the background.

Section 2

6.6. Para 2.3 and the notes to the associated tables state that the criteria apply outside *"the windows of the nearest affected residential property"*. This may be appropriate at night but during the day there is also a requirement to protect the amenity of the garden areas. Many of which are considerably closer to the sound sources (though they will benefit from screening by the building edges in most cases). The omission of the gardens is therefore a serious flaw in the assessment.

Section 3

6.7. Paras 3.1 to 3.1.2 identify the receptors likely to be most impacted noise from plant areas 1 and 2. The text ignores the possibility of certain areas being impacted by both plant areas (for example around the middle of Egbert Street). Figure 2 shows how 'hemmed-in' the area around the plant will be, with the surrounding buildings creating multiple reflecting surfaces that are likely to result in propagation of the sound to some of the more remote and apparently screened receptors.

6.8. Paras 3.2 to 3.2.2 give some details of the plant to be installed in areas 1 and 2. Para 3.2.1 describes the large heat recovery unit to be installed in area 1. A total airflow rate of 67.89 m^3/s is quoted along with a sound power level of 101 dB L_{WA}. Both of these are very high for a source that is to be located within a few metres of residences. The inlet air for the unit is to be drawn in through an opening in the eastern façade of the building (perhaps in the location marked in purple on Figure 2 and the discharge via what is described as "*a newly formed ventilation opening*" (perhaps in the location marked in grey). Air passing through an opening at high velocities will create flow generated sound. Vents so close to residential areas will need relatively low velocities, ideally much less than 5 m/s. To achieve this with a volume flow of 68 m^3/s both the inlet and outlet opening would need a free open area of more than 14 m^2. The vents illustrated on Figure 2 have an area of around 3 m^2 which would give a velocity of around 23 m/s, which would result in unacceptable levels of flow generated noise.

6.9. No details are given of how the plant room in which the unit would be installed is to be configured and constructed.

6.10. Para 2.3 and the notes to the associated tables clearly state that the criteria apply to all plant cumulatively yet the calculations in Section 3.3 and 3.4 identify required sound reductions by comparing predicted contributions for each source individually with the criteria. More than one source (or transmission route) contributes at each receptor so, if all pf the plant items were reduced by the amounts identified in Section 3, the total cumulative levels would exceed the criteria. So the reductions listed are not sufficient.

6.11. The calculations also do not take sufficient account of the multiple reflections that are likely to occur within the confines of the space created by the surrounding buildings. This will have led to underestimates of plant sound levels and consequently reductions that are not sufficient.

6.12. Calculations are only made to the façade locations. This is only suitable during the night. Calculations are also needed to the garden areas to assess Impact during the daytime.

Section 4

6.13. As no details have been given of the proposed plant layouts it is not clear exactly how the noise control measures listed in Section 4 will be applied and what the combined benefits of the plant room linings, enclosures and attenuators are expected to be.

6.14. I have undertaken some basic calculations based on the noise control performance information provided in the report and my estimate of how it should be applied to the plant sound power levels. I found that the cumulative noise from all of the sources exceeded the daytime criteria at all of the receptors with the attenuated sound being dominated by the low frequency 63 Hz octave band.

6.15. The attenuator insertion loss performances given in Paras 4.1 to 4.1.2 are extremely high and unlikely to be achievable in practice, particularly at low frequencies (63 Hz, 125 Hz). Acoustical Control Engineers' extensive attenuator test data and over 50 years' experience of the design, manufacture and installation of attenuators indicates that the stated low frequency performance will not be achieved in practice. This means that not only will the overall sound level criteria be exceeded, but the resultant overall sound from the plant would be dominated by low frequency sound, making it more intrusive than would otherwise be the case.

6.16. It is very likely that the volume flow rates that the plant is designed to achieve will result in flow velocities that will create high levels of flow generated sound and undermine the performance of the attenuators. To avoid this the attenuators, ducts and openings will need to be very large.

6.17. Para 4.1.2 states that the night time requirement can be met with a night time set back mode achieving a sound power reduction of 6 dB L_A. However, this is incorrect as the night time criterion at Chalcot Road is 9 dB L_A lower than the daytime criterion. If, as I estimate, the current proposal will not meet the daytime requirements then a 6 dB L_A night time set-back mode would be insufficient to achieve the criteria at either location.

6.18. My conclusion is therefore that the proposed measures are unlikely to achieve the criteria.

7. Conclusions and Recommendations

7.1. There were several issues with the environment noise report though the net effect of these was to derive plant noise limit criteria more onerous than necessary to protect the amenity of the surrounding residents.

7.2. The plant noise report did not contain sufficient information to demonstrate either whether or how those criteria could be achieved.

7.3. The calculations had the following errors and omissions:

- The sources and transmission routes have been assessed individually rather than cumulatively as the criteria require.
- Insufficient allowance has been made in the calculations for reflection of sound between the numerous buildings surrounding the plant and sensitive receptor areas.
- No assessments have been made for garden areas, which are key receptors during the daytime.

7.4. All of these points would create an underestimate of the specific sound levels at the receptors and hence the required sound reductions identified in the report appear to be insufficient.

7.5. The details of the proposed noise control are insufficient to assess whether they are capable of achieving the required reductions. Based on the information that is provided in the report the following observations were made.

- The quoted attenuator performances are unlikely to be achievable in practice, particularly at low frequencies. The attenuators necessary to achieve the reductions required once the calculations have been corrected are likely to be impracticably large.
- The high flow volume flow rate for the plant in area 1 is very likely to result in flow velocities that will create flow generated noise either within the system or at the points of discharge/intake. No explanation of how this will be addressed has been given and the vent sizes required to achieve appropriate velocities appear unlikely to be possible.

Mike Hewett MIOA
Principal Acoustician
13th December 2023

8. Addendum Following Submission of Updated Proposals by the Applicant - 24th April 2024

8.1. In March 2024 the applicant submitted revised plans and an updated acoustic assessment. ACC have reviewed the updated design and the Noico Environmental Noise Survey & Plant Noise Assessment Report dated 19th March 2024. This addendum provides the findings of that review.

Sections 2 and 3

8.2. Sections 2 and 3 describe an additional residual sound survey undertaken by Noico between 10th January and 15th January 2024 and use the results of this and other surveys completed by others to revise the background sound levels used to assess the sound from the proposed plant. The information provided still falls far short of that necessary to meet the requirements of BS 4142.

8.3. There appears to be a more in-depth analysis of the true background sound level, which has resulted in the use of lower representative levels than previously.

8.4. Although not specifically stated in the text, the representative background sound levels selected based on this analysis were 38 dB $L_{A90,T}$ during the day and 31 dB $L_{A90,T}$ at night. These were taken from the results of a survey conducted by Syntegra. The levels chosen are typical of a quiet residential area in a wider city environment.

Section 4

8.5. Section 4 derives sound level criteria for the proposed plant based on two different sets of local authority requirements. The first set of criteria are derived from the council's sated requirement that the BS 4142 rating level should be 10 dB below the background sound level. The second set are a blanket 'minimum standard' of 30 dB $L_{Aeq,15min}$. It is stated that the minimum standard is applied by the council for 'practical reasons'.

8.6. The resulting criteria are given in a table on page 4. All of the criteria are given in terms of $L_{Aeq,15min}$, this is incorrect as the council's requirement for the first set of criteria is "rating level" (L_{Ar}), this is not the same. The rating level should be derived from a 1-hour L_{Aeq} during the daytime and evening not a 15-minute one. Rating levels also take into account the potential for character corrections and, although such a correction is extremely unlikely for a sound 10 dB below background, the units used in the table are still incorrect and indicates an apparent lack of understanding of the standard.

8.7. In Para 4.3 the 'minimum requirement' is expressed in term of $L_{Aeq,15min}$ not rating level. If this is what the council actually said then there is cause for concern. The night time background sound level is only 1 dB higher than the minimum standard, so it is possible that the character of the sound might attract a character correction, which would result in a rating level higher than 30 dB. If the council actually specified a rating level and Noico have misinterpreted this,

or if the council intended for the minimum standard to be a rating level and used the $L_{Aeq,15min}$ metric in error, then there is a potential for a problem if the sound is particularly distinctive, intermittent or contains audible tones. This could result in a rating level that exceeds the level at which there may be an unsuitable impact on amenity.

8.8. However, apart from the application of the minimum standard at night, the plant noise limits derived from the results and analysis (table after para 4.4) are low enough to protect amenity in the context of the location. In fact, we would consider that those derived by subtracting 10 dB from the background sound level are significantly lower than necessary, 28 dB L_A during the day and 21 dB L_A at night would be effectively inaudible.

Sections 5 and 6

8.9. Sections 5 and 6 merely identify receptors and give some basic information about relative elevations, propagation distances etc. We have not identified any serious issues with the figures stated. Although no information is given on exactly how that information was subsequently used so we are not able to comment on that.

Section 7

8.10. Section 7 gives details of the three heat pumps to be installed in the "newly formed" plant room and gives the manufacturer's claimed sound power output. Only one set of values are given, with no separate date for inlet, outlet and casing breakout.

8.11. It is stated that each of the three heat pumps has a "total air flow" of 13.4 m^3/s, giving a total of 40.2 m^3/s.

8.12. The notes state that air will be drawn into the new plant room via an opening at ground level in the east elevation and discharged via a newly formed opening in the roof. It is also stated that airborne breakout noise will be controlled by adding sound insulation to the walls and roof, although no details are given.

8.13. The original proposal for the discharge opening was sketched by ACC as shown on Figure 2 above. However, the drawings submitted at the same time as the updated plant acoustic assessment (22029-PE0020-F, 22029-PE0010-G , 22029-PE0020-G , 22029-PE0010-D, 22029-PD0013-B, 22029-PV0041-A) do not show this. An example is given in Figure 4 below. They show the ground level air inlet and a flat solid roof, with no outlet identified. It is therefore not possible to verify the distances and orientation from the discharge to the receptors.

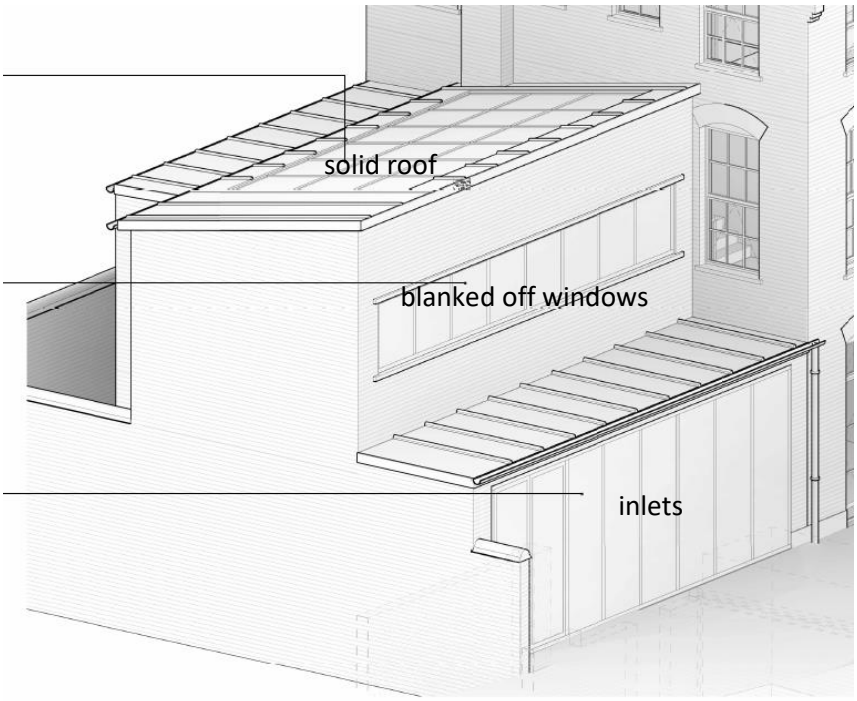

Figure 4 Latest proposal for plant room

Section 8

8.14. Section 8, sets out calculations predicting the sound level at the various receptors due to the inlets and discharges of the chillers without any additional attenuation and then uses these predictions to identify the sound reductions that would be required to meet the criteria.

8.15. The single value sound power provided in Section 7 is applied to both the inlet and outlet, although the reasons for this are not given. For the discharge an allowance is made for plenum losses, but no details are given as to how this was derived. For the inlet there are allowances for losses through the coils and due to plant room absorption, but again no details are given.

8.16. There are also issues with the distances applied in some of the calculations, particularly those related to the gardens. For example in section 8.1.2, which gives the predictions for the rear garden of No.10 Chalcot Road, the distance from the inlet to the receptor is given as 11 m, whereas the actual closest usable part of the garden is only 2 m from the inlet.

8.17. There are no calculations of airborne breakout noise and no mention of potential structure/ground borne transmission.

8.18. Each calculation includes a 5 dB “precautionary adjustment in case of tonal content”, in spite of the criteria being expressed in terms of $L_{Aeq,15min}$. It should also be noted that if the sound were to be reduced to 10 dB below background, as required for the ‘standard’ criteria, then the characteristics would not be audible as they would be masked by the residual sound.

Therefore, the application of the 5 dB character correction in the way that it has been applied has resulted in required reductions 5 dB greater than necessary. When considering reduction to meet the 'minimum' criterion then the corrections may have a relevance, but possibly not large enough to merit 5 dB. Again, this shows a fundamental lack of understanding of the standards being applied.

8.19. All of the results are significantly in excess of both sets of criteria, so some of the reductions required to meet the criteria are very large.

8.20. In section 8.3 the report summarises the reductions required to meet both the council's 'minimum' criterion and the survey derived 'standard' criteria. The report does not state which of the criteria the applicant intends to achieve and/or use as the basis of the design.

Section 9

8.21. ACC has several very serious concerns about Section 9, which purports to show how the 'design noise criteria' will be achieved. As mentioned above, it is not stated to which criteria this is referring.

8.22. Slightly more detail is given than in the previous report on the proposed noise control measures, but there are still no actual calculations given to demonstrate how, or even that, these measures will actually work. There are still only broad statements about compliance, such as "will achieve a maximum" or "This will clearly meet", with no workings shown and no actual predicted sound levels.

8.23. As the new survey-based criteria are lower than in the previous assessment the required reductions are also larger. ACC were skeptical about whether the reductions given in the previous version could be achieved in practice, so ACC are even more skeptical that the new ones can be achieved.

8.24. A single attenuator 3.8 m long is proposed for the discharge air path. It is claimed that this will give an insertion loss of 50 dB at all frequencies between 250 Hz and 4 kHz. ACC simply does not consider that this is achievable. No information is given about airway sizes/ratios for the proposed attenuator but, in order to achieve a suitable discharge velocity, it is likely that the attenuator will require a cross sectional area of more than 30 m^2. It is unclear where an attenuator of such a size would fit within the building even if it did work.

8.25. The situation with the inlet is similar both in terms of claimed performance and dimensions. The drawings submitted with the revised application appear to imply that the active area of the inlet is around the size of a single door. If this is the case, then the inlet air velocities will be extremely high, which will result in flow generated noise.

8.26. Acoustic absorption data is given for the lining to the plant room and plenum. But there are no dimensions or details of orientation so this data cannot be used to determine any meaningful attenuation values.

8.27. No information at all is given on the plant room sound insulation mentioned in Section.

Summary

8.28. The report is not an assessment of the impact of the sound that will be emitted by the proposals. Predictions are given for a plant installation without noise control and compared with two different criteria. Some details are given of potential noise control, but no predictions have been made of the sound levels that will result from its implementation. Therefore, there is no assessment of what the impact of that sound will actually be and no demonstration that the criteria will, or can, be met.

8.29. There were several issues with the environmental acoustic surveys and analysis, although the criteria derived from them are more onerous than necessary to protect the amenity of the surrounding residents. The same cannot be said for the criterion derived from the Councils 'minimum' requirement, which could result in unsuitable impacts on amenity at night. It is unclear which of the two types of criteria the applicant is proposing should apply to the proposals.

8.30. The calculations of the sound levels without noise control had the following errors and omissions:

- Only the air source heat pump plant room is considered rather than all plant cumulatively as the criteria require.
- There is no calculation of airborne building breakout sound or consideration of structureborne energy.
- Insufficient allowance has been made in the calculations for reflection of sound between the numerous buildings surrounding the plant and sensitive receptor areas.
- There is no information on the location, dimensions or orientation of the air discharge so no conclusions can be drawn about propagation path losses.

8.31. These points may have created an underestimate of the specific sound levels at the receptors and hence the required sound reductions identified in the report appear to be insufficient.

8.32. The details of the proposed noise control arrangements are insufficient to assess whether they are capable of achieving the required reductions. In fact ACC is of the opinion that they cannot. Based on the information that is provided in the report the following observations were made.

- The quoted attenuator performances are unlikely to be achievable in practice with single attenuators, particularly at low frequencies. Even based on the claimed performance, the attenuators are likely to be impracticably large.
- The high volume flow rate for the plant is very likely to result in flow velocities that will create flow generated noise either within the system or at the points of discharge/intake.

No explanation of how this will be addressed has been given and the vent sizes required to achieve appropriate velocities appear unlikely to be possible.

Mike Hewett MIOA
Principal Acoustician
25th April 2024