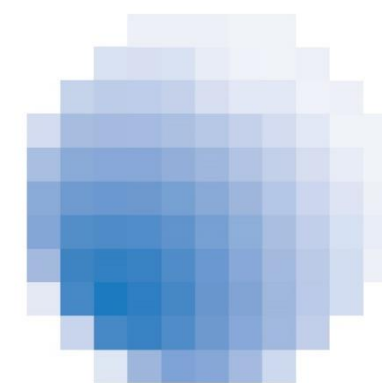




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NMGH Multistorey Car Park
Crumpsall, Manchester

Environmental Noise Impact Assessment (S3 for review & comment)

20200-SOL-NM110-ZZ-RP-Z-0002 P01

24 June 2022

PROJECT: NMGH Multistorey Car Park
Manchester
Environmental Noise Impact Assessment
(S3 for review & comment)

CLIENT: Morgan Sindall Construction &
Infrastructure Ltd
6th Floor, Anchorage 2
Manchester
M50 3YW

DOCUMENT
REFERENCE: 20200-SOL-NM110-ZZ-RP-Z-0002 P01

SIGNED: 
BRIAN HORNER

CHECKED: 
SIMON FERENCZI

DATE: 24 June 2022

SUMMARY

Sol Acoustics Ltd ("Sol") has been appointed to provide an environmental noise impact assessment for the proposed new multistorey car park which is to be sited at the North Manchester General Hospital, as located off Delaunays Road in Crumpsall, Manchester, M8 5RP.

This acoustic assessment has been based upon the results of an environmental noise survey conducted by Sol between c.11:15 hours during Wednesday 16 June and c.11:00 hours during Thursday 17 June 2021. Based upon the findings of the noise survey, maximum environmental noise level limits have been specified for all externally sited building services plant and equipment in accordance with the requirements of Planning Condition 17 of the December 2020 Planning Consent (Planning Application number: 128905/FO/2020).

The recommended minimum acoustic specification for all internal walls, doors and glazed screens is also provided.

This report has been updated in June 2022 to include a review of the proposed mechanical services equipment to be installed within the car park. Recommendations for controlling mechanical services noise and vibration from the proposed building services equipment is provided herein.

Based upon the details received of the externally sited plant, including coolers external louvres and etc., the predicted Rating Level from the Development at the surrounding noise sensitive receptors meets the requirements of Planning Condition 17.

Please refer to the main report and appendices for further information.



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1 INTRODUCTION

Sol Acoustics Ltd (“Sol”) has been commissioned by Morgan Sindall Construction & Infrastructure Ltd (“MS”) to provide an environmental noise impact assessment for the proposed new multistorey car park which is to be sited at the North Manchester General Hospital, as located off Delaunays Road in Crumpsall, Manchester, M8 5RP (the “Facility”).

This report provides the following information:

- Details of the nearest pre-existing housing around the site, (i.e. noise sensitive receptors, NSRs), which is most likely to be affected by environmental noise arising from building services plant and/or processes that are associated with the operation of the Facility.
- Noise Rating level limits for all building services plant and equipment, that is to be achieved both within the Facility and also at external, off-site noise sensitive receptors.
- Recommended minimum acoustic performance specifications (i.e. minimum required sound insulation performance) for all internal walls, doors, and glazed screens.
- A review of the proposed mechanical services equipment as proposed to be installed within the car park.
- An environmental noise impact assessment in accordance with the requirements of Planning Condition 17.

2 DESCRIPTION OF SITE

2.1 General Overview of the Site and Surroundings

The Facility is to be sited within the wider North Manchester General Hospital, as located off Delaunays Road in Crumpsall, Manchester, M8 5RB. Currently on the site is the Limbert Education Centre. However, this building is proposed to be demolished as part of the wider redevelopment of the hospital.

Excluding any exiting hospital buildings which are to be demolished as part of the redevelopment, the nearest pre-existing noise sensitive receptors shall be hospital buildings which are to be retained and which are as located c.15 metres distance to south of the Facility.

The nearest *residential* dwellings to the Facility are as follows:

- Housing on Delaunay Road, located c.250 metres distance to the north west of the Facility
- Housing on Birch Road, c.320 metres distance to the west
- Housing on Magna Drive, c.400 metres distance to the south
- Housing on Longshaw Close, c.320 metres distance to the south
- Housing on Wallbrook Drive, c.260 metres distance to the east

An aerial photograph of the Facility in relation to the nearest identified noise sensitive premises is shown in Figure 1.

2.2 Development Proposals

A new build six-storey car park is proposed to be constructed on site. The car park provides ground floor cycle storage, changing facilities, WCs and shower facilities, and the Parking Manager's Office.

The Client has confirmed that the Facility is not aspiring to achieve BREEAM accreditation, and Sol is informed that there are no Employers' Requirements which specifically relate to acoustics.

The proposed site plan is presented in Figure 2. The proposed ground floor site plan is shown in Figure 3.



Figure 1: Aerial photograph of the site and the surroundings (Google 2022)

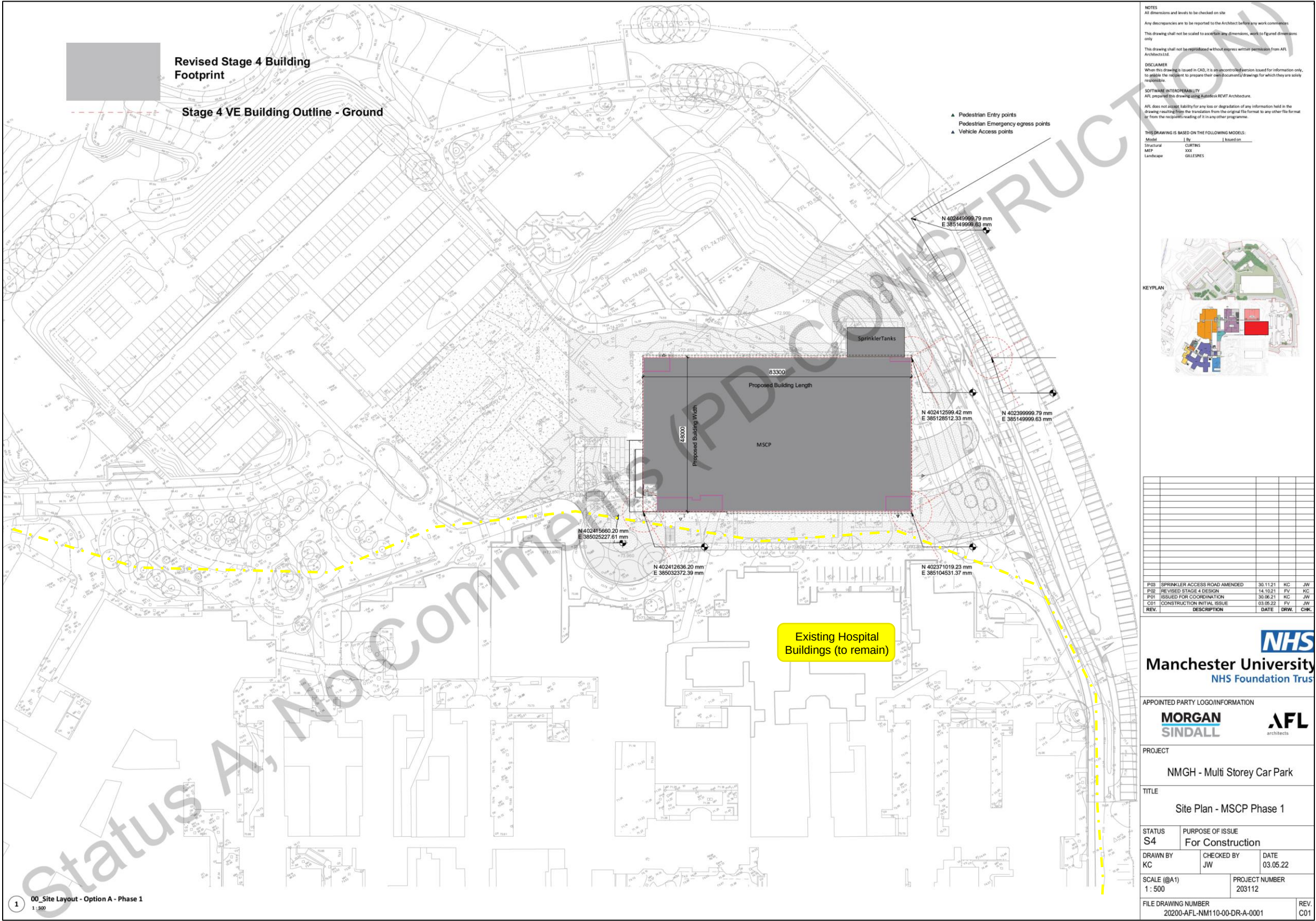


Figure 2: Proposed site plan

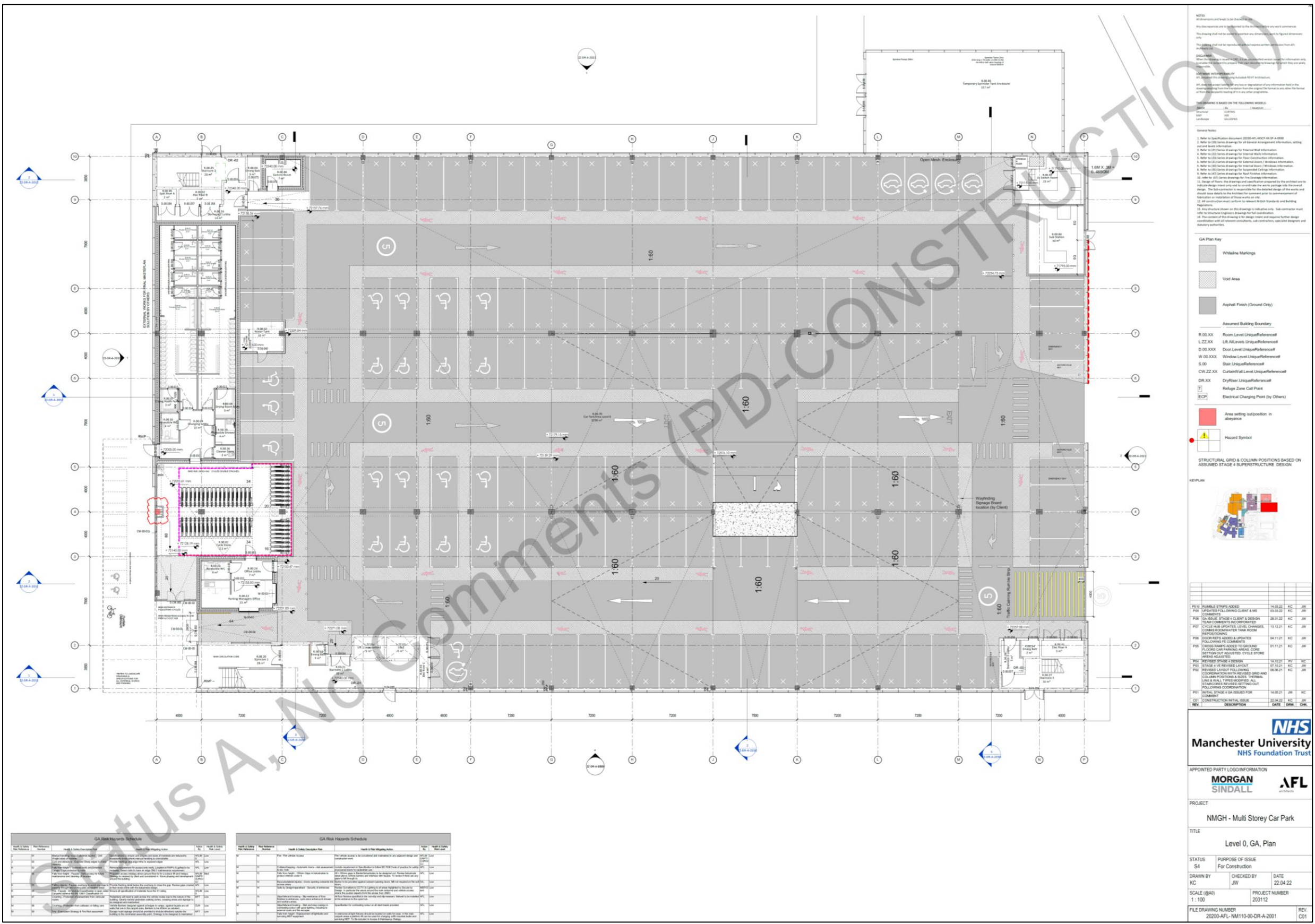


Figure 3: Proposed ground floor plan

3 ENVIRONMENTAL NOISE PERFORMANCE SPECIFICATION REQUIREMENTS

3.1 Environmental Noise Egress from the Facility

Planning permission for the Facility was granted by Manchester City Council on 16 December 2020 (Planning Application number: 128905/FO/2020). Condition 17 relates to noise and states the following:

'... 17) Notwithstanding the noise impact assessment stamped as received by the City Council, as Local Planning Authority, on the 16 December 2020, (a) Prior to the first use of the MSCP and cycle hub hereby approved, details of any externally mounted ancillary plant, equipment and servicing shall be submitted for approval in writing by the City Council, as Local Planning Authority. For the avoidance of doubt, externally mounted plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

(b) Prior to the first use of MSCP and cycle hub, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met. In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ.

Reason - To minimise the impact of plant pursuant to policies SP1 and DM1 of the Manchester Core Strategy (2012) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995) ...'

Planning Condition 17 refers to the noise impact assessment report as issued by RSK, as dated 11 December 2020 (document reference: 298207-RSK-RP-002-(02)). Summary details and results from the RSK environmental noise survey are summarised and provided Sections 4.2 and 5.2 of this report.

3.2 BS 4142: 2014+A1: 2019

British Standard BS4142: 2014+A1: 2019: 'Method for rating and assessing industrial and commercial sound' (BS4142) is intended to be used to assess environmental noise of an industrial nature, which includes sound from fixed installations, which comprise mechanical and electrical plant and equipment.

The procedure contained in BS 4142: 2014+A1:2019 for assessing the impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive premises, with the "Background Sound Level". Where the noise contains attention attracting characteristics (i.e. acoustic features) such as tonal, impulsive, intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level."

BS4142 states that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level and the context in which the sound occurs:

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are typically defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

4 ENVIRONMENTAL NOISE SURVEY

4.1 Basis of Assessment – Sol

In order to inform this acoustic assessment, an environmental noise survey has been conducted by Sol between c.11:15 hours during Wednesday 16 June and c.11:00 hours during Thursday 17 June 2021. The purpose of this survey was to determine the prevailing pre-existing Ambient and Background Sound Levels at the nearest noise sensitive premises to the Facility, as during a typical weekday, daytime and night time period for environmental noise benchmarking and subsequent acoustic impact assessment purposes.

The environmental noise survey consisted of a single environmental noise measurement position, as follows:

- **Noise Monitoring Position 1:** Mast-mounted microphone and weather station sited at c.3 metres above local ground level, c.30 metres distance to the north of the existing hospital buildings (which are to remain). The noise climate at this position was dominated by noise from the adjacent car park and noise from distant, existing mechanical plant associated with the existing hospital buildings (which is to remain).

The noise survey was carried out using Type 1 Precision Grade noise monitoring equipment, and the complete measuring systems were field calibrated immediately prior to and following the noise survey period. (Full details of the noise monitoring systems are retained on file by Sol, including traceable calibration records; these are available for review if needed).

Meteorological data was recorded at Noise Monitoring Position 1 for the duration of the noise survey, as using a Professional Grade Vaisala “WXT520” weather station. The prevailing weather conditions remained favourable for the full survey period for the purposes of environmental noise assessment. Average wind speeds remained below 1ms^{-1} for the duration of the survey.

Notwithstanding the weather conditions recorded, the microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with bird spike.

4.2 Basis of Assessment – RSK

Full details of the RSK survey are provided within their noise impact assessment report dated 11 December 2020 (document reference: 298207-RSK-RP-002-(02)). The environmental noise survey was conducted between Friday 25 September and Wednesday 30 September 2020. The approximate locations of the noise measurement positions as adopted by RSK are shown in Figure 1.



5 ENVIRONMENTAL NOISE SURVEY RESULTS

5.1 Environmental Noise Survey – Sol Acoustics

Table 1 provides a basic summary of the free field environmental noise levels measured at Measurement Position 1:

Date	Daytime (07:00 Hours – 23:00 Hours)			Night Time (23:00 Hours – 07:00 Hours)		
	dB L _{Amax}	dB L _{Aeq,15min}	dB L _{A90,15min}	dB L _{Amax}	dB L _{Aeq,15min}	dB L _{A90,15min}
16 June 2021	49 – 83	45 – 61	43 – 44	46 – 63	44 – 49	43 – 45
17 June 2022	60 – 86	47 – 68	43 - 47	-	-	-

Table 1: Summary of typical, measured environmental noise levels, broadband terms

Appendix A provides further information and a full summary of the measurement data.

5.2 Environmental Noise Survey – RSK

Table 2 provides a summary of the representative background sound levels of the RSK environmental noise survey (as per Table 4.5 of the RSK report):

Measurement Location	Representative Background Sound Level, dB L _{Af90,15mins}		
	Commercial Daytime (07:00 Hours – 19:00 Hours)	Evening (19:00 Hours – 23:00 Hours)	Night Time (23:00 Hours – 07:00 Hours)
UL1	52	40	36
UL2	43	42	41
UL3	39	34	30
UL4	44	41	37

Table 2: Summary of representative background sound levels (as per Table 4.5 of the RSK report)



6 INTERNAL SOUND INSULATION

6.1 Internal Partitions

The *recommended* minimum airborne sound insulation performance to be provided by all internal partitions is shown in Appendix B. It shall be noted, however, that the stated acoustic performances are *recommended targets only*. There are no statutory requirements nor applicable Employer's Requirements to achieve the acoustic performance stated for any internal partition.

Please note that there are two performance parameters stated in Appendix B for each partition types:

- The $D_{nT,w}$ parameter is the on-site performance requirement and it is required to be achieved *in situ*. Note, however, that corridor walls containing a door are not required to achieve a minimum performance on site, as in practical terms the overall performance achieved will be largely dictated by the acoustic performance provided by the doorset.
- The R_w parameter is the *laboratory tested* acoustic performance, as under ideal conditions; this is always higher than the corresponding on site $D_{nT,w}$ performance. This is due to several factors including penetrations, pattressing and junction detailing, on-site workmanship, as well as other room factors such as physical room dimensions and reverberation time. To avoid confusion, it is the R_w parameter only that should be included on the specifications submitted to drywall suppliers.

Table 3 provides example drywall and masonry wall constructions capable of meeting the recommended airborne sound insulation performances as shown in Appendix B:

Rating	Minimum Recommended On-Site Sound Insulation Performance, dB $D_{nT,w}$	Minimum Recommended Laboratory Sound Insulation Performance, dB R_w	Example Drywall Construction		Example Masonry Construction
1	35	40	1 x 12.5mm BG SoundBloc board each side of 70mm metal studs (97mm).		100mm thick fair-faced blockwork with a minimum density of $\geq 1350\text{kg/m}^3$. Overall construction depth of 100mm.
2	40	50	2 x 12.5 mm wallboard on 70mm C-studs with 50mm BG APR1200 insulation (97mm)		140mm thick fair-faced blockwork with a minimum density of $\geq 1350\text{kg/m}^3$. Overall construction depth of 140mm
3	45	53	2 x 12.5mm BG SoundBloc on single 70mm C-studs with 50mm BG APR1200 insulation (122 mm)		

Table 3: Airborne sound insulation performance of internal partitions

6.2 Internal Doors

There is no requirement for any acoustic related internal doorsets on this project.

6.3 Internal Glazed Screens / Vision Panels

The recommended minimum sound insulation performances for the proposed internal glazed screens are provided in Table 4:

Location	Recommended Minimum Laboratory Sound Insulation Performance, dB R_w	Possible Glazing Configuration (For Costing Purposes Only)
Parking Manager's office – Car Park	35	10mm glass
Main Circulation Core – Car Park	37	19mm glass

Table 4: Recommended minimum laboratory sound insulation performance for internal glazed screens

The glazing configurations are provided for guidance/costing purposes only. Other requirements such as relating to fire, cost, security, thermal performance, robustness etc. must also be taken into consideration when determining the required glazing configuration. To satisfy the acoustic guide requirements, the proposed glazing supplier need only confirm compliance with the acoustic (dB R_w) specification. Alternative glazing configurations can be adopted if preferred providing the recommended acoustic specification is achieved.

7 BUILDING SERVICES

This report section has been updated in June 2022 as based upon information as received from the M&E Engineer: Imtech Engineering Services North Ltd ("Imtech") and the following mechanical services drawing:

- 20200-IES-MSCP-00-DR-M-5001 heating and vent, dated 17 February 2022. This drawing is reproduced in Figure 4 of this report.

The following externally sited plant is proposed:

- LOUD/02: Comms Room DX, model: RAV-RM561KRTP-E

The following mechanical ventilation plant is proposed:

- EF/01: Cycle Store extract fan, model: T Series Wall Fan (TX7 Wall)
- EF/02: Accessible WC extract fan, model: SLP125EC
- MVHR/01: Changing Room MVHR, model: TOPVEX TC25-R-EL11,8-B
- MVHR/02: Parking Managers Office, model HR200Wk

The location of the above building services plant is highlighted in Figure 4.

Noise data as provided for the various plant has been provided in varying formats. Table 5 to Table 7 provides a summary of the commercially available noise level data for the various plant, as supplied by Imtech:

Plant Ref.	Room Served	Model	Broadband A-Weighted Sound Power Level, dB L_{WA}
LOUD/02	Comms Room	RAV-RM561KRTP-E	63 (Cooling) 65 (Heating)
MVHR/01	Changing Room	TOPVEX TC25-R-EL11,8-B	53

Table 5: Broadband A-weighted sound power level data

Plant Ref.	Room Served	Model	Broadband A-Weighted Sound Pressure Level at 3 Metre Distance, dB $L_{Aeq,T}$		
			1/Low	2/Medium	3/High
EF/01	Cycle Store	T Series Wall Fan (TX7 Wall)	-	39	-
MVHR/02	Parking Man. Office	HR200Wk	19	33	46

Table 6: Broadband A-weighted sound pressure level data at 3 metre distance

Plant Ref.	Room Name	Air Flow, l/s	Location	Sound Power Level (dB L_w) at Octave Band Centre Frequency (Hz)								dB L_{WA}
				63	125	250	500	1k	2k	4k	8k	
EF02	Accessible WC	13	Inlet	58	69	70	70	60	56	48	58	65
			Outlet	58	70	71	73	70	67	60	52	75
			Breakout	62	58	59	57	52	46	37	62	58

Table 7: Octave band sound power level data

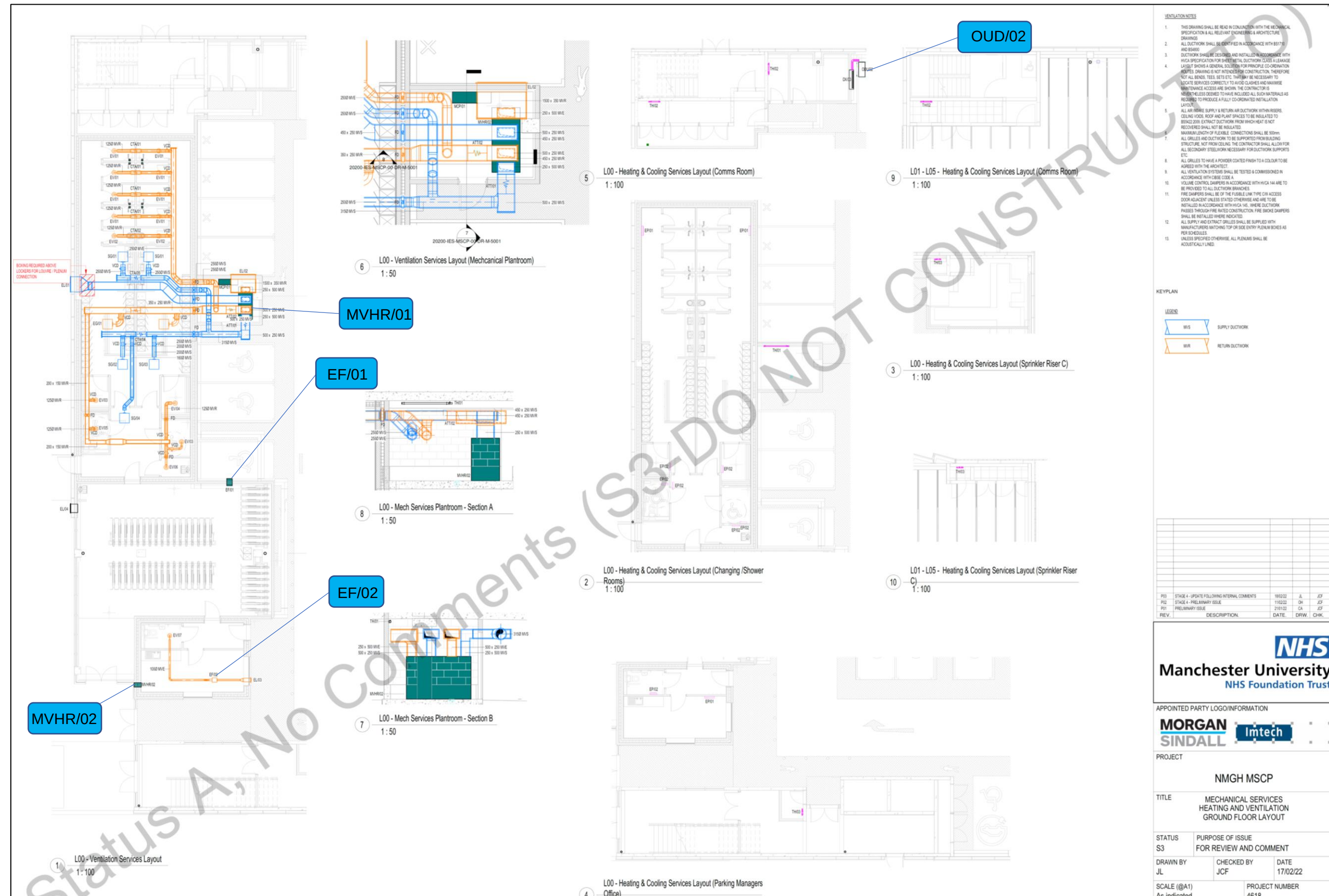


Figure 4: Building services mechanical ductwork layout drawing (annotated)

7.1 Externally Sited Building Services Equipment

7.1.1 Environmental (Atmospheric Side) Plant Noise Limits

Planning permission for the Facility was granted by Manchester City Council on 16 December 2020 (Planning Application number: 128905/FO/2020). Condition 17 relates to noise and states the following:

'... 17) Notwithstanding the noise impact assessment stamped as received by the City Council, as Local Planning Authority, on the 16 December 2020, (a) Prior to the first use of the MSCP and cycle hub hereby approved, details of any externally mounted ancillary plant, equipment and servicing shall be submitted for approval in writing by the City Council, as Local Planning Authority. For the avoidance of doubt, externally mounted plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB ($L_{Aeq,T}$) below the typical background (L_{A90}) level at the nearest noise sensitive location.

(b) Prior to the first use of MSCP and cycle hub, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met. In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ.

Reason - To minimise the impact of plant pursuant to policies SP1 and DM1 of the Manchester Core Strategy (2012) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995) ...'

Accordingly, it is necessary to limit the total, aggregate environmental noise from all M&E plant, when operating simultaneously, to an ambient noise level (in $L_{Aeq,T}$ terms) equating to the lowest, pre-existing daytime or night time background noise level at any residential property façade, in $L_{A90,T}$ terms, less a further 5dB. Table 8 sets out the maximum permissible Rating Level limits which shall be applicable to Facility at each of the identified NSR:

Location	Representative Noise Measurement Position	Maximum Permissible Rating Level Limit Imposed by Condition 17, dB $L_{Aeq,T}$	
		Daytime (07:00 – 23:00)	Night time (23:00hrs to 07:00hrs)
Existing hospital buildings, to remain (south of the Facility)	(Sol) Measurement Position 1	39	38
Housing on Delaunay Road (north west of the Facility)	RSK UL1	35	31
Housing on Birch Road (west of the Facility)	RSK UL4	36	32
Housing on Magna Drive (south of the Facility)	RSK UL3	29	25
Housing on Longshaw Close (south east of the Facility)	RSK UL3	29	25
Housing on Wallbrook Drive (east of the Facility)	RSK UL2	37	36

Table 8: Environmental noise limits for building services plant

It must be noted that the M&E plant noise limits identified above are applicable to all plant serving the scheme, when operating simultaneously. The allowable individual noise contribution from all plant items and atmospheric terminations such as louvres and cowls must be determined based on these overall noise limits – and consequently will be lower.

All noise limits are expressed in BS 4142: 2014+A1:2019 "Rating Level" terms and consequently must incorporate any and all applicable "penalties" for acoustic features such as acoustic tonality, intermittency and/or impulsivity, all as defined within the Standard.

In order to predict the likely noise levels impinging on the surrounding noise sensitive receptors, proprietary 3D computer noise models were created using the DataKustik “CadnaA” noise mapping software. The following assumptions have been made when generating the noise model:

- (a) The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: ‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’.
- (b) The model was set to include third order reflected noise from solid structures.
- (c) Ground absorption, as defined in ISO 9613-2, has been taken into consideration. The base ground absorption for the model has been set to G=0.0 (hard ground).
- (d) The noise impact as expected at the surrounding residential receptors has been modelled at a height of 4 metres above local ground level.
- (e) All externally sited plant noise sources have been modelled as point sources
- (f) The acoustic screening afforded by the car park itself has excluded from the noise model.

Table 9 presents the predicted overall A-weighted, BS4142-defined “Rating Level” at the identified noise sensitive receptor from the Facility at the identified NSR and compares the results to the requirements of Planning Condition 17. The corresponding Specific Sound Level noise contour plot is presented in Figure 5.

The following BS 4142:2014+A1:2019 defined “acoustic character corrections” have been applied to the predicted Specific Sound Levels in order to determine the noise Rating Level:

- Where the predicted Specific Sound Level is less than or equal to 10dB below the pre-existing Background Sound Level, no acoustic character correction has been applied.
- Elsewhere, a +3dB acoustic character correction has been added.

Table 9 shows that the predicted Rating Level at each of the identified NSR meets the requirements of Planning Condition 17.

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	Acoustic Character Correction, dB	Predicted Rating Level, dB $L_{Ar,T}$	Maximum Permissible Rating Level Limit Imposed by Condition 17, dB $L_{Ar,T}$	Exceedance, dB	Pass / Fail
Existing hospital buildings, to remain (south of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	28	+0	28	39	-11	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	28	+0	28	38	-10	Pass
Housing on Delaunay Road (north west of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	8	+0	8	35	-27	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	8	+0	8	31	-23	Pass
Housing on Birch Road (west of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	-1	+0	-1	36	-37	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	-1	+0	-1	32	-33	Pass
Housing on Magna Drive (south of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	-6	+0	-6	29	-35	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	-6	+0	-6	25	-31	Pass
Housing on Longshaw Close (south east of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	-3	+0	-3	29	-32	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	-3	+0	-3	25	-28	Pass
Housing on Wallbrook Drive (east of the Facility)	Daytime (07:00hrs - 23:00hrs) $T = 1$ hour	15	+0	15	37	-22	Pass
	Night Time (23:00hrs – 07:00hrs) $T = 15$ minutes	15	+0	15	36	-21	Pass

Table 9: Planning Condition 17 summary assessment

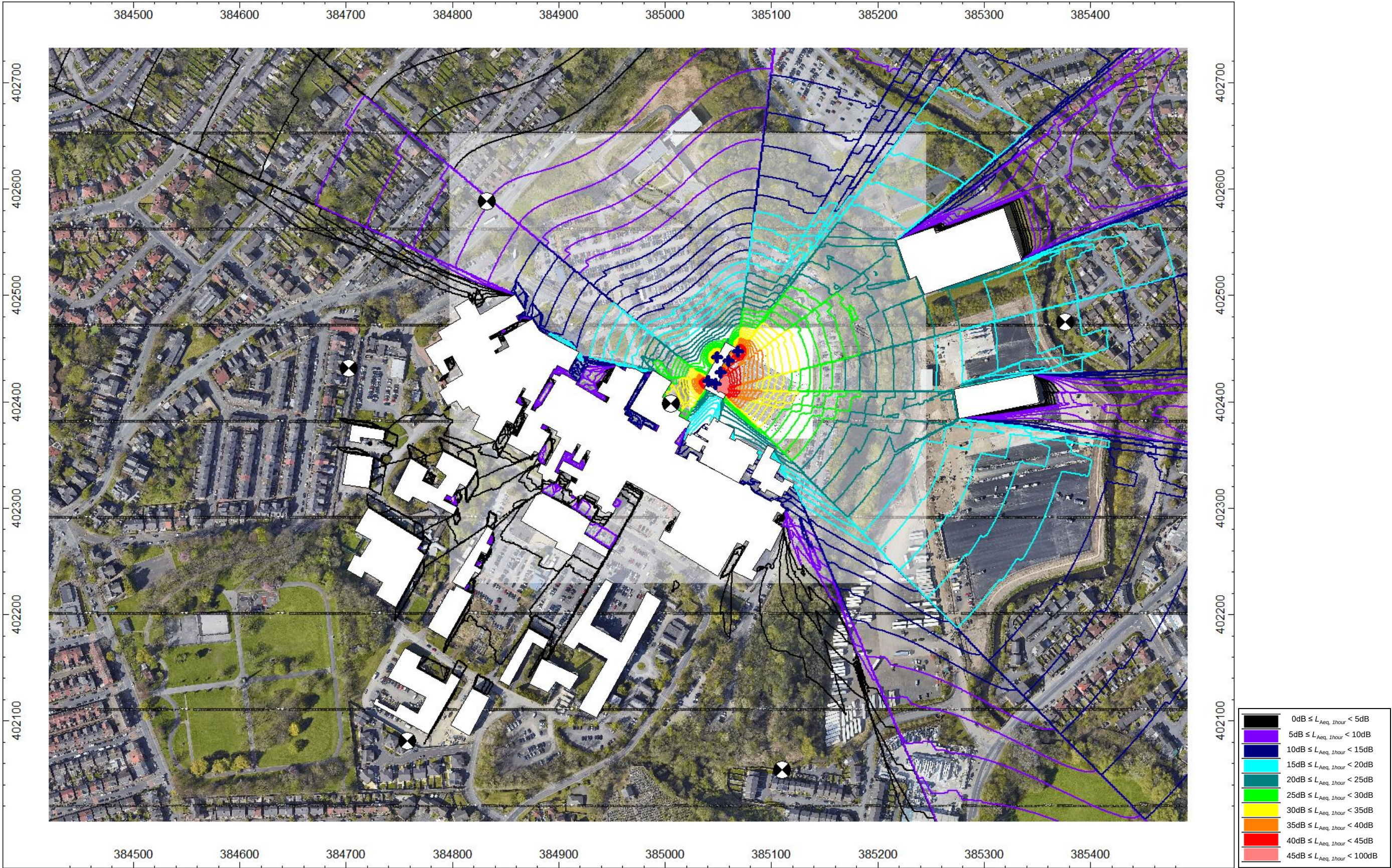


Figure 5: Predicted Specific Sound Level at 4 metre grid height (Google Maps 2022)

7.2 Internally Sited Building Services Equipment

7.2.1 Internal Building Services Noise Limits

Table 10 provides the recommended maximum Noise Rating (“NR”) limits to be achieved within each space within the Facility:

Space	Maximum Internal Noise Rating Limits from Building Services Plant and Equipment*
Parking Manager’s Office	NR35
Changing, Drying Room, WC, Shower, Cycle Store, Store rooms	NR45
Car Park Area	NR55
* Maximum internal Rating Levels shall be taken as a room spatial average. Applicable to all plant, ductwork, grilles, and diffusers etc.	

Table 10: Maximum internal Noise Rating limits from building services plant, ductwork, and grilles

NR levels within rooms shall be measured in accordance with ‘ANC guidelines – Noise measurement in Buildings Part 1: Noise from Building Services’, as at a minimum distance of 1.5 metres from any grille, diffuser, ductwork and/or opening serving, or located under building services plant, as for typical plant operational duties in unoccupied spaces.

As a guide, the maximum permissible air velocities for ductwork, grilles and diffusers are outlined in Table 11 below, as recommended in order to achieve the required room noise level NR criteria:

Low Velocity Systems	Room Noise Criterion	
	NR35	NR40/NR45
Riser ductwork and ductwork above plasterboard ceilings (m/s)	7.5	9
Ductwork above suspended ceilings (m/s)	5	6
Grilles face velocity (m/s, no OBDs)	3	3
Diffusers face velocity (m/s, no OBDs)	2	2
Ceiling extract ducts (m/s)	3	4

Table 11: CIBSE Guide B2 guidance on maximum recommended air velocities in building services

It is essential that all ductwork, grilles and diffusers is suitably sized such that the criteria in Table 11 is not exceeded (and additionally in the specific case of grilles and diffusers, these must also be sized and selected so as to be compatible with the room NR criterion for each area served). Further, the incorporation of opposed blade dampers (OBDs) directly within any terminal grilles and/or diffusers is not recommended, most especially for all units required to limit room noise levels to NR40 or lower. All required system airflow balancing must be achieved via the use of *duct mounted* volume control dampers (VCDs), as located at least one linear metre duct length from any grilles and diffusers.

Building services noise must not contain any acoustic features, including anything that is likely to attract attention. Examples of acoustic features include knocking, rattling, audible acoustic tone(s), hissing and/or whistling.

7.2.1 Attenuators

Attenuators are currently shown on the M&E drawing. ***In lieu of attenuators, Sol recommends that a minimum 500mm linear length of acoustic flexible ductwork, specifically “Lindab Tecflex 400” (see product link below) or equal and approved and be installed to all supply and extract ductwork, to connect each air terminal (i.e. grille/diffuser/plenum box where present), subject to M&E Engineer approval.*** Product link below:

<https://itsolution.lindab.com/lindabwebproductsdoc/pdf/documentation/ads/uk/technical/tecflex400.pdf>

The use of acoustic flexible ductwork reduce noise from the extract fans and MVHR units and reduce noise transfer between spaces via common ductwork connection (i.e. “crosstalk”).

7.2.2 MVHR Units

MVHR unit: MVHR/02 is located within a dedicated plant room and serves the changing rooms, WCs, drying rooms, and showers. Full octave band noise level data is not available from the manufacturer and therefore it is not possible to accurately assess whether the unit will comply with the maximum internal NR limits as stipulated within Table 10 shall be achieved within each space served. However, provided that acoustic flex ductwork (as recommended in Section 7.2.1) noise from the MVHR unit is likely to be capable of meeting the specified NR limits.

MVHR unit: MVHR/02 is façade mounted within the Parking Manager’s Office. Full octave band noise level data is not available from the manufactory and therefore it is not possible to accurately assess whether the unit will comply Noise Rating (NR) limits as stipulated within Table 10. Based upon the limited noise data available from the manufacturer, it is expected that the unit is just about capable of achieving NR35 within the space when operating at fan speed 2 or lower.

7.2.3 *Vibration Isolation Requirements*

Vibration from all building services plant, including pumps and associated pipework, and also from electricity substations (transformers) should be vibration isolated from the building structure using appropriate anti-vibration mounts, resilient connections, pipework spring hangers, and flexible duct connections etc., where required.

APPENDIX A NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

North Manchester General Hospital, Crumpsall, Manchester

WEATHER CONDITIONS

Date	Daytime (07:00 hours – 23:00 Hours)				Night Time (23:00 hours – 07:00 hours)			
	Temp, °C	Rain, mm/h	Wind Direction	Average Wind Speed, m/s	Temp, °C	Rain, mm/h	Wind Direction	Average Wind Speed, m/s
16/12/2020	22	0.0	NE	0.9	14	0.0	NE	0.5
17/12/2020	17	0.0	NE	0.6	-	-	-	-

PERSONNEL PRESENT DURING MEASUREMENTS

Brian Horner BSc (Hons) MIOA – Sol Acoustics Ltd

INSTRUMENTATION

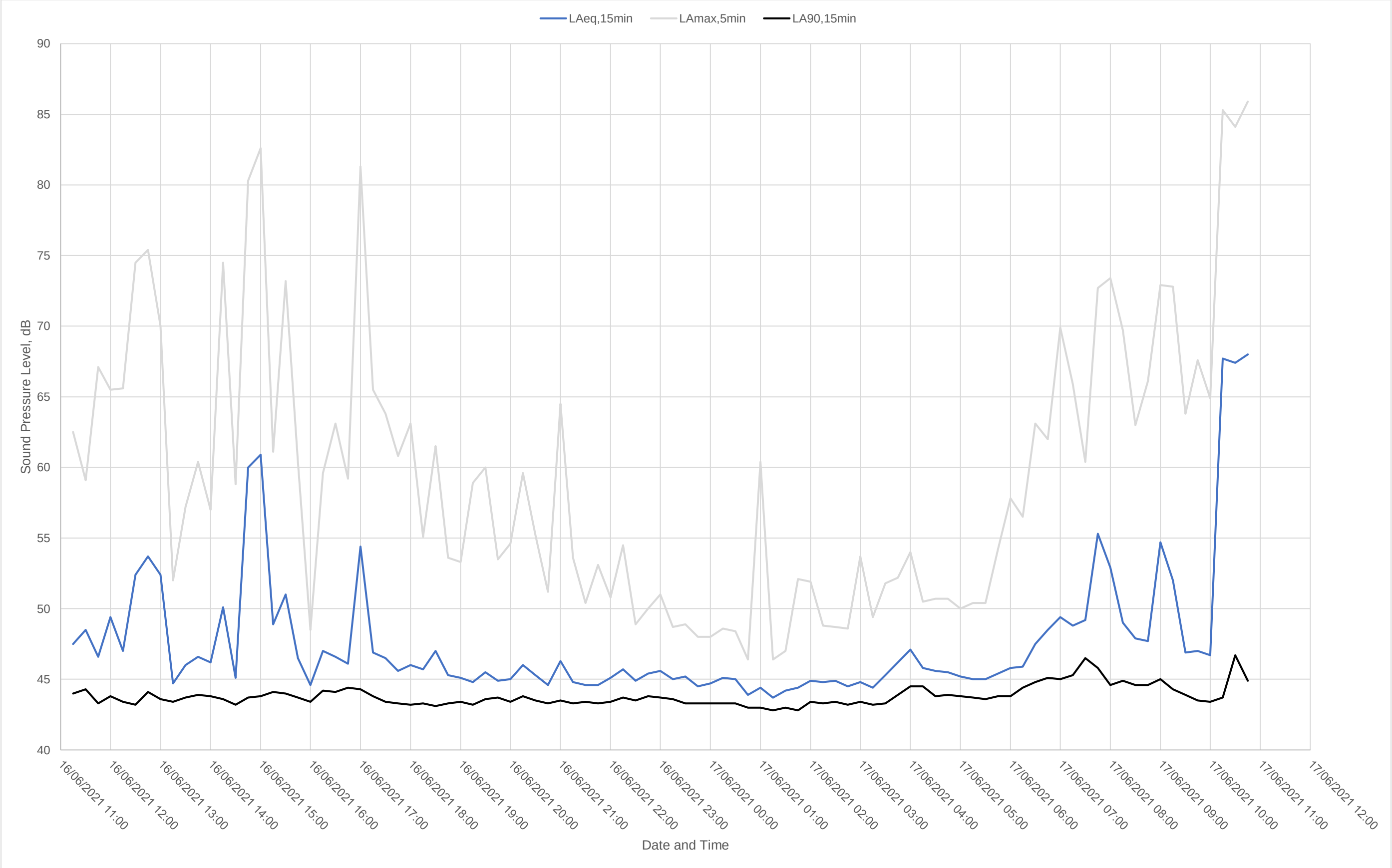
01dB Cube Sound Level Meter (Serial No. 12068)
 01dB Pre22 Microphone Preamplifier (Serial No. 1936010)
 GRAS 40CD Microphone Capsule (Serial No. 292577)
 01dB CAL 21 Acoustic Calibrator (Serial No. 34375244)

METHODOLOGY

Before and after the measurements the sound level meters were checked and calibrated to an accuracy of ± 0.3 dB using the 01dB CAL 21 Calibrator. The calibrator produces a sound pressure level of 94dB re 2×10^{-5} Pa @ 1kHz.

MEASUREMENT RESULTS

Graph A1 summarise the results obtained at Measurement Position 1.



Graph A1: Measurement Position 1, 16 to 17 June 2021

APPENDIX B RECOMMENDED INTERNAL SOUND INSULATION PERFORMANCE

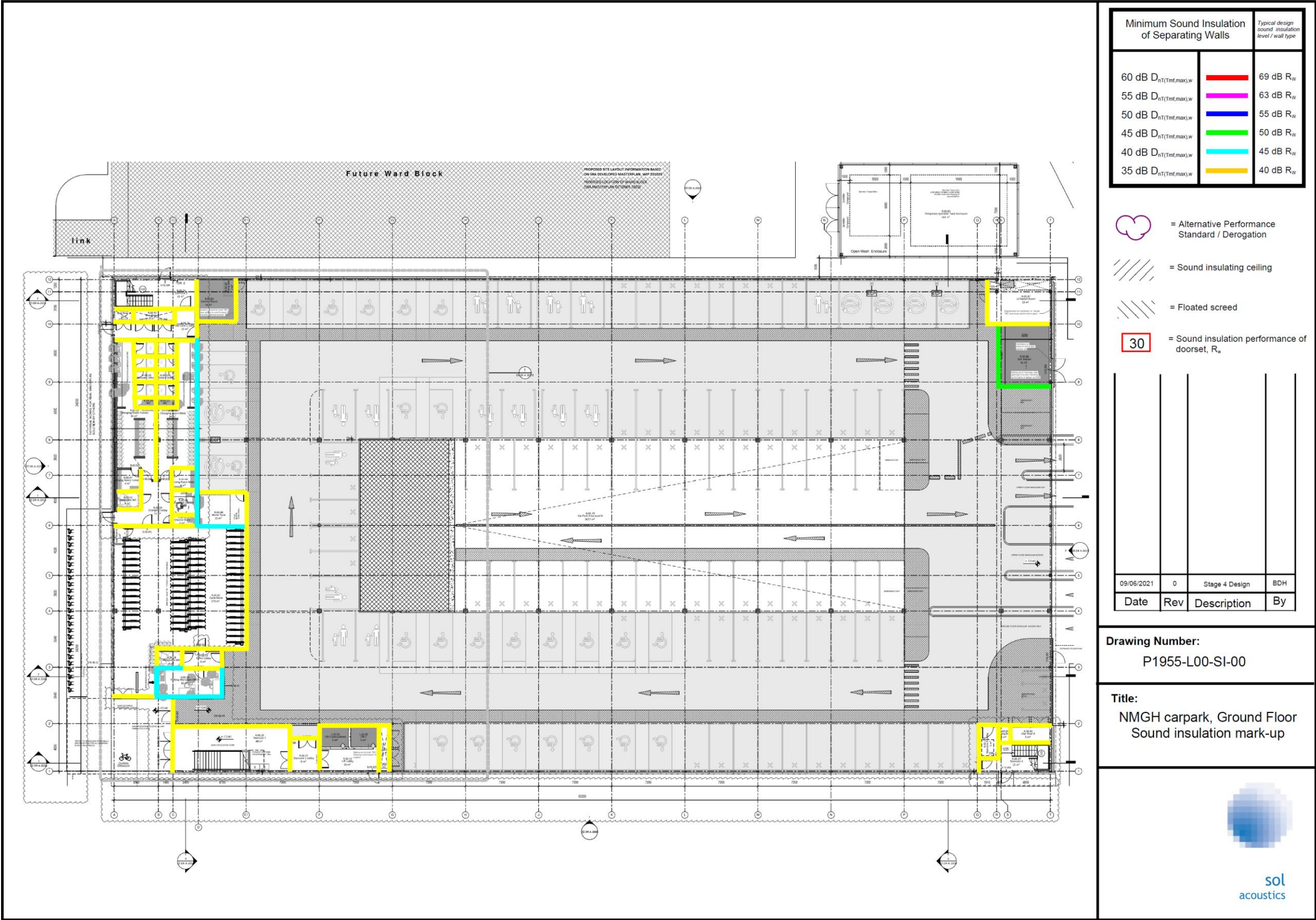


Figure B1: Ground floor sound insulation acoustic performance specification requirements mark up