



Homes England

Former Colt International Site, New Lane, Havant

Noise Assessment March 2018

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1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise assessment for a proposed mixed-use development, including 99 residential dwellings and employment area on land at the Former Colt International, Havant.

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise. The existing noise environment has been verified to predict noise at proposed dwellings. Noise levels from the proposed employment area have been predicted at local representative receptors using CADNA noise modelling software which incorporates ISO 9613 methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and a set of location plans and noise contour plots relevant to the assessment are presented in Appendix B.

1.2 Legislative Context (England)

PPG24 was replaced by NPPF on 27 March 2012. With regard to noise and planning NPPF contains the following 4 short statements (section 123):

- A. Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- B. Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- C. Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- D. Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

The national Planning Practice Guidance (PPG) web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6 March 2014 to support the National Planning Policy Framework and make it more accessible. The overall aim of the guidance, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England, is to *identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.*

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG: Noise and repeated as follows:

Table 1.1 Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No Specific Measures Required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOEL)	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Observed Adverse Effect	Prevent

The NPPF, NSPE and PPG: Noise do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents including the 'World Health Organisation Community Noise Guidelines' (1999) and 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings' (2014), Section 2.0 presents the noise level criteria used as a basis of this assessment.

The PPG: Noise also states that *neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.*



1.3 Relevant Guidance (England)

ProPG Planning and Noise - New Residential Development

Professional Practice Guidance on Planning and Noise for new residential development (ProPG) was launched on 22nd June 2017 by the Chartered Institute of Environmental Health (CIEH), the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA). The guidance has been published to provide practitioners with guidance on the management of noise within the planning system in England.

The guidance is specifically for 'new residential development that would be exposed predominantly to noise from existing transport sources' and reflects the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF), and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance.

The guidance provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers which complements Government planning and noise policy and guidance and, in particular, aims to:

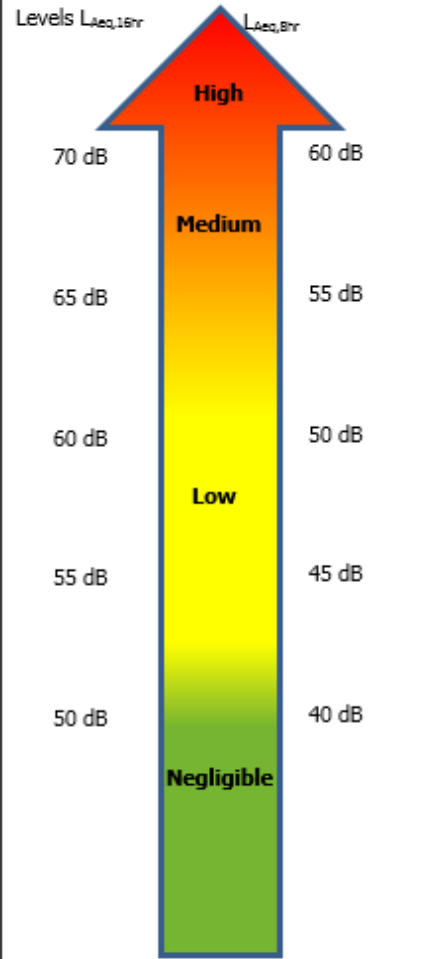
- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

There are two stages of the overall approach outlined in the ProPG:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of 4 key elements which is underpinned by an Acoustic Design Statement.

With regard to Stage 1, ProPG provides guidance for the producing an initial site risk assessment, pre-mitigation, with regards to noise based on the prevailing daytime and night time noise levels across the site, from which the site (or areas thereof) can be allocated a Noise Risk as shown in Figure 1.1, overleaf shows the various NRCs together with their corresponding sound levels as referred to in the ProPG.

Figure 1.1 ProPG Stage 1, Noise Risk Assessment

Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
Indicative Daytime Noise Levels $L_{Aeq,16hr}$ Indicative Night-Time Noise Levels $L_{Aeq,8hr}$ 	 Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigate and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective ~~provided that~~ a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

2.0 Assessment Criteria

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from standards and design guidance:

BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'

World Health Organisation: *Guidelines on Community Noise (1999)*

Table 2.1 Noise Level Criteria and Actions

Effect Level	Assessment	Noise Level Criteria	Action / Justification
No Observed Adverse Effect	Proposed Residential Dwellings	Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 30 dB $L_{Aeq,16hours}$ External Amenity Space – 50 dB $L_{Aeq,16hours}$	None Within BS8233 / WHO criteria
	Assessment of noise from proposed Building Services Plant and Deliveries	BS4142 Score of 0 or lower	No Action Required Score of 0 or lower is an indication of the sound source having a low impact
Lowest Observed Adverse Effect Level (LOAEL)	Proposed Residential Dwellings	Noise levels exceed: Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$ External Amenity Space – 55 dB $L_{Aeq,16hours}$	Mitigate to achieve: <i>Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}</i> <i>Living Rooms – 35 dB $L_{Aeq,16hours}$</i> <i>External Amenity Space – 55 dB $L_{Aeq,16hours}$</i> Within BS8233 / WHO criteria
	Assessment of noise from proposed Building Services Plant and Deliveries	BS4142 Score of between 0 and +5	No Action Required Difference of +5dB likely to be an indication of an adverse effect depending on context BS4142 Score of plus 5 or lower
Significant Observed Adverse Effect Level (SOAEL)	Proposed Residential Dwellings	Noise levels exceed: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ External Amenity Space – 55 dB $L_{Aeq,16hours}$	Avoid However, if due to other design considerations noise criteria is not achievable or that the target criteria can be achieved for certain periods (e.g. when windows are closed), the following noise levels may be acceptable as an upper limit: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ External Amenity Space – 60 dB $L_{Aeq,16hours}$ This is on the basis that the guideline noise values do not represent people's response to noise in all cases with the specified criteria only a marginal exceedance of the target criteria.



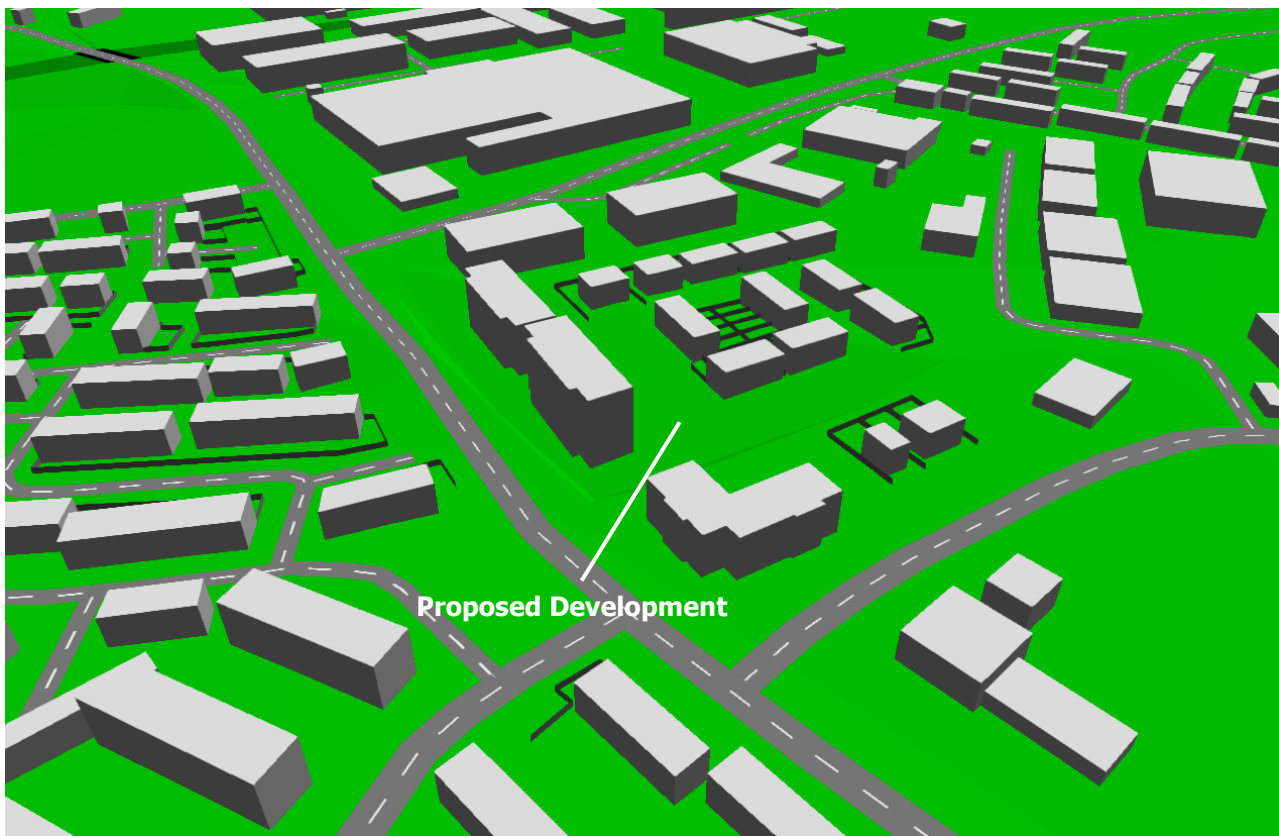
Effect Level	Assessment	Noise Level Criteria	Action / Justification
	Assessment of noise from proposed Building Services Plant and Deliveries	BS4142 Score greater than +5	Difference of up to +10dB likely to be an indication of a significant adverse effect depending on context. Mitigate to achieve: BS4142 Score of + 5 or lower
Unacceptable Observed Adverse Effect Level (UOAEI)	Proposed Residential Dwellings	Noise levels with mitigation exceed: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ External Amenity Space – 60 dB $L_{Aeq,16hours}$	Prevent
	Assessment of noise from proposed Building Services Plant and Deliveries	BS4142 Score of + 10 or higher	Avoid Mitigate to achieve: BS4142 Score of 5 dB or lower

3.0 Assessment Methodology

3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict L_{Aeq} and L_{Amax} noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used (as shown in Figure 3.1). This model is based on the ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

Figure 3.1 CADNA Noise Model



The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	Ordnance Survey
Ground levels – other areas	Site Observations and Ordnance Survey	OS 1:25,000 contours and OS 1:10,000 spot heights.
Traffic data, main surrounding roads	WYG	Traffic flows for local roads based on WYG observations and experience.
Traffic data – local roads	WYG	Traffic flows for local roads based on WYG observations and experience.
Building heights – around site	WYG Observations	8m height for two storey and 12m for three storey residential properties, and 4 m for Bungalows
Barrier heights	WYG Observations	All existing barriers at observed height with the exception of hedges and trees which are assumed to offer no noise protection. Proposed garden fences are considered to be 1.8m.
Receptor positions	WYG	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 1.5 m height for model grid and monitoring locations for validation.
Plans	WYG	Drawing Number: A090070-182[ST1]31 (No date)

It is acknowledged that a number of these parameters will affect the overall noise levels presented in this report. However, it should be noted that certain assumptions made, as identified above, are worst-case.

3.2 Model Input Data

3.2.1 Existing Ambient Noise Climate

Sources affecting the site, including all roads expected to make a significant contribution and nearby industrial and commercial units including noise from the proposed employment area to the east of the site, existing yard noise from 'Marsh Plant Hire' and the Havant and Westleigh Park stadium to the West of the site, have been included within this assessment. Noise emissions from existing road traffic flows have been derived from verification of the measured noise levels, along with observations made during the site survey and/or WYG Environment (WYGE) experience of similar road systems. Estimates of the vehicle speeds have been made based upon the speed restrictions currently in force in the area.

3.2.2 Specific Existing Noise Sources

The following sources have been included in the model as point sources to represent the routine maintenance and testing of cranes within the external yard of 'Marsh Plant Hire' located directly to the south of the proposed development. The noise data, outlined within table 3.2 below, which has been sourced from Table C.3 of BS5228-1:2009 'Code of practice for noise and vibration control on construction and open sites – part 1: Noise', which gives a list of noise equipment for typically mobile plant used at a construction site. Noise data for a 70 ton Wheeled mobile crane has been used.

Although the makes and models of vehicles on the site are variable, the noise data selected is considered to represent a worst-case scenario. Furthermore, it is understood that 'Marsh Plant Hire' only operates during the daytime, however for the purposes of this worst-case assessment the following noise sources have also been included within the night-time L_{Aeq} and L_{Amax} scenarios.

Table 3.2 Marsh Plant Hire Crane Noise Data

Description	Octave band sound pressure levels @ 10m, Hz								Sound Pressure Level @ 10m, L_{Aeq} dB(A)	L_{Amax} @ 10m dB(A)
	63	125	250	500	1k	2k	4k	8k		
70t Wheeled Mobile Crane	80	72	71	67	65	62	57	49	70	97

Westleigh Park, Havant and Waterlooville Football Club's stadium is located approximately 200m to the west of the site. The stadium has the potential to generate noise during both the daytime and night-time periods (albeit night-time use is considered to be unlikely). The noise data presented in table 3.3 below has been included in the model as an area source, derived taken from measurements of the stadium, during a Saturday daytime football match.

Table 3.3 Havant and Waterlooville Stadium Noise Data

Description	Octave band sound pressure levels @ 10m, Hz								Sound Pressure Level @ 10m, L _{Aeq} dB(A)	L _{Amax} @ 10m dB(A)
	63	125	250	500	1k	2k	4k	8k		
Football Stadium Noise	68.3	64.0	56.5	57.3	52.2	52.2	45.5	38.7	60.9	81.6

3.2.3 Model Verification

The model was verified by modelling the monitoring locations for the 'existing' scenario. Daytime and night-time L_{Aeq} and night-time L_{Amax} scenarios have been verified. The comparison between the monitoring and modelling results are shown in the tables below.

Table 3.4 Modelled vs. Monitored Results L_{Aeq}; daytime 07:00 – 23:00

Location	Monitored L _{Aeq}	Modelled L _{Aeq}	Difference between Monitored and Modelled Results
LT1	61.0	61.0	0.0
LT2	53.2	53.2	0.0
LT3	65.6	65.6	0.0
LT4	58.7	56.3	-2.4
ST1	71.4	70.7	-0.7
ST2	69.3	69.3	0.0
ST3	62.6	62.6	0.0
ST4	70.1	69.4	-0.7
ST5	50.4	52.4	2.0

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa

Table 3.5 Modelled vs. Monitored Results L_{Aeq}; night-time 23:00– 07:00

Location	Monitored L _{Aeq}	Modelled L _{Aeq}	Difference between Monitored and Modelled Results
LT1	47.8	49.3	1.5
LT2	47.0	46.8	-0.2
LT3	57.7	57.7	0.0
LT4	50.0	47.3	-2.7
ST1	56.7	59.0	2.3
ST2	57.2	58.0	0.8
ST3	52.4	52.6	0.2
ST4	55.0	57.8	2.8
ST5	39.6	42.4	2.8

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa

**Table 3.6 Modelled vs. Monitored Results L_{Amax} ; night-time 23:00– 07:00**

Location	Monitored L_{Amax}	Modelled L_{Amax}	Difference between Monitored and Modelled Results
LT1	88.3	88.3	0.0
LT2	72.7	74.5	1.8
LT3	81.3	79.1	-2.2
LT4	69.8	68.4	-1.4
ST1	78.7	80.3	1.6
ST2	80.6	81.3	0.7
ST3	76.3	76.4	0.1
ST4	83.6	81.7	-1.9
ST5	59.0	61.7	2.7

All values are sound pressure levels in dB re: 2×10^{-5} Pa

The verification points show a divergence between monitored and modelled results of no more than ± 2.8 dB at all locations during all scenarios. The greatest weight and confidence has been given to LT2 due to the longer measuring time period. The models are therefore considered to be suitably verified.

3.2.4 Proposed Employment Area Noise Data

Although the specific nature of each unit within the employment area is unknown, the following data has been used within the model to represent worst-case noise associated with HGVs delivering goods to the proposed units.

Noise of a delivery event has been known to vary from site to site by as much as 22 dB L_{Aeq} at 3 m distance even with the same vehicle type. Similarly, individual events using the same vehicle and at the same store have been recorded to vary by as much as 14 dB.

As such, the following worst-case calculations have been based on measurements of refrigerated, articulated HGVs delivering consumables. All measurements were undertaken in free-field conditions. In addition to noise from the unloading process, the levels used in the assessment include noise from the vehicle pulling up to the unloading bay, manoeuvring into position and then pulling away once unloading/loading is complete, together with other sources such as trolleys and reversing alarms. The calculations are based on a maximum of one event per hour during either daytime or night-time periods.

Delivery Vehicle Unloading

- *$L_{Aeq,1hr}$ Noise Level*

5 minutes at L_p 75 dB at 3 m distance (vehicle arriving and manoeuvring)
 38 minutes at L_p 70 dB at 3 m distance (vehicle unloading)
 2 minutes at L_p 72 dB at 3 m distance (vehicle leaving)
 15 minutes of quiet (associated with documentation and waiting with engine off)

$$L_{Aeq(60 \text{ mins})} = 10\log(1/60)(5\text{mins} \times 10^{0.1 \times 75\text{dB}} + 38\text{mins} \times 10^{0.1 \times 70\text{dB}} + 2\text{mins} \times 10^{0.1 \times 72\text{dB}})$$

$$= 73.7 \text{ dB at 3 m distance}$$

Delivery Vehicle Arriving/Exiting along access road

The following calculations have been used to represent this as a line source in the model.

- *L_{Aeq,1hr} Noise Level*

$$1 \times 10 \text{ seconds } L_p = 69.3 \text{ dB at 3 m distance} \quad (\text{vehicle arriving and leaving})$$

$$L_{Aeq(60 \text{ mins})} = 10\log(1/60)(10 \text{ sec} \times 10^{0.1 \times 69.3 \text{ dB}})$$

$$= 43.7 \text{ dB at 3 m distance}$$

3.2.5 Building Services Plant Data

Point sources have been used in the model to represent the proposed roof plant associated with the employment area of the development. The maximum sound pressure levels of the point sources at 1 and 3 metres were estimated in the model as a conditional maximum level that the noise levels at nearby receptors were predicted to meet the BS 4142 assessment criteria. Noise emission limits have been specified to ensure that plant noise rating levels (including a + 5 dB correction for potential tonal and intermittent aspects of the noise source) are at least 10 dB below existing daytime and night-time background noise levels.

3.2.6 Sensitive Receptors

Noise levels from existing noise sources surrounding the site have been assessed at proposed properties across the site. The locations of the proposed receptors are shown in SK02a of Appendix B. Noise levels from the proposed site have been assessed at the existing sensitive properties within proximity of the site. The locations of the existing receptors are outlined in the tables below and shown in SK02b of Appendix B

Table 3.7 Existing Residential Receptor Locations

Ref.	Description	Closest Source	Approximate Distance To Source (m)	Height (m)
ER1	212 Wakefords Way	HGV Movements	96	1.5/4.0
ER2	2a Passfield Walk	HGV Movements	50	1.5/4.0
ER3	1 Passfield Walk	Building Services Plant	56	1.5/4.0
ER4	2 Kitwood Green	Building Services Plant	75	1.5/4.0
ER5	1 Kitwood Green	Building Services Plant	101	1.5/4.0
ER6	2 Sharps Road	Building Services Plant	132	1.5/4.0
ER7	39 Monterey Drive	Building Services Plant	187	1.5/4.0
ER8	47 Monterey Drive	Building Services Plant	193	1.5/4.0
ER9	51 Monterey Drive	Building Services Plant	198	1.5/4.0



3.3 Tranquillity Rating

An assessment of the existing tranquillity level of the site has been based on the mapping data published by Campaign to Protect Rural England (CPRE). This uses a colour coded system and a 500m assessment grid for the whole of England, and a tranquillity rating of between 1 and 10 is assigned (1 being least tranquil and 10 being most). By reference to these maps the development is assessed as falling into Zone 1.



4.0 Noise Survey

4.1 Noise Survey Methodology

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

Rion NL-52	Environmental Noise Analyser (WYG15)	s/n	620869
Rion NL-52	Environmental Noise Analyser (WYG16)	s/n	1221576
Rion NL-52	Environmental Noise Analyser (WYG17)	s/n	1043466
Rion NL-52	Environmental Noise Analyser (WYG18)	s/n	510143
Rion NC-74	Sound Calibrator	s/n	35046823

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at nine locations (as specified in the following table and shown in SK01 of Appendix B) from Tuesday 06th March 2018 to Monday 12th March 2018. Attended short term measurements were undertaken at five locations during day, evening and night-time periods with four additional locations being measured unattended over a 144-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the survey period were observed as being dry. Anemometer westerly wind direction, during the survey.

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	Southern Boundary of Proposed Development Site
LT2	South-western Boundary of Proposed Development Site
LT3	Northern Boundary of Proposed Development Site
LT4	South-east Boundary of Proposed Development Site
ST1	Bartons Road
ST2	New Lane
ST3	Martin Road
ST4	New Lane
ST5	Exton Road



4.2 Noise Survey Results

The predominant noise sources found in the area include: road traffic noise from Bartons Road to the north of the site, New Lane to the east of the site and Martin Road to the west of the site. Limited demolition activities were observed within the Former Colt International site during the survey, including the use of mobile plant and temporary generators that are considered to have artificially elevated noise levels at monitoring locations LT1 and LT2. During the daytime noise was audible from the external yard areas of 'Marsh Plant Hire'; located on the southern boundary of the site. Noise source predominantly included the testing and movement of small mobile crane units.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period).

Table 4.2 Meteorological Conditions during the Survey

Survey Location	Date & Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
Daytime ST1	06/03/2018 16:06	9.0	2-3	W	8	Traffic on Bartons Road and New Lane
Daytime ST2	06/03/2018 16:22	9.0	2-3	W	8	Traffic on Bartons Road and New Lane
Daytime ST3	06/03/2018 15:48	9.0	1-2	W	8	Traffic on Bartons Road and Martin Road
Daytime ST4	07/03/2018 10:03	5.0	1-2	W	7	Traffic on Bartons Road and New Lane
Daytime ST5	07/03/2018 10:22	5.0	1-2	W	7	Traffic on Bartons Road and Wakeford Way
Evening ST1	06/03/2018 19:36	6.0	1-2	W	8	Traffic on Bartons Road and New Lane
Evening ST2	06/03/2018 19:53	6.0	1-2	W	8	Traffic on Bartons Road and New Lane
Evening ST3	06/03/2018 19:17	6.0	1-2	W	8	Traffic on Bartons Road and Martin Road
Evening ST4	06/03/2018 20:09	6.0	1-2	W	8	Traffic on Bartons Road and New Lane
Evening ST5	06/03/2018 20:29	6.0	1-2	W	8	Traffic on Bartons Road and Wakeford Way
Night-time ST1	06/03/2018 23:25	4.0	1-2	W	8	Traffic on Bartons Road and New Lane.
Night-time ST2	06/03/2018 23:42	4.0	1-2	W	8	Traffic on Bartons Road and New Lane.
Night-time ST3	06/03/2018 23:02	4.0	1-2	W	8	Traffic on Bartons Road and Martin Road
Night-time ST4	06/03/2018 23:58	4.0	1-2	W	8	Traffic on Bartons Road and New Lane.
Night-time ST5	07/03/2018 00:17	4.0	1-2	W	8	Traffic on Bartons Road

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5 minute measurement over the stated survey period.

Table 4.3 Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Weekday Daytime 07:00 - 23:00	64 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00	LT1	61.0	101.0	32.5	55.9	50.0
Weekday Night-time 23:00 - 07:00	32 Hours	06/03/2018 - 12/03/2018 23:00 - 07:00		47.5	80.4	31.7	45.8	43.0
Weekend Daytime 07:00 - 23:00	32 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00		50.5	78.4	38.6	51.0	47.0
Weekend Night-time 23:00 - 07:00	16 hours	06/03/2018 - 12/03/2018 23:00 - 07:00		47.8	88.3	32.4	46.4	44.0
Weekday Daytime 07:00 - 23:00	64 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00	LT2	53.2	89.3	30.5	52.8	46.0
Weekday Night-time 23:00 - 07:00	32 Hours	06/03/2018 - 12/03/2018 23:00 - 07:00		46.8	72.3	27.9	45.1	37.0
Weekend Daytime 07:00 - 23:00	32 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00		50.7	76.0	37.1	52.2	47.0
Weekend Night-time 23:00 - 07:00	16 hours	06/03/2018 - 12/03/2018 23:00 - 07:00		47.0	72.7	28.7	46.6	40.0
Weekday Daytime 07:00 - 23:00	64 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00	LT3	65.6	100.1	45.2	68.4	56.0
Weekday Night-time 23:00 - 07:00	32 Hours	06/03/2018 - 12/03/2018 23:00 - 07:00		57.7	81.3	44.7	55.7	47.0
Weekend Daytime 07:00 - 23:00	32 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00		64.3	93.9	46.0	67.2	55.0
Weekend Night-time 23:00 - 07:00	16 hours	06/03/2018 - 12/03/2018 23:00 - 07:00		55.8	80.5	45.3	56.1	47.0
Weekday Daytime 07:00 - 23:00	64 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00	LT4	58.7	92.6	33.8	59.5	53.0
Weekday Night-time 23:00 - 07:00	32 Hours	06/03/2018 - 12/03/2018 23:00 - 07:00		50.0	69.8	32.2	48.3	39.0
Weekend Daytime 07:00 - 23:00	32 Hours	06/03/2018 - 12/03/2018 07:00 - 23:00		55.1	80.0	36.8	57.8	50.0
Weekend Night-time 23:00 - 07:00	16 hours	06/03/2018 - 12/03/2018 23:00 - 07:00		48.1	69.5	34.4	48.9	41.0
Daytime 07:00 - 19:00	15 Mins	06/03/2018 16:06	ST1	71.4	82.9	57.9	75.1	62.9
	15 Mins	06/03/2018 16:22	ST2	69.3	80.0	47.8	73.7	55.7
	15 Mins	06/03/2018 15:48	ST3	62.6	76.0	49.0	67.5	53.1
	15 Mins	07/03/2018 10:03	ST4	70.1	85.7	45.2	74.3	57.0
	15 Mins	07/03/2018 10:22	ST5	50.4	68.1	44.1	52.3	47.2
Evening 19:00 - 23:00	15 Mins	06/03/2018 19:36	ST1	68.7	83.3	48.7	73.3	56.6
	15 Mins	06/03/2018 19:53	ST2	65.7	81.5	40.7	71.0	44.2
	15 Mins	06/03/2018 19:17	ST3	61.7	79.3	40.7	66.1	46.8
	15 Mins	06/03/2018 20:09	ST4	67.8	85.3	40.3	72.8	44.4
	15 Mins	06/03/2018 20:29	ST5	47.1	72.9	35.0	49.6	39.0



Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Night-time 23:00 - 07:00	15 Mins	06/03/2018 23:25	ST1	56.7	78.7	39.9	54.3	41.1
	15 Mins	06/03/2018 23:42	ST2	57.2	80.6	38.9	49.3	40.1
	15 Mins	06/03/2018 23:02	ST3	52.4	76.3	32.3	50.3	34.8
	15 Mins	06/03/2018 23:58	ST4	55.0	83.6	37.4	52.0	39.0
	15 Mins	07/03/2018 00:17	ST5	39.6	59.0	27.9	43.7	30.1



5.0 Assessment of Key Effects

5.1 ProPG Stage 1 Assessment

Daytime noise levels are around 60 - 65 dB $L_{Aeq, 16\text{-hour}}$ and night-time $L_{Aeq, 8\text{-hour}}$ noise levels are around 55 - 60 dB, therefore the site falls within Medium Noise Risk Category and as such will need a good acoustic design.

5.2 ProPG Stage 2 Assessment – Element 2 Internal Noise Levels

Noise from the existing ambient noise climate have been assessed with respect to the proposed residential dwellings - including noise from the surrounding roads, existing industrial sources and the proposed and noise from the new employment area associated with the development.

Internal noise levels within the proposed dwellings have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing with specification $R_w + C_{tr}$ 32 dB (e.g 6/16/6mm double glazing or equivalent) has been used.

The results presented in tables C1 – C3 in Appendix C shows the predicted noise intrusion levels across the site. The recommended WHO/BS 8233 internal noise levels are generally met across the site during the daytime and night-time, assuming a windows-closed scenario however certain bedroom and living room façades facing 'Marsh Plant Hire' to the south of the site are predicted to exceed the relevant criteria with windows open and closed (on the basis of worst-case assumptions regarding the potential daytime and night-time use of the site). In order to achieve the recommended internal noise criteria, mitigation measures are outlined in Section 6.0 of this report.

5.3 ProPG Stage 2 Assessment – Element 3 Proposed External Amenity Areas

Daytime noise levels in gardens and private external spaces of the proposed development have been assessed in the table below. The location of the indicative 'garden' receptor locations are shown on SK02c of Appendix B.

Table 5.1 External Amenity Areas Daytime $L_{Aeq, 16\text{-hour}}$ Noise Levels

Ref	External $L_{Aeq, 16\text{hr}}$ Daytime	BS 8233 Lower Guideline Criteria L_{Aeq}
G1	48.9	50
G2	46.2	50
G3	46.0	50
G4	48.0	50
G5	49.0	50

Ref	External $L_{Aeq, 16hr}$ Daytime	BS 8233 Lower Guideline Criteria L_{Aeq}
G6	47.5	50
G7	47.0	50
G8	46.8	50
G9	46.8	50
G10	46.9	50
G11	43.6	50
G12	43.8	50
G13	44.7	50
G14	41.4	50

The results in Table 5.1 above show that daytime L_{Aeq} noise levels within private external amenity areas are not predicted to exceed the lower BS 8233 guideline value (50 dB) at the receptors across the development site.

5.4 BS4142 Assessment (Proposed Deliveries)

In accordance with the guidance provided by BS 4142, an assessment that compares the measured background noise level with the predicted external levels at existing sensitive receptors has been undertaken. Noise levels from proposed deliveries including unloading of goods at each unit of the proposed employment area of the development unloading simultaneously has been undertaken. Despite the use of worst-case predicted noise levels from the deliveries, a penalty of +3 dB to account for potential impulsive noises (such as bangs and clatters that may be just perceptible at nearby properties) associated with proposed delivery operations to create the noise rating level.

Table 5.2 BS4142 Noise Levels L_{Aeq}

Ref	Existing Measured Average Background L_{A90}		Specific Noise Levels L_{Aeq}		Noise rating level from Delivery (with Correction)		Difference between Specific Noise Levels and Background		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
ER1	55	47	39	41	42	44	-16	-6	-13	-3
ER2	55	47	43	45	46	48	-13	-2	-10	1
ER3	55	47	33	36	36	39	-22	-11	-19	-8
ER4	55	47	26	29	29	32	-29	-18	-26	-15
ER5	55	47	20	26	23	29	-35	-22	-32	-19
ER6	55	47	14	22	17	25	-41	-25	-38	-22
ER7	46	37	12	16	15	19	-34	-21	-31	-18
ER8	46	37	14	17	17	20	-33	-20	-30	-17
ER9	46	37	12	15	15	18	-34	-22	-31	-19

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

The assessments results in Table 5.2 above show that worst-case noise rating levels are predicted to be no more than 1 dB above background noise levels during the daytime and night-time and would be within or



below the Lowest Observed Adverse Effect Level at all surrounding receptor locations. Noise from delivery operations is therefore expected to have a low impact.

5.5 Plant Noise Assessment

This assessment has been undertaken in order to establish the maximum external noise levels from the potential building services plant associated with the proposed employment area of the development. The assessment has been undertaken with the assumption that each unit has roof-mounted plant and they are all operating at full capacity and simultaneously. The assessment compares the predicted worst-case combined noise levels from all roof mounted external plant with the existing measured average background noise L_{A90} at the closest existing residential receptors. As the proposed plant noise, could contain a 'distinguishable hum' and have intermittent features, a + 5 dB correction (specified in 9.2 and 10 of BS 4142) has been added to create the Plant 'Rating Level at Receptor'.

A series of predictions were made by defining different sound power levels at a point source. When the sound pressure levels are set as shown in Table 5.3 (which are considered to be achievable), the noise levels at all the existing receptors are predicted to be at least 10 dB below existing background levels during the daytime and night-time as shown in Table 5.4. All predicted rating noise levels fall within the Lowest Observed Adverse Effect Level; specific noise levels at proposed receptors are predicted to be below the measured background noise levels.

Table 5.3 Proposed Emission Limits for BSP as Modelled

BSP Location	Noise Emission Limit - Sound Pressure Level	
	Daytime	Night-time
Roof Mounted BSP (each unit)	76.2 dB(A) @ 1m OR 66.6 dB(A) @ 3m	67.2 dB(A) @ 1m OR 57.6 dB(A) @ 3m

Table 5.4 BS4142 Assessment for Proposed Plant

Ref	Existing Measured Average Background L_{A90}		Specific Noise Levels L_{Aeq}		Noise rating level from BSP (with Correction)		Difference between Specific Noise Levels and Background		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
ER1	55	47	35	26	40	31	-20	-21	-15	-16
ER2	55	47	37	28	42	33	-18	-19	-13	-14
ER3	55	47	37	29	42	34	-18	-18	-13	-13
ER4	55	47	36	28	41	33	-19	-20	-14	-15
ER5	55	47	33	25	38	30	-22	-22	-17	-17
ER6	55	47	30	22	35	27	-25	-25	-20	-20
ER7	46	37	32	22	37	27	-15	-15	-10	-10
ER8	46	37	30	23	35	28	-16	-15	-11	-10
ER9	46	37	30	22	35	27	-16	-15	-11	-10

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.



5.6 Tranquillity Assessment

The development is situated in CPRE Zone 1 for tranquillity (1 being least tranquil and 10 being most). The proposed use of the site is not considered likely to affect this rating. There are currently no public rights of way across the site, and given the proximity to the adjoining road network, the proposed development is considered to have a positive effect on access to areas of tranquillity.



6.0 Acoustic Design Statement (Mitigation)

The glazing and ventilation strategy provided in SK05 has been designed to achieve internal daytime L_{Aeq} of 35 dB, an internal night-time L_{Aeq} of 30 dB and an internal night-time L_{Amax} of 45 dB in habitable rooms of the proposed development.

The glazing and ventilation strategy highlights which areas would require enhanced glazing and/or an alternative means of ventilation in order to meet both ventilation and internal ambient noise criteria. Alternative ventilation can be provided in several ways from acoustic trickle vents (which need to have a minimum sound reduction equal to or greater than the glazing), to other passive ventilation systems or mechanical ventilation systems.

Glazing (with a sound reduction of up to $R_w + C_{tr}$ 39 dB) is required for dwellings located adjacent to the south of the site along with an alternative means of ventilation (to account for the potential early-morning/late evening use of the Marsh Plant Hire site). All other dwellings across the site require glazing with a minimum sound reduction of $R_w + C_{tr}$ 32 dB along with an alternative means of ventilation that is equal to or greater than the glazing.



7.0 Conclusions of Noise Assessment

This report presents the findings of a noise assessment undertaken in support of a planning application for a proposed mixed-use development on land at the Former Colt International, Havant. Section 123 of the NPPF gives four test points relating to noise; considering these the following conclusions can be drawn:

- *NPPF 123 A & B*

The proposed development is not expected to have an 'adverse impact' on health or quality of life. Similarly regards to NPPF (123) point B, it is considered that all 'adverse impacts on health and quality of life' (relating to noise) are mitigated by the following mitigation:

Glazing & Ventilation Strategy

The recommended WHO/BS 8233 internal noise levels are generally met across the site during the daytime and night-time, assuming a windows-closed scenario. A glazing and ventilation strategy has been provided which achieves both ventilation and internal ambient noise level requirements of L_{Aeq} daytime 35 dB, L_{Aeq} night-time of 30 dB and L_{Amax} night-time of 45 dB in all residential bedroom and living spaces of the proposed development; noise levels are predicted to be within or below the Lowest Observable Adverse Effect Level criteria.

Noise levels in proposed private external amenity area (gardens) are not predicted to exceed 50 dB $L_{Aeq, 16 \text{ hours}}$. Therefore, and in accordance with the requirements of the NPPF, the proposed development is not expected to have an adverse impact on health or quality of life.

A BS4142:2014 assessment has shown that noise levels from proposed deliveries associated with a new employment area at the development fall within the Lowest Observable Adverse Effect Level criteria at the closest existing sensitive receptor locations, and therefore a low impact on health or quality of life is expected. Similarly, noise limits have been set for roof-mounted building services plant associated with the proposed employment area to ensure that noise levels are at least 10 dB below the existing background at the closest existing sensitive receptor locations and therefore fall within the No Observable Adverse Effect Level criteria.

- *NPPF 123 C & D*

Given that the site is in close proximity to similarly sensitive residential properties to the north and west, and the noise assessment has shown internal and external noise criteria is met, it is considered that existing development wanting to develop would not be restricted by the use of the proposed development site for residential purposes.

The development is situated in a CPRE Zone 1 for tranquillity (1 being least tranquil and 10 being most). As there is currently no public access to the site, the proposed use of the site is not considered likely to affect this rating.

Accordingly, the proposed development satisfies the relevant policy considerations set out in the NPPF and the PPG: Noise.



Appendices



Appendix A – Acoustic Terminology and Abbreviations

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The L_{Aeq, 07:00 – 23:00} for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the L_{Aeq, 07:00 – 23:00}.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10, 1 hr} = x dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.



Abbreviations

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance

UDP – Unitary Development Plan

UKAS – United Kingdom Accreditation Service

WYGE – WYG Environment



Appendix B – Sketches

SK01 Noise Monitoring Locations

SK02a Site Layout and Receptor Locations

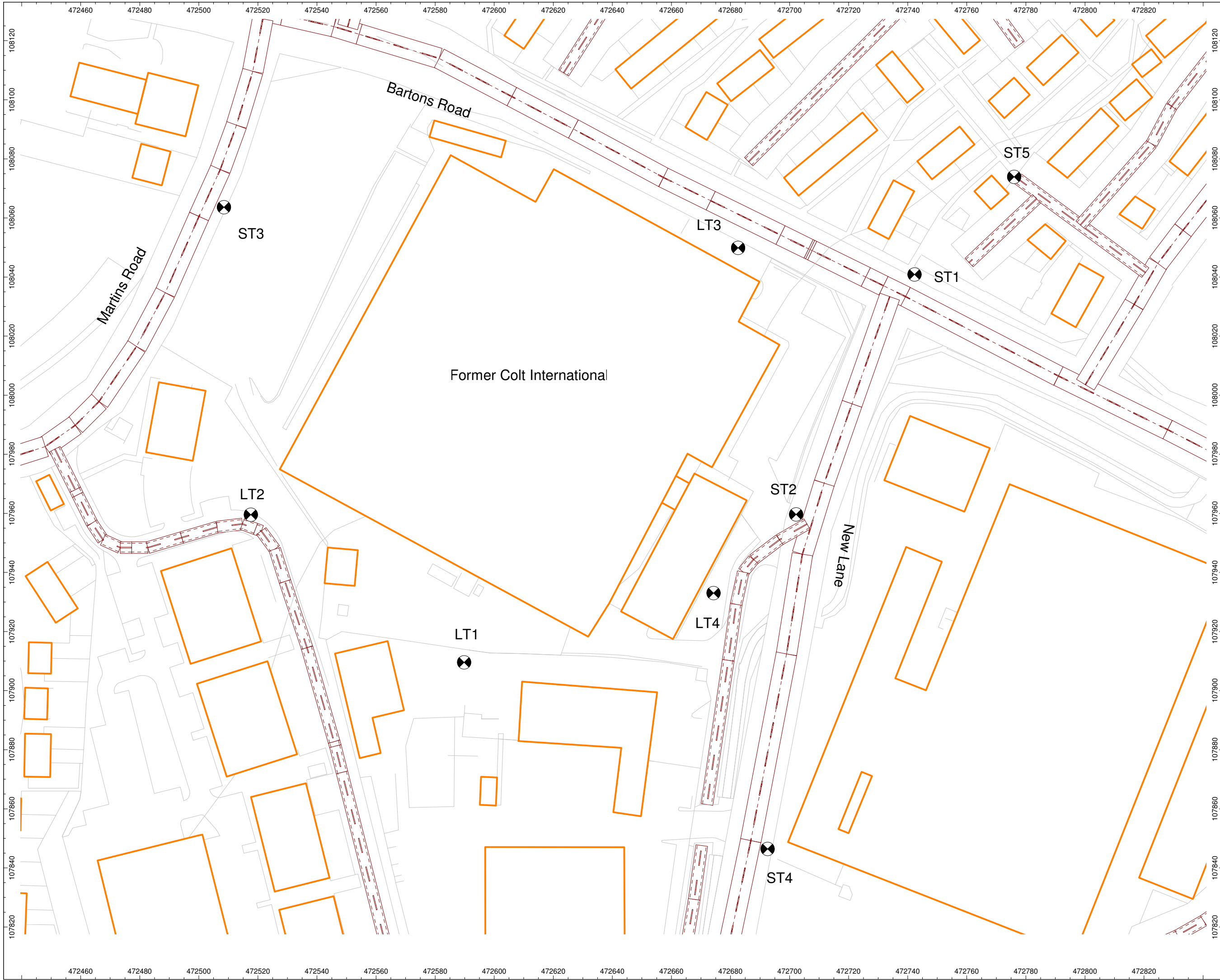
SK02b Existing Sensitive Receptor Locations

SK02c External Amenity Areas Receptor Locations

SK03 ProPG Stage 1 Risk Assessment: Existing Daytime $L_{Aeq,16hr}$

SK04 ProPG Stage 1 Risk Assessment: Existing Night-time $L_{Aeq,8hr}$

SK05 Glazing and Ventilation Strategy



Client:
Homes England

Project:
Former Colt
International,
Havant

Project Number:
A090070-182

Drawing Title / Scenario:
Noise Monitoring Locations

Drawing Number:
SK01

Scale : Not to scale

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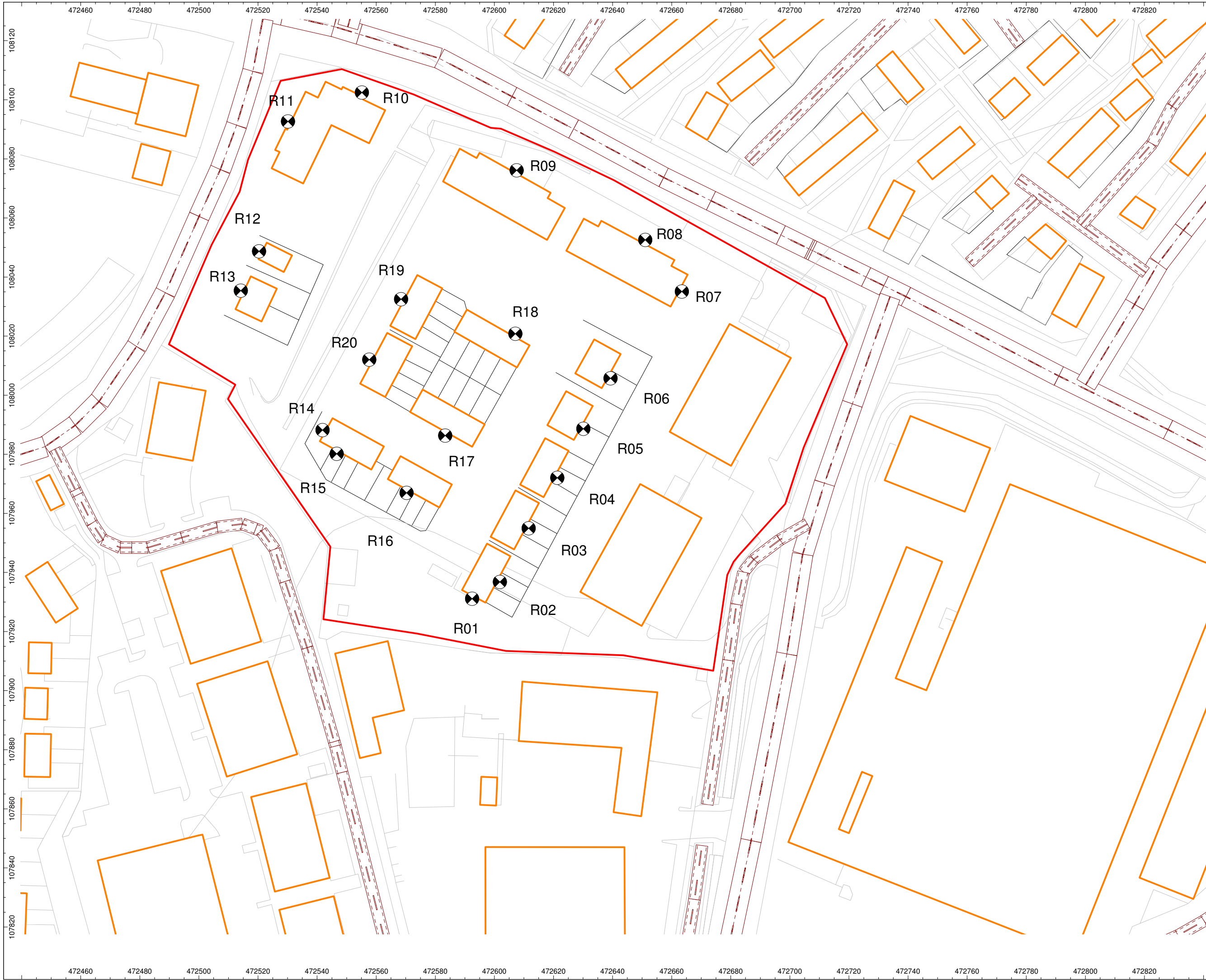
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International,
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Project Number:
A090070-182

Drawing Title / Scenario:
Site Layout and
Receptor Locations

Drawing Number:
SK02a

Key:
Site Boundary: —

Scale : Not to scale

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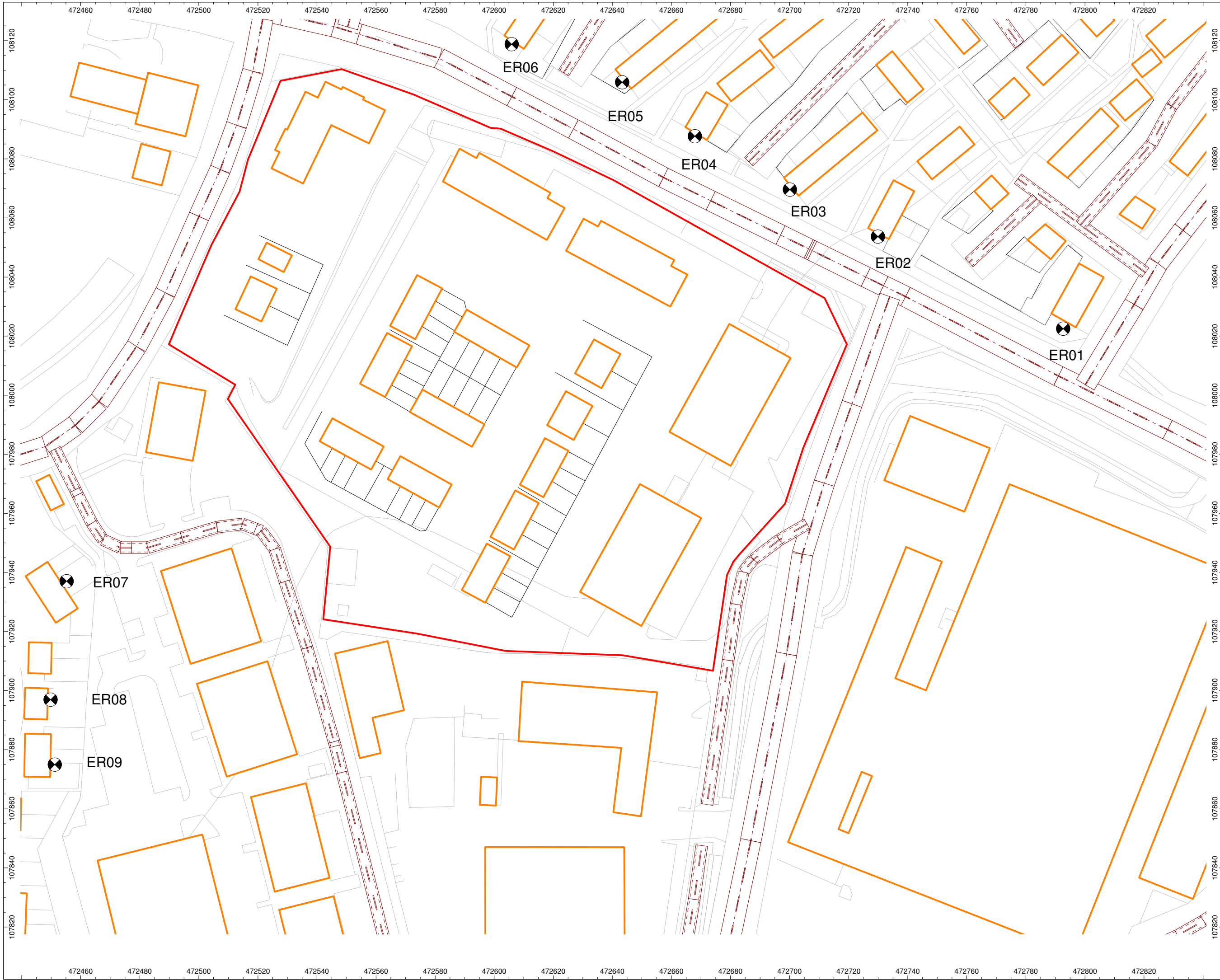
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Drawing Title / Scenario:
Existing Sensitive
Receptor Locations

Drawing Number:
SK02b

Key:
Site Boundary: —

Scale : Not to scale

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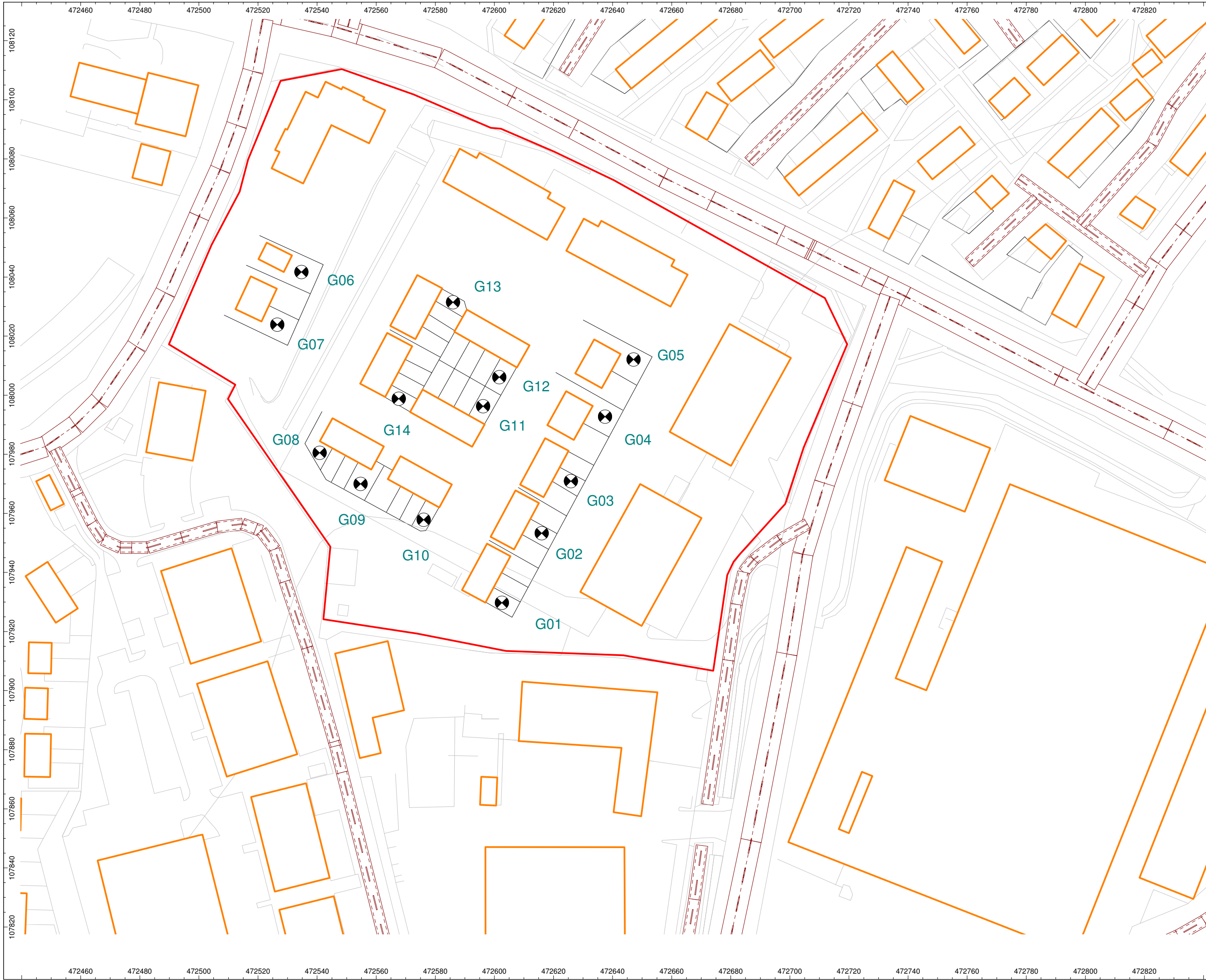
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Drawing Title / Scenario:
External Amenity
Areas Receptor
Locations

Drawing Number:
SK02c

Key:
Site Boundary: 

Scale : Not to scale

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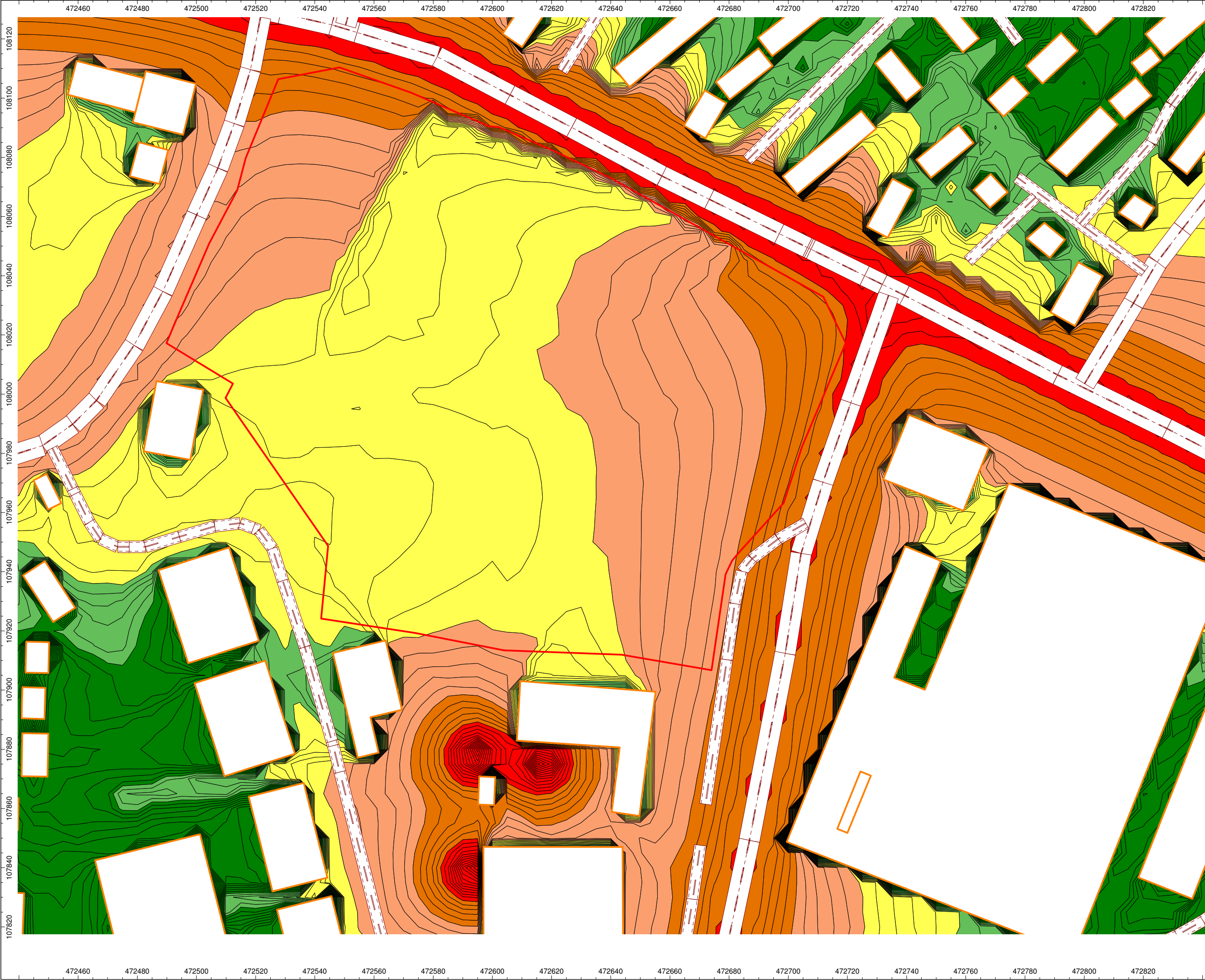
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Drawing Title / Scenario:
ProPG Stage 1
Risk Assessment
Daytime LAeq,16hour

Drawing Number:
SK03

Key:
Site Boundary: —

Negligible
Negligible - Low
Low
Low - Medium
Medium
High

Scale : Not to scale

Please note: Noise contour
plots are for illustrative
purposes only

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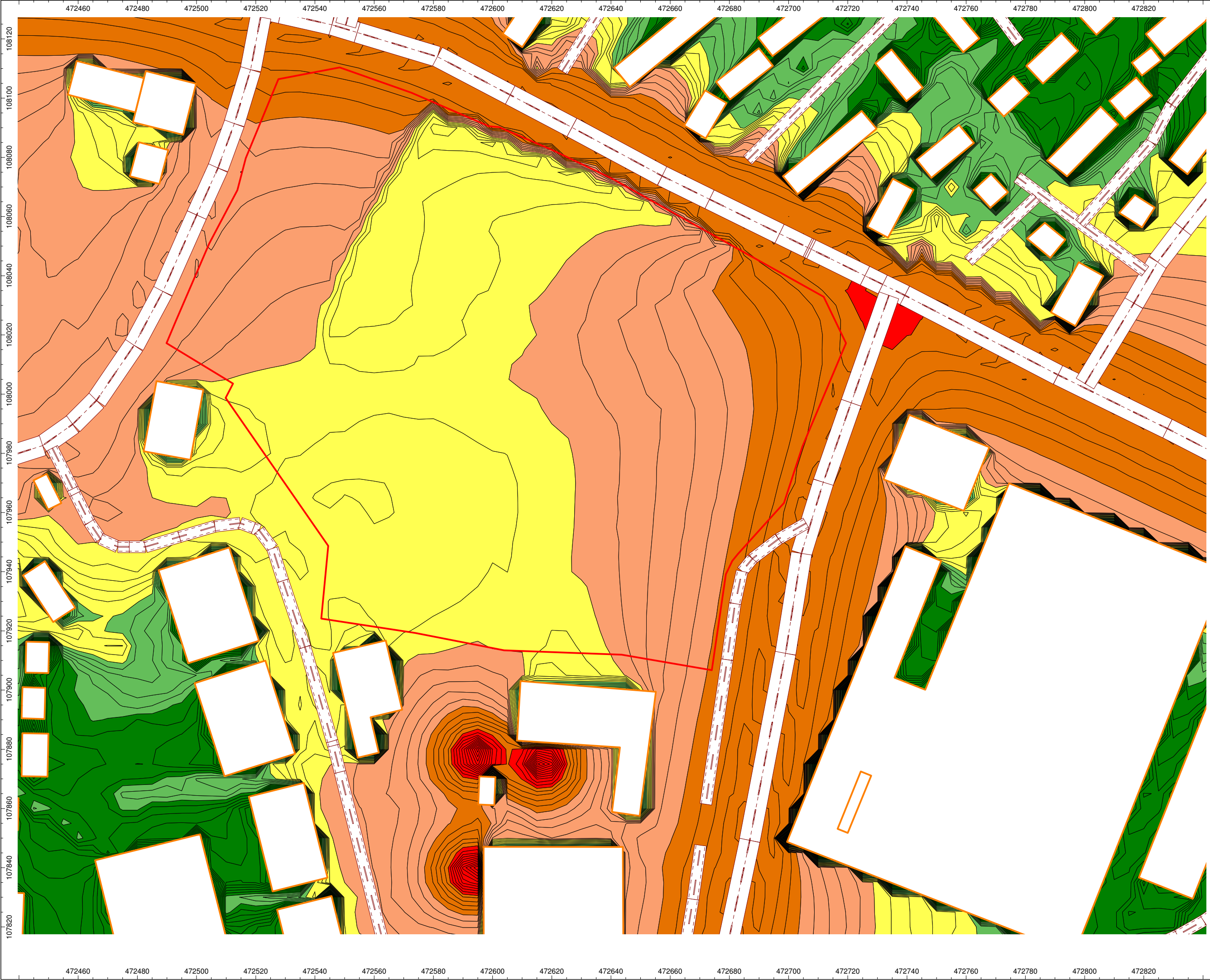
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Drawing Title / Scenario:
ProPG Stage 1
Risk Assessment
Night-time LAeq,8hour

Drawing Number:
SK04

Key:
Site Boundary: ---

■ Negligible
■ Negligible - Low
■ Low
■ Low - Medium
■ Medium
■ High

Scale : Not to scale

Please note: Noise contour
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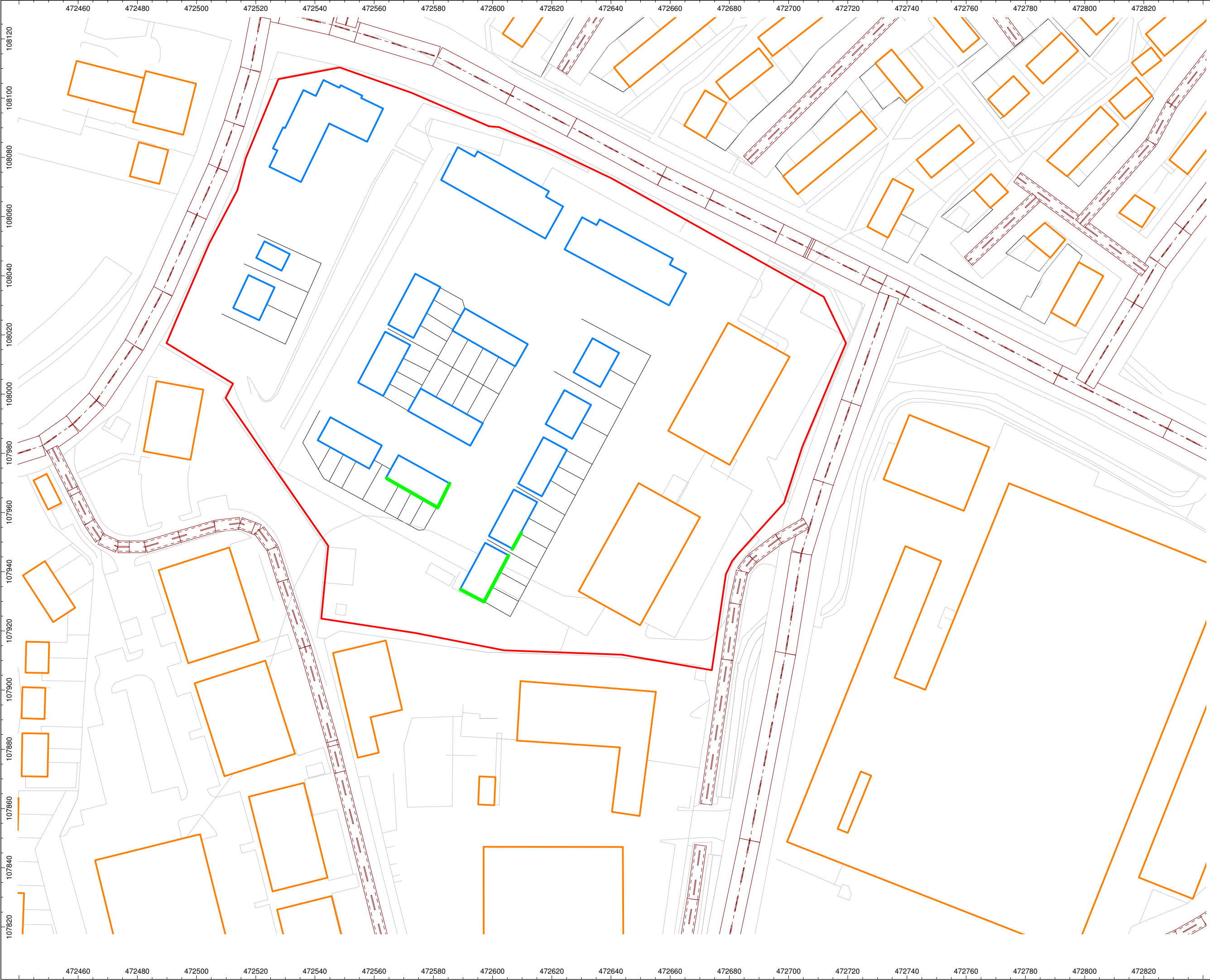
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Drawing Title / Scenario:
Glazing and
Ventilation
Strategy

Drawing Number:
SK05

Key:

Site Boundary: 

Standard Glazing
(Rw + Ctr 32 dB)
with Alternative Ventilation: 

Enhance Glazing
(Rw + Ctr 39 dB)
with Alternative Ventilation: 

Scale : Not to scale

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Appendix C – Noise Intrusion Assessment Tables

Table C1 Daytime $L_{Aeq,16hour}$ Noise Levels

Receptor No	External $L_{Aeq,16hour}$	Internal $L_{Aeq,16hour}$ with Windows Open	Internal $L_{Aeq,16hour}$ with Windows Closed	BS8233 / WHO Criteria
01	56.9	46.9	26.9	35
02	48.9	38.9	18.9	35
03	47.2	37.2	17.2	35
04	47.0	37.0	17.0	35
05	48.5	38.5	18.5	35
06	49.3	39.3	19.3	35
07	60.9	50.9	30.9	35
08	60.1	50.1	30.1	35
09	56.8	46.8	26.8	35
10	66.5	56.5	36.5	35
11	62.7	52.7	32.7	35
12	58.1	48.1	28.1	35
13	58.3	48.3	28.3	35
14	49.6	39.6	19.6	35
15	46.5	36.5	16.5	35
16	46.7	36.7	16.7	35
17	45.2	35.2	15.2	35
18	48.5	38.5	18.5	35
19	48.8	38.8	18.8	35
20	50.7	40.7	20.7	35

Table C2 Night-time $L_{Aeq,8hour}$ Noise Levels

Receptor No	External L_{Aeq}	Internal $L_{Aeq,8hour}$ with Windows Open	Internal $L_{Aeq,8hour}$ with Windows Closed	BS8233 / WHO Criteria
01	46.5	36.5	16.5	30
02	44.2	34.2	14.2	30
03	41.0	31.0	11.0	30
04	42.0	32.0	12.0	30
05	44.0	34.0	14.0	30
06	44.9	34.9	14.9	30
07	52.3	42.3	22.3	30
08	52.8	42.8	22.8	30
09	51.0	41.0	21.0	30
10	56.1	46.1	26.1	30
11	53.2	43.2	23.2	30
12	50.7	40.7	20.7	30



Receptor No	External L _{Aeq}	Internal L _{Aeq,8hour} With Windows Open	Internal L _{Aeq,8hour} With Windows Closed	BS8233 / WHO Criteria
13	50.7	40.7	20.7	30
14	45.1	35.1	15.1	30
15	43.9	33.9	13.9	30
16	42.9	32.9	12.9	30
17	39.4	29.4	9.4	30
18	42.6	32.6	12.6	30
19	43.4	33.4	13.4	30
20	44.2	34.2	14.2	30

Table C3 Night-time L_{Amax} Noise Levels

Receptor No	External L _{Amax}	Internal L _{Amax} with Windows Open	Internal L _{Amax} with Windows Closed	BS8233 / WHO Criteria
01	84.1	74.1	54.1	45
02	80.0	70.0	50.0	45
03	76.3	66.3	46.3	45
04	73.8	63.8	43.8	45
05	72.4	62.4	42.4	45
06	71.6	61.6	41.6	45
07	75.2	65.2	45.2	45
08	72.2	62.2	42.2	45
09	70.4	60.4	40.4	45
10	75.7	65.7	45.7	45
11	74.1	64.1	44.1	45
12	71.3	61.3	41.3	45
13	71.5	61.5	41.5	45
14	67.9	57.9	37.9	45
15	75.6	65.6	45.6	45
16	77.0	67.0	47.0	45
17	68.5	58.5	38.5	45
18	62.3	52.3	32.3	45
19	63.4	53.4	33.4	45
20	63.3	53.3	33.3	45



Appendix D – Report Conditions

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