**Bellway Homes Limited**

# Lathom Pastures Phase 2, Lathom, Skelmersdale

Noise Assessment Report

297980-RSK-RP-002-(00)

**DECEMBER 2020**

# QUALITY ASSURANCE

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|---|---|
| **Client:** | Bellway Homes Limited |
| **Project Name:** | Lathom Pastures Phase 2, Lathom, Skelmersdale |
| **RSK Acoustics Project No.:** | 297980 |
| **Document Title:** | Noise Assessment Report |
| **Document Reference:** | 297980-RSK-RP-002-(00) |

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*Document history*

| Rev. | Purpose Description | Author | Reviewer | Date |
|---|---|---|---|---|
| 00 | Noise Assessment Report – Draft to Client | GP | DC | 04.12.20 |
| | | | | |
| | | | | |

*GP – Graeme Parker, MIOA (Senior Acoustic Consultant)*
*DC – Daniel Clare, MIOA (Director – Acoustics)*

 Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of RSK.

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# 1 INTRODUCTION

## 1.1 Instruction

RSK has been instructed by Bellway Homes Ltd to undertake a noise assessment report to support a full planning application for the proposed Lathom Pastures Phase 2 residential development, Lathom, Skelmersdale.

The proposed development is directly south of an existing, 140 dwelling consented development (Wainhomes), currently in construction. The Lathom Pastures Phase 2 development (Bellway Homes Ltd) is expected to include approximately 200 additional dwellings.

This report describes the assessment methodology, the baseline conditions prevailing across the application site and the impact of the noise levels on the proposed residential development.

Mitigation measures/methods have been identified where necessary and practicable to achieve appropriate acoustic standards.

Given the work undertaken by RSK on the neighbouring development, and current COVID-19 restrictions, the field data collected for the 2019 neighbouring development has been considered appropriate for use in this study. This may need updating at planning stage, following a lifting of COVID-19 restrictions.

A glossary of acoustic terminology relevant to the assessment is included within Appendix 1.

## 1.2 Objectives

The aim of this document is to:

- Identify sources of noise that may impact upon the residents of the proposed development;
- Quantify and report the likely noise climate across the site to determine the suitability of the site for the proposed residential use;
- Identify the potential for disturbance on existing receptors as a result of the proposed development, specifically in terms of potential increases in road traffic.
- Specify the level of noise mitigation that would be required to reduce the potential for disturbance at future sensitive receptors.

The type of construction works, given the nature of the existing site and the nature of the development, is not considered to be especially noisy, for example there will be no buildings/ structures to demolish, areas of concrete to be broken up, piles to be sunk and therefore a quantitative noise assessment is excluded from this assessment. Construction activities will be restricted to daytime hours (Monday – Friday and Saturday mornings) and will be temporary in nature; therefore, significant adverse noise and vibration effects are considered unlikely.

# 2 REGULATORY FRAMEWORK

## 2.1 Noise Policy Statement for England (NPSE): 2010

The Noise Policy Statement for England is published by the Department for Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

The significance of impacts from noise within the NPSE are defined as follows:

*There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*

*NOEL – No Observed Effect Level*

- *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*

*LOAEL – Lowest Observed Adverse Effect Level*

- *This is the level above which adverse effects on health and quality of life can be detected.*

*Extending these concepts for the purpose of the NPSE leads to the concept of a significant observed adverse effect level.*

*SOAEL – Significant Observed Adverse Effect Level*

- *This is the level above which significant adverse effects on health and quality of life occur.*

The three aims of the NPSE are stated as:

- *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

## 2.2 National Planning Policy Framework (NPPF): 2019

Since its publication by the Department for Environment, Food and Rural Affairs in 2010 the Noise Policy Statement for England (NPSE) has been the Central Government noise policy that has been available to inform the consideration of environmental noise in relation to the consenting of everything from small scale residential development to national infrastructure. The National Policy Planning Framework (NPPF), as updated by the Ministry of Housing, Communities and Local Government in 2019, has noise aims that are consistent with the NPSE.

The noise policy aims as stated in the NPSE are:

> **Noise Policy Aims**
>
> **Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:**
>
> - **avoid significant adverse impacts on health and quality of life;**
> - **mitigate and minimise adverse impacts on health and quality of life; and**
> - **where possible, contribute to the improvement of health and quality of life.**

In order to translate these aims into practical guidance the NPSE uses the same terminology as used by the World Health Organisation (WHO), in the Night Noise Guidelines for Europe (2009) by referring to the Lowest Observed Adverse Effect Level (LOAEL). The NPSE extends this concept to define the level above which significant adverse effects on health and quality of life can be detected, hence the Significant Observed Adverse Effect Level (SOAEL).

The NPSE notes *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".* The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

Not having quantified effect thresholds in the NPSE means that relevant standards and guidance are used to put forward values for the LOAEL and SOAEL for the proposed development under consideration.

The suitability of internal noise levels within a development for its intended uses can be determined with reference to BS 8233.

## 2.3 Professional Practice Guidance on Planning and Noise (ProPG): 2017

The Professional Practice Guidance on Planning and Noise is written to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The CIEH, IOA and the ANC have worked together to produce the guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. This ProPG is based on the best knowledge available at the time of publication. It does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

In relation with achieving internal noise values with open windows, ProPG states that:

"*Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal* $L_{Aeq}$ *target levels should not normally be exceeded".*

***Acoustic Design***

ProPG encourages the use of acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:

- Maximising the separation distance between source and receiver;
- Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;
- Use existing features to reduce noise propagation across the site;
- Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms);
- Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.

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

British Standard (BS) 8233 establishes internal ambient noise levels for dwellings based upon occupancy patterns and derived from WHO Guidelines for Community Noise (1999). These are summarised overleaf:

**Table 2.1 Summary of Internal ambient noise levels**

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16h}$ | --- |
| Dining | Dining room/area | 40 dB $L_{Aeq,16h}$ | --- |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,16h}$ | 30 dB $L_{Aeq,8h}$ |
| *NOTE 3: These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.* <br> *NOTE 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.* | | | |

BS 8233 also provides design criteria for external noise and Section 7.7.3.2 states:

*"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

## 2.5 British Standard 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

BS 4142:2014+A1:2019 describes the methods for rating and assessing noise from industrial or commercial sources, including manufacturing processes, fixed installations and plant equipment, loading of goods and sound from mobile plant. Although primarily focussed on the assessment of new or extended commercial or industrial developments, the standard is applicable for the purpose of assessing sound at proposed new dwellings, through the determination of a rating level of an industrial or commercial noise source.

Rating penalties should be established based on a subjective assessment of the characteristics of the noise source. Commentary within BS 4142 states:

*"Tonality*

*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to* *a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*

*Impulsivity*

*A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.*

*Intermittency*

*When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

*Other sound characteristics*

*Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied".*

Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- 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.

BS 4142 explicitly states that the method defined is not intended for assessment of internal noise levels (Paragraph 1.3). However, ProPG (Paragraph 2.43) advises that aspects of the standard can be applied when assessing new residential development applications, stating:

*"Professional judgement will have to be exercised in addressing these sorts of issues. One possible approach may be to apply BS 4142:2014 character corrections to the noise level guideline values in order to derive suitable effect thresholds and/ or mitigation design targets and to use the same reference time periods recommended in the standard".*

Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    - façade insulation treatments,
    - ventilation and/or cooling, and
    - acoustic screening.

## 2.6 Calculation of Road Traffic Noise, 1988

The Calculation of Road Traffic Noise (CRTN) describes the procedures for calculating noise from Road traffic. The memorandum uses traffic flows, %HGV's and Road speed, amongst other parameters to calculate the noise level in terms of the $L_{A10,\ 18hr}$. The 18-hour period is defined between 06:00 and 24:00.

## 2.7 LA 111 'Noise and Vibration', Design Manual for Roads and Bridges, 2020

The Design Manual for Roads and Bridges LA 111 *'Noise and Vibration'* (DMRB) provides advice on the assessment of noise and vibration impacts due to road traffic.

Two sets of criteria are presented for assessing the impact of traffic noise changes, one for the short term and another for the long term, which takes into account the difference in the human perception of short- and long-term environmental noise changes. In the short term a change in road traffic noise of 1 dB $L_{A10,18hour}$ is the smallest that is considered perceptible whilst in the longer term a 3 dB $L_{A10,18hour}$ change is considered just perceptible. A change in road traffic flow of 25% is generally predicted to give rise to a change in noise of approximately 1 dB(A).

The criteria from DMRB for short and long-term effects are presented in Table 2.2 overleaf:

**Table 2.2: DMRB Criteria for Determining Magnitude of Impact**

| Short Term | | Long Term | |
|---|---|---|---|
| Change in noise level ($L_{A10,18hr}$ dB) | Magnitude of impact | Change in noise level ($L_{A10,18hr}$ dB) | Magnitude of impact |
| 0 | No Change | 0 | No Change |
| 0.1 – 0.9 | Negligible | 0.1 – 2.9 | Negligible |
| 1.0 – 2.9 | Minor | 3.0 – 4.9 | Minor |
| 3.0 – 4.9 | Moderate | 5.0 – 9.9 | Moderate |
| 5.0 + | Major | 10.0 + | Major |

## 2.8 International Standard ISO 9613:1996 'Acoustics – Attenuation of sound during propagation outdoors'

International Standard: ISO 9613-2: 1996: '*Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*' provides a prediction methodology which is suitable for a wide range of engineering applications where external noise propagation is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstacles.

The method predicts noise levels under meteorological conditions favourable to propagation from the sound source to the receiver, such as downwind conditions, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

## 2.9 Acoustics, Ventilation and Overheating – Residential Design Guide, 2020

The '*Acoustics, Ventilation and Overheating Residential Design Guide*' (AVO Guide) provides an integrated approach to sustainable design for both thermal and acoustic comfort in our work and living spaces. The guide recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating.

Where proposed dwellings will be exposed to low levels of noise, it will generally be feasible to adopt open windows to provide thermal comfort during the summer months.

Where dwellings will experience higher noise levels, it will be necessary to adopt an alternative cooling strategy, in accordance with the principles of the cooling hierarchy. The cooling hierarchy seeks to address overheating in a sustainable manner.

## 2.10 Local Authority Requirements

Due to the early stage of the project, the local authority of West Lancashire Borough Council (WLBC) has not yet been consulted regarding the proposed noise monitoring and assessment methodology for development.

However, based on RSK's experience of similar projects in the immediate vicinity, namely the Wainhomes site to the north of the application site, a similar strategy would be proposed here.

As such, the proposed methodology would involve; a site suitability assessment undertaken in line with the NPPF and the ProPG; and a DMRB assessment in order to assess changes in road traffic affecting existing receptors. This approach would be expected to be deemed appropriate by the WLBC to assess noise impacts for the proposed residential development.

# 3 DEVELOPMENT OVERVIEW

## 3.1 Site Location

The proposed development site is located on the western edge of Lathom, West Lancashire, as shown in Figure 3.1 (overleaf).

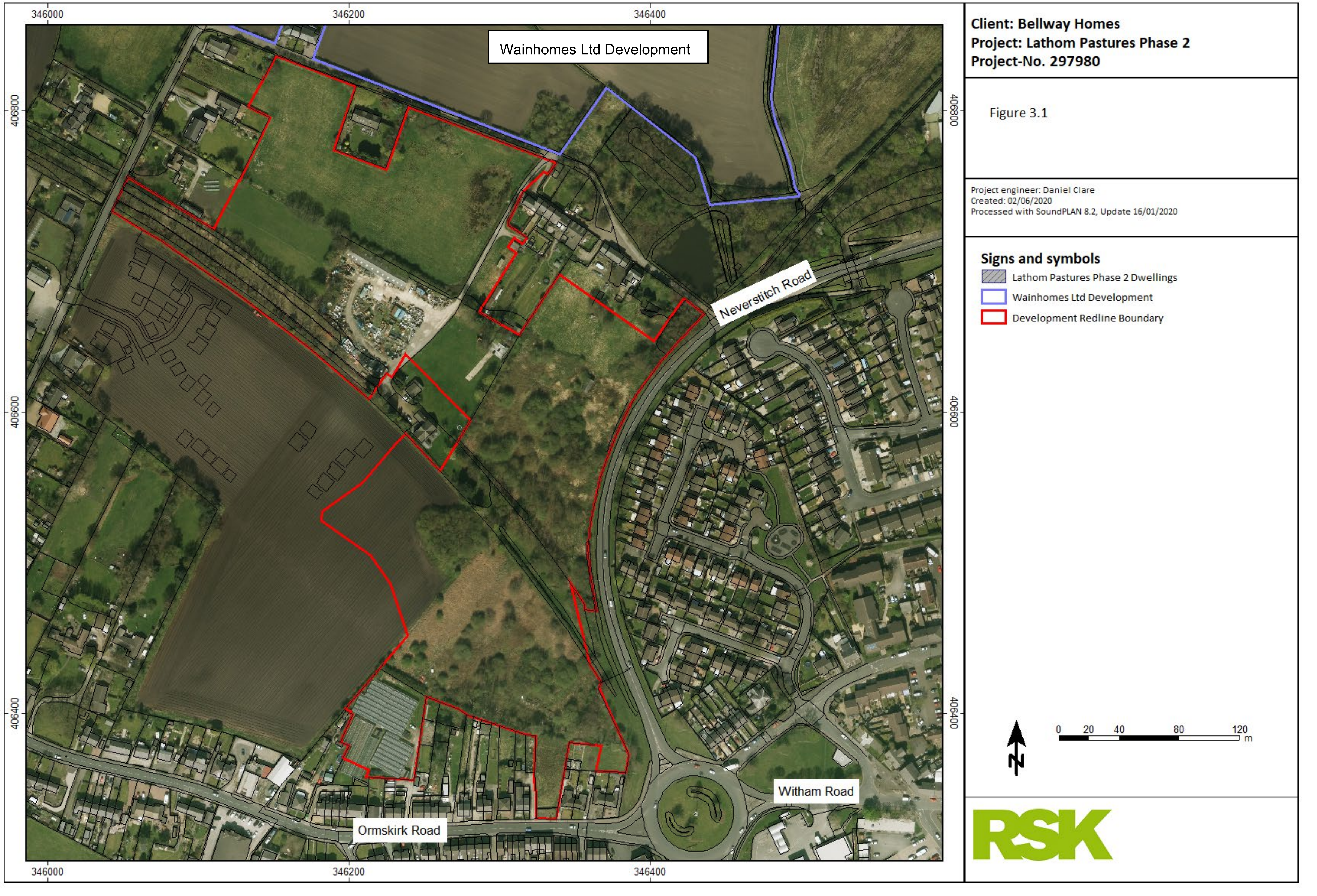
The surroundings of the proposed development site are as follows:

- The site is neighboured by existing residential areas to the south, west and east, which are accessed via Ormskirk Road (to the south), Neverstitch Road (to the east), Meadow Nook Drive, Barn Croft Close and Firswood Road to the west;
- The Wainhomes residential site occupies land to the north, as well as existing properties on Old Engine Lane,
- Two large distribution centres are located approximately 600 metres and 700 metres to the north and northeast of the site respectively. The Wainhomes development is located between the distribution centres and the Bellway development; and;
- A number of commercial units are located circa 300 metres to the northeast of the site, off the A577 Neverstitch Road.

The proposed development, in its current draft, includes up to 200 residential dwellings comprising 2-storey detached and semi-detached houses, two blocks of eleven 3-storey apartments with ancillary parking, associated new access, landscaping and related infrastructure works.

The proposed development site will be accessed via Neverstitch Road.

Figure 3.1 Development Layout



# 4 BASELINE NOISE SURVEY

As discussed earlier in this document, the current pandemic caused by COVID-19 has a significant impact on the accuracy and suitability of infield noise data that can be collected at this stage. A change in habits and availability of transportation means the noise environment now is unlikely to be representative of the environment expected once the development is habitable, or pre-COVID-19.

Given the detailed assessment, and associated survey, undertaken by RSK for the neighbouring Wainhomes site, we feel the data collected then will provide a good indication of potential impacts at the proposed Bellway Homes Ltd development. In addition, a detailed traffic assessment has been undertaken and as such can be used to update the previous noise survey data through a modelling exercise.

An extract on the baseline noise survey, taken from the Wainhomes report (Ref: RSK 297377-01(00) - Firswood Road, Lathom. Noise assessment report_00, dated February 2019), is presented in Appendix 2.

A summary of the data relevant to this study is presented below in Tables 4.1 and 4.2, for unattended and attended measurements respectively. The tables represent the daytime (07:00 to 23:00 hrs) and night-time (23:00 to 07:00 hrs) noise levels.

A full set of results is provided in Appendix 2, including notes on which measurements have been discounted as result of unsuitable weather conditions or extraneous noise sources affecting the measurements.

**Table 4.1 Noise monitoring results – Unattended noise monitoring**

| NML Id | Date | Period | $L_{Aeq,T}$ dB | $L_{Amax,T}$ dB | $L_{A90,T}$ dB | $L_{A10,T}$ dB |
|---|---|---|---|---|---|---|
| UL03 | Tue 12/02/2019 | Daytime [1] | 50.9 | 80.8 | 45.8 | 50.7 [2] |
| | | Night time | 49.6 | 77.3 | 38.4 | 45.7 [2] |
| | Wed 13/02/2019 | Daytime | 54.4 | 84.0 | 49.0 | 54.7 |
| | | Night time | 50.9 | 81.6 | 41.7 | 47.9 [2] |
| | Thu 14/02/2019 | Daytime | 54.1 | 80.4 | 50.5 | 54.3 |
| | | Night time | 50.9 | 77.1 | 43.6 | 48.9 [2] |
| | Fri 15/02/2019 | Daytime | 54.0 | 77.7 | 50.2 | 54.0 |
| | | Night time | 49.9 | 84.9 | 37.9 | 45.2 [2] |
| | Sat 16/02/2019 | Daytime | 52.7 | 87.5 | 46.2 | 52.3 [2] |
| | | Night time | 50.3 | 80.0 | 41.5 | 47.3 [2] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Sun 17/02/2019 | Daytime | 51.5 | 89.8 | 46.5 | 51.4 [2] |
| | | Night time | 52.6 | 94.8 | 40.0 | 45.9 [2] |
| | Mon 18/02/209 | Daytime [1] | 53.7 | 78.6 | 49.7 | 54.1 |

(1) *Incomplete 16h period;*

(2) *$L_{A10}$ in many cases is higher than the $L_{Aeq}$ however where the background noise environment is generally low with a couple of high magnitude but short duration events, the $L_{10}$ can be lower.*

Attended noise measurements at AL02 (Wainhomes development report) north of the Lathom Pastures Phase 2 boundary captured road traffic noise from the A577 and intermittent construction noise from the residential site that is currently under construction. The noise data captured for $L_{max}$ levels have been used to inform the maximum noise assessment.

A summary of the attended noise measurement results is shown in Table 4.2 below.

**Table 4.2 Noise monitoring results – Attended noise monitoring**

| NML Id | Date | Start Time | Duration | $L_{Aeq, T}$ dB | $L_{Amax, T}$ dB | $L_{A90, T}$ dB | $L_{A10, T}$ dB |
|---|---|---|---|---|---|---|---|
| AL02 | Tue 12/02/2019 | 12:55 | 60 min | 50.5 | 75.3 | 47.4 | 52.4 |

# 5 PREDICTIVE MODELLING

## 5.1 Modelling parameters

Operational noise predictions considering road traffic noise have been undertaken using computational noise modelling software SoundPlan v8.2.

An outline of the modelling assumptions and model settings, for traffic modelling, are presented in Table 5.1. The distribution centres to the north are not considered to be of significance due to the screening effect provided by the Wainhomes development. This should be confirmed at the detailed planning stage.

The noise model has been calibrated in relation to the unattended noise measurements for the site taken in February 2019 and updated where required in accordance with the new traffic study (see Tables 5.2 to 5.5 and Section 5.5).

**Table 5.1 Modelling parameters**

| Item | Setting |
|---|---|
| Ground Absorption | • Hard, acoustically reflective ground (0.0 coefficient) – roads, pavements and hard standing areas; and<br>• Acoustically medium/ soft (assumed 0.75 coefficient) – grass or vegetated areas |
| Meteorological Conditions | • 10 degrees Celsius;<br>• 70% humidity; and<br>• Wind from source to receiver. |
| Receptor Height | New residential dwellings:<br>• Ground Floor 1.5 m above ground; and<br>• First Floor 4.0 m above ground.<br>• Second Floor 6.5 m above ground |

| Item | Setting |
|---|---|
| Source Modelling | External noise sources, such as road traffic have been treated as line sources. Algorithms for road traffic noise:<br>• CRTN; this is used for those roads with traffic flows (18 hr AAWT) above 1000 vehicles, or hourly flows above 50 vehicles.<br>• The maximum noise levels across the development are likely to result from road traffic movements. These have been based on a typical assumed truck pass-by of 100 dB(A) at 1 m. This has been added into the noise model as a 'point source' and calculated in accordance with ISO 9613. It is assumed that there would be more than 10 truck movements on the road network during a night time period and therefore this will be the basis of the $L_{max}$ assessment. An increase of this value to 105 dB(A) at 1 m has been assumed to allow for an overheating scenario (difference between average highest $L_{max}$ and $10^{th}$ highest)<br>• Traffic movements along internal access routes are likely to be responsible for $L_{max}$ events at new dwellings without direct exposure to Neverstich Road. Through RSK file data, a sound pressure level of 68 dB(A) at 7 m has been assumed for internal access roads. This will be used for both the overheating $L_{max}$ and typical scenarios. |
| Traffic Information | Road traffic levels for the baseline year (2020), opening year (2021), and future year (2036) as provided by CBO Transport. |
| Terrain | LiDAR 2 meter-resolution elevation points (DTM)<br>Development site assumed at a level site of 61 m datum. |
| Barriers | Garden fences (closed boarded wood with minimum surface density of 12 $kg/m^{-2}$) have been included within the model. These vary in height between 1.8 m and 3 m (see Appendix 3).<br>The Wainhomes development was not finalised at the time of the noise impact assessment and therefore building footprints are not available. However, it is assumed the noise from the distribution centres to the north would be suitably mitigated by the Wainhomes development so that the contribution of the centres would not be audible at the Lathom Pastures Phase 2 development. |
| Uncertainty | Due to the inability to gather noise data from current site conditions, an uncertainty level of 2 dB(A) has been applied to the predictions. |

## 5.2 Noise Sensitive Receptors – Existing

The closest sensitive receptors to the proposed development site are described below:

- 2-storey residential dwellings/farmhouses at Slater Lane;
- 2-storey residential dwellings at Old Engine Lane;
- 2-storey residential dwellings at Firswood Road; and
- 2-storey residential dwellings at the Wainhomes development.

A selection of these receptors has been analysed within this noise report, in order to assess operational noise (additional traffic) for the proposed residential development. The Lathom Pastures Phase 2 development is not expected to include any significant plant items and therefore an assessment of operational plant from the proposed development has not been included. The assessment for existing receptors will be based on Basic Noise Levels (BNLs) for changes in Road Traffic noise only (see Section 8).

## 5.3 Noise Sensitive Receptors – Development

A layout (.dwg file) of the Phase 2 development has been provided and covers the 200 dwellings (drawing ref: BHNM118 Lathom Pastures Phase 2 rev PL01 rev B), a combination of detached and semi-detached houses and two blocks of apartments. No room layout plans are available and therefore at this stage any façade could include a habitable room.

All façades of all dwellings have been included in the assessment to inform the mitigation requirements. The assessment results are provided graphically.

## 5.4 Source Inputs – Road Traffic

A quantitative assessment of Road Traffic noise has been undertaken to derive the impact of changes in traffic flows attributable to the proposed development. The assessment focuses on the change in noise levels for the roads near the site. The road traffic noise levels have been calculated in accordance with the methodology set out in CRTN.

Road traffic data have been provided by CBO Transport. The data include the scenario for the development's opening year (2021), baseline scenario (2020), future year (2036) and proposed traffic flows on the development's surrounding road networks. It should be noted that the provided traffic data consider traffic flows with and without the proposed development, including consideration to other committed developments in the area.

A summary of this data is presented overleaf in Tables 5.2 to 5.5. It should be noted that speed limits for each road have been adopted as the assumed speed for the road links.

**Table 5.2 Traffic data for the baseline assessment year (2020)**

| Road Name | 18 hr Annual Average Weekly Traffic (AAWT) | | |
|---|---|---|---|
| | Total vehicles | % HGV | Average Speed (km/h)* |
| Site access | 0 | 0 | 32 |
| A557 (north of site access) | 8817 | 4.1 | 64 |
| A557 (south of site access) | 8817 | 4.1 | 64 |
| Witham Road | 6812 | 4.6 | 48 |
| B5312 Railway Road | 10571 | 4.5 | 64 |
| Ormskirk Road (East of Lyelake Lane, west of Hollands Lane) | 8433 | 1.3 | 64 |

**Assumed speed*

**Table 5.3 Traffic data for the development's opening year (2021) without the proposed development**

| Road Name | 18 hr Annual Average Weekly Traffic (AAWT) | | |
|---|---|---|---|
| | Total vehicles | % HGV | Average Speed (km/h)* |
| Site access | 0 | 0 | 32 |
| A557 (north of site access) | 8921 | 4.1 | 64 |
| A557 (south of site access) | 8921 | 4.1 | 64 |
| Witham Road | 6892 | 4.6 | 48 |
| B5312 Railway Road | 10696 | 4.5 | 64 |
| Ormskirk Road (East of Lyelake Lane, west of Hollands Lane) | 8811 | 1.3 | 64 |

**Assumed speed*

**Table 5.4 Traffic data for the development's opening year (2021) including the proposed development**

| Road Name | 18hr Annual Average Weekly Traffic (AAWT) | | |
|---|---|---|---|
| | Total vehicles | % HGV | Average Speed (km/h)* |
| Site access | 1400 | 0 | 32 |
| A557 (north of site access) | 9641 | 4.1 | 64 |
| A557 (south of site access) | 10173 | 4.1 | 64 |
| Witham Road | 7178 | 4.6 | 48 |
| B5312 Railway Road | 11902 | 4.5 | 64 |
| Ormskirk Road (East of Lyelake Lane, west of Hollands Lane) | 9635 | 1.3 | 64 |

**Assumed speed*

**Table 5.5 Traffic data for the development's future year (2036) including the proposed development**

| Road Name | 18hr Annual Average Weekly Traffic (AAWT) | | |
|---|---|---|---|
| | Total vehicles | % HGV | Average Speed (km/h)* |
| Site access | 1400 | 0 | 32 |
| A557 (north of site access) | 11007 | 4.1 | 64 |
| A557 (south of site access) | 11539 | 4.1 | 64 |
| Witham Road | 8234 | 4.6 | 48 |
| B5312 Railway Road | 13539 | 4.5 | 64 |
| Ormskirk Road (East of Lyelake Lane, west of Hollands Lane) | 10985 | 1.3 | 64 |

**Assumed speed*

In addition to the assessment of traffic noise on the new development, an assessment of the change in traffic noise in the short term and long term for the surrounding road network has also been provided. This will indicate impacts at existing receptors.

## 5.5 Noise Model Validation

Due to the lack of access to the site, and variance in current road conditions as a result of COVID-19, it has not been possible to validate the existing model in relation to the new traffic data. However, the model for future scenarios is considered robust and suitable representation of the noise environment on the opening year of the development.

# 6 NOISE PREDICTIONS

Graphical representations of the predicted $L_{Aeq}$ noise levels for the opening year (2021) for both daytime and night time periods are shown in Figure 6.1 and Figure 6.2 overleaf. Daytime noise levels have been calculated considering a receptor height of 1.5 m above ground (equivalent to ground level), while night-time noise levels have been calculated considering a receptor height of 4.0 m above ground (equivalent to first floor level). This account for a 2.5 dB reduction to account for CRTN façade predictions to a free-field assessment level, and a 2 dB addition for uncertainty. No free-field correction is applied for the grid noise maps except the uncertainty.

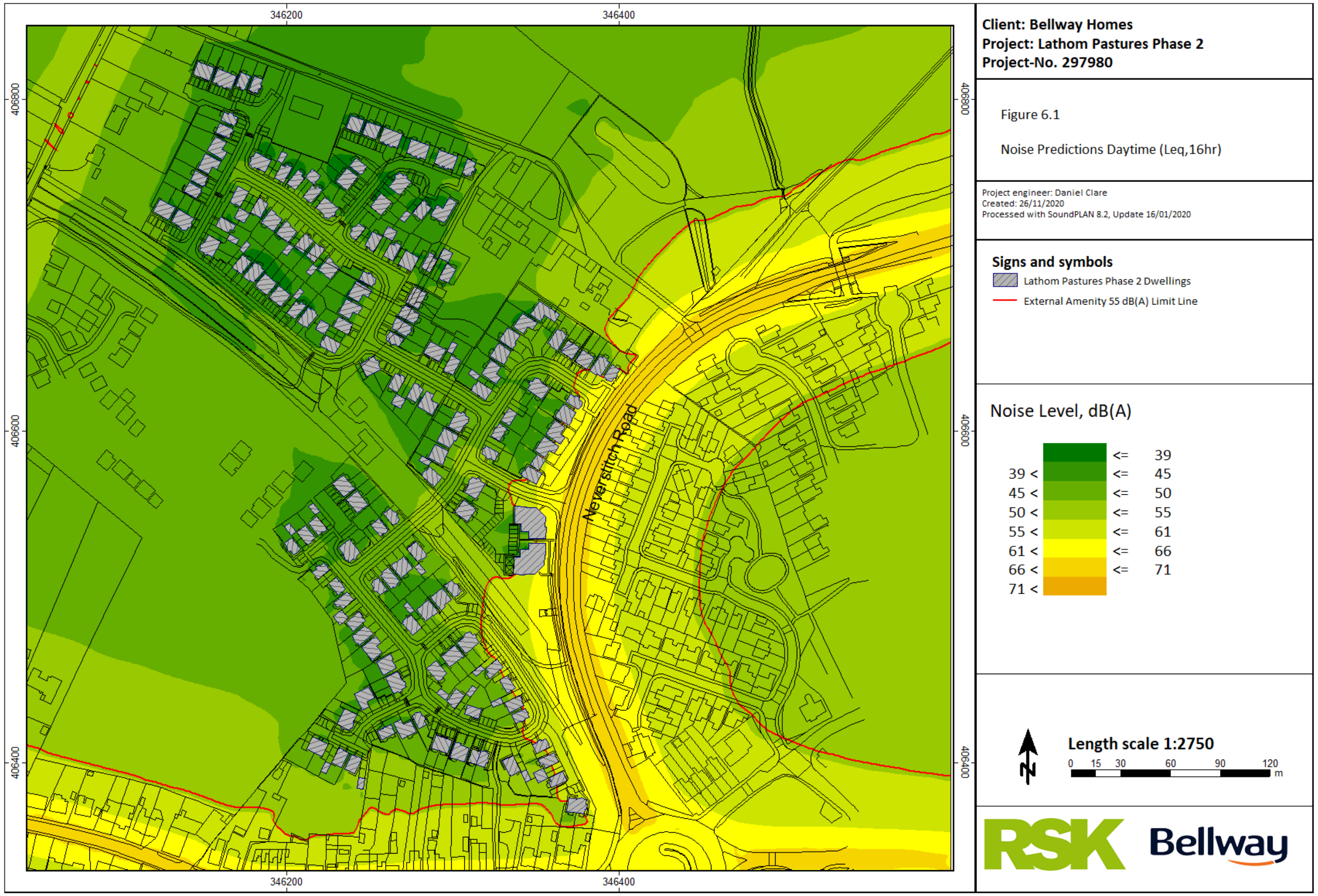
As well as façade noise levels, the daytime levels provide an indication of external amenity impacts. This is illustrated by a red limit line showing the upper assessment target as per BS 8233:2014.

Maximum noise level predictions at the nearest development façades have also been undertaken, considering the 10$^{th}$ highest individual night maximum ($L_{max}$) events in accordance with WHO guidelines. The noise model has been adopted by calibration of the measured maximum levels at the long-term measurement location, in order to inform likely maximum night-time levels at indicative property locations. This assumes that road traffic will be responsible for $L_{max}$ values across the site. This is displayed graphically in Figure 6.3. At this stage the maximum noise events from internal access road use has not been included and should be considered at detailed design. It is unlikely that these will impact on the assessment conclusions.

The guidance document, BS 8233:2014 on sound insulation and noise reduction for buildings states that indoor noise levels within bedrooms should not exceed 30 dB(A) during the night-time and 35 dB(A) for noise sources within living rooms for the daytime. Furthermore, in accordance with WHO guidelines, maximum internal noise levels ($L_{max}$) have been assessed against their threshold of 45 dB $L_{Amax}$ at night. It is considered that these three levels are the lowest observed adverse effect levels (LOAELs) in line with NPSE.

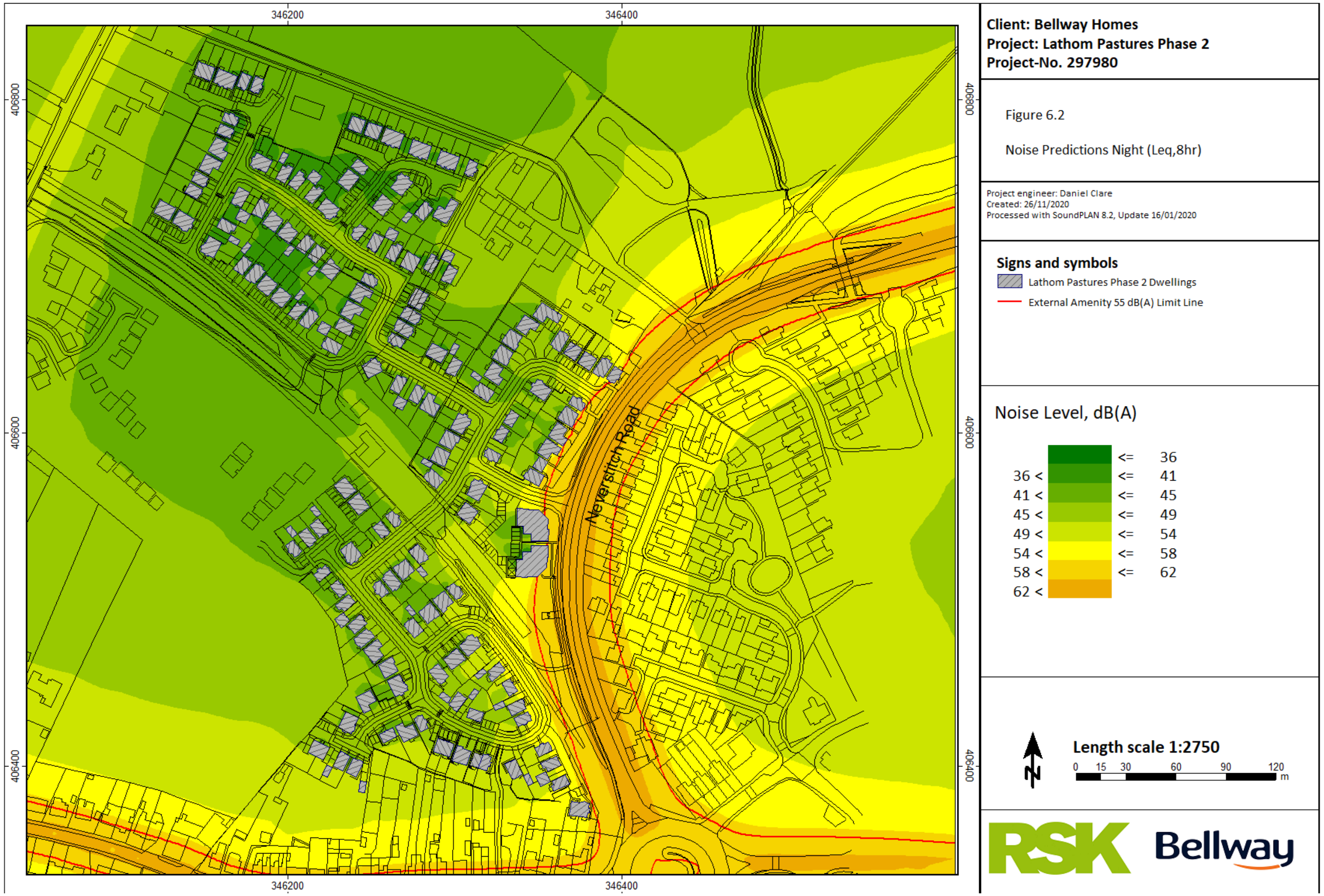
Overheating scenarios have also been considered using an average of the highest $L_{max}$ values from each night time period.

## Figure 6.1 Noise Predictions Daytime ($L_{eq,16hr}$)

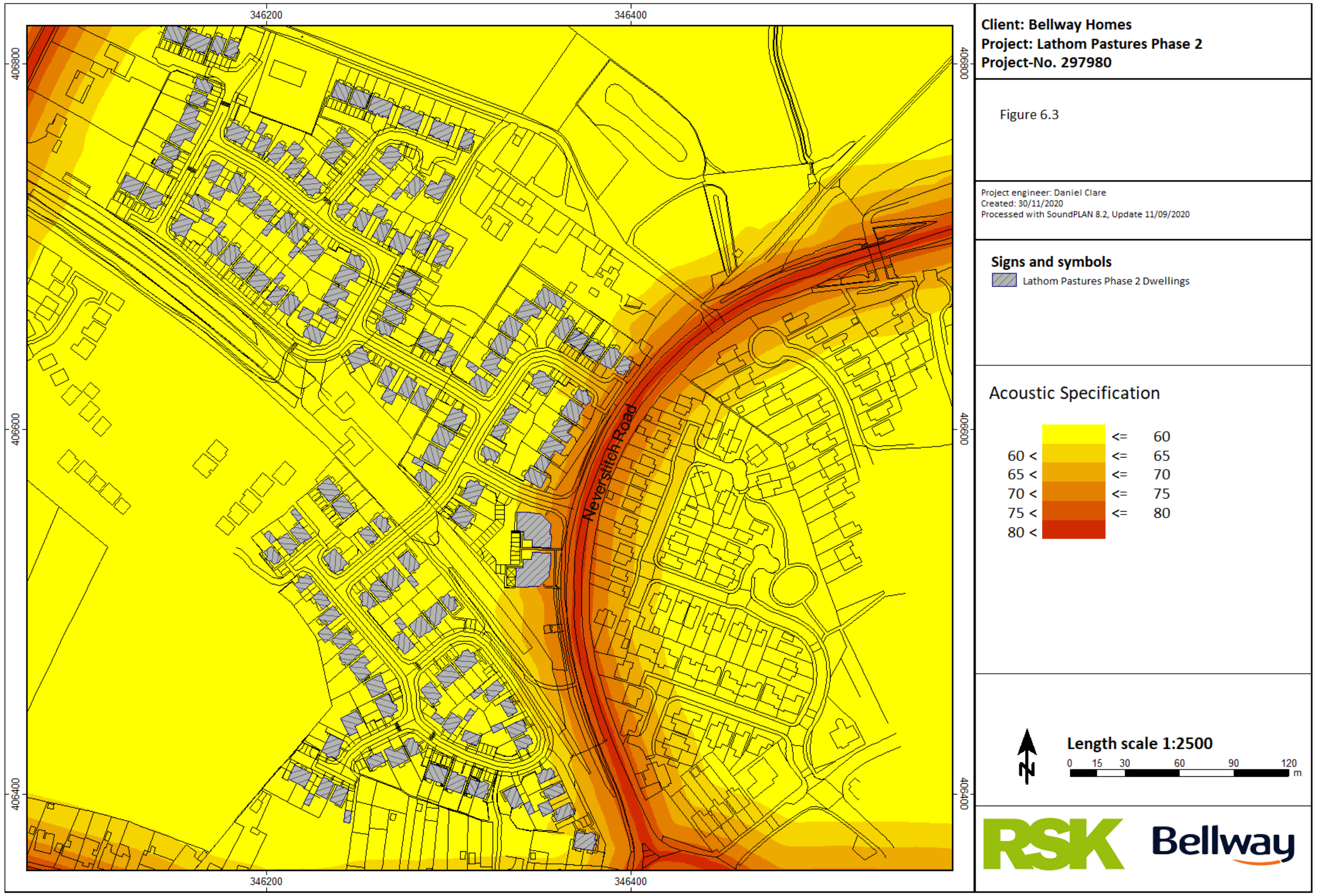



C:\Users\dclare.RSKHELSBY\Documents\SP 8.2 Lathom Pastures 2\Figure 6.1 Noise Predictions Daytime.sgs

**Figure 6.2** **Noise Predictions Night time ($L_{eq,8hr}$)**



## Figure 6.3 Noise Predictions Night time ($L_{max}$) – for assessment only

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## 6.1 Façade Specifications

The following set of standard specifications has been derived for the development as an indicator to requirements.

For the purposes of providing an indicative mitigation strategy for the proposed dwellings, which accounts for the varying levels of noise exposure across the site, three acoustic performance specifications have been considered for acoustically sensitive spaces within the proposed dwellings i.e. living rooms, dining rooms and bedrooms including en-suites. These correlate to the proposed building plots presented in Figure 6.4. It should be noted that these are examples of façade specifications, with a number of alternate options available to meet the same acoustic performance. This will need to be verified at detailed design, following receipt of room layouts and compliance with Part F of the Building Regulations.

The external wall and roof specifications are consistent across the performance specifications. Example products are provided based on a presumed internal layout for bedrooms (i.e. façade area = 25 $m^2$, window area = 3 $m^2$, room volume = 35 $m^3$). Bellway Homes Ltd typically looks to use a System 3 Positive Input Ventilation System (PIV) in dwellings/rooms where a higher acoustic performance, or higher air flow is required. This applies to Acoustic Specification C, below.

**Table 6.1 Acoustic performance specification – walls & roof**

| Element | Octave band centre frequency, Hz | | | | | $R_w/D_{n,e,w}$ ($C$; $C_{tr}$) |
|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1,000 | 2,000 | |
| External wall | 40 | 44 | 45 | 51 | 56 | 51 (-1; -4) |
| Roof | 26 | 39 | 46 | 50 | 51 | 47 (-2; -8) |

**Note 1:** The external wall build-up is based on masonry cavity construction, with cavity insulation infill.

**Note 2:** The roof construction is based on a tiled finish over a trussed or purlin/rafter roof structure, with a single layer of plasterboard to the soffit of the ceiling joists, overlain with thermal insulation.

### 6.1.1 Acoustic Specification – Type A (Green)[1]

The performance requirements for acoustic specification Type A are defined below.

**Table 6.2 Acoustic performance specification – Type A**

| Element | Octave band centre frequency, Hz | | | | | $R_w/D_{n,e,w}$ ($C$; $C_{tr}$) |
|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1,000 | 2,000 | |
| Glazing | 23 | 18 | 26 | 38 | 41 | 30 (-1; -4) |
| Ventilator | 33 | 32 | 29 | 28 | 30 | 30 (0; -1) |

**Note 1:** An example glazing specification which achieves the performance noted above would be a Saint-Gobain 4/16/4 double glazing system.

**Note 2:** Any trickle ventilator providing the above acoustic performance and 6,400mm$^2$ equivalent area (subject to Part F ventilation assessment at detailed design).

### 6.1.2 Acoustic Specification – Type B (Yellow)[1]

The performance requirements for acoustic specification Type B are defined below.

**Table 6.3 Acoustic performance specification – Type B**

| Element | Octave band centre frequency, Hz | | | | | $R_w/D_{n,e,w}$ ($C$; $C_{tr}$) |
|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1,000 | 2,000 | |
| Glazing | 21 | 26 | 36 | 42 | 38 | 37 (-2; -5) |
| Ventilator | 37 | 36 | 40 | 53 | 62 | 46 (-1; -3) |

**Note 1:** An example glazing specification which achieves the performance noted above would be a Saint-Gobain 8/14/6 double glazing system. The acoustic performance accounts for all elements of the glazing system i.e. includes frame.

**Note 2:** An example ventilator specification which achieves the performance noted above would be 2 x Caice 500x600x400 trickle ventilator (5,966mm$^2$ equivalent area). This is subject to room layout and Part F compliance. To be confirmed at detailed design following room layouts.

[1] Refers to colour coding used in figures

### 6.1.3 Acoustic Specification – Type C (Red)[1]

The performance requirements for acoustic specification Type C are defined below.

**Table 6.4 Acoustic performance specification – Type C**

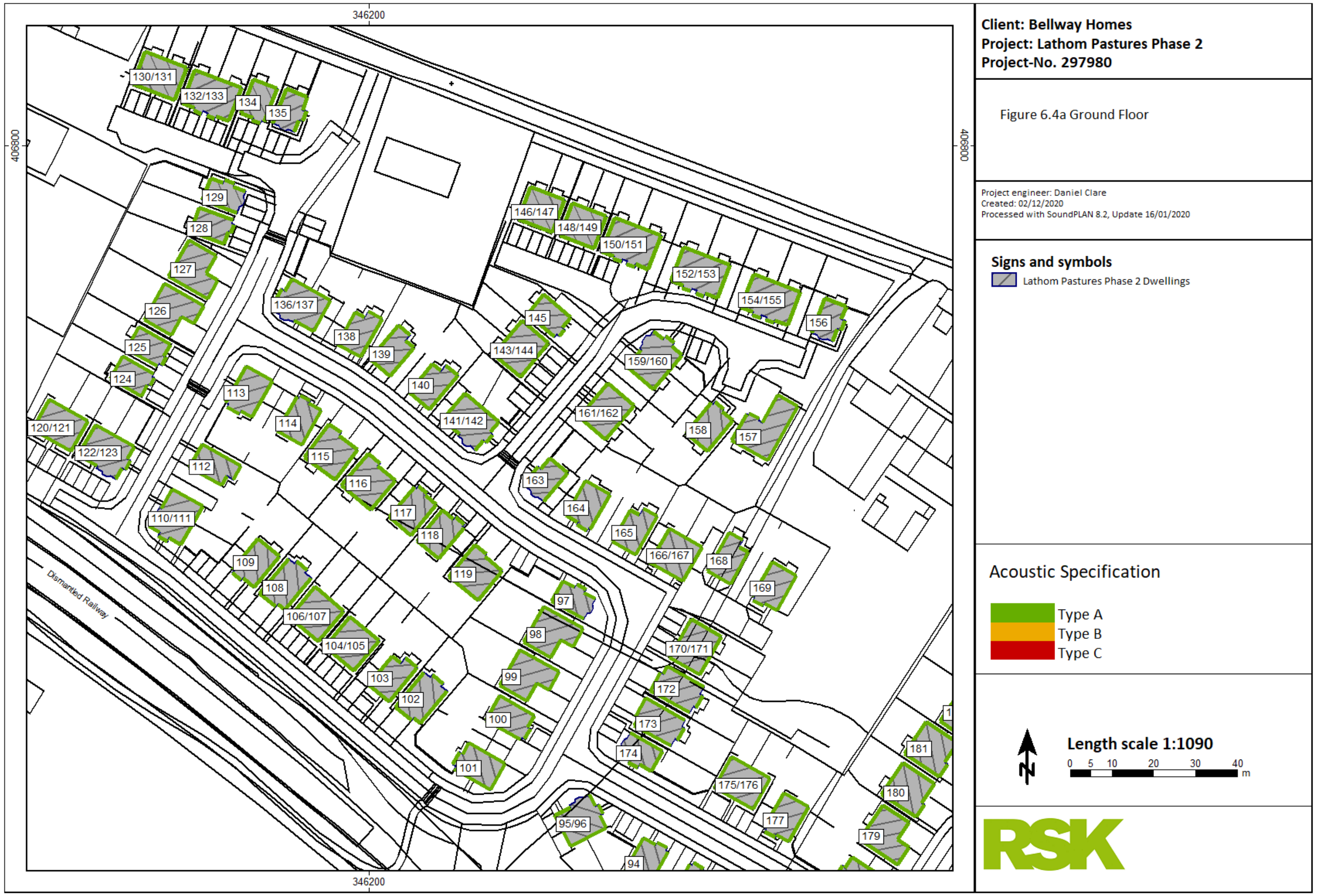
| Element | Octave band centre frequency, Hz | | | | | $R_w/D_{n,e,w}$ ($C$; $C_{tr}$) |
|---|---|---|---|---|---|---|
| | 125 | 250 | 500 | 1,000 | 2,000 | |
| Glazing | 28 | 29 | 38 | 45 | 50 | 42 (-2; -6) |
| Ventilator | 47 | 46 | 49 | 56 | 66 | 55 (-1; -3) |

**Note 1:** An example glazing specification which achieves the performance noted above would be a Saint-Gobain 12(12)8.4A double glazing system (no trickle vent). The acoustic performance accounts for all elements of the glazing system i.e. includes frame.

**Note 2:** For dwellings which are designed to be highly 'airtight' and include a System 3 PIV system, trickle ventilators to the above acoustics specification will be required to an equivalent area to meet Part F of the Building Regulations. Where the building has a high permeability (i.e. low/poor air tightness) trickle vents may not be required. This will be confirmed at detailed design on receipt of room layouts.

**Note 3:** Roof void ventilators and extract fan terminations serving en-suites shall be located or routed to the screened façade of the building i.e. away from road noise.

## Figure 6.4a Indicative Façade Specifications (Ground Floor) – Plots 97-181



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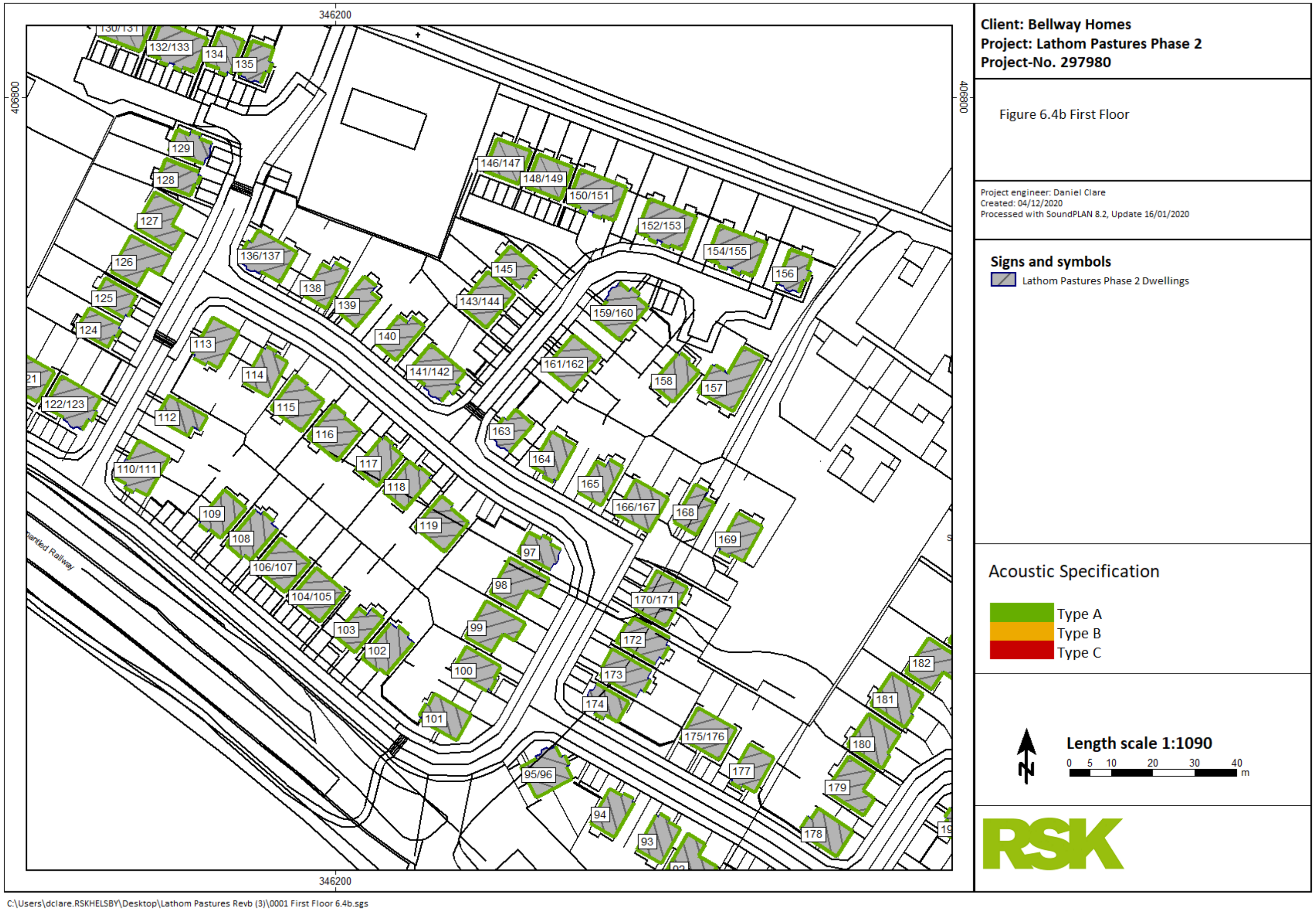
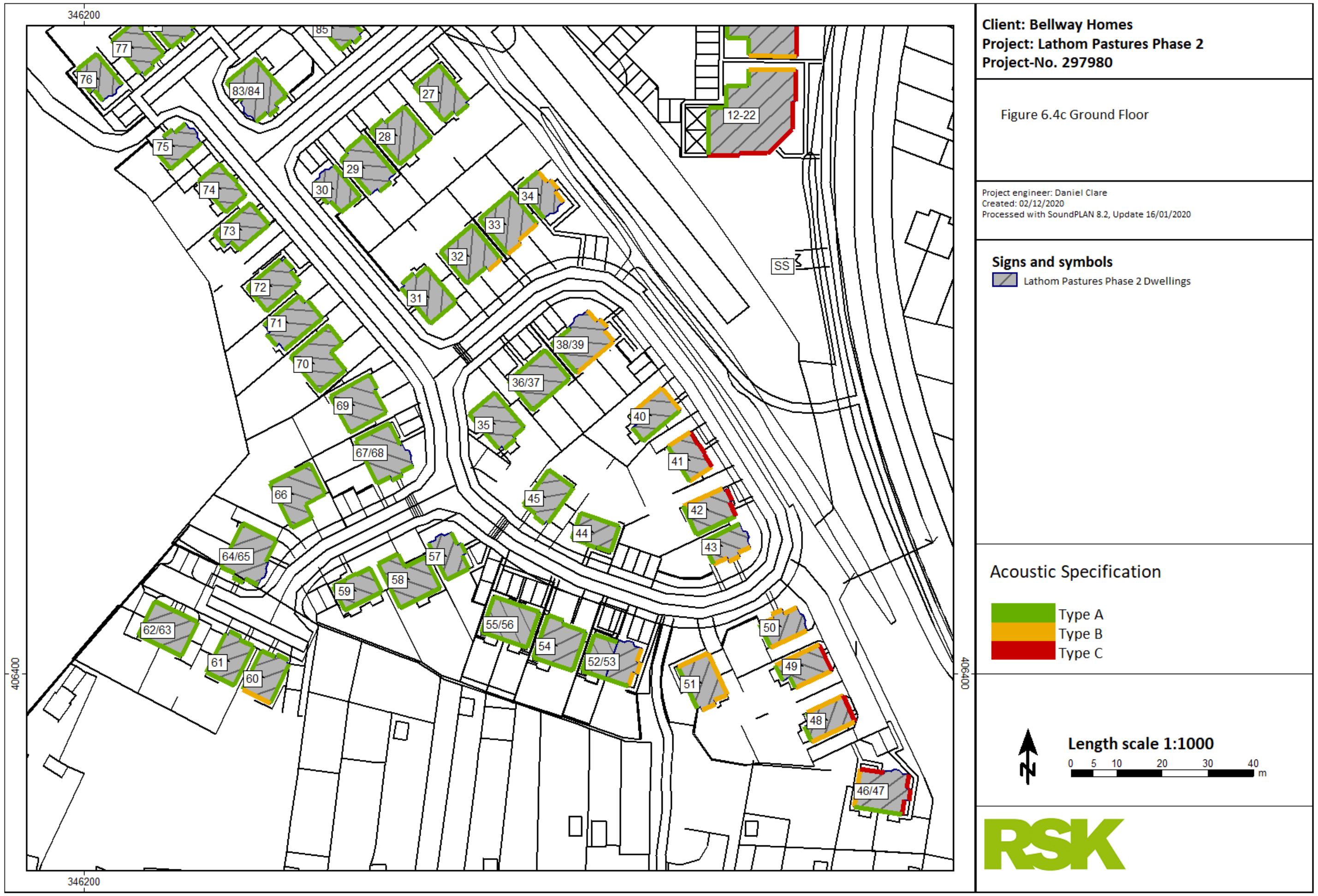
## Figure 6.4b Indicative Façade Specifications (First Floor) – Plots 97-182



## Figure 6.4c Indicative Façade Specifications (Ground Floor) – Plots 27-77

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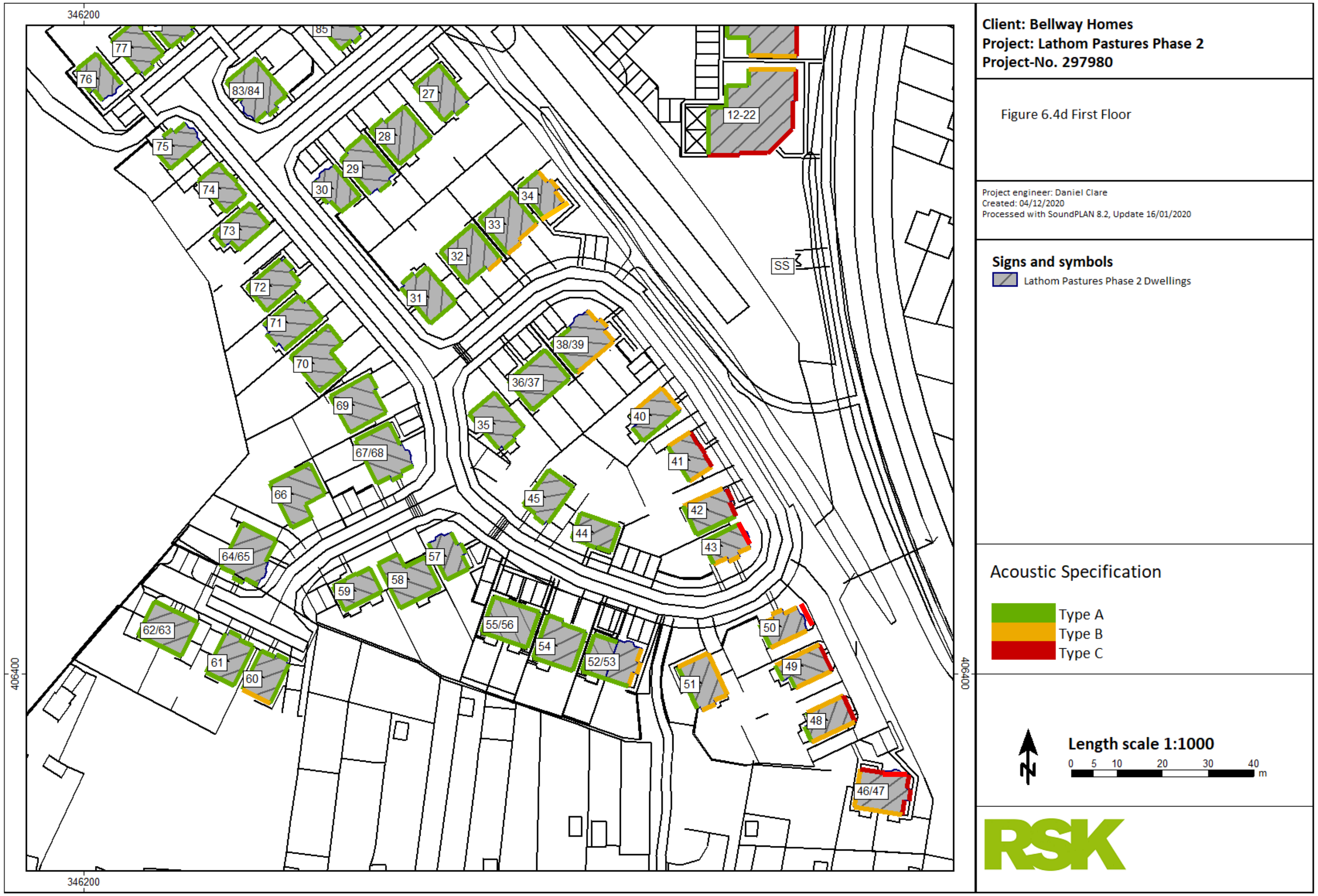
## Figure 6.4d Indicative Façade

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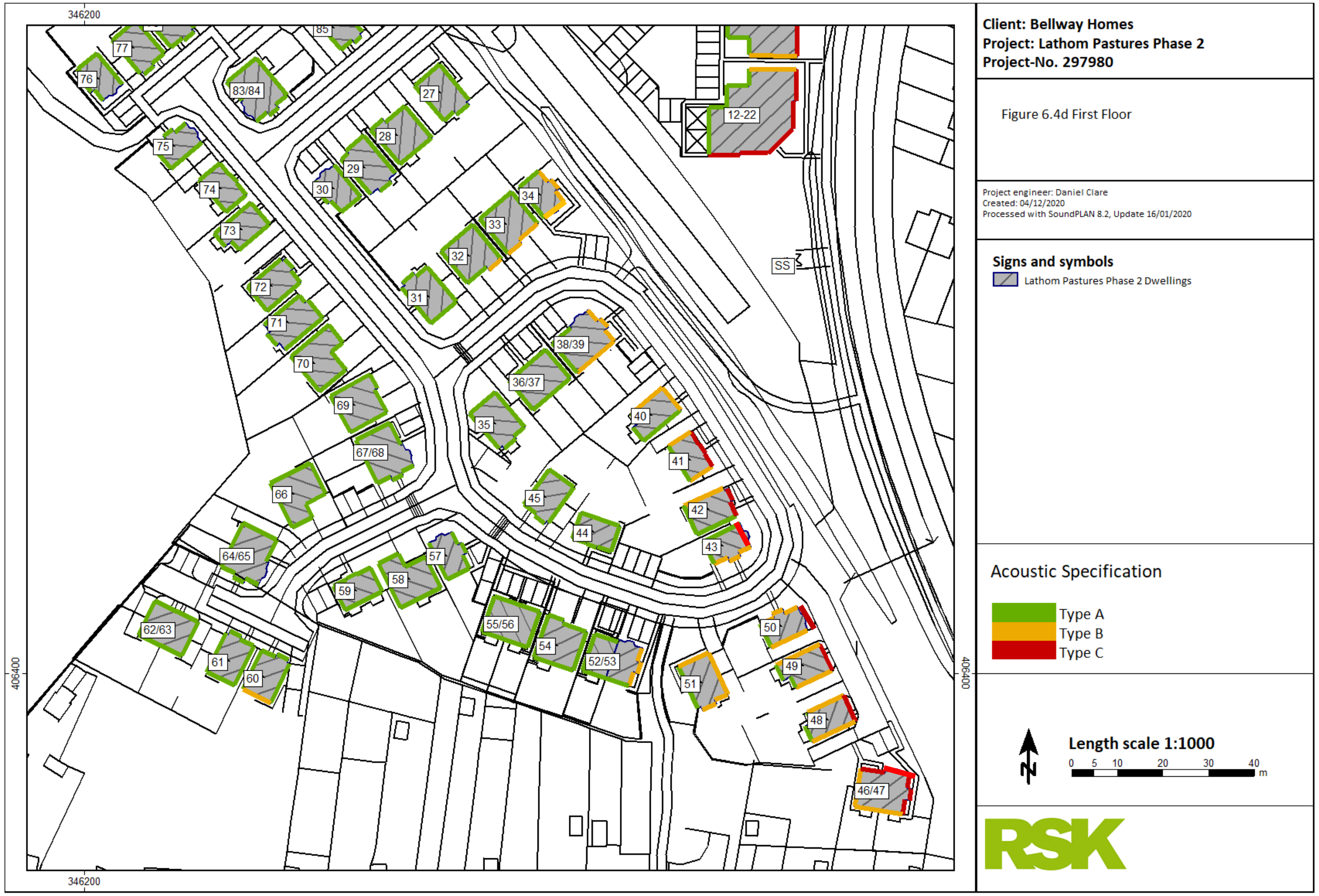
## Specifications (First Floor) – Plots 27-77

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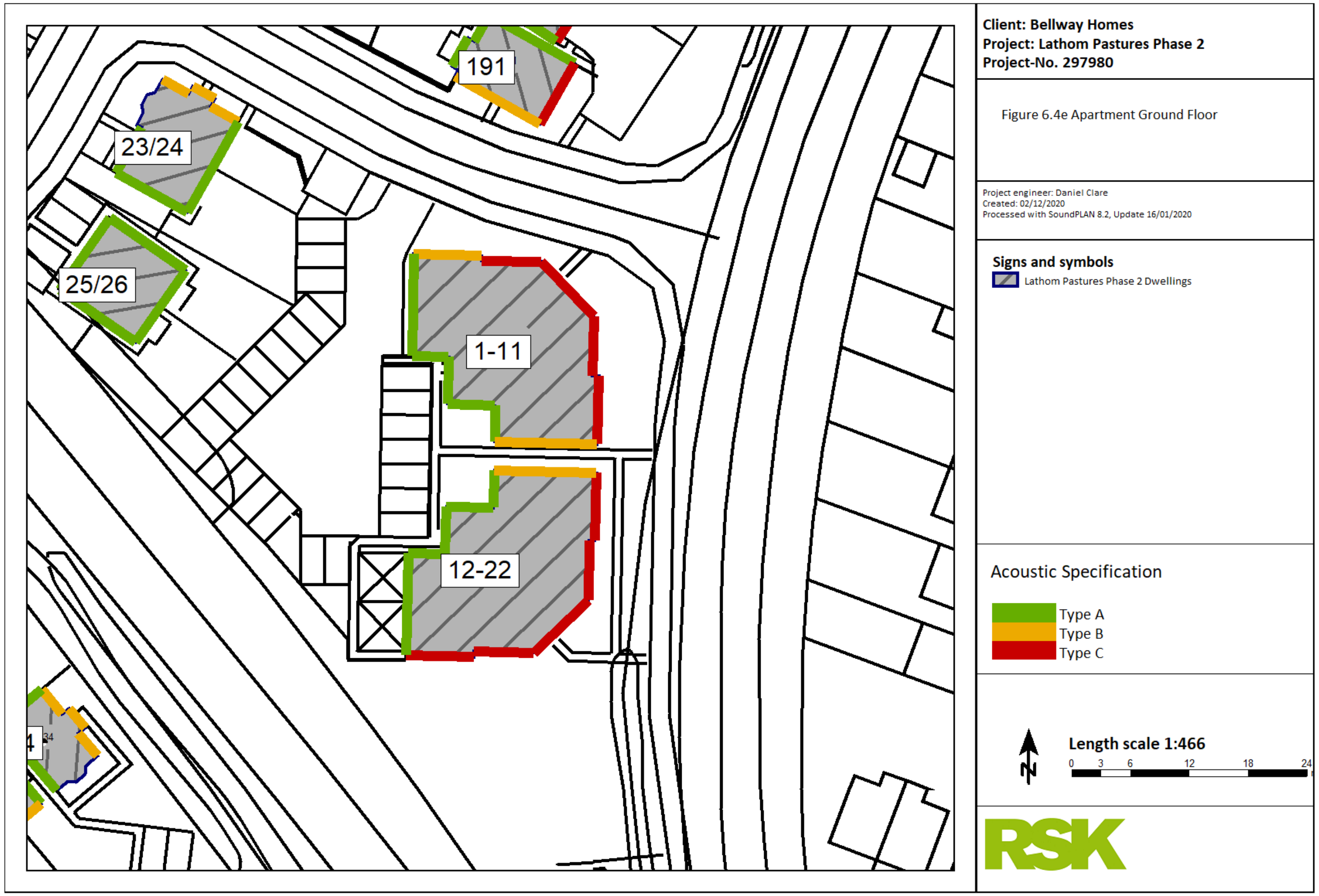
## Figure 6.4e Indicative Façade Specifications (Apartments Ground Floor)

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## Figure 6.4f Indicative Façade Specifications (Apartments First Floor)

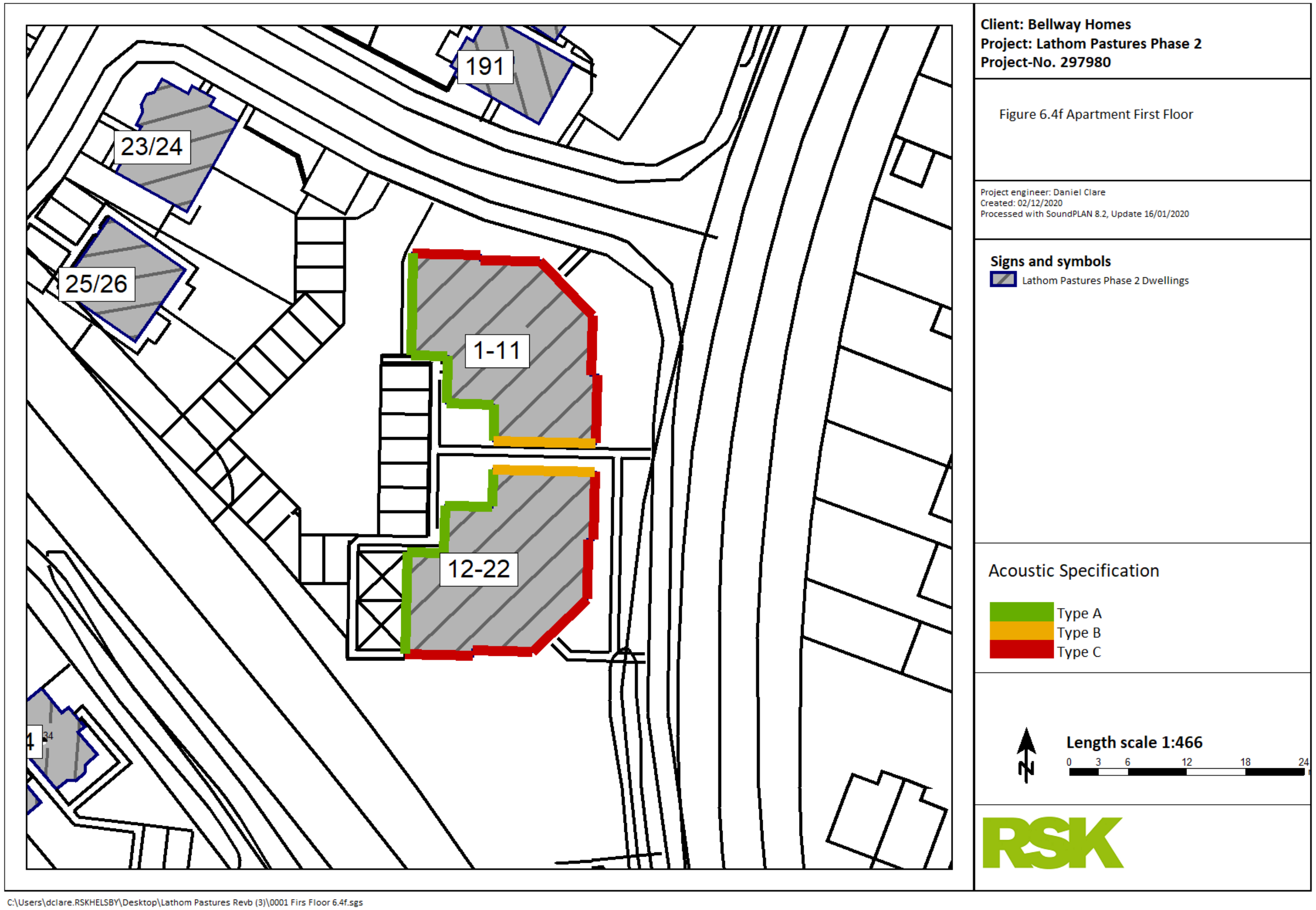
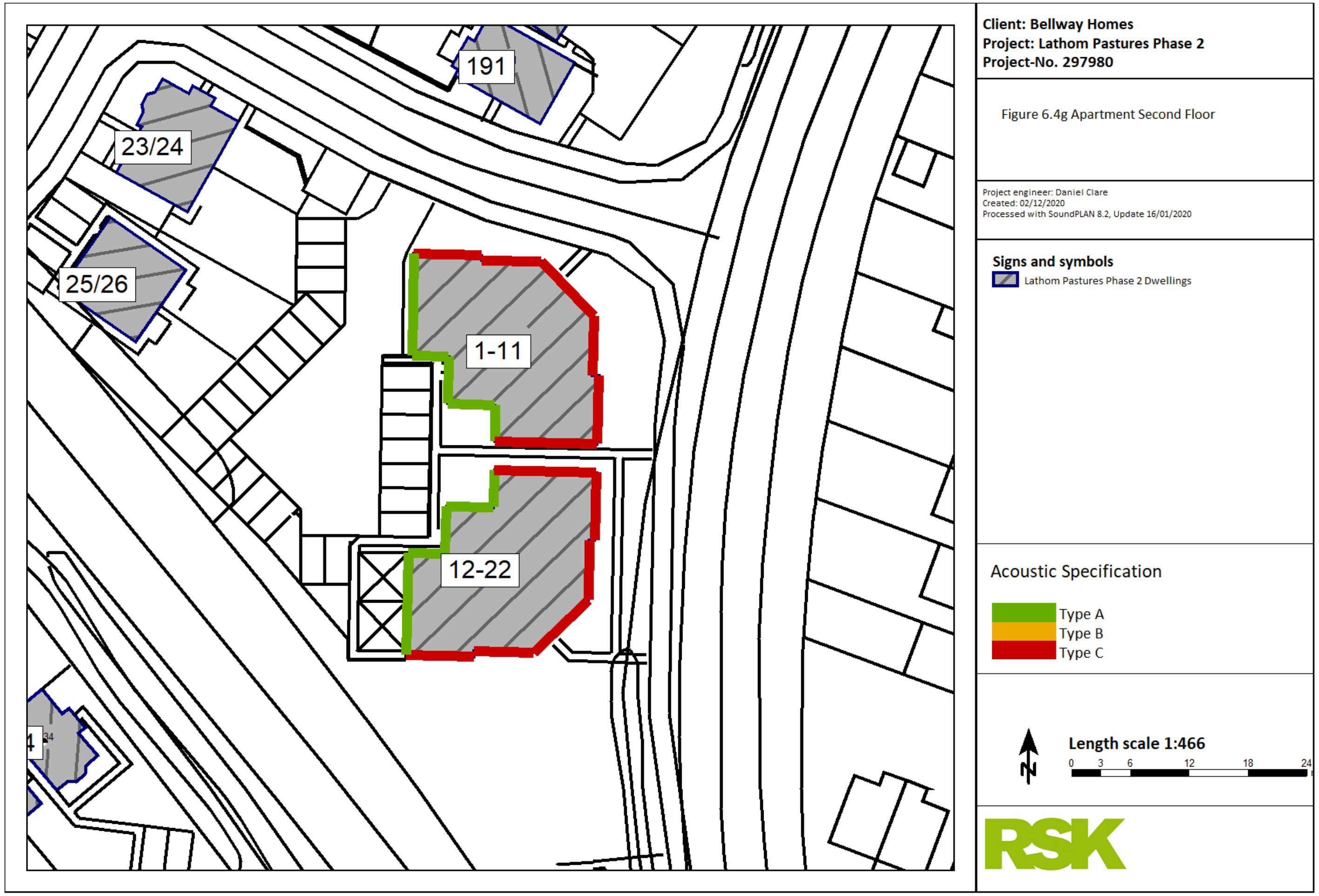


**Figure 6.4g Indicative Façade Specifications (Apartment Second Floor)**

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## 6.2 Discussion

Based on the predictions presented in the above figures, the majority of dwellings are suitable for a standard façade build up (double glazing and trickle vents – See Type A specification), and are exposed to noise levels sufficiently low to allow open windows for ventilation (subject to internal access road noise).

The proposed dwellings, on the eastern most extent, are likely to require a higher level of acoustic performance from the façade, in the order of 30 to 40 dB(A). This is due to the proximity to Neverstitch Road, and associated road traffic noise. A higher specification glazing system accompanied by a System 3 PIV, including acoustically attenuated trickle vents, will be required.

Through an assessment of both maximum noise events and $L_{Aeq,T}$ values, the $L_{Aeq}$ has been identified as the determining factor for noise control requirements for the main part of the development, with the determining factor at dwellings on the eastern extent.

In addition, proposed dwellings with habitable/sensitive rooms facing internal access roads should also be constructed with a minimal façade specification equivalent to Type A specification to ensure noise from future internal traffic movements is suitably considered.

External noise levels across the majority of the site are predicted to be below the upper design target of 55 dB $L_{Aeq,\ 16hr}$ for external amenity spaces. This is with the exception of Plots 46 and 47 which have approximately 30% of the amenity space in levels in the order of 56 dB(A), but with the remainder of the amenity space below the upper thresholds. BS 8233 makes allowances for the upper threshold to be exceeded in areas close to strategic road networks, which we would consider this to be. Given that the level is only of minor elevation, and the majority of the amenity area is below the upper target, it is not considered of significance, and therefore suitable for occupation.

# 7 MITIGATION AND DESIGN

## 7.1 Recommended Mitigation – Building Design

Table 7.1 provides generic measures which have been incorporated into the design (following acoustic guidance at the early stage of the design).

On the basis that a partially open window typically provides up to 15 dB of attenuation (BS 8233), it is apparent that some of the site is exposed to traffic noise which will result in an exceedance of the recommended internal acoustic design target during a situation in which windows are partially open for ventilation purposes. Therefore, a number of dwellings within the design will need to allow for 'closed windows' in order to achieve the internal design targets of BS 8233.

Any ventilation should also allow for potential overheating scenarios, taking into account the the Associate of Noise Consultants (ANC) publication *'Acoustics Ventilation and Overheating – Residential Design Guide* (AVO). This will be based on an overheating assessment, to be undertaken prior to, or during planning. From an initial review of the noise levels in line with the AVO level 1 assessment, the majority of this site would be considered low risk so further detailed assessment is unlikely to be required (see Section 9 for further information).

To ensure an appropriate internal acoustic standard within the proposed residential properties during normal conditions, the acoustic specifications set out in Section 6 should be included as a minimum. Understandably, treatments at those façades facing away from the dominant noise source can afford a lower level of specification.

**Table 7.1 Generic Mitigation – included in design**

| Plots | Proposed Measures |
|---|---|
| All | Locating the most sensitive internal spaces away from the dominant noise sources i.e. where practicable, locating bedrooms on the rear façade of the buildings which are screened from the road network. |
| | Siting external amenity areas in locations that are afforded acoustic screening from the intervening buildings. |
| | Massing and layout of the proposed dwellings which minimise sound transmission within the site. |
| | Introduction of noise barriers along the boundary with Neverstitch Road where feasible to reduce the noise levels close to source. |

It is expected that the proposed development includes provision for external amenity spaces, in the form of rear gardens and landscaped areas. A number of mitigation measures will be required, including the use of boundary fencing in order to achieve the upper design target of BS 8233. Those amenity areas most affected are those situated along Neverstitch Road. A number of the fences around garden boundaries have been increased from the standard 1.8 m to between 2.4 m and 3 m. Approximately 75% of the site has standard 1.8 m garden fences, 20% with 2.4 m, and 5% with 3 m.

Timber fences should follow these specifications:

- A superficial timber mass of at least 10 - 15 kg/m$^2$;
- Avoid using timbers that show signs of warping, knot holes or any visible damage that could affect the sound transmission;
- Where possible, an absorptive layer, covered with a protective membrane is recommended on the inner side of the barrier to reduce reflected sound to existing closest receptors;
- For a longer life, lower maintenance solution with potentially more acceptable visual impact other materials could be considered providing they have the same surface density.

An indication of the increased height garden fences is presented in Appendix 3.

# 8 ROAD TRAFFIC NOISE ASSESSMENT

An assessment of the road traffic noise impact has been undertaken with reference to the criteria within DMRB HD 213/11. In order to assess the magnitude of impact on existing receptors, the following scenarios have been utilised for the assessment:

- Scenario 1 – Do-Minimum scenario in the opening year (2021) against Do-Something scenario in the opening year (2021) – Short Term Impacts
- Scenario 2 – Do-Minimum scenario in the opening year (2021) against Do-Something scenario in the future year (2036) – Long Term Impacts.

**Table 8.1 Traffic Assessment**

| 18 hr Annual Average Weekly Traffic (AAWT) | | | All Scenarios | | Change / Assessment | |
|---|---|---|---|---|---|---|
| Opening Year Do Nothing | Opening Year Do Something | Future Year Do Something | % HGV | Average Speed (km/h) | Short Term | Long Term |
| **A557 (north of site access)** | | | | | | |
| 8817 | 9641 | 11007 | 4.1 | 64 | 0.3* | 0.9* |
| **A557 (south of site access)** | | | | | | |
| 8817 | 10173 | 11539 | 4.1 | 64 | 0.6* | 1.1* |
| **Witham Road** | | | | | | |
| 6812 | 7178 | 8234 | 4.6 | 48 | 0.2* | 0.8* |
| **B5312 Railway Road** | | | | | | |
| 10571 | 11902 | 13539 | 4.5 | 64 | 0.6* | 1.1* |
| **Ormskirk Road (East of Lyelake Lane, west of Hollands Lane)** | | | | | | |
| 8433 | 9635 | 10985 | 1.3 | 64 | 0.6* | 1.1* |

**negligible*

Predictions indicate that all road links are subject to a negligible impact (i.e. less than 1 dB increase in the short term and less than 2.9 in the long term). Therefore, existing receptors will be unlikely to perceive an impact from an increase in traffic as a result of the development.

# 9 OVERHEATING

An overheating assessment has not been undertaken at this stage and therefore a high-level appraisal has been prepared instead, including considerations in the event that the overheating risk assessment identifies that the proposed residential units are at risk of overheating.

The preparation of an overheating risk assessment is recommended as part of the detailed design. A mechanical engineer would carry out an overheating risk assessment to establish the likely duration for which the overheating condition will occur for the most exposed dwellings to the main noise sources affecting the site. It should be noted that from the initial appraisal the site is likely to the proposed dwellings across the site would be able to control overheating via openable windows.

In the event that some of the proposed dwellings will be at risk of overheating during summer months, the background ventilation rates provided by trickle ventilators will not be sufficient to control thermal comfort. In line with the guidance set out in the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide), it is considered reasonable to allow higher levels of internal ambient noise when increased rates of ventilation are required in relation to an overheating condition. The basis for this is that the overheating condition occurs for a limited time and during this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. The results of the overheating risk assessment would be used to determine the allowable relaxation in the internal ambient noise level during the overheating condition.

During an overheating condition, the preference is to adopt opening windows as a primary means of mitigating thermal issues, however, this is subject to the resultant internal ambient noise level. An internal ambient level above 50 dB $L_{Aeq,T}$ in living rooms and bedrooms during the day or above 42 dB $L_{Aeq,8hr}$ in bedrooms spaces at night would constitute a high risk of an adverse effect that would cause a material change in the behaviour of residents, due for example to potential sleep disturbance or premature waking.

On the basis that a partially open window provides approximately 13-15 dB of attenuation, an internal ambient level of 50 dB $L_{Aeq,T}$ during the day equates to an external free-field level of 63-65 dB $L_{Aeq,T}$, and an internal ambient level of 42 dB $L_{Aeq,8hr}$ during the night equates to an external free-field level of 55-57 dB $L_{Aeq,8hr}$. The predicted noise levels do not exceed the daytime level of 65 dB $L_{Aeq,T}$, nor the 57 dB $L_{Aeq,8hr}$ threshold for night-time periods at the proposed dwellings.

As a general rule of thumb to protect sensitive spaces during an overheating scenario, the following should be considered:

- Siting sensitive bedroom spaces on the acoustically screened façade of the buildings (westward facing)

Where this is not feasible, one of the following solutions may be required:

- Passive ventilative cooling – Introduction of ventilation openings within the building façade which have an integral means of attenuating sound. Typically, this may be acoustic louvres or acoustically lined ducts/plena;
- Passive solutions would need to be sized to provide the cooling ventilation rate as required by the design; this would be determined by a mechanical engineer based on the outcome of thermal modelling;
- Passive ventilative cooling offers a sustainable solution to the overheating issue, however, it would need to be considered at an early stage in the design of the proposed dwellings to ensure that the measures are incorporated into the building elevations and internal room layouts;
- Mechanical ventilative cooling – Using fans to introduce external air to a space to provide a cooling effect. Due to the airflow required, this type of system often involves significant plant and duct size requirements;
- Comfort cooling – Using a mechanical system to cool the air within a space to achieve a user-defined setpoint. This type of system will require some form of mechanical device to cool the air, such as a fan coil unit;
- Tempered fresh air system – System add a small amount of cooling to the whole dwelling ventilation supply system (e.g. to the MVHR). This provides a reduced temperature fresh air supply which can provide some cooling to a space. Unlike comfort cooling, these systems are not designed to achieve a specific temperature in a space.

# 10 CONCLUSIONS

A noise assessment has been undertaken for the potential residential development of Lathom Pastures Phase 2, off Neverstitch Road, Lathom, Skelmersdale. This assessment includes the use of noise monitoring data from an assessment undertaken for a neighbouring development in 2019, and traffic data provided by the client's traffic consultant. This report includes predicted noise levels across the site along with recommended mitigation measures derived from the computational noise model.

An operational traffic noise assessment has been undertaken for the closest existing receptors to the proposed development to assess the site suitability for the proposed development, considering road traffic flows for the opening year (2021) with and without the proposed development, and for a future assessment year (2036). This assessment predicts 'negligible' noise impacts at the closest receptors to the development, for both the short term and long-term scenarios, as a result of changes in road traffic flows during the operation of the proposed development.

This development layout has been incorporated into the noise model to determine the future noise levels at the façades of future dwellings. This has identified the level of noise mitigation to be incorporated into the design of dwellings, specifically in relation to glazing and ventilation specifications. The dwellings closest to Neverstitch Road are exposed to the highest levels, with levels dropping off as you head westwards into the development. The proposed façade treatments to meet internal design targets are not considered to be significant and would likely be acceptable at a planning stage.

In terms of outdoor amenity, a small number of gardens attached to the dwellings (two dwellings) closest to Neverstitch Road have the potential to exceed the upper design targets for daytime noise in small areas of the garden. Although the British Standards can make an allowance for elevated external noise levels the report recommends mitigation to be incorporated into design.

In summary, existing noise levels across the site are predicted to be of a magnitude suitable for proposed residential development, assuming appropriate and compliant mitigation measures are included through design.

# APPENDIX 1: ACOUSTIC GLOSSARY

***$L_p$* - Sound Pressure Level**

The basic unit of sound measurement is the sound pressure level, which is measured on a logarithmic scale and expressed in decibels (dB). The logarithmic scale makes it easier to manage the large range of audible sound pressures, and also more closely represents the way the human ear responds to differences in sound pressure:

$L_p = 20 \log_{10} (p/p_o)$

where p = RMS (root mean square) sound pressure; and

$p_0$ = reference sound pressure $2 \times 10^{-5}$ Pa.

***Frequency Weighting Networks***

Frequency weighting networks, which are generally built into sound level meters, attenuate the signal at some frequencies and amplify it at others. The A-weighting network approximately corresponds to human frequency response to sound. Sound levels measured with the A-weighting network are expressed in dB(A). Other weighting networks also exist, such as C-weighting which is nearly linear (i.e. unweighted) and other more specialised weighting networks. Variables such as $L_p$ and $L_{eq}$ that can be measured using such weightings are expressed as $L_{pA}$ / $L_{pC}$, $L_{Aeq}$ / $L_{Ceq}$ etc.

***Time Weighting***

Sound level meters use various averaging times for the measurement of RMS sound pressure level. The most commonly used are fast (0.125 s averaging time), slow (1 s averaging time) and impulse (0.035 s averaging time). Variables that are measures with time weightings are expressed as $L_{AFmax}$ etc.

***$L_{Aeq}$* – Equivalent Continuous Sound Pressure Level**

Sound levels tend to fluctuate, and as such an ‘instantaneous’ measurement like sound pressure level cannot fully describe many real-world situations. A summation can be made of the measured sound energy over a certain period, and a notional steady level can be calculated which would contain the same total energy as the fluctuating sound. This notional level is termed the equivalent continuous sound level $L_{eq}$. $L_{eq}$ can be determined over any time period, which is indicated as $L_{eq,T}$ where T is the time period (e.g. $L_{eq,24h}$).

In mathematical terms, for n discrete sound level measurements, Leq is given by:

$L_{eq,T}$ = 10 log10 (t1 x 10L1/10 + t2 x 10L2/10 +… tn x 10Ln/10)/T

where $t_1$ = time at level $L_1$ dB;

$t_2$ = time at level $L_2$ dB;

and T = total time

***$L_{max}$* - Maximum Sound Pressure Level or Maximum Noise Level**

This is the maximum RMS sound pressure level occurring within a specified period. The time weighting is usually specified, such as in $L_{Fmax}$.

***$L_N$* - Percentile or Statistical Levels**

Sometimes it is useful to calculate the level which is exceeded for a certain percent of a total period. Background noise is often defined as the A-weighted sound pressure level exceeded for 90% of the specified period T, expressed $L_{90,T}$. Road traffic noise is often characterised in terms of $L_{A10,18hr}$.

# APPENDIX 2: WAINHOMES BASELINE SURVEY (FEBRUARY 2019, RSK)

The following is an extract from the Wainhomes development report for the baseline survey.

### Measurement Details

A baseline noise measurement survey was undertaken between Tuesday 12 and Monday 18 February 2019. to determine the baseline noise levels for the purposes of assessing noise impacts at the site in order to consider its suitability for residential development.

Unattended noise measurements were undertaken over a period of more than 120 hours at four locations considered representative of the proposed receptors to the main noise sources affecting the site (i.e. UL01 located at the northern part of the site boundary, UL02 at the north-east parts of the site, UL03 at the south site boundary and UL04 at the west boundary) were undertaken between Tuesday 12 and Monday 18 February 2019.

During the survey it became apparent that a number of noise sources other than road traffic (e.g. road traffic at the local road network, service yard activities and fixed plant operating at the DHL distribution centre to the north of the site, farm-related activities, construction activities at a site located to the south of the development area, etc.) could affect the unattended sound level meters and affect the baseline noise measurements; therefore and in order to investigate the nature of the noise sources affecting the unattended measurements, audio recordings were undertaken during the unattended measurements for UL01.

Attended noise measurements were undertaken during daytime periods at two locations (AL01 at the northern parts of the site and AL02 to the southeast), in order to assist with determining the variance in the noise environment across the site with respect to the unattended locations, and to gain an active understanding through live perception of the noise sources present.

### Noise Measurement Locations

Noise survey locations including distances to the closest noise sources are presented in Table A2.1 below.

**Table A2.1 Noise measurement locations**

| Location ID | Coordinates | Closest source | Distance from noise source, Approx. |
|---|---|---|---|
| UL01 | 346278, 407009 | Slate Lane/ DHL Distribution Centre/ Firswood Road/ A577 | 6 m Slate Lane/ 80 m DHL Distribution Centre/ 110 m Firswood Road/ 430 m A577 |

| Location ID | Coordinates | Closest source | Distance from noise source, Approx. |
|---|---|---|---|
| UL02 | 346467, 406875 | Slate Lane/ DHL Distribution Centre/ A577/ Commercial units off A577 | 60 m Slate Lane/ 130 m DHL Distribution Centre/ 210 m 577/ 130 m Commercial units off A577 |
| UL03 | 346252, 406813 | Old Engine Lane/ Firswood Road/ A577/ Construction site (Bellway's) | 7 m Old Engine Lane/ 150 m Firswood Road/ 250 m A577/ 190 m Construction site (Bellway's) |
| UL04 | 346141, 406923 | Firswood Road/ DHL distribution centre/ Old Engine Lane/ Construction site (Bellway's) | 5 m Firswood Road/ 220 m DHL distribution centre/ 65 m Old Engine Lane/ 220 m Construction site (Bellway's) |
| AL01 | 346402, 406921 | Slate Lane/ DHL Distribution Centre/ A577/ Commercial units off A577 | 10 m Slate Lane/ 100 m DHL Distribution Centre/ 250 m A577/ 210 m Commercial units off A577 |
| AL02 | 346486, 406755 | A577/ Commercial units off A577/ Construction site (Bellway's) | 60 m A577/ 100 m Commercial units off A577/ 280 m Construction site (Bellway's) |

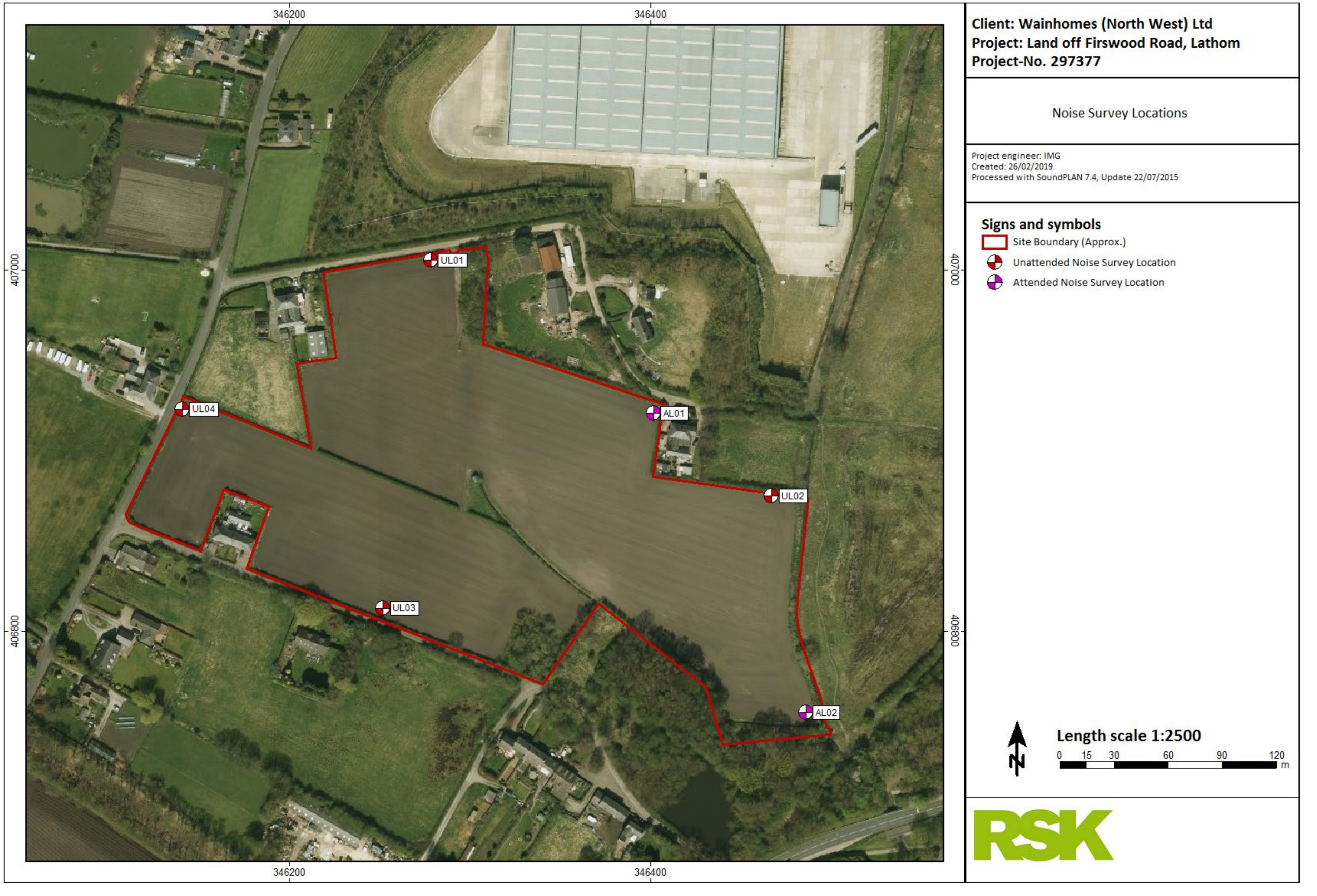
As previously described, the selected noise survey locations will be representative of the proposed development area. The noise environment across the development site is considered to be similar to the environment around existing receptors, and therefore the measured levels are assumed to represent the baseline at the closest sensitive receptors to the site. This has been summarised in Table A2.2 overleaf:

**Table A2.2 Noise measurement locations and receptors represented**

| Noise Monitoring Location ID | Representative Noise Sensitive Receptor | |
|---|---|---|
| | Type of receptor | Location |
| UL01 | Existing | Existing residential properties/ farmhouses at Slater Lane |
| | Proposed | New residential properties at the northern site boundary |
| UL02 | Existing | Existing residential properties/ farmhouses at Slater Lane (East) |
| | Proposed | New residential properties at the north-eastern part of the site |
| UL03 | Existing | Existing residential properties at Old Engine Lane |
| | Proposed | New residential properties at the southern site boundary |
| UL04 | Existing | Existing residential properties at Firswood Road |
| | Proposed | New residential properties at the western site boundary |
| AL01 | Existing | Existing residential properties/ farmhouses at Slater Lane (East) |
| | Proposed | New residential properties at the north-eastern part of the site |
| AL02 | Proposed | New residential properties at the south-eastern part of the site |

The noise survey locations are shown in Figure A2.1 overleaf.

**Figure A2.1 Noise Survey Locations (to scale when printed at A4)**



## Noise Survey Equipment

Noise measurements were undertaken using the following equipment:

**Table A2.3 Measurement Equipment**

| Equipment | Type | Serial number | Calibration date |
|---|---|---|---|
| Class 1 Sound Level Meters | RION NL-52 | 01121392 | 05/12/2017 |
| | RION NL-52 | 00976225 | 29/11/2017 |
| | RION NL-52 | 00976252 | 08/11/2017 |
| | RION NL-52 | 01043376 | 10/04/2017 |
| Acoustic Calibrator | RION NC-74 | 34857332 | 20/03/2018 |

All noise measurements were undertaken in free field conditions with the microphone positioned away from reflecting surfaces and at 1.5 m above the ground height to the requirements of BS7445-1:2003 *'Description and measurement of environmental noise. Guide to quantities and procedures'*.

The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift was noted.

The sound level meters used conform to the requirements of BS EN 61672-1: 2002, 2003, 2006 *'Electroacoustics. Sound level meter, Specifications'*. The calibrator used conforms to the requirements of BS EN IEC 60942: 2003 *'Electroacoustics, Sound calibrators'*. The equipment used has a calibration history that is traceable to a certified calibration institution. Sound Level Meters are required for calibration every 2 years, with acoustic calibrators requiring calibration annually. Calibration certificates will be provided upon request.

As previously noted, audio records were undertaken during the noise measurements at UL01 in order to obtain complementary information regarding the nature of the noise sources affecting the unattended noise measurements for the site.

## Meteorological Conditions

Weather conditions during the attended measurements were noted to be dry and calm, with temperatures of 10-11 $^{\circ}$C. Wind speeds during the attended noise measurement were below 1 $ms^{-1}$ in average.

Available weather records for a weather station located in Ormskirk (weather station ID '*IORMSKIR5')* were obtained through Wunderground[2]. The analysis of that data show that the weather conditions during the unattended noise measurements were suitable for

[2] www.wunderground.com

noise monitoring, with dry and calm weather conditions being recorded during the entire unattended noise measurement.

The available weather data have been summarised in Table A2.4.

**Table A2.4 Weather conditions during the first round of unattended noise measurements (weather station ref. '*IORMSKIR5*').**

| Date | Temperature (°C) | Precipitation (mm) | Average wind speed ($ms^{-1}$) | Wind direction |
|---|---|---|---|---|
| Tuesday 12/02/2019 | 2 to 12 | 0 | 1.4 | SSW |
| Wednesday 13/02/2019 | 6 to 11 | 0 | 1.4 | South |
| Thursday 14/02/2019 | 3 to 11 | 0 | 1.9 | South |
| Friday 15/02/2019 | 3 to 13 | 0 | 2.8 | SSE |
| Saturday 16/02/2019 | 9 to 14 | 0 | 1.9 | SSW |
| Sunday 17/02/2019 | 8 to 14 | 0 | 3.1 | South |
| Monday 18/02/2019 | 7 to 11 | 0 | 1.9 | SSW |

Taking all the above into account, the weather conditions during the baseline survey are considered to be suitable for environmental noise monitoring.

## Noise Survey Results

### Overview of Existing Noise Environment

The existing environment is dominated by road traffic noise from the local road network (A577, Firswood Road); both Slater Lane to the north of the site and Old Engine Lane to the south are used for the vehicular access to a number of dwellings and farms, and do not represent relevant noise sources for the proposed residential site.

No noise from the commercial units to the north and east of the site (e.g. distribution centres for DHL and Asda) was audible during the installation and retrieval of the unattended sound level meters and during the undertaking of the attended measurements; similarly, after analysing the audio files recorded at UL01, no noise from these units were audible.

Other noise sources affecting the site included airplanes and helicopters passing overhead, some farm activities and bird calls. Construction noise from Bellway's site to the south was noted to be intermittent and audible from the southern parts of the development area.

After analysing the audio files recorded at location UL01 it was noted that same shooting was undertaken at or around the development area during daytime periods.

**Unattended Monitoring Positions**

The unattended noise measurements at UL01, which was placed in the north site boundary and in close proximity to Slate Lane were complemented with audio recordings for all those events which exceed a 65 dB $L_{Aeq,\ 1s}$ trigger level; these audio records provide valuable information on the noise sources affecting the site. After analysing the audio files for the entire duration of the unattended noise measurement, it should be noted that no noise from the commercial units around the development site was noted. The main noise source affecting this location was road traffic noise from the local road network, as well as low-speed vehicle movements at Slate Lane, bird calls and shooting activities.

Unattended location UL02 was placed to the east of the site, in line with the nearby commercial units to the east of the site and off A577. Unattended location UL03 was located at the south site boundary, in line with Old Engine Lane and various residential dwellings. Finally, unattended location UL04 was placed at the western site boundary and in line with Firswood Road.

A summary of the measured noise levels at monitoring positions UL01 to UL04 are presented in Table A2.5 overleaf. The table presents the daytime (07:00h to 23:00h) and night-time (23:00h to 07:00h) noise levels.

**Table A2.5 Noise monitoring results – Unattended noise monitoring**

| NML ID | Date | Period | $L_{Aeq, T}$ dB | $L_{Amax, T}$ dB | $L_{A90, T}$ dB | $L_{A10, T}$ dB |
|---|---|---|---|---|---|---|
| UL01 | Tue 12/02/2019 | Daytime [1] | 48.9 | 77.6 | 44.5 | 49.1 |
| | | Night time | 45.2 | 68.7 | 38.4 | 44.2 [2] |
| | Wed 13/02/2019 | Daytime | 51.7 | 79.5 | 47.9 | 52.6 |
| | | Night time | 49.4 | 72.3 | 41.4 | 47.2 [2] |
| | Thu 14/02/2019 | Daytime | 52.9 | 78.2 | 49.7 | 52.9 |
| | | Night time | 49.0 | 71.3 | 43.4 | 48.2 [2] |
| | Fri 15/02/2019 | Daytime | 52.5 | 82.8 | 49.3 | 52.5 |
| | | Night time | 44.1 | 70.0 | 38.2 | 44.4 |
| | Sat 16/02/2019 | Daytime | 48.9 | 83.0 | 45.1 | 49.9 |
| | | Night time | 46.2 | 70.3 | 41.5 | 46.2 |
| | Sun 17/02/2019 | Daytime | 49.9 | 72.0 | 45.7 | 51.0 |
| | | Night time | 47.4 | 71.5 | 40.0 | 45.1 [2] |
| | Mon 18/02/209 | Daytime [1] | 51.9 | 75.2 | 48.6 | 53.1 |
| UL02 | Tue 12/02/2019 | Daytime [1] | 50.3 | 73.0 | 47.2 | 50.9 |
| | | Night time | 49.7 | 77.6 | 40.8 | 46.8 [2] |
| | Wed 13/02/2019 | Daytime | 52.2 | 72.8 | 50.0 | 53.0 |
| | | Night time | 51.7 | 76.1 | 43.6 | 49.0 [2] |
| | Thu 14/02/2019 | Daytime | 54.1 | 79.4 | 51.5 | 54.2 |
| | | Night time | 51.4 | 79.9 | 45.1 | 49.9 [2] |
| | Fri 15/02/2019 | Daytime | 53.5 | 77.4 | 51.1 | 53.9 |
| | | Night time | 47.7 | 75.7 | 39.8 | 46.4 [2] |
| | Sat 16/02/2019 | Daytime | 51.6 | 88.0 | 47.3 | 51.7 |

| NML ID | Date | Period | $L_{Aeq, T}$ dB | $L_{Amax, T}$ dB | $L_{A90, T}$ dB | $L_{A10, T}$ dB |
|---|---|---|---|---|---|---|
| | | Night time | 45.9 | 67.8 | 42.4 | 47.2 |
| | Sun 17/02/2019 | Daytime | 51.2 | 77.5 | 47.5 | 52.1 |
| | | Night time | 48.8 | 77.4 | 41.4 | 46.6 [2] |
| | Mon 18/02/209 | Daytime [1] | 52.5 | 73.9 | 50.5 | 53.6 |
| UL03 | Tue 12/02/2019 | Daytime [1] | 50.9 | 80.8 | 45.8 | 50.7 [2] |
| | | Night time | 49.6 | 77.3 | 38.4 | 45.7 [2] |
| | Wed 13/02/2019 | Daytime | 54.4 | 84.0 | 49.0 | 54.7 |
| | | Night time | 50.9 | 81.6 | 41.7 | 47.9 [2] |
| | Thu 14/02/2019 | Daytime | 54.1 | 80.4 | 50.5 | 54.3 |
| | | Night time | 50.9 | 77.1 | 43.6 | 48.9 [2] |
| | Fri 15/02/2019 | Daytime | 54.0 | 77.7 | 50.2 | 54.0 |
| | | Night time | 49.9 | 84.9 | 37.9 | 45.2 [2] |
| | Sat 16/02/2019 | Daytime | 52.7 | 87.5 | 46.2 | 52.3 [2] |
| | | Night time | 50.3 | 80.0 | 41.5 | 47.3 [2] |
| | Sun 17/02/2019 | Daytime | 51.5 | 89.8 | 46.5 | 51.4 [2] |
| | | Night time | 52.6 | 94.8 | 40.0 | 45.9 [2] |
| | Mon 18/02/209 | Daytime [1] | 53.7 | 78.6 | 49.7 | 54.1 |
| UL04 | Tue 12/02/2019 | Daytime [1] | 55.1 | 80.3 | 44.4 | 51.0 [2] |
| | | Night time | 45.9 | 77.0 | 38.4 | 43.9 [2] |
| | Wed 13/02/2019 | Daytime | 56.3 | 82.8 | 48.4 | 54.0 [2] |
| | | Night time | 48.1 | 78.9 | 41.4 | 46.8 [2] |
| | Thu 14/02/2019 | Daytime | 56.8 | 81.1 | 50.1 | 54.3 [2] |

| NML ID | Date | Period | $L_{Aeq,T}$ dB | $L_{Amax,T}$ dB | $L_{A90,T}$ dB | $L_{A10,T}$ dB |
|---|---|---|---|---|---|---|
| | | Night time | 49.3 | 77.5 | 43.5 | 47.8 [2] |
| | Fri 15/02/2019 | Daytime | 56.6 | 82.7 | 49.7 | 54.3 [2] |
| | | Night time | 45.9 | 79.5 | 37.6 | 43.1 [2] |
| | Sat 16/02/2019 | Daytime | 54.9 | 88.8 | 45.4 | 52.3 [2] |
| | | Night time | 46.7 | 77.3 | 41.6 | 47.0 |
| | Sun 17/02/2019 | Daytime | 53.5 | 81.9 | 45.8 | 51.2 [2] |
| | | Night time | 47.0 | 75.6 | 39.8 | 44.7 [2] |
| | Mon 18/02/209 | Daytime [1] | 56.5 | 83.4 | 48.9 | 55.0 [2] |

(1) *Incomplete 16hr period;*

(2) *$L_{A10}$ in many cases is higher than the $L_{Aeq}$ however where the background noise environment is generally low with a couple of high magnitude but short duration events, the $L_{10}$ can be lower.*

**Attended Monitoring Positions**

Attended measurements at AL01 (to the rear of Ende Cottage, at the north east corner of the site) included daytime periods for the closest areas of the site to the adjacent distribution centres (DHL, Asda) and captured distant road traffic noise from the A577 and intermittent construction noise from the construction site located to the south of the proposed development area. Attended noise measurements at AL02 (southeast site boundary) captured road traffic noise from the A577 and intermittent construction noise from the residential site that is currently under construction.

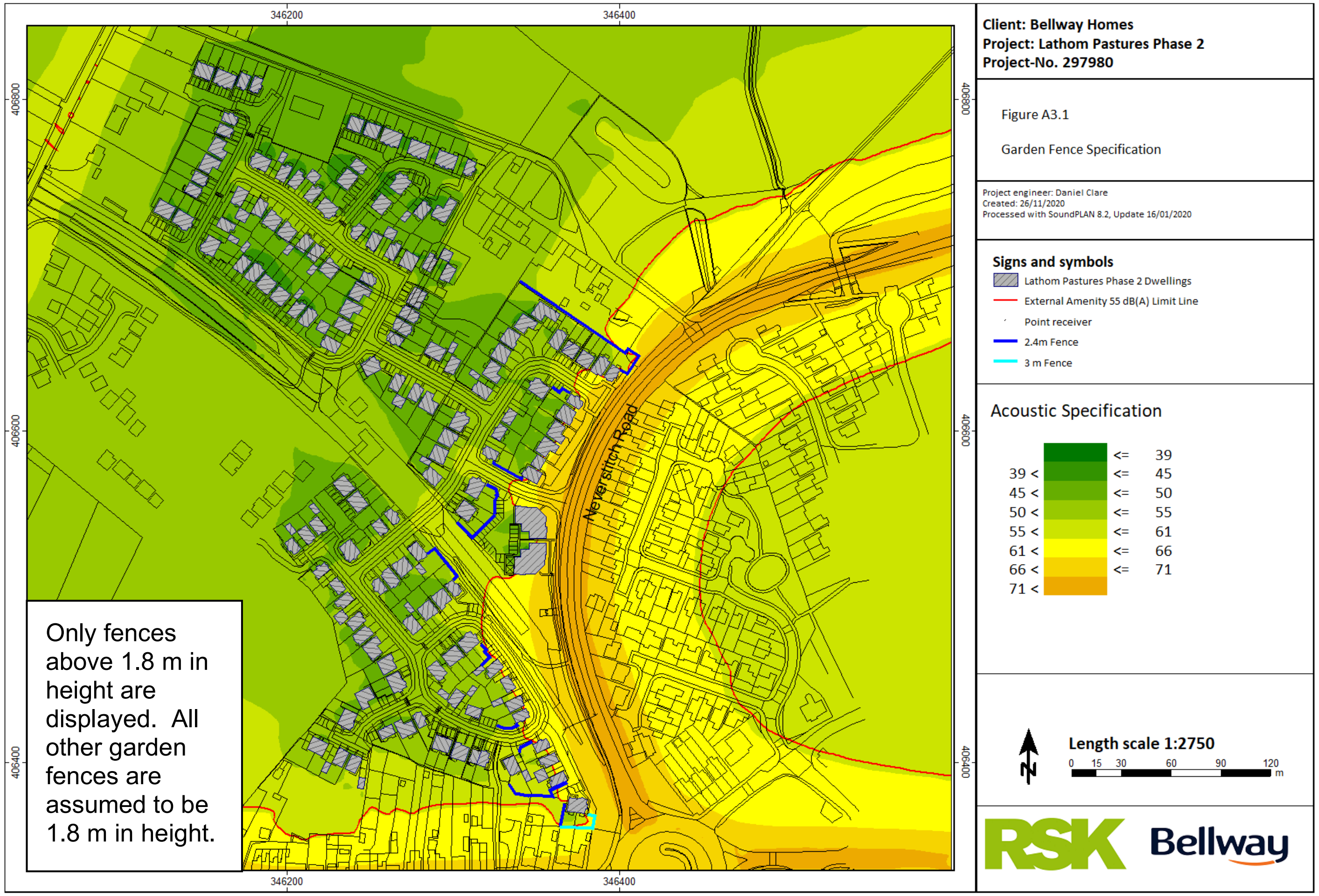
A summary of the attended noise measurement results is shown in Table A2.6 below.

**Table A2.6 Noise monitoring results – Attended noise monitoring**

| NML Id | Date | Start Time | Duration | $L_{Aeq,T}$ dB | $L_{Amax,T}$ dB | $L_{A90,T}$ dB | $L_{A10,T}$ dB |
|---|---|---|---|---|---|---|---|
| AL01 | Tue 12/02/2019 | 12:45 | 60 min | 50.3 | 68.1 | 47.4 | 52.1 |
| AL02 | | 12:55 | 60 min | 50.5 | 75.3 | 47.4 | 52.4 |

# APPENDIX 3: GARDEN FENCE SPECIFICATIONS

**Figure A3.1 Garden Fence Specification**

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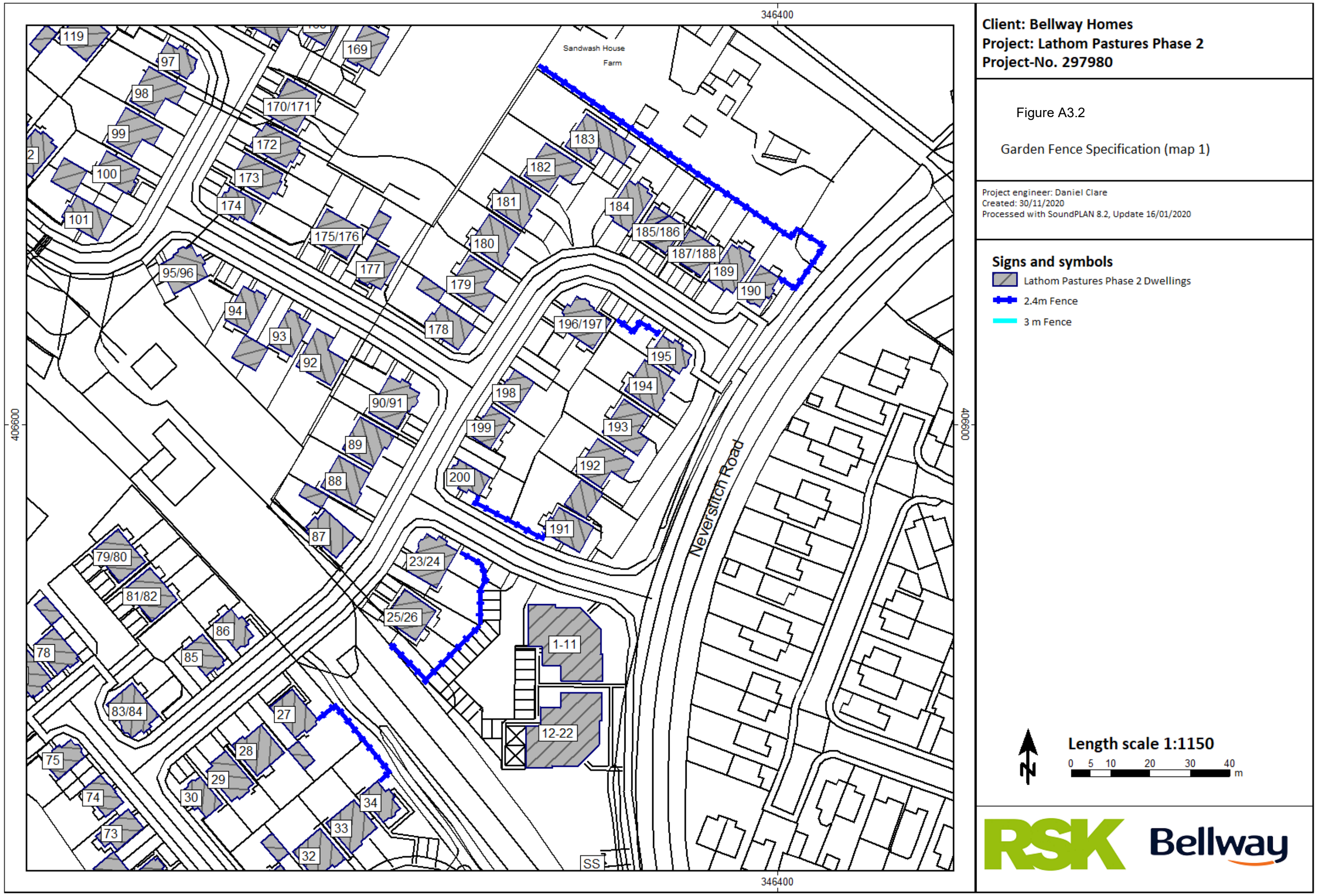
## Figure A3.2 Garden Fence Specification (map 1)

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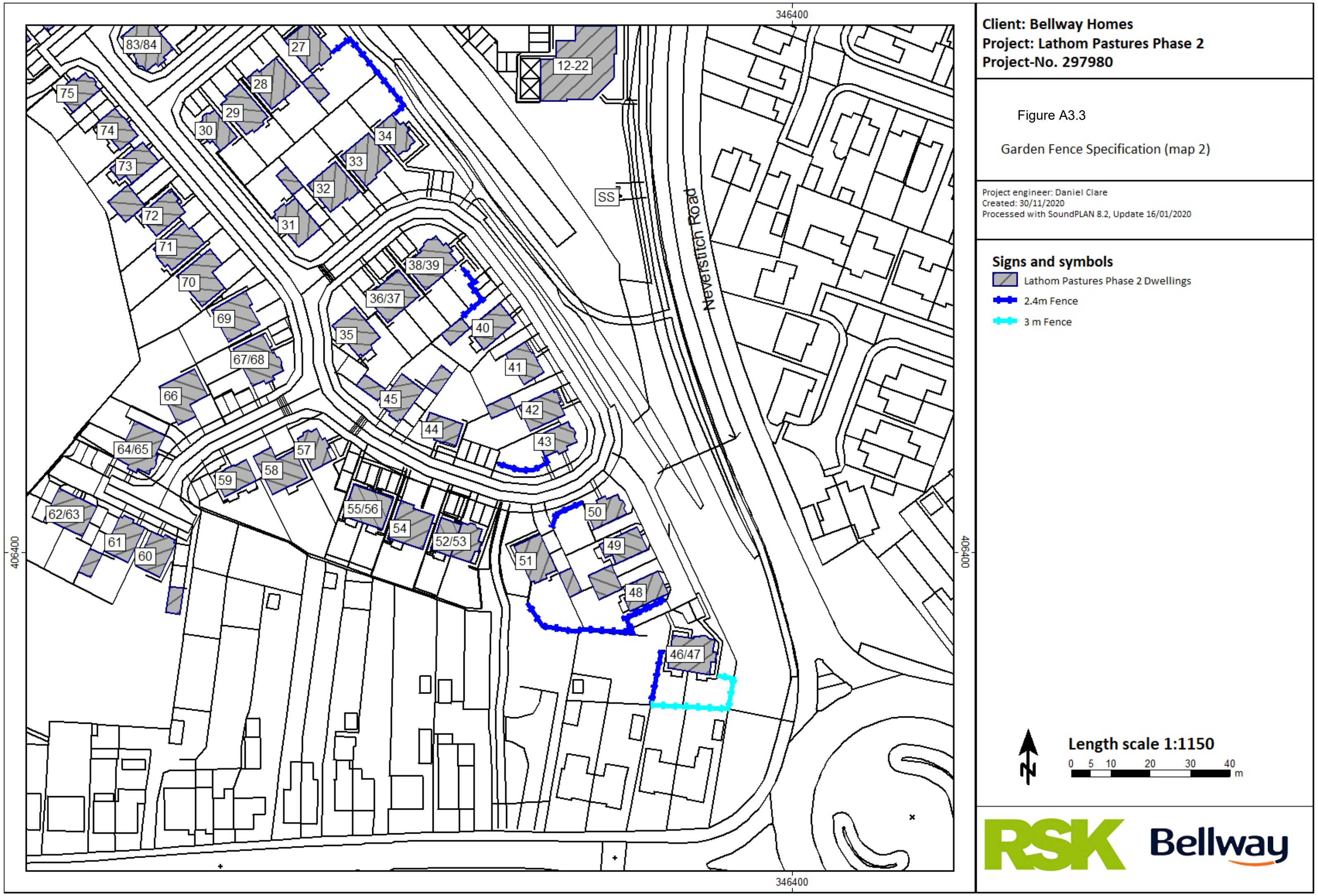
## Figure A3.3 Garden Fence Specification (map 2)

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