Hollins Grove Street, Darwen, BB3 1HF

Planning Noise Assessment for a Proposed Residential Development

Report ref.
RK2253/16414/Rev 1

Issued to
Gleeson Homes

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1. INTRODUCTION

Gleeson Homes are seeking planning permission for a residential development at land off Hollins Grove Street in Darwen, Lancashire. The proposed development site is a former paper mill and is in an area predominantly consisting of industrial sites. Consequently, the Local Planning Authority require a noise assessment be submitted to form part of the planning application.

Accordingly, Spectrum Acoustic Consultants has been instructed to carry out a noise assessment for the purpose of establishing the impact on the proposed residential properties. This report provides the information required to inform and satisfy the requirements of the Local Planning Authority, for the purpose of determining the application.

2. SITE DESCRIPTION AND PROPOSALS

The proposed development site is the former Hollins Paper Mill off Hollins Grove Street in Darwen, BB3 1HF. The paper mill was recently demolished and the site has since been cleared. Hollins Grove Street bounds the site to the south east and leads to Lower Eccleshill Road heading north. Opposite the site to the east on Lower Eccleshill Road is Oakfield Caravan Park. To the west of the proposed development is a large Crown Paints site. The Crown Paints site is primarily used for storage and distribution. To the south of the development site are existing houses along with a breakers yard. Bounding the development to the north is Crown Paints Polymers, a manufacturing arm of Crown Paints. Beyond Crown Paints Polymers are a number of other commercial properties and the M65 motorway. The motorway is approximately 600m away from the proposed development site. Existing site location plans are included in Appendix A.

The proposed development would comprise of 151 houses. The houses would consist of a mixture of detached and semi-detached properties. Each of the houses would have a small garden to the rear and parking for vehicles to the front. Access to the development would be gained via Hollins Grove Street and Lower Eccleshill Road. A 3m high bund is proposed along the northern boundary of the site and would also be extended further to the north in order to screen the western boundary of the Crown Paints Polymers site. One top of the bund would be a 3m high acoustic barrier fence. A buffer zone is also proposed between the Crown Paints Polymers site and the dwellings proposed at the north end of the site. The proposed scheme plans are included in Appendix B.

3. CRITERIA FOR ACCEPTABILITY

3.1 PLANNING GUIDELINES

3.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the government's guidance for local planning authorities and planning application decision-takers.

It says that the planning system should contribute to and enhance the environment by (among other things) preventing development from contributing to, being put at risk from, or being adversely affected by unacceptable levels of noise pollution. (Para. 109)

Paragraph 123 states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- 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;
- 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
- 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."

3.1.2 Noise Policy Statement for England (NPSE), DEFRA, March 2010

The NPPF refers to the Noise Policy Statement for England (NPSE) which sets out the long term vision of Government noise policy as follows: *Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*

The first aim of the Noise Policy Statement for England
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.

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

The second aim of the Noise Policy Statement for England
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.

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (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 (paragraph 1.8). This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England
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.

2.25 This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

3.1.3 Planning Practice Guidance – Noise (PPG)

The PPG sets out government guidance on the role of noise in the planning process. This provides advice on issues such as when noise is relevant to planning, how to determine noise impact, discussion on the context of noise and how the impact of noise can be mitigated.

Of relevance to this scheme, it advises that *"Noise needs to be considered when …new developments would be sensitive to the prevailing acoustic environment."* Whilst it does advise that noise can override other planning concerns, it states that as with the NPSE and the NPPF it does not expect noise to be considered in isolation from other economic, social and environmental dimensions of a proposed development.
It asks an LPA to consider

- *whether or not a significant impact is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur;*
- *whether or not a good standard of amenity can be achieved.*

This includes identifying whether the noise exposure is above or below SOAEL or LOAEL.

The PPG talks about "impact" and "effect". This is an important part of the context discussion, as a noise may have a significant impact for brief period of time, but because the impact is only brief, the overall "effect" in not significant, as it does not materially affect behaviour.

The PPG summarises examples of the perception of noise, with the outcome and the effect level:

- No observed effect: Noise is not noticeable, and no specific measures are required. This would correlate to NOEL of the NPSE;
- No observed adverse effect: Noise is noticeable and not intrusive, does not cause any change in behaviour or attitude, can affect the acoustic character of an area but not such that there is a perceived change in the quality of life. No specific measures are required;
- Observed adverse effect: Noise causes small changes in behaviour (eg closing windows for some of the time because of the noise), potential for some sleep disturbance, and there is a perceived change in the quality of life. In this case noise should be mitigated and reduced to a minimum as it represents the onset of the LOAEL as defined in the NPSE;
- Significant observed adverse effect: Noise causes a material change in behaviour and attitude (eg avoiding certain activities during periods of intrusion, or having to keep windows closed most of the time because of the noise where there is no alternative ventilation), potential for difficulty getting back to sleep, quality of life diminished. This correlates to a SOAEL as defined by the NPSE and should be avoided.
- Unacceptable adverse effect: Extensive and regular changes in behaviour and/or an inability to mitigate effects, leading to psychological stress and physiological effects (eg regular sleep deprivation, medically definable harm). This, the PPG advises, should be prevented.

It is of note that the examples given in the PPG relate to changes of behaviour, changes to quality of life and changes in the character of an area. In the case of this development, residents would be moving into an existing situation, so behaviours would not change, as no pattern of behaviour is already established.

This is reflected formally in paragraph 007 of the PPG. This paragraph helps the LPA consider the balance between planning and statutory nuisance (Environmental Protection Act 1990). It states that *"When assessing whether a statutory nuisance exists, local authorities will consider a number of relevant factors including the noise level, its duration, how often it occurs, the time of day or night that it occurs and the 'character of the locality'. The factors influencing the 'character of the locality' may include long-established sources of noise in the vicinity, for example church bells, industrial premises, music premises or public houses'."*

As stated in the NPSE, there is no simple relationship between noise levels and the effect of those noise levels. The NPSE lists a number of factors as relevant, and the following are those that apply to this scheme:

- Source and level of noise;
- Number of noise events, how often they occur, and the pattern;
- The spectral content of the noise and its character;
- Whether noise effects can be mitigated by closing windows, allowing for alternative ventilation to be provided;
- The acoustic environment in external amenity spaces where they are an intrinsic part of the overall design;
- The effect on a nearby existing business.

The PPG says that for development, mitigation can be considered in terms of engineering (reducing noise at source, or containing it). This is unlikely to be practicable in a case like this, as the proposed developer would need to rely on the goodwill (unless formal agreements could be reached) with those responsible for the source of the noise. However, layout (orientating site to minimise impact, and including screening), planning conditions, and mitigation to the dwellings themselves are all likely to be feasible.

Such mitigation techniques are therefore recognised by the PPG as normal practice in the case of noise sensitive schemes.

The noise impact can also be offset where residents have access to a quiet facade, a quiet external amenity space for their sole or shared use, or a public amenity space nearby.

3.2 CRITERIA FOR ASSESSMENT

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

BS 4142 provides a method for rating and assessing sound of an industrial nature, and is applicable when assessing sound at new dwellings. It uses the outdoor sound level to assess the likely effects on people who may be inside or outside a dwelling. The standard is not intended to be applied to the assessment of indoor sound levels.

It uses the concept of a 'Rating Level', which is based on the 'Specific' sound from the existing commercial site, (measured in terms of L_{Aeq} at the defined assessment position), with corrections applied to account for any tonal or impulsive characteristics (as these can increase the likelihood of an adverse impact). The assessment level is obtained by comparing the Rating Level with the existing Background Sound Level (measured in terms of L_{A90} at the assessment position).

The Background Sound Level is established by measuring the sound when the industrial noise (the "Specific Noise") is not present. This is called the Residual Sound. The Background Sound Level is then the sound pressure level that is exceed for 90% off the time, denoted $L_{A90,T}$.

However, in a situation like this, the Background Sound Level can be difficult to establish as the industrial installations operate continuously. In addition, the industrial noise is not a new process, and so has been part of the sound character of the area for many years and could perhaps be argued to be an inherent part of the noise climate. The Standard is clear the "lowest" assessment should not necessarily be used, but a typical level should be quantified. For example, the Guidelines for Environmental Noise Impact Assessment, (IEMA 2014) recommends use of the mode average (the most commonly occurring sound level), or, if a weighting towards the worst case is preferred, the mean average minus one standard deviation.

The Specific Sound Level is a measurement of the sound level whilst the industrial activity occurs. This then is corrected to take account of the residual sound level (the level that would be measured if the industrial activity were not occurring), corrected to take account of particular acoustical characteristics (eg tone, impulse or other distinguishing characteristic), to determine a Rating Level, for comparison to the Background Sound Level. For daytime activity, a 1 hour time period is used. At night, a 15 minute period is used, and the sound level is an average over that time period (denoted $L_{Aeq,T}$). The same time periods are to be used when considering the Background Sound Level.

The standard advises that, where the Rating Level exceeds the Background Sound Level by around +10 dB or more this is likely to indicate a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact. The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

In all cases, the Standard states that the assessment is dependent on the particular context in which the sound occurs. In particular, the following factors must be considered:

- The absolute level of the sound;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings will incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as facade insulation, ventilation and/or cooling that reduces the need to open windows and acoustic screening.

Whilst BS 4142 talks about "impact", the NPSE talks about "effect". This is an important part of the context discussion, as a noise may have a significant impact for brief period of time, and because the impact is only brief, the overall "effect" in not significant, as it does not materially affect behaviour.

It is therefore important that any assessment of sound in accordance with BS 4142 takes these additional factors into consideration, and WHO and BS 8233:2014 can assist in such a process.

3.2.2 WHO – Guidelines for Community Noise

The NPPF requires that significant adverse impacts do not arise as a result of new development. Guidelines for Community Noise - World Health Organization, 1999 (WHO) gives guidance on suitable noise levels for sleeping and resting conditions in dwellings. It sets out these values in table 4.1, and lists them as being guideline values for community noise. WHO recommends internal noise levels of 30dB(A) at night for bedrooms, and 35dB(A) during the day for living-rooms. The guideline levels are based on annual average data.

To avoid sleep disturbance in bedrooms during the night time period, it also recommends that noise levels from single sound events should not regularly exceed L_{Amax} 45dB(A). WHO defines 'regular' as not more than 10-15 events per night.

WHO also gives guidance on suitable noise levels for outdoor living areas such as gardens. The WHO guidelines state that "*to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}".*

As WHO states that $L_{Aeq,16hr}$ 50 dB represents a noise level below which few people would be moderately annoyed, this seems to represent the LOAEL. $L_{Aeq,16hr}$ 55 dB is the level below which few people would be seriously annoyed. However, no guidance is provided as to a guideline value that could be interpreted as representing the onset of a SOAEL.

The preface to WHO states that community noise includes road, rail and air traffic, industries, construction and public work, and the neighbourhood. Therefore, although these noise levels are usually used to determine acceptability from steady continuous noise from anonymous sources, such as road traffic or rail movements, they provide helpful guidance when considering noise from industrial sources.

3.2.3 BS 8233:2014 guidance on sound insulation and noise reduction for buildings

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* gives guidance on indoor ambient noise levels to be achieved in dwellings for reasonable resting and sleeping conditions. The guidance in BS 8233:2014 is based on guidelines issued by the WHO, Guidelines for Community Noise (1999). The guideline desirable levels are shown in Table 1, copied from BS 8233:2014.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16\ hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hour}$	30 dB $L_{Aeq,8\ hour}$

Table 1: BS 8233 guideline noise level limits in dwellings for resting and sleeping

BS8233 advises that "*If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment."*

It also advises that *"Where development is considered necessary or desirable…the internal target levels may be relaxed by up to 5 dB and reasonable conditions still achieved."*

The standard also advises that *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{AFmax} depending on the character and number of events per night. Sporadic noise events could require separate values."* It does not give guidance on what might constitute a guideline value. However, as the standard does cross reference Guidelines for Community Noise - World Health Organization, 1999 (WHO), it is suggested that the guideline value of L_{AFmax} 45 dB, inside bedrooms, should not be exceeded during the night more than 10-15 times, which reflects the WHO position.

BS 8233:2014 suggests the following guidelines for noise levels in external spaces that are used for amenity space, such as gardens and patios. *"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."*

4. NOISE MEASUREMENT SURVEY

4.1 MEASUREMENT LOCATIONS

Originally, the intention was to carry out long term noise measurements across the site at a number of monitoring locations. However, some of the logging instrumentation was damaged by a third party midway through the survey period resulting in a loss in data. Therefore, noise measurements were completed over shorter periods from Tuesday 15 to Wednesday 23 November, as well as Friday 25 November 2016. Measurements consisted of fifteen minute periods at the selected monitoring locations.

For the purpose of the assessment, unattended noise loggers were utilised for the recording of continuous noise measurements at five measurement locations, each representative of the most sensitive façades of the proposed properties. These noise measurement locations are detailed as follows:

Noise logger measurement locations

Position 1 – Hollins Grove St, representative of proposed Plot 137 (Tues 15 to Wed 16 Nov 2016)
Position 2 – Hollins Grove St, representative of proposed Plot 151 (Tues 15 to Thurs 17 Nov 2016)
Position 3 – Lower Eccleshill Rd, representative of proposed Plot 14 (Tues 15 to Thurs 17 Nov 2016)
Position 4 – Lower Eccleshill Rd, adjacent to Crown Paints Polymers (Tues 15 to Thurs 17 Nov 2016)
Position 5 – South west of site, representative of proposed Plot 7 (Thurs 17 to Wed 23 Nov 2016)

Shorter term attended noise measurements were also recorded at six other locations, each representative of the most sensitive façades of the proposed properties. These are detailed as follows:

Short term attended noise measurement locations

Position 6 – West of site, representative of proposed Plot 60 (Fri 25 Nov 2016)
Position 7 – North west of site, representative of proposed Plot 45 (Fri 25 Nov 2016)
Position 8 – Middle of site, representative of proposed Plot 20 (Tues 15 to Wed 16 Nov 2016)
Position 9 – Middle of site, representative of proposed Plot 34 (Tues 15 to Wed 16 Nov 2016)
Position 10 – Middle of site, representative of proposed Plot 100 (Tues 15 to Wed 16 Nov 2016)
Position 11 – Somerset Avenue, representative of proposed Plot 128 (Tues 15 to Wed 16 Nov 2016)

Free field noise measurements were carried out at a height of 1.5m above ground at all of the monitoring locations. The locations are illustrated on the existing site location plan, included in Appendix A.

4.2 SURVEY DETAILS AND INSTRUMENTATION

Throughout the survey, weather conditions were monitored at the site using a weather station. However, the weather station instrumentation was also damaged by a third party midway through the survey period, this resulted in a loss of data. Throughout the monitoring period though, weather conditions were generally mild with very occasional rain showers and low wind speeds.

Noise measurement parameters consisted of equivalent continuous (L_{Aeq}) noise levels and maximum (L_{Amax}) noise levels, as well as statistical noise levels (termed L_n, where n is the percentage of time the level is exceeded during the measurement period). Both overall and 1/1 octave band measurements were stored for later analysis.

The following instrumentation was used during the noise measurement survey:

- Bruel & Kjaer Type 2260 Sound Level Meter s/n 2311704
- Bruel & Kjaer Type 4189 Microphone s/n 2733049
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2688672

- Bruel & Kjaer Type 2260 Sound Level Meter s/n 1772232
- Bruel & Kjaer type 4189 Microphone s/n 2469838
- Bruel & Kjaer Type 4230 Acoustic Calibrator s/n 1234621

- Bruel & Kjaer Type 2238 Sound Level Meter s/n 2246383
- Bruel & Kjaer Type 4188 Microphone s/n 2951073
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2951073

- Bruel & Kjaer Type 2238 Sound Level Meter s/n 2654440
- Bruel & Kjaer Type 4188 Microphone s/n 2658551

- Bruel & Kjaer Type 2250 Light Sound Level Meter s/n 3006950
- Bruel & Kjaer Type 4952 Microphone s/n 2922622
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3010648

- Bruel & Kjaer Type 2250 Light Sound Level Meter s/n 3006951
- Bruel & Kjaer Type 4952 Microphone s/n 2922623

Before and after the survey, the sound level meters were field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meters, microphones and field calibrators are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

4.3 RESULTS & OBSERVATIONS

The charts below show the noise profiles measured at Positions 1 to 5, representative of the most sensitive facades of the proposed dwellings. A full listing of the short term attended noise measurements carried out at Positions 6 to 11, together with a description of the incident noise at each position is included on environmental noise data record sheets included in Appendix C.

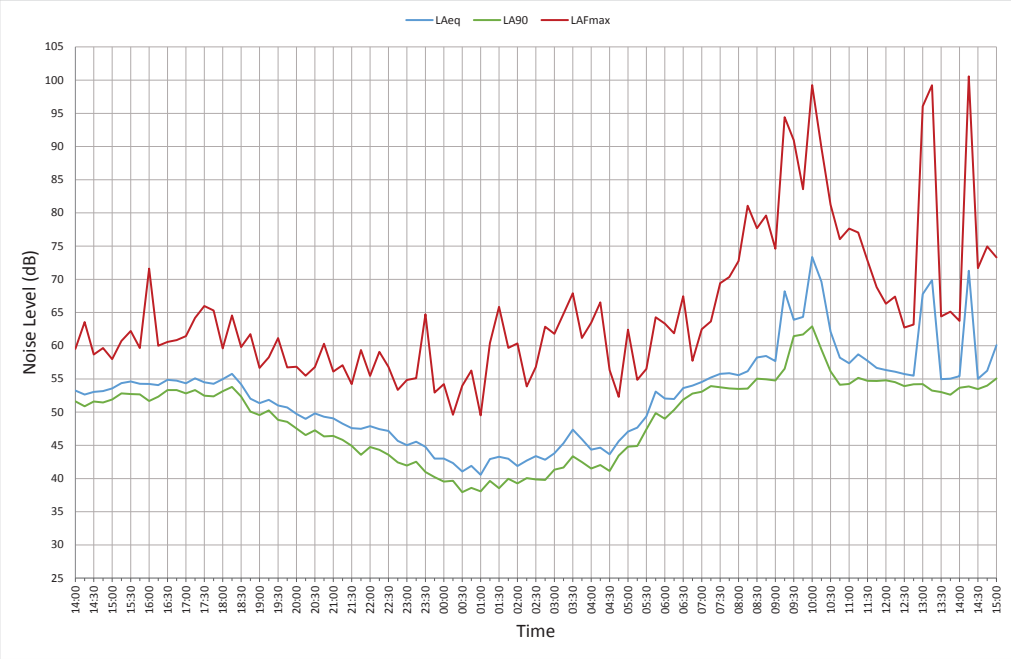


Chart 1: Position 1, Hollins Grove St, representative of proposed Plot 137 (Tues 15 to Wed 16 Nov 2016).

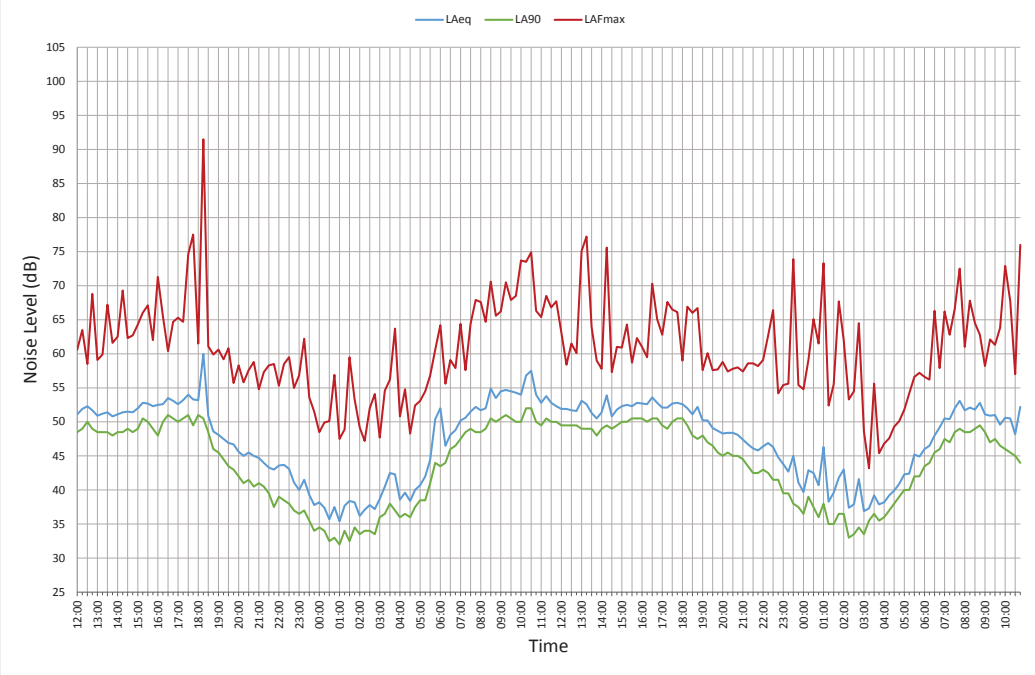


Chart 2: Position 2, Hollins Grove St, representative of proposed Plot 151 (Tues 15 to Thurs 17 Nov 2016).

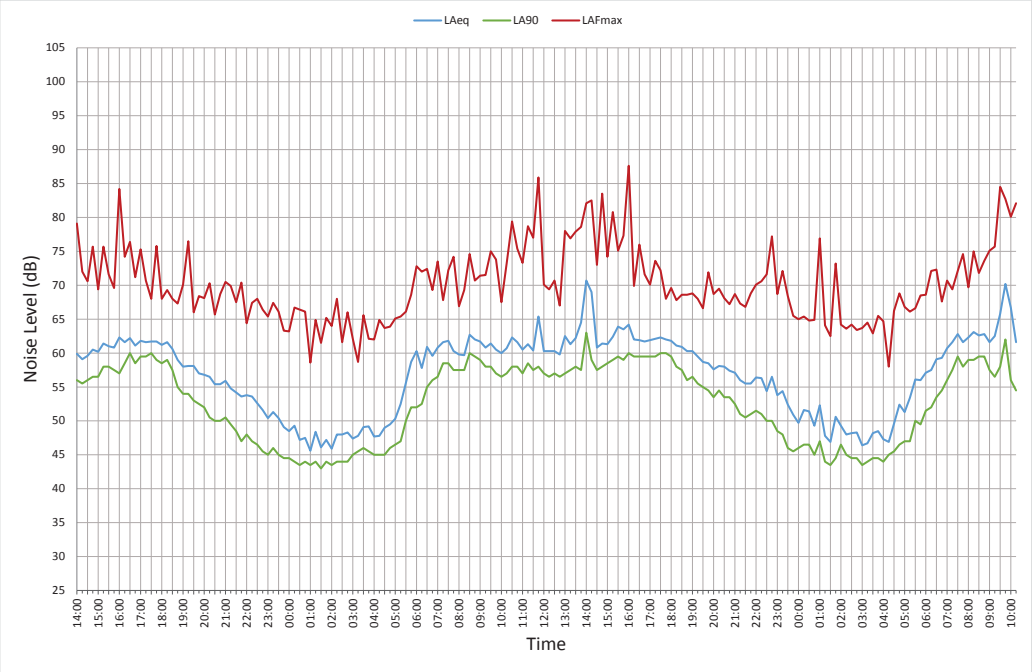


Chart 3: Position 3, Lower Eccleshill Rd, representative of proposed Plot 14 (Tues 15 to Thurs 17 Nov 2016).

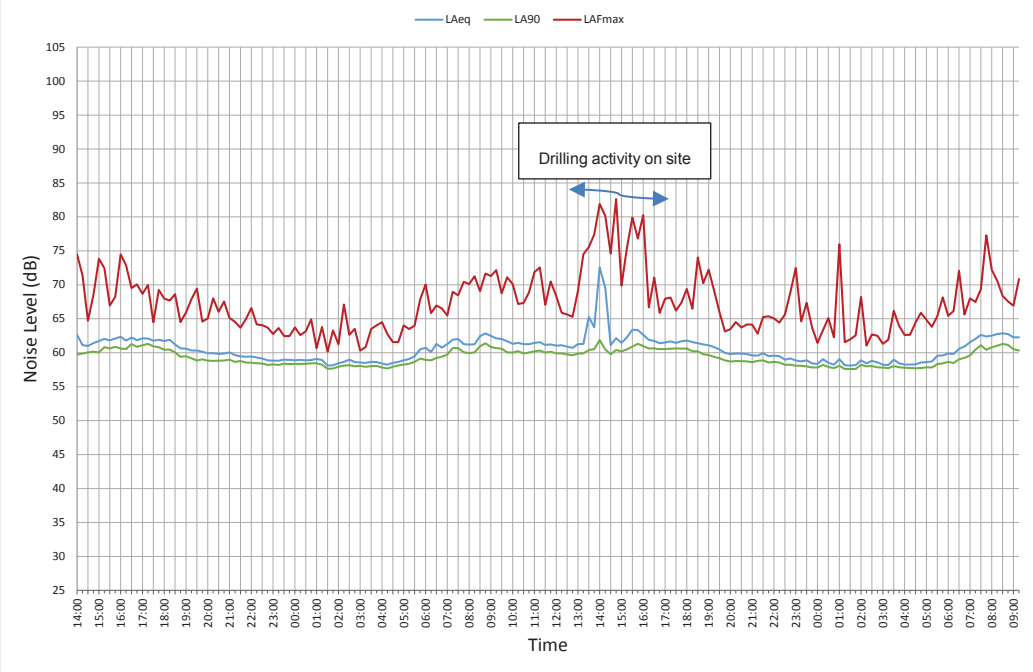


Chart 4: Position 4, Lower Eccleshill Rd, adjacent to Crown Paints Polymers (Tues 15 to Thurs 17 Nov 2016).

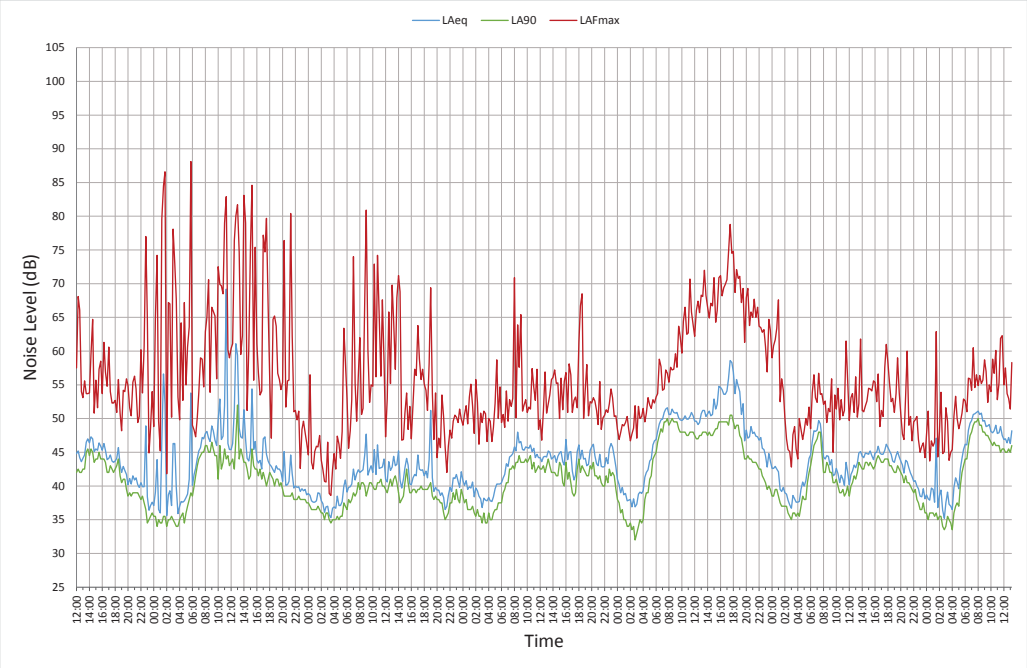


Chart 5: Position 5, South west of site, representative of proposed Plot 72 (Thurs 17 to Wed 23 Nov 2016).

A summary of the measured noise data over the daytime and night time periods is included in Table 2. The overall $L_{Aeq,16\ hour}$ and $L_{Aeq,8\ hour}$ have been taken from the average of all of the daytime and night-time noise measurements.

World Health Organisation (WHO) guidelines for community noise, define regular as not more than 10-15 events per night. Therefore the L_{Amax} levels measured during the night time periods at Positions 1 to 5 have been sorted from highest to lowest. It is then possible to read off the 10-15th highest L_{Amax} levels during each of the night time periods which are regarded as being typical. The typical L_{Amax} values for each of the night-time periods obtained in this survey are included in Table 2.

Note that the attended noise measurements at Positions 6 to 11 were only carried out during the daytime period, as the site was unsafe to access at night.

Measurement Position	Date	Daytime L_{Aeq} (dB) 0700-2300[1]	Night-time L_{Aeq} (dB) 2300-0700[2]	Night-time typical L_{Amax}[3] (dB)
Position 1 Hollins Grove St, representative of proposed Plot 137.	15-16/11/2016	61	48	62
Position 2 Hollins Grove St, representative of proposed Plot 151.	15-17/11/2016	52	43	57
Position 3 Lower Eccleshill Rd, representative of proposed Plot 14.	15-17/11/2016	62	53	67
Position 4 Lower Eccleshill Rd, adjacent to Crown Paints Polymers.	15-17/11/2016	61	59	65
Position 5 South west of site, representative of proposed Plot 73.	17-23/11/2016	49	43	54
Position 6 West of site, representative of proposed Plot 60.	26/11/2016	54	-	-
Position 7 North west of site, representative of proposed Plot 45.	26/11/2016	54	-	-
Position 8 Middle of site, representative of proposed Plot 20.	15-16/11/2016	57	-	-
Position 9 Middle of site, representative of proposed Plot 34.	15-16/11/2016	57	-	-
Position 10 Middle of site, representative of proposed Plot 100.	15-16/11/2016	55	-	-
Position 11 Somerset Avenue, representative of proposed Plot 128.	15-16/11/2016	64	-	-

Table 2: Summary of measured ambient noise levels across the site

Notes: 1 Overall $L_{Aeq,16hr}$ taken from log average over all of the daytime periods
2 Overall $L_{Aeq,8hr}$ taken from log average over all of the night-time periods
3 The L_{Amax} data is only relevant to the night time period

During the daytime and night time periods, ambient noise levels in the environment across the proposed development site are controlled by vehicle movements on nearby roads, as well as the M65 motorway.

On the northern boundary of the site at Position 4, continuous noise from the Crown Paints Poylmers site is audible. Noise associated with the main Crown Paints site is generally inaudible. At Position 4 opposite the Crown Paints storage yard, fork lift truck movements are audible during the daytime. However, fork lift truck movements in the storage yard are very occasional and generally only last for short periods of time. Vehicle movements at the main Crown Paints site are also audible during the daytime. However, the main Crown Paints site does not operate during the night time and the vehicle movements are only very occasional throughout the daytime.

5. ASSESSMENT OF NOISE

5.1 BS 4142:2014

During the daytime, ambient noise levels across the site are dominated by road traffic movements. Noise associated with some of the nearby industrial uses is audible, though not significant. During the night-time, road traffic movements reduce and noise associated with Crown Paints Polymers, which bounds the site to the north, is clearly audible at Position 4.

Normally for a development of this nature, a BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* assessment should be carried out. At Position 3, representative of Plot 14 which would be nearest to Crown Paints Polymers, background $L_{A90,T}$ levels are also controlled by continuous noise emanating from the Crown Paints Polymers site. Consequently, it is not possible to determine a robust background $L_{A90,T}$ level at that location.

In instances where existing specific noise sources operate continuously, section 8.4 of BS 4142:2014 states that background sound levels should be measured at a location which is not subject to the specific sound and where the residual sound is considered to be comparable to that of the assessment location. Therefore, a representative background level may be determined from the night-time noise measurements carried out at Position 1 further to the south.

Table 3 below sets out an assessment in accordance with BS 4142:2014 during the night time period at Position 3, representative of proposed Plot 14 which would be nearest to Crown Paints Polymers.

Results		Relevant Clause	Commentary
Measured ambient sound level	$L_{Aeq,15min}$ = 46 dB	7.1 7.3.1	Measured at Position 3 (03:00-03:15 on 17/11/2016) when the specific sound source was active and the level unaffected by any other sound sources
Residual sound level	$L_{Aeq,15min}$ = 42 dB	7.3.2	Measured at Position 1 (02:45-03:00 on 16/11/2016) where noise from Crown Paints Polymers was not audible.
Background sound level	$L_{A90,15min}$ = 40 dB	8.1.2 8.1.3	Measured at Position 1 (02:15-02:30 on 17/11/2016) where noise from Crown Paints Polymers was not audible.
Assessment made during night-time. Time reference period is 15 min		7.2	
Specific sound level	$L_{Aeq,15min}$ = 44 dB	7.3.4 7.3.5	
Acoustic feature correction	+3 dB	9.2	The specific sound is not distinctly tonal or impulsive, though is otherwise distinctive against the residual acoustic environment.
Rating level	(44 + 3) dB = 47 dB	9.2	
Background sound level	$L_{A90,15min}$ = 40 dB	8	
Excess of rating over background sound level	(47 - 40) dB = 7 dB	11	Assessment indicates that mitigation measures are desirable in order to reduce the potential impact.
Assessment indicates a likely adverse impact		11	
Uncertainty of the assessment		10	The excess of the rating level over the background sound level is not very large and in this instance the uncertainty of the measurement might have some influence on the outcome of the assessment.

Table 3: BS 4142:2014 assessment at Position 3, representative of the nearest residential properties to Crown Paints Polymers.

The BS 4142:2014 assessment indicates that an adverse noise impact would be present at the proposed residential properties that would be located closest to Crown Paints Polymers at the north end of the site.

In order to reduce the noise impact, the developer is proposing to construct a 3m high bund between the proposed residential properties and Crown Paints Polymers. On top of the bund would be an 3m high acoustic barrier fence. With the bund and barrier in place, it is expected that noise levels emanating from Crown Paints Polymers would be attenuated by more than 7dB. Consequently, the noise impact would be reduced to low with the proposed mitigation in place.

5.2 BS 8233:2014 AND WHO

During the daytime, noise levels across the site are $L_{Aeq,16hour}$ 49-64dB. During the night-time, noise levels across the site are $L_{Aeq,8hour}$ 43-59dB. The lower noise levels were measured in the central and western aspects of the site, as those areas are further away from the nearby roads. Following development, it would be expected that noise levels would reduce even further in these areas, as the houses would provide screening from one another. Nonetheless, noise levels inside some of the habitable rooms with windows open during the daytime and night-time periods would exceed the "reasonable" internal noise levels set out in BS 8233:2014. Therefore, mitigation measures would need to be considered in order to achieve acceptable internal noise levels.

As stated previously, BS 8233:2014 states that if relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (eg trickle ventilators should be open) during assessment. This therefore recognises that it is a normal mitigation practice to close windows, though in such circumstances the method of ventilation must also be considered.

In view of the above, noise levels across the site would not be characterised as a SOAEL, but do exceed the LOAEL. Accordingly, mitigation measures are considered below.

5.2.1 Internal noise levels

Internal noise levels can be calculated from the measured site external noise levels, taking into account the size and construction of the elements of the building façades, including glazing and ventilation. BS 8233 sets out a method of calculating the internal noise levels, based on the external noise levels, areas of wall, glazing and ventilator. The calculations take into account the character of the noise, as they include octave band noise levels.

It is assumed that all of the dwellings would have brick and block external walls. Sound insulation data for the external walls has been taken from BS 8233. Sound insulation data for glazing has been taken from manufacturers' data.

Note that each dwelling would incorporate a Positive Input Ventilation (PIV) system, negating the need for trickle or wall ventilators. These work by drawing 'dry' air in via the loft space using a fan unit with filters and is distributed into the house via a ceiling mounted diffuser. The moisture laden air is pushed out through the natural leakage points in the dwelling.

The proposed sound insulation scheme will be designed to meet the BS 8233 recommended $L_{Aeq,16h}$ 35dB for living rooms (resting purpose) and $L_{Aeq,8h}$ 30dB for bedrooms during the night time (sleeping purpose). The requirement for L_{AFmax} values in bedrooms at night, has been taken as individual events not regularly exceeding 45dB.

The façade insulation requirements for the living rooms and bedrooms are detailed in Table 4 as follows.

Position	Parameter	Room	External Noise Level dB(A)	Indoor target dB(A)	Reduction Required dB(A)
Position 1 Hollins Grove St, representative of proposed Plot 137.	$L_{Aeq,16\ hour}$ $L_{Aeq,8\ hour}$ L_{AFmax}	Living Room Bedrooms Bedrooms	61 48 62	35 30 45	26 18 17
Position 2 Hollins Grove St, representative of proposed Plot 151.	$L_{Aeq,16\ hour}$ $L_{Aeq,8\ hour}$ L_{AFmax}	Living Room Bedrooms Bedrooms	52 43 57	35 30 45	17 13 12
Position 3 Lower Eccleshill Rd, representative of proposed Plot 14.	$L_{Aeq,16\ hour}$ $L_{Aeq,8\ hour}$ L_{AFmax}	Living Room Bedrooms Bedrooms	62 53 67	35 30 45	27 23 22

Table 4: Numeric sound insulation requirements for sensitive rooms at the proposed development
Note: Sensitive rooms are living rooms and bedrooms

Based on the required overall façade sound insulation (column 6 'Reduction Required' in Table 4), an individual sound insulation specification has been determined for the two main elements of the façades (window and wall). It should be noted that the performance of the window may be lower than the overall façade requirement, as the wall element provides a higher sound insulation performance to compensate.

Intrusive noise calculations are included in Appendix D. Table 5 below details the sound insulation specification for all the proposed properties at the development. The numeric sound insulation rating for the glazing has been specified in terms of $R_w + C_{tr}$.

Room	Wall type	Window Performance $R_w + C_{tr}$ dB
Living Room	Brick/block	25
Dining/Kitchen	Brick/block	25
Bedrooms	Brick/block	25

Table 5: Sound insulation specification for the proposed development site

Assuming PIV systems are installed to provide adequate levels of ventilation, acoustic performances in all habitable rooms across the proposed development site can typically be achieved using standard double glazed units (rated $R_w + C_{tr}$ 25dB), typically comprising of 4mm float glass, 12mm cavity, 4mm float glass.

5.2.2 Noise levels in outdoor living spaces

During the daytime, noise levels across the site are $L_{Aeq,16\ hour}$ 49-64dB. Accordingly, mitigation measures would be required to achieve the lowest practicable levels in the external amenity spaces. Therefore, it is recommended that each of the proposed gardens be surrounded by 1.8m high close boarded timber fences. As the fences between the residential plots themselves are less critical, 600mm post and wire fences between plots would be sufficient. With the barrier fences in place, it is expected that ambient noise levels in gardens would be lower than the recommended guideline of $L_{Aeq,16hr}$ 55dB(A), as defined by BS 8233:2014 and WHO.

6. CONCLUSIONS

Gleeson Homes have commissioned Spectrum Acoustic Consultants to complete a noise assessment in order to support a planning application in connection with land off Hollins Grove Street in Darwen, earmarked for a proposed residential development.

During the daytime and night-time periods, noise levels across the site are controlled by vehicle movements on nearby roads, as well as the M65 motorway. On the northern boundary of the site, continuous noise from the Crown Paints Poylmers site is audible. Noise associated with the main Crown Paints site is generally inaudible. During the night-time, the main Crown Paints site does not operate.

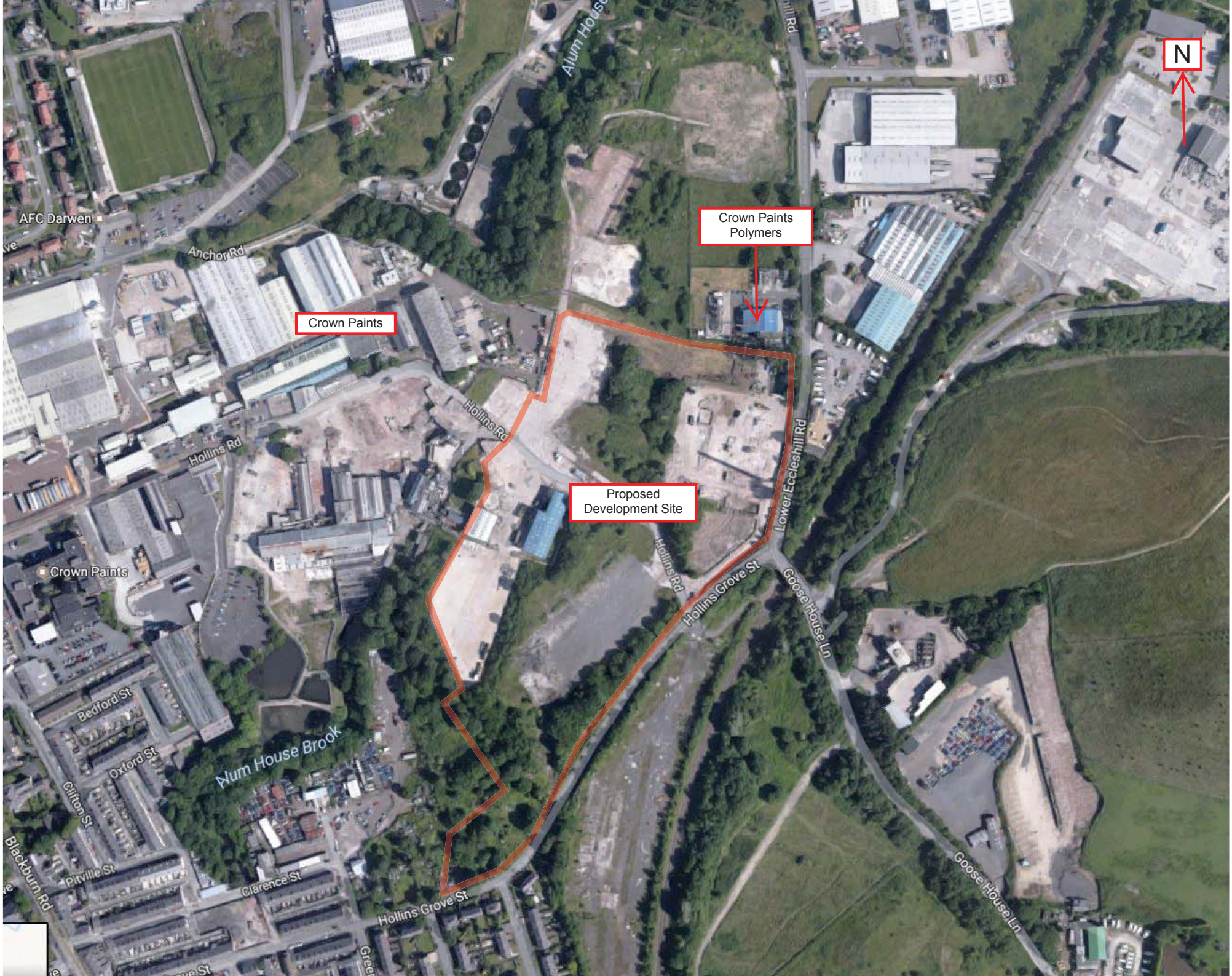
An assessment of noise from the Crown Paints Polymers site in accordance with BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* has been conducted. The assessment indicates that an adverse noise impact would be present at the nearest proposed residential properties. Therefore, mitigation measures in the form of a bund with an acoustic barrier fence on top have been proposed by the developer. With the mitigation measures in place, noise levels from the Crown Paints Polymers site would be reduced sufficiently enough to result in a low noise impact.

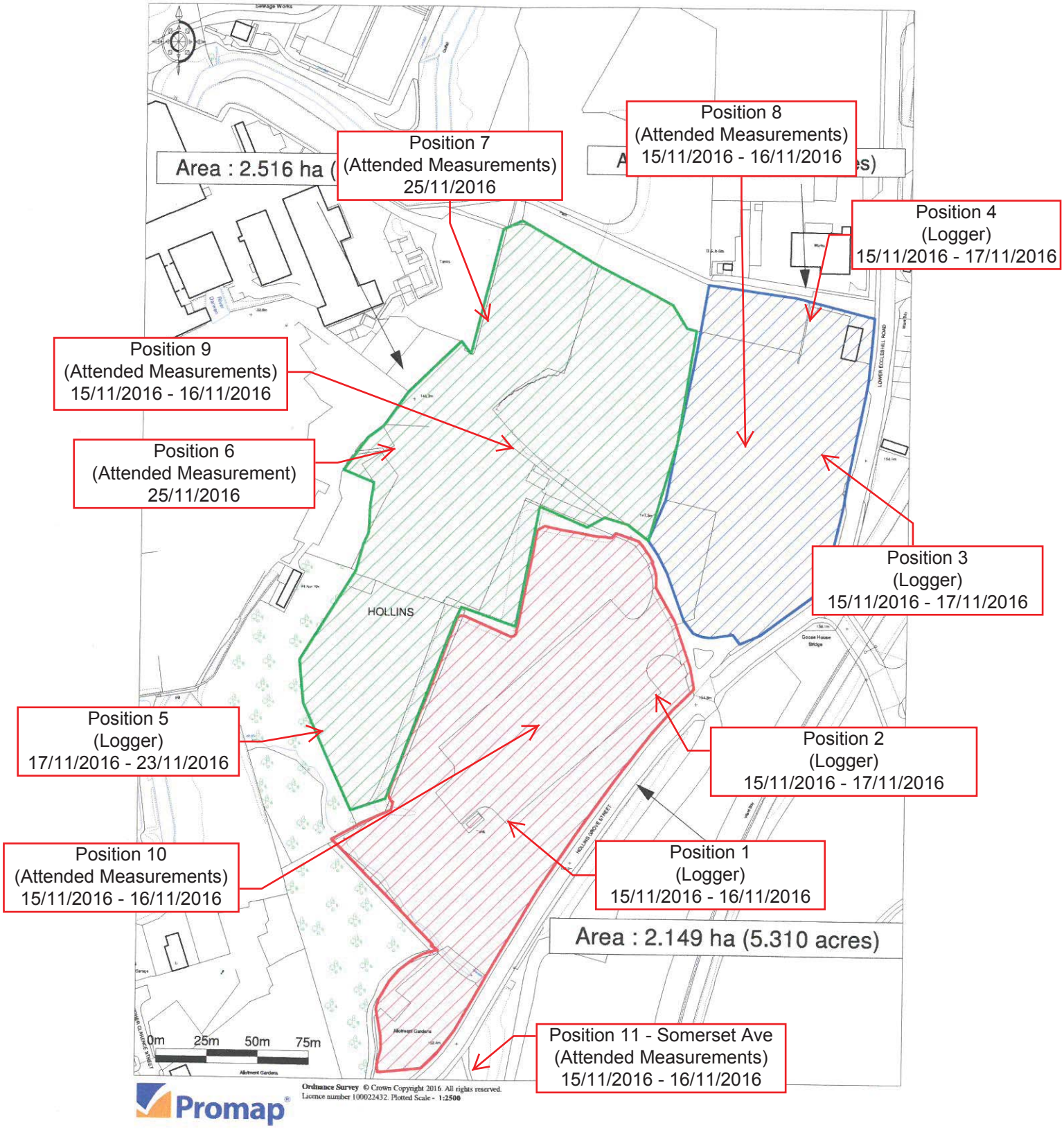
A façade and garden mitigation strategy has been developed, by considering the character to the noise impacting on the proposed development, as well as the noise insulation and noise control requirements for each of the proposed plots. The mitigation scheme that has been proposed and specified satisfies internal and external noise levels in accordance with BS 8233:2014 and WHO Guidelines for Community Noise.

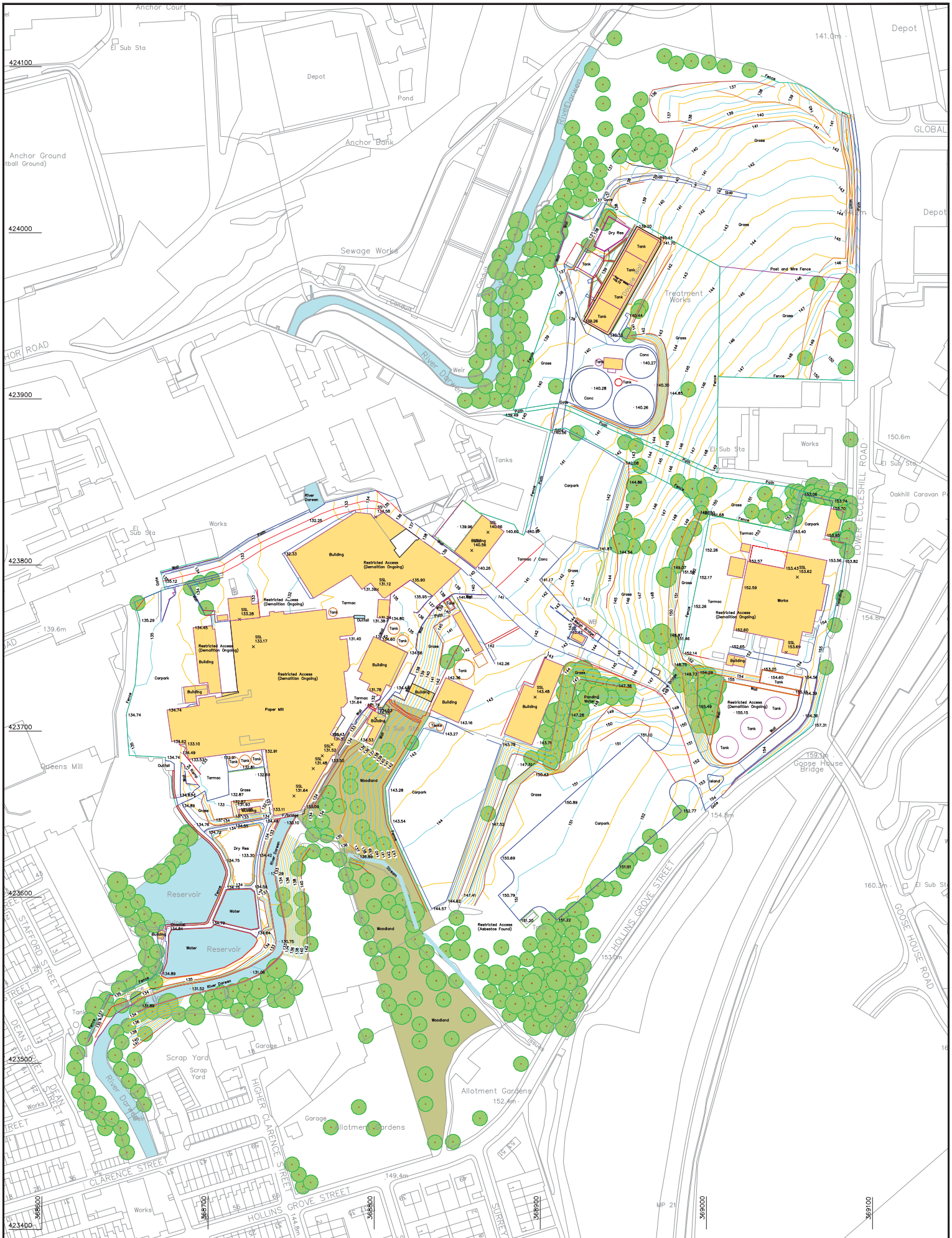
Report Code: E/RT/EH

APPENDIX A

Site Location Plan


N
Crown Paints Polymers
Crown Paints
Proposed Development Site
AFC Darwen
Anchor Rd
Hollins Rd
Hollins Grove St
Lower Eccleshill Rd
Goose House Ln
Alum House Brook
Bedford St
Oxford St
Clifton St
Blackburn Rd
Pitville St
Clarence St


Position 8
(Attended Measurements)
15/11/2016 - 16/11/2016
Position 7
(Attended Measurements)
25/11/2016
Position 4
(Logger)
15/11/2016 - 17/11/2016
Position 9
(Attended Measurements)
15/11/2016 - 16/11/2016
Position 6
(Attended Measurement)
25/11/2016
Position 3
(Logger)
15/11/2016 - 17/11/2016
Position 5
(Logger)
17/11/2016 - 23/11/2016
Position 2
(Logger)
15/11/2016 - 17/11/2016
Position 10
(Attended Measurements)
15/11/2016 - 16/11/2016
Position 1
(Logger)
15/11/2016 - 16/11/2016
Position 11 - Somerset Ave
(Attended Measurements)
15/11/2016 - 16/11/2016
Area : 2.516 ha (
Area : 2.149 ha (5.310 acres)
HOLLINS
0m 25m 50m 75m
Promap
Ordnance Survey © Crown Copyright 2016. All rights reserved.
Licence number 100022432. Plotted Scale - 1:2500



NOTES:

1. SURVEY UNDERTAKEN FEB–MARCH 2013
2. COORDINATE SYSTEM : OSGB36 (02) National Grid
3. ACCESS TO BUILDINGS RESTRICTED – LEVELS TBC FOLLOWING DEMOLITION
4. 'SSL ???.??' INDICATES STRUCTURAL SLAB LEVEL (BUILDINGS)
5. CONTOURS INDICATED AT 0.5m Minor AND 1m Major

Scale	1:1000	Project	DARWEN PAPERMILL
Drawn	SB		
Date	18/03/2013	Title	SITE SURVEY - MARCH 2013
Paper Size	A1	Drawing Number	BES/B823/001
		Revision	0

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Benchmark
Engineering Services Limited
Survey, Setting-Out, Measurement, CAD Drafting & Modelling

APPENDIX B

Proposed Scheme

Schedule of Accommodation

To be read in conjunction with drawing no. 2895-0-001-C

Housetype	No. of Beds	Type	No. of Units	Percentage
201	2 Bedrooms	Semi-detached	30	19.87
202	2 Bedrooms	Semi-detached	18	11.92
212	2 Bedrooms	Semi-detached	6	3.97
301	3 Bedrooms	Semi-detached	14	9.27
311	3 Bedrooms	Semi-detached	7	4.64
309	3 Bedrooms	Semi-detached	10	6.62
313	3 Bedrooms	Semi-detached	5	3.31
304	3 Bedrooms	Detached	23	15.23
307	3 Bedrooms	Detached	15	9.93
310	3 Bedrooms	Detached	11	7.28
314	3 Bedrooms	Detached	4	2.65
401	4 Bedrooms	Detached	4	2.65
403	4 Bedrooms	Detached	4	2.65
		Totals	151	100.00

N

S

LEGEND:

- 1.8M (h) TIMBER FENCE
- POST & WIRE FENCE
- 3M (h) ACOUSTIC FENCE
- DRIVE DETAIL
- PROPOSED TREES
- EXISTING TREES TO BE REMOVED/PRUNED
- EXISTING TREES TO BE RETAINED
- DENOTES FUTURE GARAGE

revision	date	content	initials
H	24.07.17	LAYOUT UPDATED FOLLOWING CLIENTS COMMENTS. SCHEDULE OF ACCOMMODATION UPDATED.	LD
G	06.06.17	RED LINE EXTENDED TO INCLUDE ACOUSTIC FEATURE TO NORTH OF SITE.	RB
F	31.05.17	ACOUSTIC BUND & FENCE EXTENDED AND PUBLIC FOOTPATH RE-ROUTED.	JB
E	30.05.17	ACOUSTIC BUND & FENCE ADDED TO NORTH EAST BOUNDARY.	JB
D	26.05.17	STREET SCENE INDICATORS ADDED. PLOTS 13, 14, 31 & 32 HANDED.	JB
C	18.05.17	PLOTS 21, 22, 23, 24, 27, 28, 92, 93, 94, 108 & 109 AMENDED. SCHEDULE OF ACCOMMODATION UPDATED.	JB
B	12.05.17	SITE LAYOUT RE-DRAWN. SCHEDULE OF ACCOMMODATION UPDATED.	JB
A	14.12.16	VEHICLE TRACKING AND VISIBILITY SPLAYS ADDED.	JB

SKETCH
subject to structural review
subject to accurate measured survey

project: PROPOSED RESIDENTIAL
HOLLINS PAPER MILL
HOLLINS GROVE STREET, DARWEN

client: GLEESON HOMES

title: PROPOSED SITE LAYOUT

date	scale	drawn
28.11.16	1:1000 @A1	JB

drawing number	checked
2895-0-001 H	

niemen architects
Niemen Architects
Deck 2 The Waterscape
42 Leeds & Bradford Road
Kirkstall Leeds LS5 3EG
Tel: 0113 239 5400
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office@niemen.co.uk
www.niemen.co.uk

Hollins Paper Mill, **DARWEN**

Schedule of Accommodation

To be read in conjunction with drawing no. 2895-0-001-C

Housetype	No. of Beds	Type	No. of Units	Percentage
201	2 Bedrooms	Semi-detached	30	19.87
202	2 Bedrooms	Semi-detached	18	11.92
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401	4 Bedrooms	Detached	4	2.65
403	4 Bedrooms	Detached	4	2.65
		Totals	151	100.00

N

S

LEGEND

1.8M (H) TIMBER FENCE

POST & WIRE FENCE

3M (H) ACOUSTIC FENCE

DRIVE DETAIL

PROPOSED TREES

EXISTING TREES TO BE REMOVED/PRUNED

EXISTING TREES TO BE RETAINED

DENOTES FUTURE GARAGE

Hollins Paper Mill, DARWEN

DO NOT SCALE - ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE - THIS DRAWING IS COPYRIGHT

SKETCH
subject to structural review
subject to accurate measured survey

revision	date	content	initials
H	24.07.17	LAYOUT UPDATED FOLLOWING CLIENTS COMMENTS. SCHEDULE OF ACCOMMODATION UPDATED.	LD
G	06.06.17	RED LINE EXTENDED TO INCLUDE ACOUSTIC FEATURE TO NORTH OF SITE.	RB
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C	18.05.17	PLOTS 21, 22, 23, 24, 27, 28, 92, 93, 94, 108 & 109 AMENDED. SCHEDULE OF ACCOMMODATION UPDATED.	JB
B	12.05.17	SITE LAYOUT RE-DRAWN. SCHEDULE OF ACCOMMODATION UPDATED.	JB
A	14.12.16	VEHICLE TRACKING AND VISIBILITY SPLAYS ADDED.	JB

project: PROPOSED RESIDENTIAL
HOLLINS PAPER MILL
HOLLINS GROVE STREET, DARWEN

client: GLEESON HOMES

title: PROPOSED SITE LAYOUT

date: 28.11.16 | scale: 1:1000 @A1 | drawn: JB

drawing number: 2895-0-001 H | checked:

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Niemen Architects
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office@niemen.co.uk
www.niemen.co.uk

DRAWING SCHEDULE

TITLE & NUMBER	Revision	Date
ELEVATIONS (URBAN 13) 13/313/314-2 -		
GROUND FLOOR 313/314 -03 D	D. W.C. width shown. C. Notes added, SVP added to W.C. B. Dims to projection. A. Client amendments.	04.08.16 11.04.16 04.12.15 23.11.15
FIRST FLOOR 313/314 -04 D	D. Boxing/tiling note added to bathroom. C. SVP added to En-suite. B. Dims to projection. Bed1 & 2 rads. A. Client amendments.	04.08.16 11.04.16 04.12.15 23.11.15
FOUNDATION 313/314 -05 A	A. Water entry added.	04.08.16
SECTION A-A 313/314 -06 -		
SECTION B-B 313/314 -07 -		
1st FLOOR DIMS 313/314 -08 -		
ELEVATIONS (RURAL 13) 13/313/314-9 -		
ELEVATIONS (CONTEMPORARY 13) 13/313/314-10 -		
SALES PLAN issue 313G		

READ IN CONJUNCTION WITH:

STANDARD CONSTRUCTION NOTES

MANUFACTUERERS JOIST LAYOUT

MANUFACTUERERS ROOF TRUSS DESIGN

313 Door Schedule

Door Number	Location	Door size	Comments
Dr1	Front	838 x 1981	
Dr2	WC	838x1981	
Dr3	Lounge	838x1981	
Dr4	Dining	838x1981	
Dr5	DiningEXT	1500 x 2100	
Dr6	Bathroom	762x1981	
Dr7	Bedroom 2	762x1981	
Dr8	Bedroom 3	762x1981	
Dr9	Bedroom 1	762x1981	
Dr10	En-suite	762x1981	
Dr11	Cupboard	762x1981	

Grand total: 11

313 Window Schedule

Window Number	Location	Frame Width	Frame Height	construction
Wn1	WC	630	1050	obscure
Wn2	Lounge	1200	1350	
Wn3	Lounge	1200	1350	
Wn4	Hall	630	1200	
Wn5	Dining	1200	1350	
Wn6	Kitchen	1200	1050	
Wn7	Bedroom 3	1200	1200	escape
Wn8	Bedroom 1	1200	1200	escape
Wn9	En-suite	630	1050	obscure
Wn10	Bedroom 2	1200	1200	escape
Wn11	Bathroom	630	1050	obscure

Grand total: 11

FLOOR AREA
75.311m², 811ft²

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: 313(semi) 314(detached) INDEX

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 313/314 - 00 Rev. H

SIDE ELEVATION

FRONT ELEVATION

REAR ELEVATION

Elevation when detached

SIDE ELEVATION

Revisions: Date:

FEATURES
* Rolled profile roof tiles.
* Dry verge detail.
* Exposed rafter feet at eaves.
* Flat brick soldier arches.
* Cottage style windows with horizontal glazing bar.
* Brick cills.
* Cottage style main entrance door, with dual pitch canopy over on "gallows brackets"
* Triple band course at FF window cill level, cill omitted
* Brick quoins to corner and render on selected plots
* Vertical panel garage door
* Dark brick below DPC

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 313 (314 DET) ELEVATIONS (RURAL 13)

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 13/313 -9 Rev. -

Revisions: Date:

FEATURES
* Flat profile roof tiles.
* Dry verge detail.
* UPVC fascia at eaves, with brick corbel to gable.
* Flat brick arch with false key brick to window head on exposed elevations.
* Plain side hung casement windows.
* Brick soldier course cills.
* Six panel solid main entrance door, with lean to canopy over on "gallows brackets"
* Contrasting brick plinth 900mm above Floor level
* Brick quions
* Horizontal panel garage door
* Dark brick below DPC.

SIDE ELEVATION

FRONT ELEVATION

REAR ELEVATION

Elevation when detached

SIDE ELEVATION

gleeson

Client: GLEESON HOMES & REGENERATION

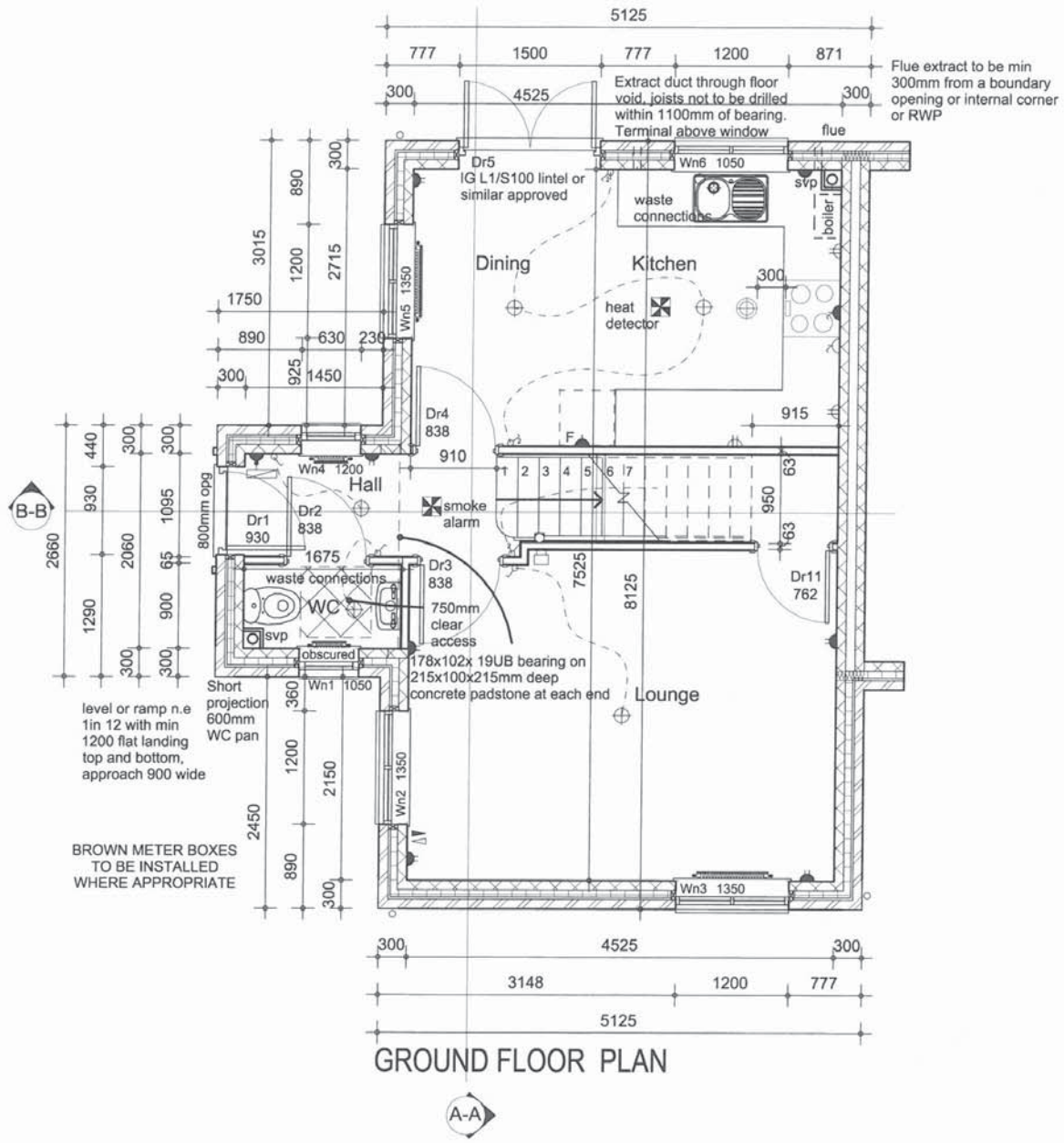
Project: HOUSE TYPE DRAWING

Title: TYPE 313 (314 DET) ELEVATIONS (URBAN 13)

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 13/313 -02 Rev. -



Revisions:	Date:
D. W.C. width shown.	04.08.16
C. Notes added, SVP added to W.C.	11.04.16
B. Dims to projection.	04.12.15
A. Client amendments.	23.11.15

ELECTRIC KEY

- CEILING LIGHT FITTED WITH ENERGY EFFICIENT BULB
- SINGLE POLE LIGHT SWITCH
- TWO WAY LIGHT SWITCH
- SWITCHED SINGLE SOCKET LOW LEVEL
- SWITCHED TWIN SOCKET LOW LEVEL
- SWITCHED SINGLE SOCKET HIGH LEVEL
- SWITCHED TWIN SOCKET HIGH LEVEL

NOT TO BE POSITIONED WITHIN 300mm OF SINK OR DRAINER

- SWITCHED FUSED SPUR LOW LEVEL
- SWITCHED FUSED SPUR HIGH LEVEL
- FUSED SPUR LOW LEVEL FOR FUTURE ALARM (ONLY APPLICABLE TO CODE PLOTS)
- EXTRACT FAN
- TV AERIAL POINT
- INCOMING BT POINT
- SMOKE/HEAT DETECTOR to BS5839-6:2004 (positioned min 300mm away from light fittings)
- CONSUMER UNIT
- RADIATOR POSITION
- SOIL AND VENT PIPE BOXING
- HEATING THERMOSTAT (dual zone control)

gleeson

Client: GLEESON HOMES & REGENERATION

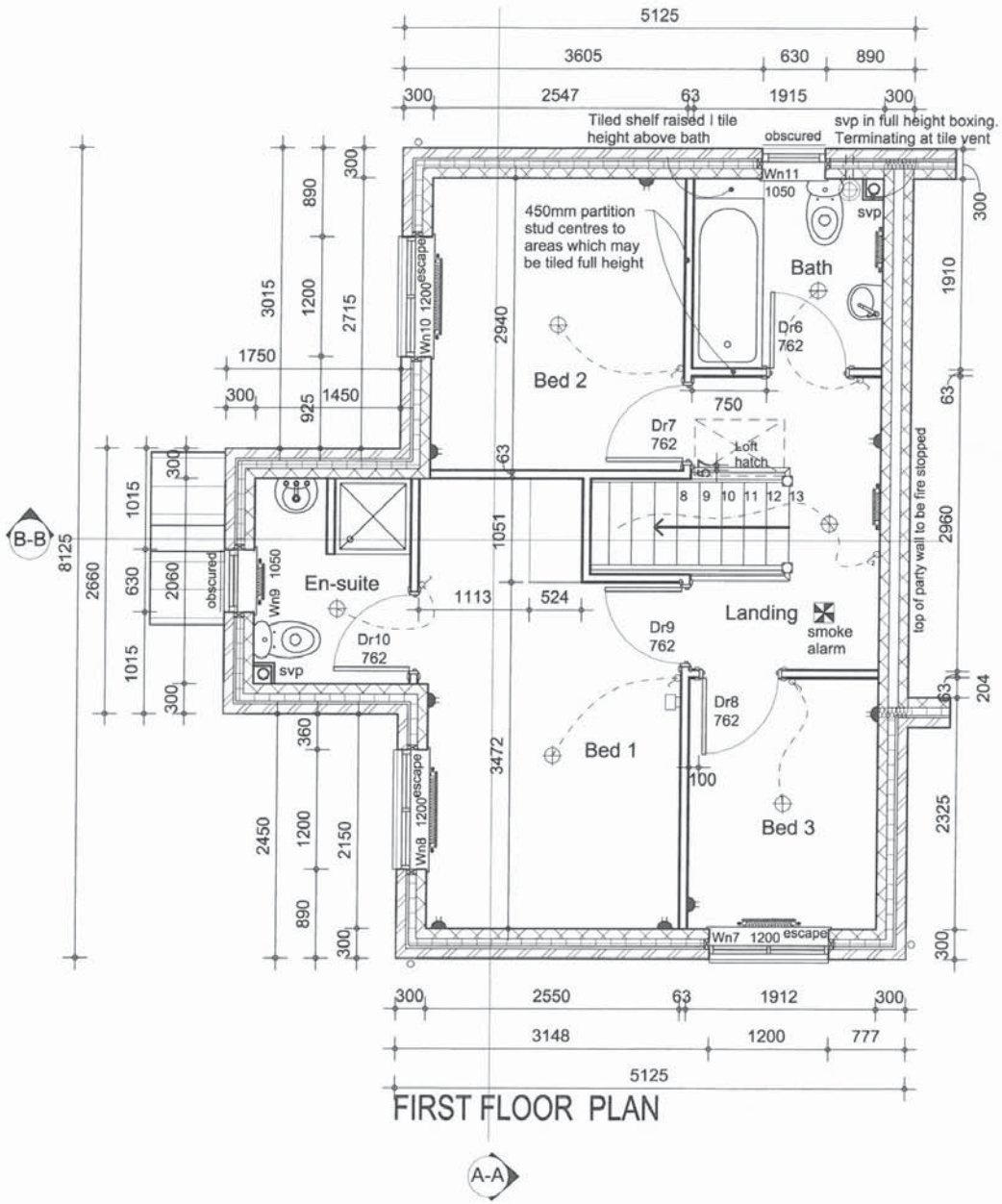
Project: HOUSE TYPE DRAWING

Title: 313(semi) 314(detached) GROUND FLOOR

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 313/314 Rev 03 D



Revisions:	Date:
D. Boxing/tiling note added to bathroom.	04.08.16
C. SVP added to En-suite.	11.04.16
B. Dims to projection. Bed1 & 2 rads.	04.12.15
A. Client amendments.	23.11.15

ELECTRIC KEY

- CEILING LIGHT FITTED WITH ENERGY EFFICIENT BULB
- SINGLE POLE LIGHT SWITCH
- TWO WAY LIGHT SWITCH
- SWITCHED SINGLE SOCKET LOW LEVEL
- SWITCHED TWIN SOCKET LOW LEVEL
- SWITCHED SINGLE SOCKET HIGH LEVEL
- SWITCHED TWIN SOCKET HIGH LEVEL

NOT TO BE POSITIONED WITHIN 300mm OF SINK OR DRAINER

- SWITCHED FUSED SPUR LOW LEVEL
- SWITCHED FUSED SPUR HIGH LEVEL
- FUSED SPUR LOW LEVEL FOR FUTURE ALARM (ONLY APPLICABLE TO CODE PLOTS)
- EXTRACT FAN
- TV AERIAL POINT
- INCOMING BT POINT
- SMOKE/HEAT DETECTOR to BS5839-6:2004 (positioned min 300mm away from light fittings)
- CONSUMER UNIT
- RADIATOR POSITION
- SOIL AND VENT PIPE BOXING
- HEATING THERMOSTAT (dual zone control)

gleeson

Client: GLEESON HOMES & REGENERATION

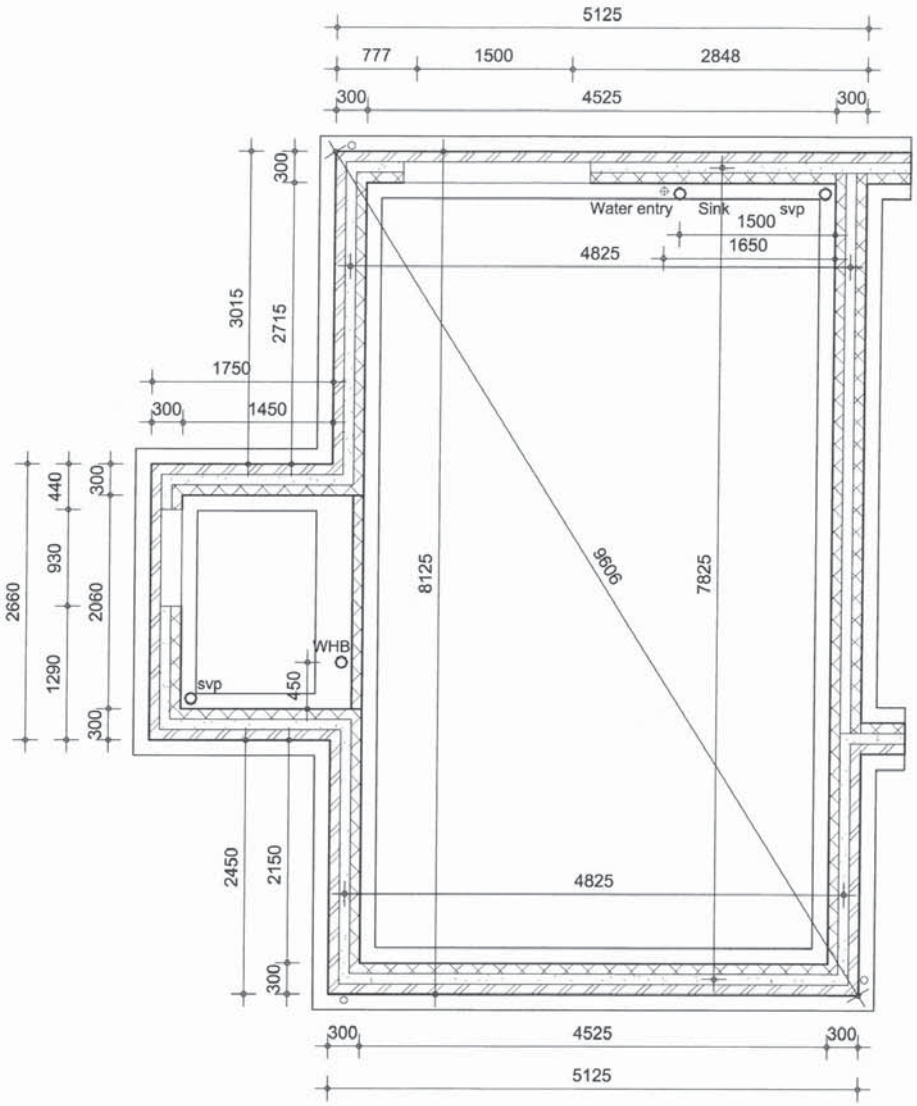
Project: HOUSE TYPE DRAWING

Title: 313(semi) 314(detached) FIRST FLOOR

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 313/314 Rev 04 D



FOUNDATION PLAN

Revisions:	Date:
A. Water entry added.	04.08.16

303 Foundation Line Loads (porches together)	
Location	Line Load (kN/m)
Front Wall	44
Rear Wall	39
Gable Wall	51
Party Wall	69

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

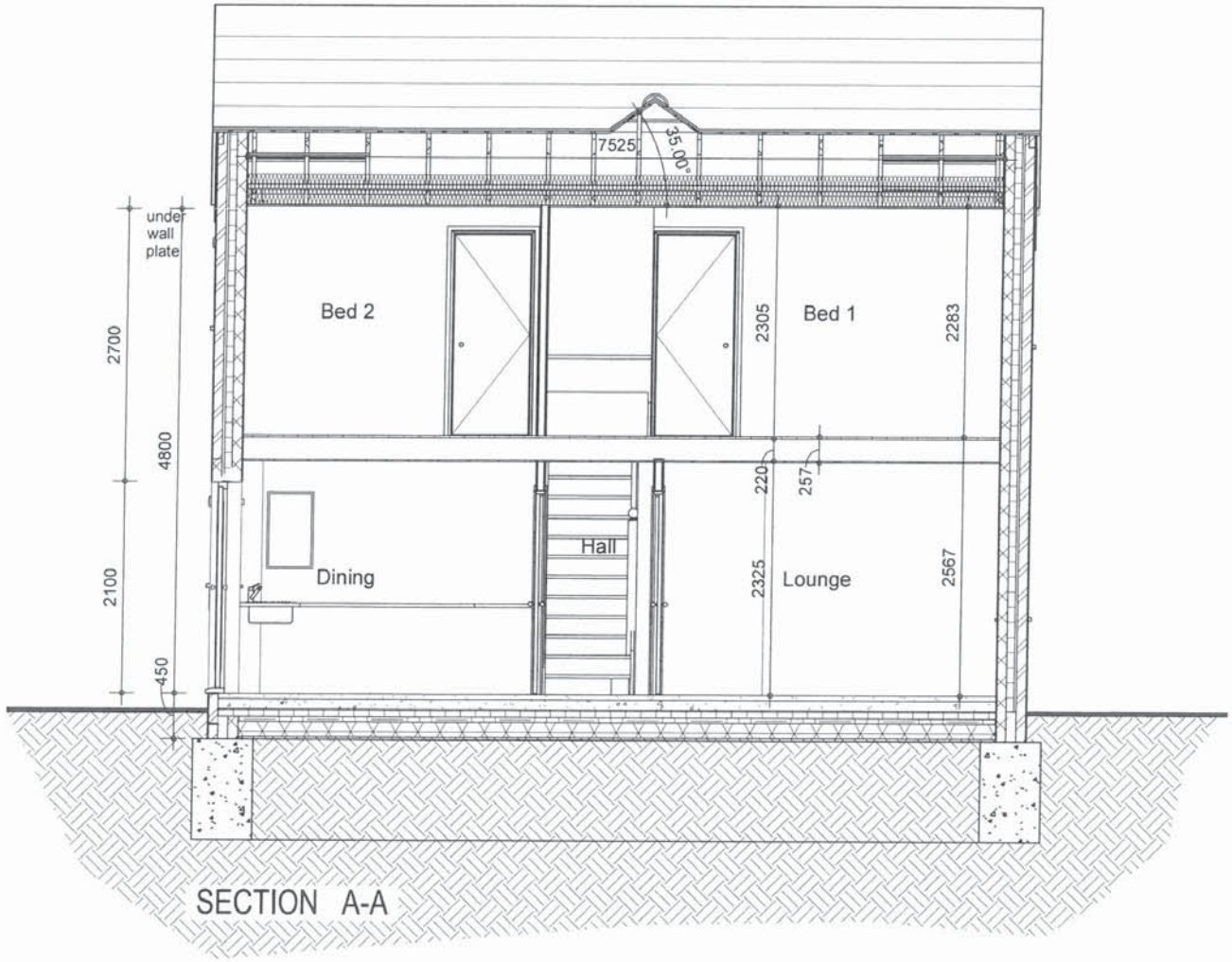
Title: 313(semi) 314(detached) FOUNDATION

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 313/314 Rev. 05 A

Revisions:	Date:



SECTION A-A

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

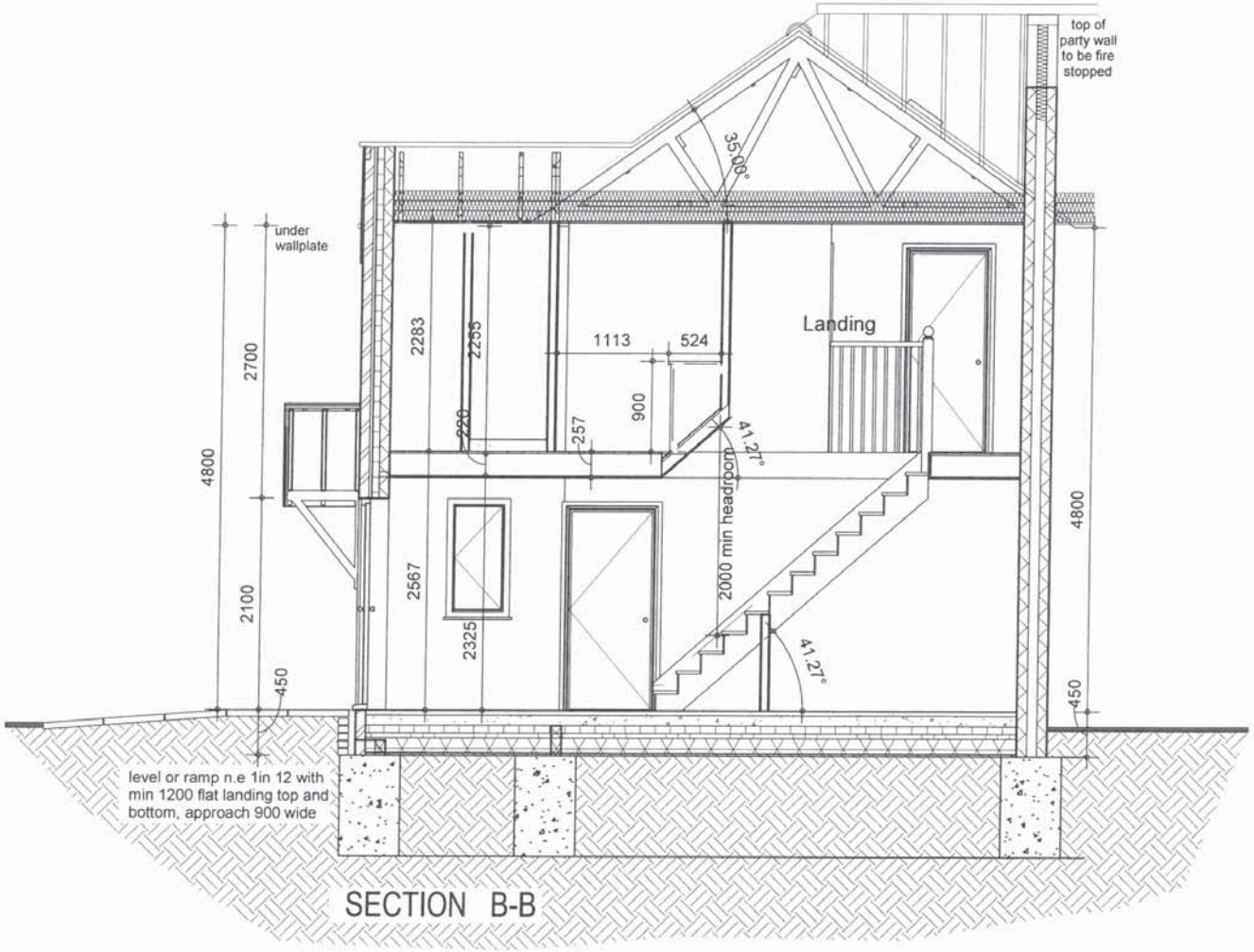
Title: TYPE 313 (314 DET) SECTION A-A

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Nov 2015

Drawing no. 313 -06 Rev. -

Revisions:	Date:



SECTION B-B

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 313 (314 DET) SECTION B-B

Scales: 1:50 @ A3 Cad ref :

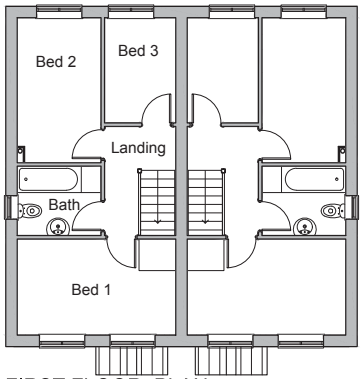
Drawn: Checked: Date: Nov 2015

Drawing no. 313 -07 Rev. -

FRONT ELEVATION

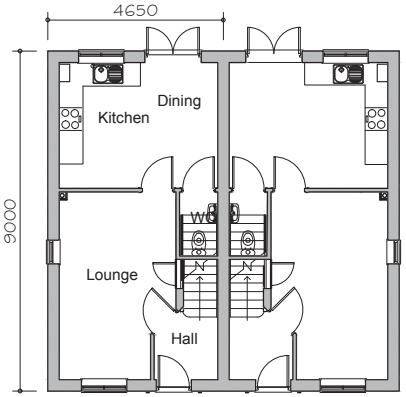
SIDE ELEVATION

REAR ELEVATION



FIRST FLOOR PLAN

SIDE ELEVATION



GROUND FLOOR PLAN

optional bay window

SIDE ELEVATION

0m 1m 5m 10m 12m

FLOOR AREA
70.56m², 759ft²

PLANNING DRAWING

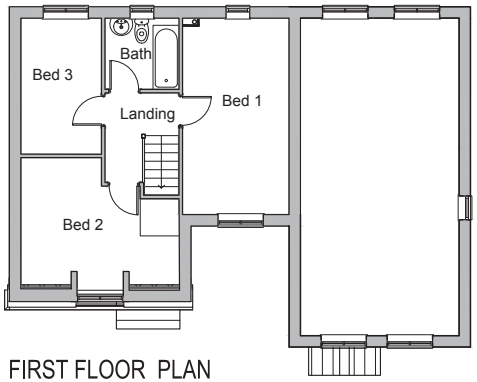
311 dwelling type

GLEESON HOMES & REGENERATION

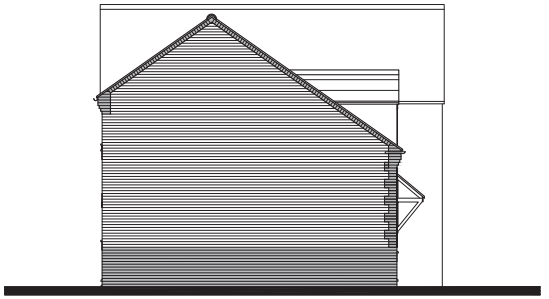
A. Based on latest Rev B working drawing 28.09.14	Scale
	1:100 at A2
	Date
	Dec.13
	Dwg No
	311/1A

FRONT ELEVATION

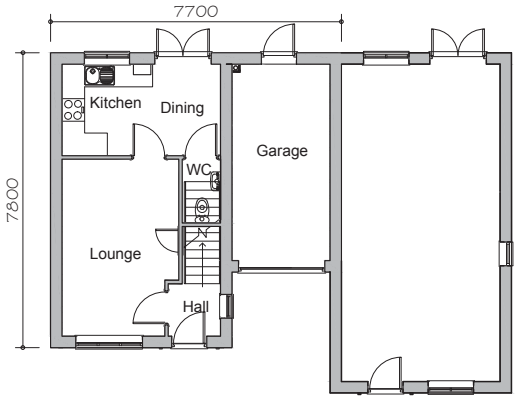
REAR ELEVATION



FIRST FLOOR PLAN



SIDE ELEVATION



GROUND FLOOR PLAN

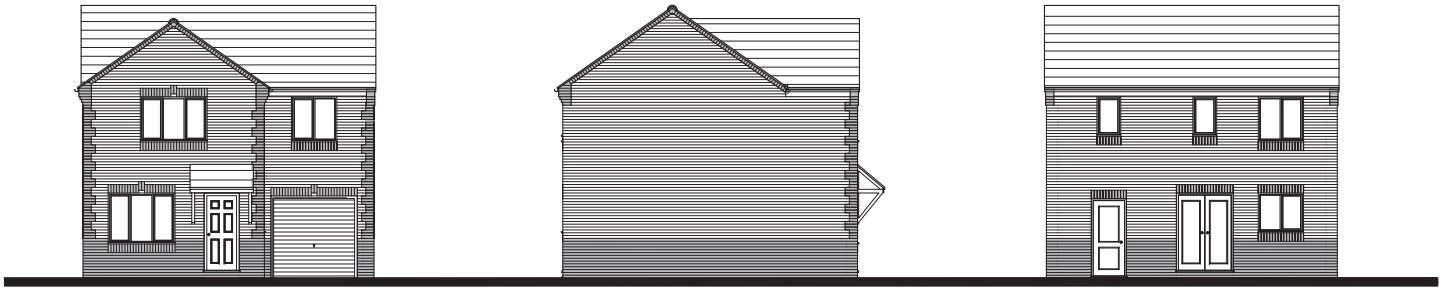
FLOOR AREA
73.24m², 788ft²

PLANNING DRAWING

309 dwelling type

GLEESON HOMES & REGENERATION

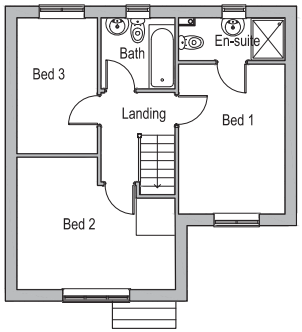
A	Dormer and ground floor WC revised	12.09.12	Scale
B	Dimensions added	22.10.12	1:100 at A2
C	Elevational styling revised	20.09.13	
D	Based on latest Rev N working drawing	27.05.14	
E	Floor area corrected	27.11.14	
			Date
			Jun.11
			Dwg No
			309/1E



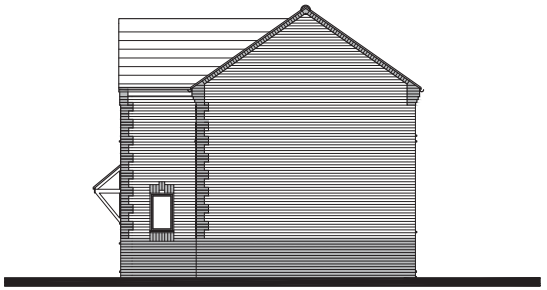
FRONT ELEVATION

SIDE ELEVATION

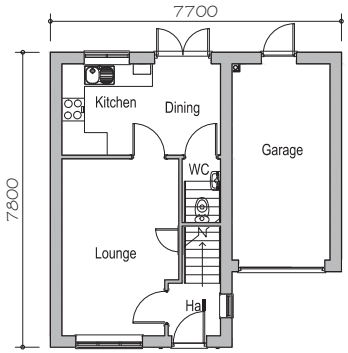
REAR ELEVATION



FIRST FLOOR PLAN



SIDE ELEVATION



GROUND FLOOR PLAN

0m 1m 5m 10m 12m

FLOOR AREA
75.00m², 807ft²

PLANNING DRAWING

307 dwelling type

GLEESON HOMES & REGENERATION

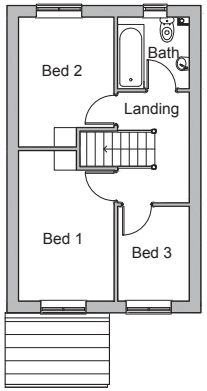
A	Based on latest Rev S working drawing	27.05.14
B	Based on latest Rev Z working drawing	19.10.19

Scale
1:100 at A2
Date
Sept.13
Dwg No
307/1B

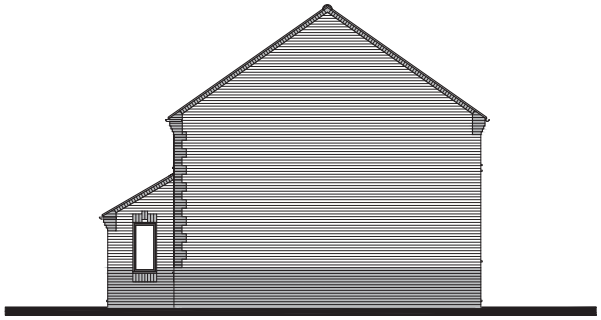
FRONT ELEVATION

SIDE ELEVATION

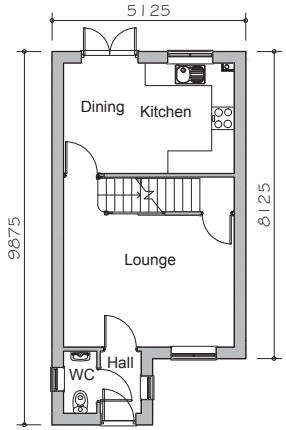
REAR ELEVATION



FIRST FLOOR PLAN



SIDE ELEVATION



GROUND FLOOR PLAN

PLANNING DRAWING

304 dwelling type

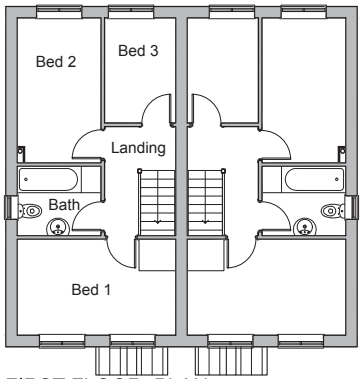
GLEESON HOMES & REGENERATION

A	Redrawn, derived from 305 type.	29.05.11	Scale
B	Brickwork detailing, GF WC revised.	29.08.12	
C	Dimensions added.	22.10.12	1:100 at A2
D	Elevational styling revised.	20.09.13	
E	Based on latest Rev F working drawing.	27.05.14	Date
			July.10
			Dwg No
			304/1E

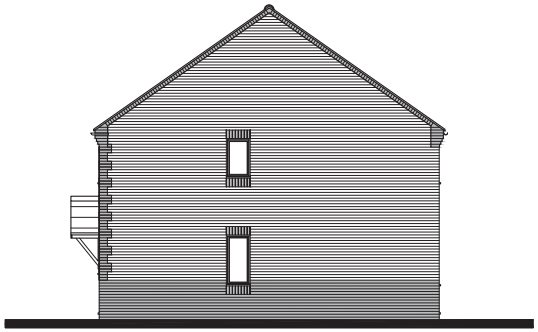
FRONT ELEVATION

SIDE ELEVATION

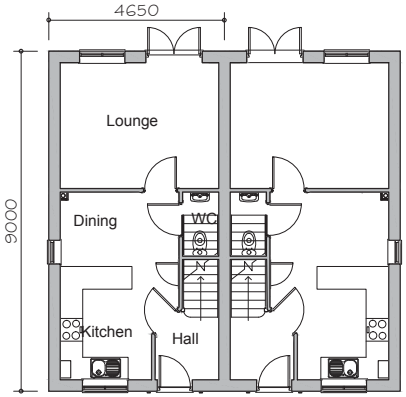
REAR ELEVATION



FIRST FLOOR PLAN



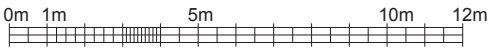
SIDE ELEVATION



GROUND FLOOR PLAN

optional bay window

SIDE ELEVATION



FLOOR AREA
70.56m², 759ft²

PLANNING DRAWING

301 dwelling type

GLEESON HOMES & REGENERATION

A	Type redesign.	11.02.11	Scale
B	Front door canopy revised.	23.05.11	
C	Brickwork detailing, front door, option elevation	28.08.12	1:100 at A2
D	Dimensions added	22.10.12	Date
E	Elevational styling revised.	20.09.13	
F	GF layout, rear window and patio door swapped.	06.12.13	
G	Based on latest Rev W working drawing	27.09.14	July.10
			Dwg No
			301/1G

DRAWING SCHEDULE

TITLE & NUMBER	Revision	Date
ELEVATIONS (URBAN 13) 13/212 -02 A	A. Hall window omitted.	03.02.16
GROUND FLOOR 212 -03 F	F. Kitchen layout revised. E. Lounge door handed. D. Hall/WC beam/support spec revised. C. Hall window omitted.	12.09.16 04.08.16 29.04.16 04.12.15
FIRST FLOOR 212 -04 C	C. Additional studwork added to bathroom shelf return. Bathroom radiator relocated. B. Dim to Bed1 window, Elec Bed1 revised. A. Client revisions	29.04.16 04.12.15 24.11.15
FOUNDATION 212 -05 B	B. Kitchen sink and water entry revised. A. Water entry added.	12.09.16 04.08.16
SECTION A-A 212 -06 -		
SECTION B-B 212 -07 A	A. Detail at eaves corrected.	04.08.16
1st FLOOR DIMS 212 -08 -		
ELEVATIONS (RURAL 13) 13/212 -9 -		
ELEVATIONS (CONTEMPORARY 13) 13/212 -10 -		
SALES PLAN issue 212H		

READ IN CONJUNCTION WITH:

STANDARD CONSTRUCTION NOTES

MANUFACTUERERS JOIST LAYOUT

MANUFACTUERERS ROOF TRUSS DESIGN

212 Door Schedule

Door Number	Location	Door size	Comments
Dr1	Front	838 x 1981	
Dr2	WC	838x1981	
Dr3	Lounge	838x1981	
Dr4	Dining	838x1981	
Dr5	Stair Cupboard	762x1981	
Dr6	KitchenEXT	930 x 2100	Half glazed
Dr7	Bedroom 2	762x1981	
Dr8	Bathroom	762x1981	
Dr9	Bedroom 1	762x1981	
Dr10	Cupboard	610x1350	

Grand total: 10

212 Window Schedule

Window Number	Location	FrameWidth	Frame Height	construction
Wn1	Lounge	1200	1350	
Wn2	Lounge	1200	1350	
Wn3	WC	630	1050	
Wn4	Kitchen	1200	1050	
Wn5	Bedroom 1	1200	1200	escape
Wn6	Bedroom 1	1200	1200	
Wn7	Bathroom	630	1050	omit when mid terrace
Wn8	Bedroom 2	1200	1200	escape

Grand total: 8

FLOOR AREA
62.37m², 671ft²

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 212 INDEX

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 212 - 00 Rev. H

Revisions:	Date:
A. Hall window omitted.	03.02.16

SIDE ELEVATION

FRONT ELEVATION

FEATURES
* Flat profile roof tiles.
* Dry verge detail.
* UPVC fascia at eaves, with brick corbel to gable.
* Flat brick arch with false key brick to window head on exposed elevations.
* Plain side hung casement windows.
* Brick soldier course cills.
* Six panel solid main entrance door, with lean to canopy over on "gallows brackets"
* Contrasting brick plinth 900mm above Floor level
* Brick quions
* Horizontal panel garage door
* Dark brick below DPC.

REAR ELEVATION

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 212
ELEVATIONS (URBAN 13)

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 13/212 -02 Rev. A

SIDE ELEVATION

FRONT ELEVATION

REAR ELEVATION

Revisions:	Date:

FEATURES
* Rolled profile roof tiles.
* Dry verge detail.
* Exposed rafter feet at eaves.
* Flat brick soldier arches.
* Cottage style windows with horizontal glazing bar.
* Brick cills.
* Cottage style main entrance door, with dual pitch canopy over on "gallows brackets"
* Triple band course at FF window cill level, cill omitted
* Brick quoins to corner and render on selected plots
* Vertical panel garage door
* Dark brick below DPC

gleeson

Client: GLEESON HOMES & REGENERATION

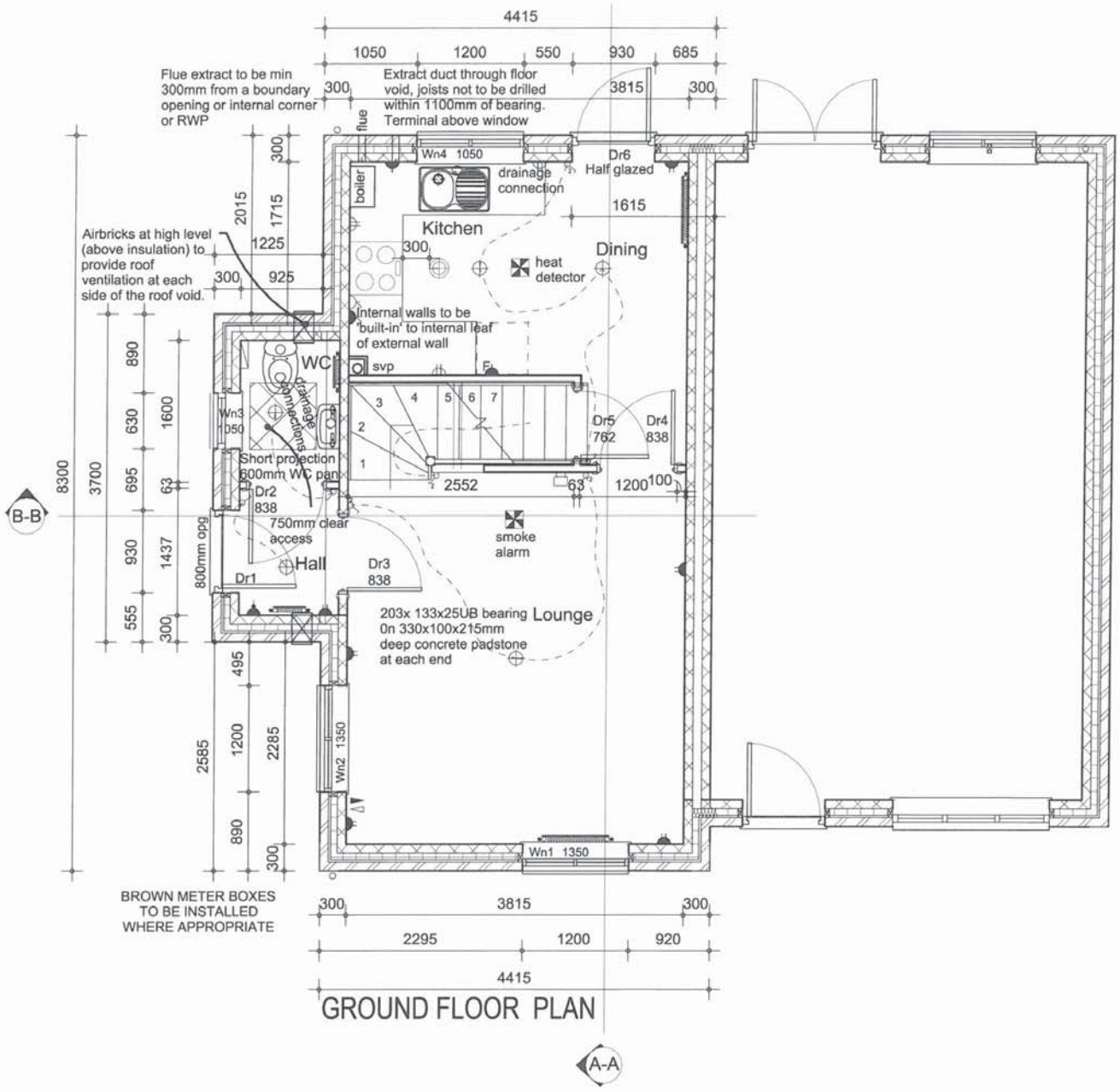
Project: HOUSE TYPE DRAWING

Title: TYPE 212
ELEVATIONS (RURAL 13)

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 13/212 -9 Rev. -



GROUND FLOOR PLAN

Revisions:	Date:
F. Kitchen layout revised.	12.09.16
E. Lounge door handed.	04.08.16
D. Hall/WC beam/support spec revised.	29.04.16
C. Hall window omitted.	04.12.15
B. Hall/WC projection dimensioned.	24.11.15
A. Client revisions	

ELECTRIC KEY

- CEILING LIGHT FITTED WITH ENERGY EFFICIENT BULB
- SINGLE POLE LIGHT SWITCH
- TWO WAY LIGHT SWITCH
- SWITCHED SINGLE SOCKET LOW LEVEL
- SWITCHED TWIN SOCKET LOW LEVEL
- SWITCHED SINGLE SOCKET HIGH LEVEL
- SWITCHED TWIN SOCKET HIGH LEVEL

NOT TO BE POSITIONED WITHIN 300mm OF SINK OR DRAINER

- SWITCHED FUSED SPUR LOW LEVEL
- SWITCHED FUSED SPUR HIGH LEVEL
- FUSED SPUR LOW LEVEL FOR FUTURE ALARM (ONLY APPLICABLE TO CODE PLOTS)
- EXTRACT FAN
- TV AERIAL POINT
- INCOMING BT POINT
- SMOKE/HEAT DETECTOR to BS5839-6:2004 (positioned min 300mm away from light fittings)
- CONSUMER UNIT
- RADIATOR POSITION
- SOIL AND VENT PIPE BOXING
- HEATING THERMOSTAT (dual zone control)

gleeson

Client: GLEESON HOMES & REGENERATION

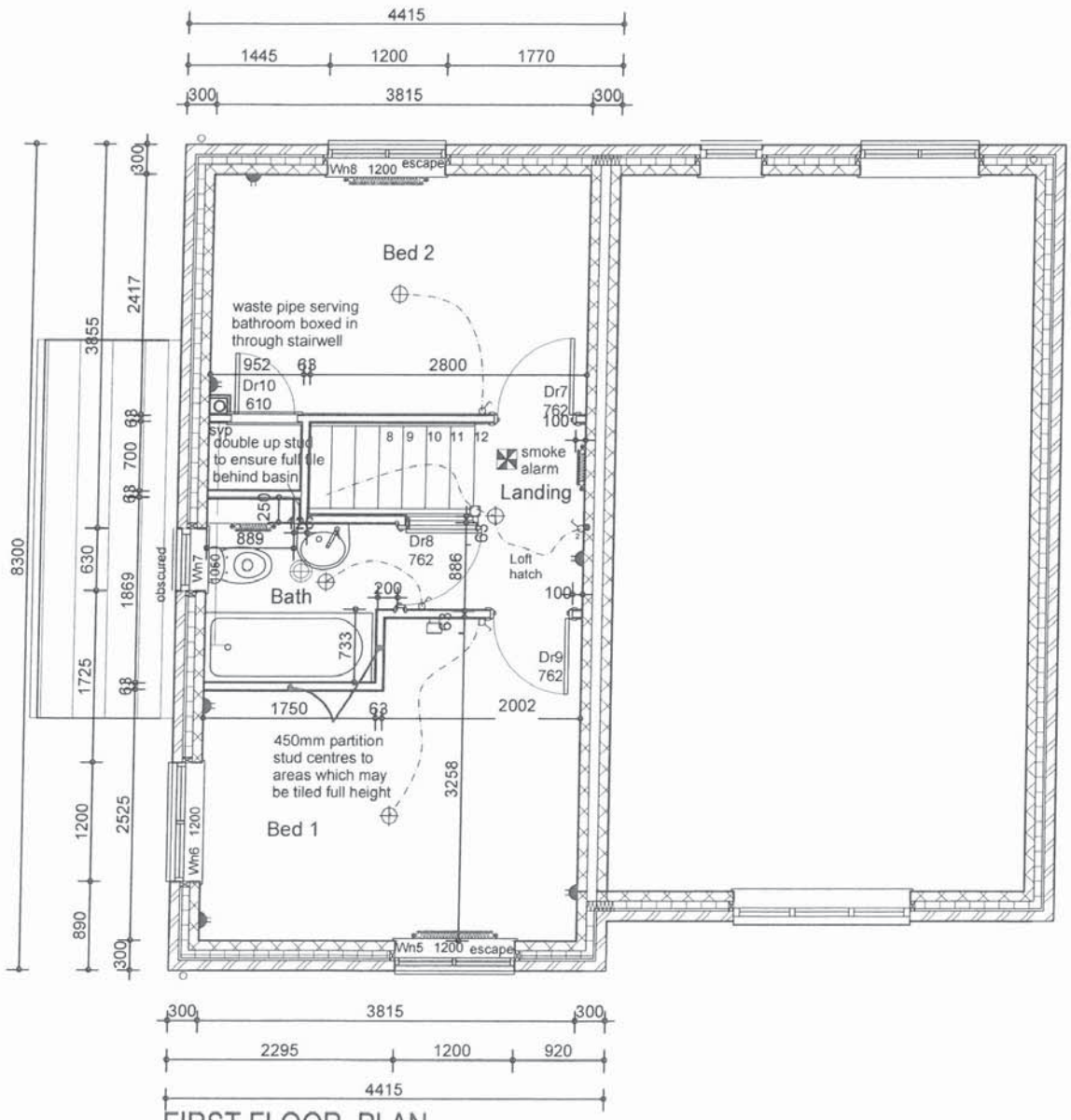
Project: HOUSE TYPE DRAWING

Title: TYPE 212 GROUND FLOOR

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 212 -03 Rev. F



FIRST FLOOR PLAN

Revisions:	Date:
C. Additional studwork added to bathroom shelf return. Bathroom radiator relocated.	29.04.16
B. Dim to Bed1 window, Elec Bed1 revised.	04.12.15
A. Client revisions	24.11.15

ELECTRIC KEY

- CEILING LIGHT FITTED WITH ENERGY EFFICIENT BULB
- SINGLE POLE LIGHT SWITCH
- TWO WAY LIGHT SWITCH
- SWITCHED SINGLE SOCKET LOW LEVEL
- SWITCHED TWIN SOCKET LOW LEVEL
- SWITCHED SINGLE SOCKET HIGH LEVEL
- SWITCHED TWIN SOCKET HIGH LEVEL
- SWITCHED FUSED SPUR LOW LEVEL
- SWITCHED FUSED SPUR HIGH LEVEL

NOT TO BE POSITIONED WITHIN 300mm OF SINK OR DRAINER

- FUSED SPUR LOW LEVEL FOR FUTURE ALARM (ONLY APPLICABLE TO CODE PLOTS)
- EXTRACT FAN
- TV AERIAL POINT
- INCOMING BT POINT
- SMOKE/HEAT DETECTOR to BS5839-6:2004 (positioned min 300mm away from light fittings)
- CONSUMER UNIT
- RADIATOR POSITION
- SOIL AND VENT PIPE BOXING
- HEATING THERMOSTAT (dual zone control)

gleeson

Client: GLEESON HOMES & REGENERATION

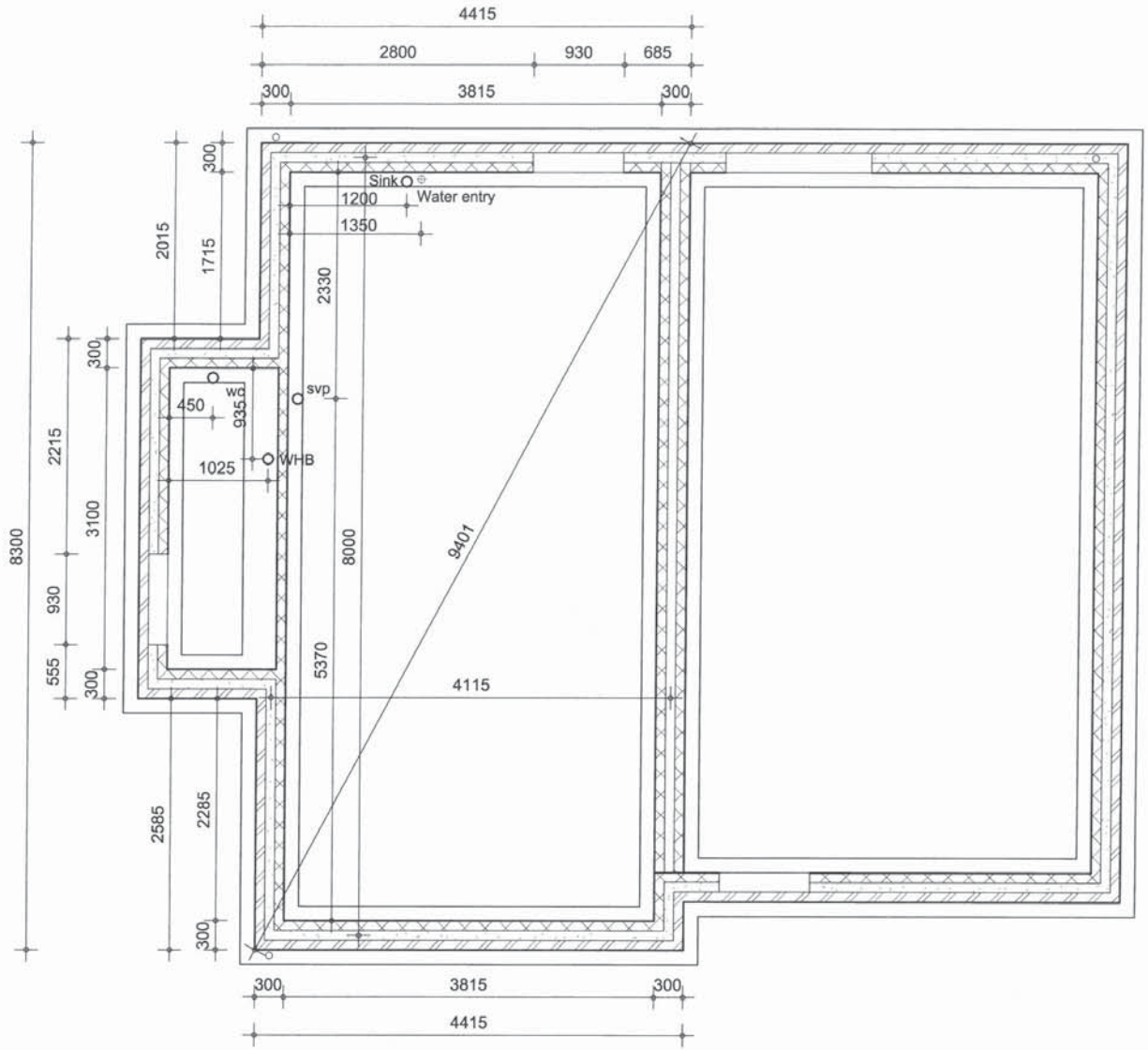
Project: HOUSE TYPE DRAWING

Title: TYPE 212 FIRST FLOOR

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 212 -04 Rev. C



FOUNDATION PLAN

Revisions:	Date:
B. Kitchen sink and water entry revised.	12.09.16
A. Water entry added.	04.08.16

202 Foundation Line Loads	
Location	Line Load (kN/m)
Front Wall	46
Rear Wall	39
Gable Wall	45
Party Wall	72

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

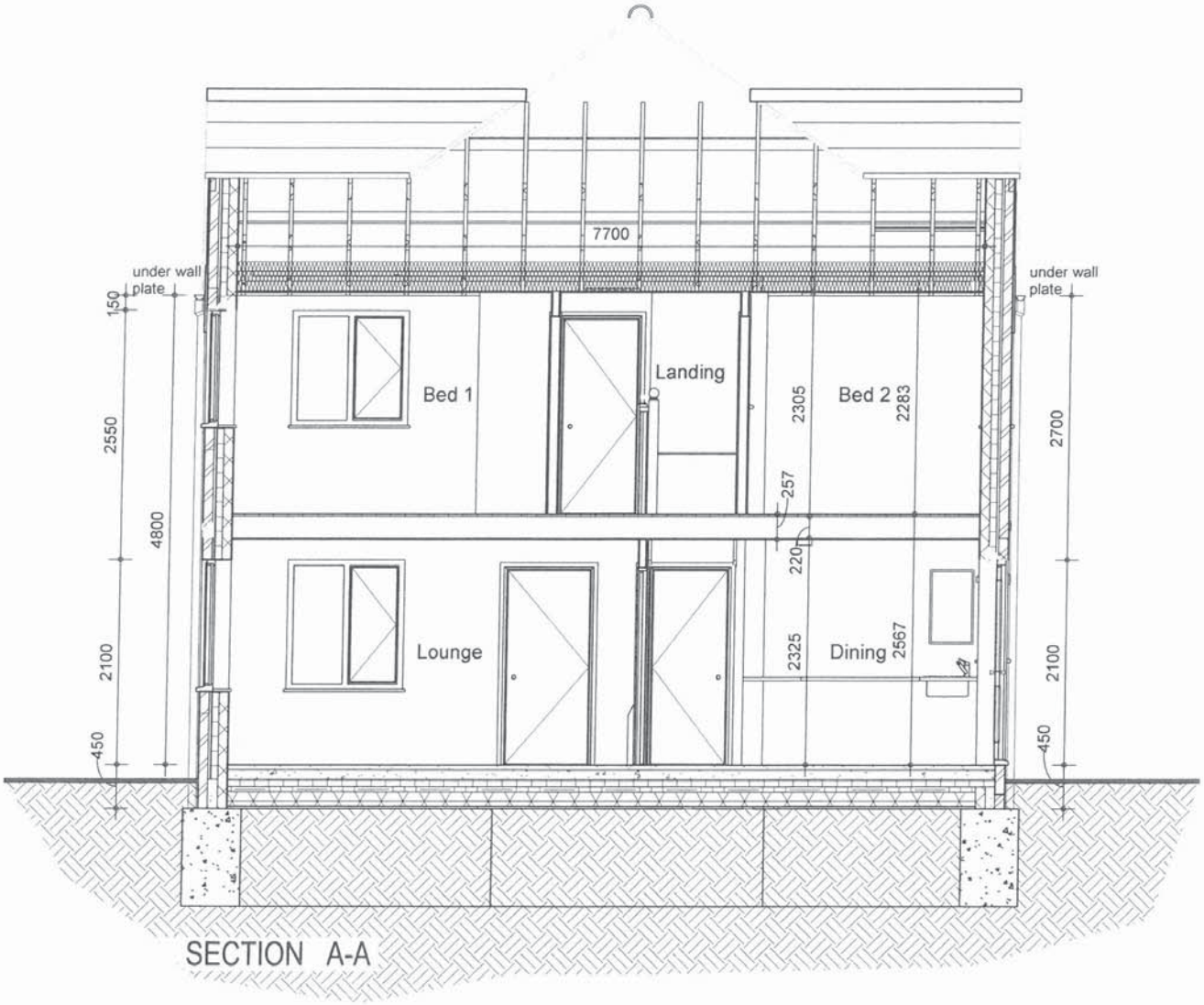
Title: TYPE 212 FOUNDATION

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 212 -05 Rev. B

Revisions:	Date:



SECTION A-A

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

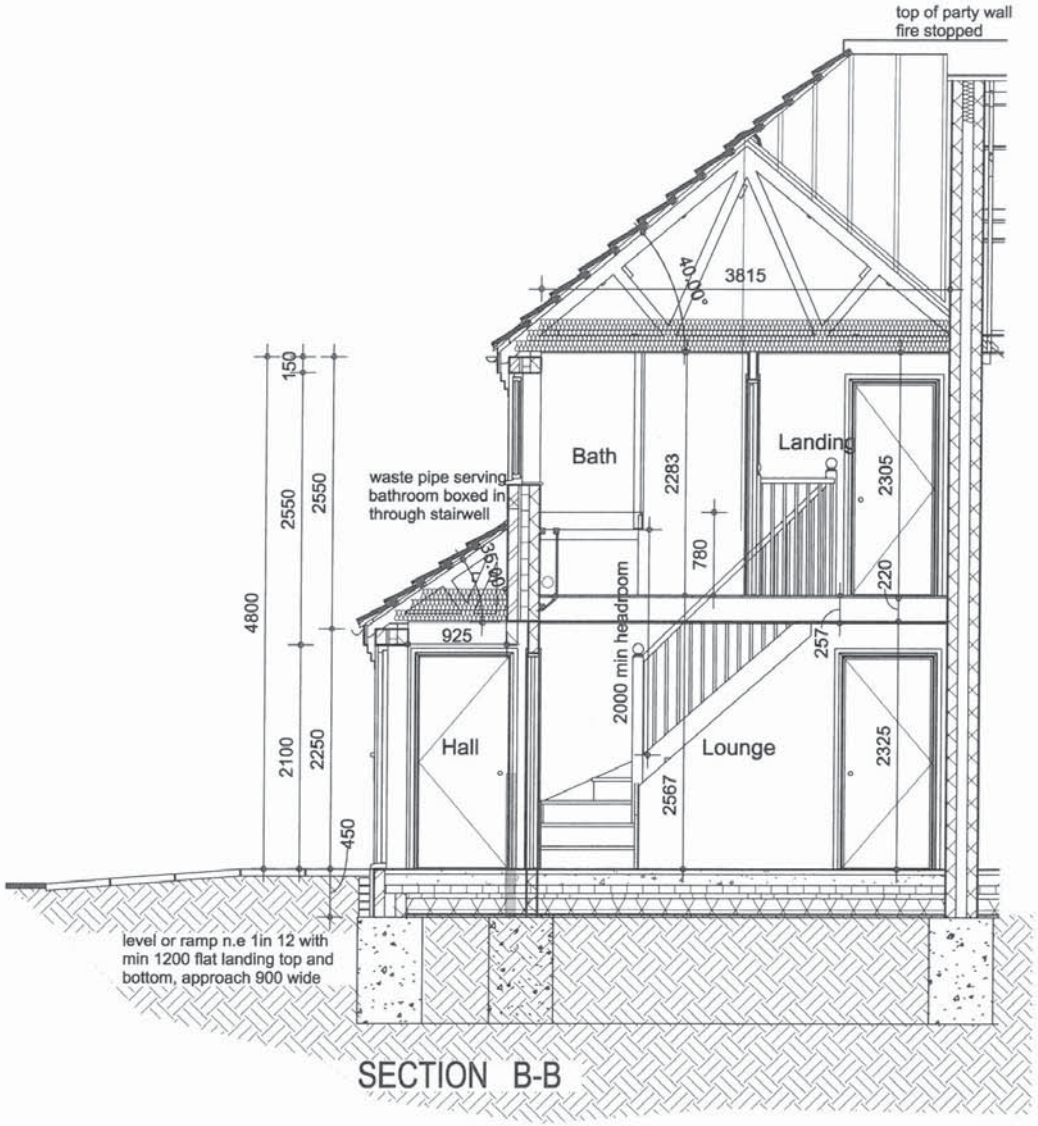
Title: TYPE 212 SECTION A-A

Scales: 1:50 @ A3 Cad ref :

Drawn: Checked: Date: Oct 2015

Drawing no. 212 -06 Rev. -

Revisions:	Date:
A. Detail at eaves corrected.	04.08.16



SECTION B-B

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 212 SECTION B-B

Scales: 1:50 @ A3 Cad ref :

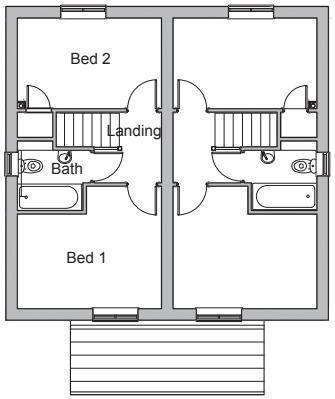
Drawn: Checked: Date: Oct 2015

Drawing no. 212 -07 Rev. A

FRONT ELEVATION

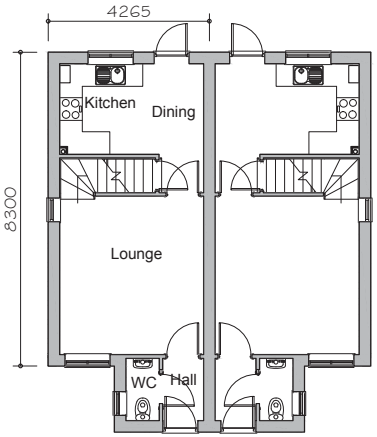
SIDE ELEVATION

REAR ELEVATION



FIRST FLOOR PLAN

SIDE ELEVATION



GROUND FLOOR PLAN

FLOOR AREA
62.37m², 671ft²

PLANNING DRAWING

202 dwelling type

GLEESON HOMES & REGENERATION

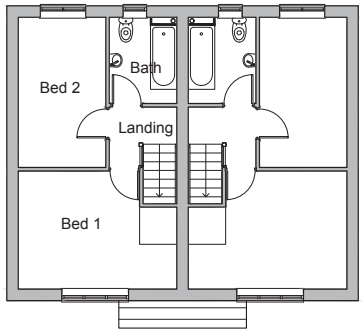
A.	Minor revision to internal layout.	11.02.11	Scale
B.	Rear door revised.	25.05.11	
C.	Brick detailing, Ground floor WC door revised.	29.08.12	1:100 at A2
D.	Dimensions added.	22.10.12	
E.	Elevational style revised.	20.09.13	Date
F.	Based on latest Rev Q working drawing.	27.05.14	July.10
			Dwg No
			202/1F

optional bay window

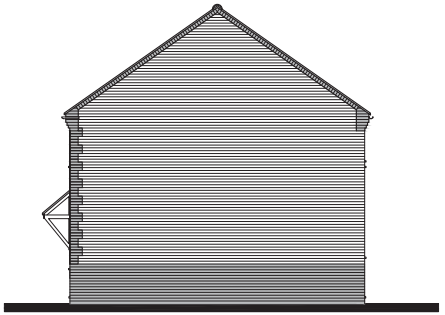
FRONT ELEVATION

SIDE ELEVATION

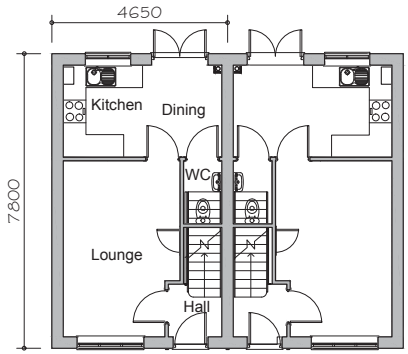
REAR ELEVATION



FIRST FLOOR PLAN



SIDE ELEVATION



GROUND FLOOR PLAN

0m 1m 5m 10m 12m

FLOOR AREA
60.48m², 651ft²

PLANNING DRAWING

201 dwelling type

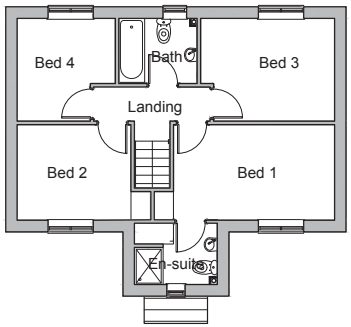
GLEESON HOMES & REGENERATION

A	Internal layout revised.	11.01.11	Scale
B	Brick detailing revised.	15.02.12	1:100 at A2
C	Ground floor WC revised.	28.08.12	
D	Dimensions added.	22.10.12	Date
E	Elevational styling revised.	20.09.13	July.10
F	Based on latest Rev 5 working drawing.	27.09.14	Dwg No
			201/1F

FRONT ELEVATION

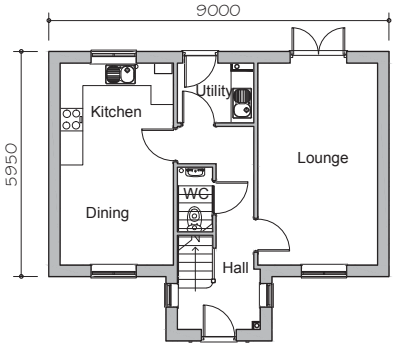
SIDE ELEVATION

REAR ELEVATION



FIRST FLOOR PLAN

SIDE ELEVATION



GROUND FLOOR PLAN

FLOOR AREA
97.36m², 1048ft²

Richard Ward Design

Chartered Architectural Technologist
Architectural Design & Development Consultant

Richard S. Ward
M.C.I.A.T.
Telephone 01604 410943

2. Burtram Close
Weston Favell
Northampton NN3 3PH

PLANNING DRAWING

403 dwelling type

GLEESON REGENERATION & HOMES

A.	Kitchen, bath and external detailing revised.	24.02.11
B.	En-suite shower revised.	25.05.11
E.	Updated to working drawing rev L.	12.10.12
F.	Dimensions added.	22.10.12
G.	Elevational styling revised.	20.09.13

Scale: 1:100

Date: July.10

Dwg No: 403/1G

Revisions:	Date:
B. Verge detail notes revised.	22.10.13
A. SVP tile vent added.	19.09.13

FRONT ELEVATION

SIDE ELEVATION

FEATURES
* Flat profile roof tiles.
* Dry verge detail.
* UPVC fascia at eaves, with brick corbel to gable.
* Flat brick arch with false key brick to window head on exposed elevations.
* Plain side hung casement windows.
* Brick soldier course cills.
* Six panel solid main entrance door, with lean to canopy over on "gallows brackets"
* Contrasting brick plinth 900mm above Floor level
* Brick quions
* Horizontal panel garage door.
* Dark brick below DPC.

REAR ELEVATION

SIDE ELEVATION

gleeson

Client: GLEESON HOMES & REGENERATION

Project: HOUSE TYPE DRAWING

Title: TYPE 403
ELEVATIONS (URBAN 13)

Scales: 1:100 @ A3 Cad ref :

Drawn: Checked: Date: July 2010

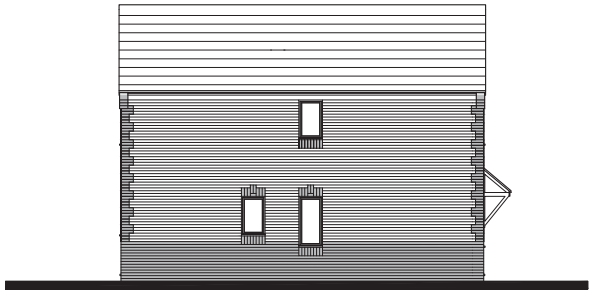
Drawing no. 13/403 -02 Rev. B

FRONT ELEVATION

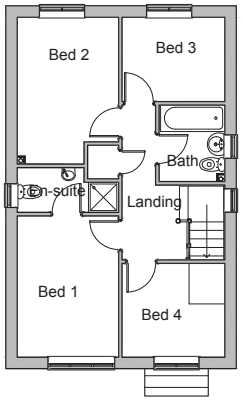
SIDE ELEVATION

REAR ELEVATION

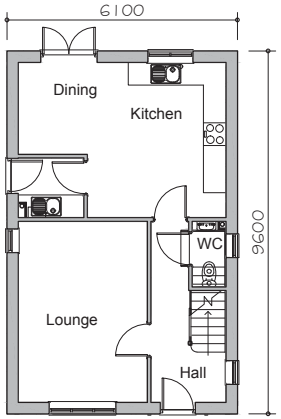
SIDE ELEVATION



SIDE ELEVATION
exposed corner plots



FIRST FLOOR PLAN



GROUND FLOOR PLAN

FLOOR AREA
99.00m², 1066ft²

PLANNING DRAWING

401 dwelling type

GLEESON HOMES & REGENERATION

A	Kitchen & dining layout, external detailing. 25.02.11.	Scale
B	Rear GF layout revised, Alt side elevation added 19.07.11.	
C	Brickwork detailing, WC & landing window. 05.09.12.	1:100 at A2
D	Dimensions added. 22.10.12.	
E	Elevational detailing revised. Utilitity omitted kitchen Dining revised. 20.09.13.	Date
F	Utilitity added kitchen Dining revised. 19.11.13.	
G	Based on latest Rev U working drawing. 27.05.14.	July.10
		Dwg No
		401/1G

APPENDIX C

Environmental Noise Record Sheets

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 6
Date: 15/11/2016, 16/11/2016
Calibration Times: 13:10, 15:20
Project: 16414
Instrumentation: Brüel & Kjær 2238/2 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
25/11/2016	13:15	15	-	-	-			53	60		55	Distant motorway.
25/11/2016	13:30	15	-	-	-			53	61		55	Distant motorway.
25/11/2016	13:45	15	-	-	-			53	65		55	Distant motorway.
25/11/2016	14:00	15	-	-	-			52	61		54	Distant motorway.
25/11/2016	14:15	15	-	-	-			52	60		54	Distant motorway.
25/11/2016	14:30	15	-	-	-			51	61		53	Distant motorway.
25/11/2016	14:45	15	-	-	-			51	60		53	Distant motorway.
25/11/2016	15:00	15	-	-	-			52	62		54	Distant motorway.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 7
Date: 15/11/2016, 16/11/2016
Calibration Times: 12:55, 15:05
Project: 16414
Instrumentation: Brüel & Kjær 2260/4 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
25/11/2016	13:00	15	-	-	-	56	54	53	51	76	55	Distant motorway.
25/11/2016	13:15	15	-	-	-	55	53	52	50	60	54	Distant motorway.
25/11/2016	13:30	15	-	-	-	55	53	52	51	63	54	Distant motorway.
25/11/2016	13:45	15	-	-	-	56	54	53	51	61	55	Distant motorway.
25/11/2016	14:00	15	-	-	-	56	54	53	50	62	55	Distant motorway.
25/11/2016	14:15	15	-	-	-	57	54	53	50	64	55	Distant motorway.
25/11/2016	14:30	15	-	-	-	55	53	51	49	60	53	Distant motorway.
25/11/2016	14:45	15	-	-	-	55	53	52	50	61	54	Distant motorway.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
25/11/2016	13:00	55	59	59	54	48	49	53	44	32	21	Distant motorway.
25/11/2016	13:15	54	58	59	53	45	47	52	43	29	19	Distant motorway.
25/11/2016	13:30	54	58	59	53	45	47	53	44	33	24	Distant motorway.
25/11/2016	13:45	55	58	59	55	47	48	54	44	28	17	Distant motorway.
25/11/2016	14:00	55	59	60	57	47	48	53	44	34	18	Distant motorway.
25/11/2016	14:15	55	59	58	51	47	49	54	44	30	21	Distant motorway.
25/11/2016	14:30	53	59	58	50	45	47	52	43	31	24	Distant motorway.
25/11/2016	14:45	54	58	59	53	45	47	52	43	29	20	Distant motorway.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 8
Date: 15/11/2016, 16/11/2016
Calibration Times:

Project: 16414
Instrumentation: Brüel & Kjær 2260/5 Sound Level Meter
Plant Operating Condition: -

Date	Time		Weather			Noise Level dB(A)						Comments (Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	
15/11/2016	14:42	15:00	-	-	85	58	57	55	62	53	57	Nearby road, distant motorway, nearby plant, banging from factory, lorry on nearby road, reverse alarm to north, reverse alarm to west, birds, clanking to north.
15/11/2016	16:07	15:00	-	-	80	58	57	56	66	54	57	Reverse alarm, nearby plant, nearby road, distant motorway.
16/11/2016	12:11	15:00	-	-	80	59	58	56	65	54	58	Distant motorway, nearby plant (constant humming), local traffic, plane, digger on site, reverse alarm from nearby plant, car horn.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
15/11/2016	14:42	57	64	65	60	53	52	55	47	38	30	Nearby road, distant motorway, nearby plant, banging from factory, lorry on nearby road, reverse alarm to north, reverse alarm to west, birds, clanking to north.
15/11/2016	16:07	57	63	65	62	54	51	55	48	38	28	Reverse alarm, nearby plant, nearby road, distant motorway.
16/11/2016	12:11	58	69	66	60	54	53	56	49	40	---	Distant motorway, nearby plant (constant humming), local traffic, plane, digger on site, reverse alarm from nearby plant, car horn.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 9
Date: 15/11/2016, 16/11/2016
Calibration Times:
Project: 16414
Instrumentation: Brüel & Kjær 2260/5 Sound Level Meter
Plant Operating Condition:

Date	Time		Weather			Noise Level dB(A)						Comments (Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	
15/11/2016	15:06	15:00	-	-	85	56	55	54	60	52	55	Distant motorway (NW), distant road (SE), banging from nearby storage yard, low level humming from crown paints factory, car horns, reverse alarm, nearby engine noise, banging from factory, birds.
15/11/2016	16:29	15:00	-	-	80	59	57	56	64	53	58	Distant motorway, factory noise, birds, distant siren.
16/11/2016	14:24	15:00	-	-	80	58	56	55	62	54	57	Distant motorway, banging from factory, drilling from digger on site, digger moving to the east, birds.
16/11/2016	15:02	15:00	-	-	80	59	58	56	64	54	58	Distant motorway, sawing from factory (W), reverse alarm from factory, birds, small plane flying overhead (loud), banging from factory (NW).

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
15/11/2016	15:06	55	61	62	56	49	52	54	42	27	---	Distant motorway (NW), distant road (SE), banging from nearby storage yard, low level humming from crown paints factory, car horns, reverse alarm, nearby engine noise, banging from factory, birds.
15/11/2016	16:29	58	59	60	54	50	51	57	45	29	23	Distant motorway, factory noise, birds, distant siren.
16/11/2016	14:24	57	65	61	54	50	52	55	44	32	23	Distant motorway, banging from factory, drilling from digger on site, digger moving to the east, birds.
16/11/2016	15:02	58	62	62	56	51	54	56	46	32	---	Distant motorway, sawing from factory (W), reverse alarm from factory, birds, small plane flying overhead (loud), banging from factory (NW).

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 10
Date: 15/11/2016, 16/11/2016
Calibration Times:
Project: 16414
Instrumentation: Brüel & Kjær 2260/5 Sound Level Meter
Plant Operating Condition:

Date	Time		Weather			Noise Level dB(A)						Comments
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	(Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
15/11/2016	14:22	15:00	-	-	85	55	53	51	65	49	53	Nearby road, distant motorway, banging from factory, birds, car horn, reverse alarm.
15/11/2016	15:47	15:00	-	-	80	56	54	52	64	49	55	Distant motorway, birds, nearby road, reverse alarm (quiet), motorbike.
16/11/2016	11:24	15:00	-	-	80	58	55	54	66	51	56	Distant motorway, trees rustling, local traffic, digger, alarm from factory, whistling from factory.
16/11/2016	12:30	15:00	-	-	80	57	56	54	62	53	56	Distant motorway, sawing from factory, reverse alarm, local traffic, digger, rain.
16/11/2016	14:42	15:00	-	-	80	57	55	54	65	52	56	Distant motorway, local traffic, birds, trees rustling, siren, banging from digger, sawing from factory.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
15/11/2016	14:22	53	63	62	58	50	47	52	42	31	20	Nearby road, distant motorway, banging from factory, birds, car horn, reverse alarm.
15/11/2016	15:47	55	59	62	56	50	48	53	44	32	21	Distant motorway, birds, nearby road, reverse alarm (quiet), motorbike.
16/11/2016	11:24	56	75	67	58	51	52	53	47	41	34	Distant motorway, trees rustling, local traffic, digger, alarm from factory, whistling from factory.
16/11/2016	12:30	56	63	64	56	49	51	54	46	37	---	Distant motorway, sawing from factory, reverse alarm, local traffic, digger, rain.
16/11/2016	14:42	56	66	61	54	49	51	54	45	35	25	Distant motorway, local traffic, birds, trees rustling, siren, banging from digger, sawing from factory.

ENVIRONMENTAL NOISE RECORD SHEET

Location: Hollins Paper Mill, Darwen – Position 11
Date: 16/11/2016
Calibration Times:
Project: 16414
Instrumentation: Brüel & Kjær 2260/5 Sound Level Meter
Plant Operating Condition:

Date	Time		Weather			Noise Level dB(A)						Comments (Including description of noise (eg whine, hiss, rumble, impact, vehicle rain, vegetation, or animal noise).
	Start	Dur'n (Min)	Wind Speed m/s	Wind Dir'n	Cloud (%)	L_{10}	L_{50}	L_{90}	L_{MAX}	L_{MIN}	L_{Aeq}	
16/11/2016	10:44	15:00	-	-	85	68	56	52	81	49	64	Local traffic, siren, trees rustling, HGVs passing, music from cars, chimes outside houses, car horns, distant motorway (quiet), distant plant to west.
16/11/2016	14:02	15:00	-	-	85	69	56	52	79	50	64	Local traffic, distant motorway, birds.

Date	Time	dB(A)	Octave Band Pressure Level									Comments
			31	63	125	250	500	1k	2k	4k	8k	
16/11/2016	10:44	64	69	68	62	61	59	60	57	52	48	Local traffic, siren, trees rustling, HGVs passing, music from cars, chimes outside houses, car horns, distant motorway (quiet), distant plant to west.
16/11/2016	14:02	64	65	67	61	59	58	61	58	53	47	Local traffic, distant motorway, birds.

APPENDIX D

Intrusive Noise Calculations

Date: 17/05/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 137 - Type 304 - Living Room

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 16hr) - i.e. the design external LAeq,
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 16hr	**61.1**	67	64	61	57	55	53	51	45
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.68	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		24.72	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:			m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		26.4	m^2						
Room Volume		40.8	m^3						
Overall sound reduction of the facade									
Combined sound reduction		28.6	34.6	31.7	36.4	45.6	49.1	46.8	46.9

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	29	**44.9**	**36.4**	**35.0**	**26.7**	**14.9**	**9.1**	**9.0**	**0.0**

Date: 17/05/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 137 - Type 304 - Bedroom

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 8hr) - i.e. the design external LAeq,
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 8hr	**47.7**	56.7	49.3	43.8	43.5	45.0	37.1	32.8	27.9
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.3	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		16.2	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:			m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		17.52	m^2						
Room Volume		23.5	m^3						
Overall sound reduction of the facade									
Combined sound reduction		28.1	34.1	31.0	35.7	45.1	48.5	46.1	46.1

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	15.4	**34.3**	**21.8**	**18.4**	**13.4**	**0.0**	**0.0**	**0.0**	**0.0**

Date: 17/05/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 137 - Type 304 - Bedroom

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFMax
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**61.7**	70.7	63.3	57.8	57.5	59.0	51.1	46.8	41.9
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.3	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		16.2	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:			m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		17.52	m^2						
Room Volume		23.5	m^3						
Overall sound reduction of the facade									
Combined sound reduction		28.1	34.1	31.0	35.7	45.1	48.5	46.1	46.1

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	29.2	**48.3**	**35.8**	**32.4**	**27.4**	**18.3**	**7.0**	**5.2**	**0.0**

Date : 01/06/2017 **Project No.:** 16414 **Project:** Hollins Grove Street

Receiver room for this calculation: Plot 151 - Type 314 - Lounge

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 16hr) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 16hr	**52.0**	58.0	55.0	52.0	48.0	46.0	44.0	42.0	36.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		2.5	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		26							
R:		34	40	44	45	51	56	60	63
Doors									
Area:		0	m^2						
R:									
Rooflight									
Area:		0	m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		28.5	m^2						
Room Volume		36	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.6	33.6	30.4	35.1	44.6	47.9	45.4	45.5

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	22.6	**38.1**	**29.1**	**28.5**	**19.7**	**7.3**	**0.0**	**0.0**	**0.0**

Date : 01/06/2017 **Project No.:** 16414 **Project:** Hollins Grove Street

Receiver room for this calculation: Plot 151 - Type 314 - Bedroom 1

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 8hr) - i.e. the design external LAeq
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 8hr	**42.8**	52.0	44.0	39.0	39.0	40.0	32.0	28.0	23.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.25	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		12	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:		0	m^2						
R:									
Rooflight									
Area:		0	m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		13.25	m^2						
Room Volume		26	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.3	33.3	30.1	34.9	44.3	47.6	45.1	45.2

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	9.4	**28.7**	**15.6**	**12.9**	**8.1**	**0.0**	**0.0**	**0.0**	**0.0**

Date : 01/06/2017 **Project No.:** 16414 **Project:** Hollins Grove Street

Plot name and receiver room: Plot 151 - Type 314 - Bedroom 1

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFMax
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**56.8**	66.0	58.0	53.0	53.0	54.0	46.0	42.0	37.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.25	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		12	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:		0	m^2						
R:									
Rooflight									
Area:		0	m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		13.25	m^2						
Room Volume		26	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.3	33.3	30.1	34.9	44.3	47.6	45.1	45.2

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	23.6	**42.7**	**29.6**	**26.9**	**22.1**	**12.4**	**0.0**	**0.0**	**0.0**

Date: 01/06/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 14 - Type 301 - Living Room

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 16hr) - i.e. the design external LAeq,
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 16hr	**62.0**	68.0	65.0	62.0	58.0	56.0	54.0	52.0	46.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.68	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		14.85	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:		3.15	m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Living Room Reverberation Time		0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Total Façade Area		19.68	m^2						
Room Volume		33.6	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.8	33.8	30.5	35.3	44.8	48.1	45.6	45.6

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	31	**46.5**	**37.5**	**37.0**	**28.2**	**15.8**	**10.5**	**11.0**	**3.7**

Date: 01/06/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 14 - Type 301 - Bedroom 2

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAeq, 8hr) - i.e. the design external LAeq,
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAeq, 8hr	**52.8**	62.0	54.0	49.0	49.0	50.0	42.0	38.0	33.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.44	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		14.64	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:			m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		16.08	m^2						
Room Volume		20.4	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.5	33.5	30.3	35.1	44.5	47.8	45.3	45.4

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	21.4	**40.4**	**27.3**	**24.6**	**19.8**	**10.1**	**0.0**	**0.0**	**0.0**

Date: 01/06/2017 **Project No:** 16414 **Project:** Hollins Grove Street, Darwen

Plot name and receiver room: Plot 14 - Type 301 - Bedroom 2

Estimated Indoor Ambient Noise Levels

Estimation of the indoor ambient noise level in a room based on the external noise levels and façade sound insulation taken from equations in Section 6.7.2.1 of BS8233:1999

$$L_{internal} = L_{external} - \Sigma R + 10 \log S + 10 \log T - 10 \log 0.163V + 3 + C$$

Where: -

- $L_{internal}$ - estimated indoor reverberant sound pressure level
- $L_{external}$ - measured external sound pressure level (LAFMax) - i.e. the design external LAFMax
- C - correction factor to convert the measured external sound pressure level to 'free field' (6dB for measurements within millimetres of the façade, 3dB for mesurements 2m from the façade)
- Σ R - overall sound reduction of the facade
- T - reverberation time inside the room in question
- V - volume of the room in question

		Octave Band Centre Frequency (Hz)							
External Noise Spectral Data	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
LAFMax	**66.8**	76.0	68.0	63.0	63.0	64.0	56.0	52.0	47.0
Façade Correction Factor, C		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduction of façade elements									
Glazing - Pilkington 4/12/4									
Area:		1.44	m^2						
R:		18	24	20	25	35	38	35	35
Wall - Brick and block external wall									
Area:		14.64	m^2						
R:		34	40	44	45	51	56	60	63
Doors									
Area:			m^2						
R:									
Rooflight									
Area:			m^2						
R:									
Ventilators - None									
Number of:		0							
D_{ne}		0	0	0	0	0	0	0	0
Room Data									
Bedroom Reverberation Time		0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.2
Total Façade Area		16.08	m^2						
Room Volume		20.4	m^3						
Overall sound reduction of the facade									
Combined sound reduction		27.5	33.5	30.3	35.1	44.5	47.8	45.3	45.4

		Octave Band Centre Frequency (Hz)							
Estimated Indoor Noise Level	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
	35.3	**54.4**	**41.3**	**38.6**	**33.8**	**24.1**	**12.8**	**11.3**	**4.4**

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