BELAIR RESEARCH LIMITED
BROADWAY . BOURN . CAMBRIDGESHIRE . CB23 2TA
Tel: (01954) 718366 Fax: (01954) 718355
Email: brl@acoustical.co.uk

**TITLE**

# ACOUSTIC IMPACT ASSESSMENT OF

# PROPOSED PETROL FILLING STATION

# WILBRAHAM ROAD

# CHORLTON, MANCHESTER

## CLIENT

**RAPLEYS COMMERCIAL PROPERTY AND PLANNING CONSULTANTS**

**1ST FLOOR**

**PALL MALL COURT**

**61-67 KING STREET**

**MANCHESTER**

**M2 4PD**

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# 1 SYNOPSIS

1.1 Rapleys Commercial Property and Planning Consultants (Rapleys) proposes to redevelop a site on Wilbraham Road, Chorlton in Manchester to provide a petrol filling station. The site is presently occupied by a filling station and associated infrastructure (operated by Shell) and an automotive mechanics to the rear (north).

1.2 This report provides an acoustic impact assessment of the proposed development on the nearest dwellings on Buckingham Road and Buckingham Place to the east and north of the site respectively. Where appropriate this assessment provides details of measures that will ensure the proposals do not create unsuitable levels of noise to the surrounding areas and that the amenity of the nearest residents is properly protected.

1.3 There will be a number of different types of noise associated with activities at the filling station. These sources and their cumulative effect has been considered within the context of the existing use and the existing soundscape.

1.4 Movement of vehicles will not disturb the residents

1.5 Refuelling activities will not disturb the residents.

1.6 Items of fixed plant can be selected, located, oriented and attenuated (if necessary) in order to ensure that the identified appropriate noise level, depending upon the hours of operation of the plant, is achieved at the nearest dwellings.

# 2 BRIEF

2.1 To visit the location of the proposed development on Wilbraham Road, Chorlton.

2.2 To take suitable sound pressure level measurements of the existing acoustic environment in the vicinity of the site and to record relevant observations during the measurement period.

2.3 To analyse the data obtained and other information, in order to assess the likely acoustic impact of the proposed development, particularly to residents of the nearest dwellings.

2.4 If appropriate, to propose suitable noise control measures in order to ensure that the residents are not disturbed by the presence of the development.

2.5 To report on the findings of the analysis.

# 3 SITE VISIT, PERSONNEL, INSTRUMENTATION & WEATHER

3.1 A late evening and night-time visit was carried out on Tuesday 16th and Wednesday 17th July 2013. The purpose of this visit was to observe the acoustic characteristics of the locality, identify noise sensitive locations and obtain representative sound pressure level measurements at identified noise sensitive locations during the quieter parts of the day and night.

3.2 Personnel undertaking visits to the site for the purposes of the Acoustic Impact Assessment:

L Dursley - Belair Research Limited

3.3 Acoustic instrumentation used for taking measurements during the visit:

B&K Modular precision sound analyser type 2250, Serial No. 2626249
B&K Calibrator Type 4231, Serial No. 2309678
B&K Windscreen Type UA 1650

Tripod

3.4 In accordance with relevant Standards, the performance of calibrators is checked by an accredited laboratory annually, with sound level analysers being checked on a bi-annual basis. The sound level analyser was calibrated before and after the measurements were taken and showed no significant drift throughout the measurement period.

3.5 During the measurement surveys, the temperature ranged between approximately 15°C and 25°C, with clear skies, and almost calm conditions. It remained dry throughout the survey periods. The meteorological conditions were appropriate for the survey being undertaken.

# 4 OBSERVATIONS & MEASUREMENTS

4.1 The site is currently occupied by a Shell filling station and automotive garage to the rear. The area surrounding the site has a mixture of residential and commercial uses with the majority of the residential dwellings located to the north and north east of the site. A Morrisons foodstore and car park is located to the north west of the site on the opposite side of the railway line. To the south of Wilbraham Road are a number of commercial premises with residential accommodation above.

4.2 The closest residential dwellings to the site are located on Buckingham Place, to the immediate north of the site. These properties appear to be flats spread over three storeys so the upper floors overlook the site. The next closest properties are situated on Buckingham Road and comprise houses with gardens extending towards the site.

4.3 As part of the proposals the existing access from Buckingham Road will be closed and all customer, staff and delivery vehicles will enter and exit the site from Wilbraham Road.

## OBSERVATIONS & MEASUREMENTS (cont'd)

4.4 There are currently various items of refrigeration/air conditioning plant and also a jet wash, air compressor and other mechanical plant located at the filling station. In addition there are a range of mechanical tools and machinery in use at the automotive garage.

4.5 The existing filling station is open 24 hours per day and from observations on site was reasonably busy throughout. The existing jet wash, on the eastern boundary, was in use into the late evening and does not appear to have any restrictions on its operation. Although the jet wash was just visible from the monitoring location on Buckingham Road it was only infrequently audible due to the masking of other road traffic.

4.6 The dwellings to the north of the site will be approximately 17m from the closest pumps. The closest properties to the east are approximately 35m from the location of the proposed pumps.. Gardens of these properties on the opposite side of Buckingham Road are approximately 30m form the new pumps.

4.7 The existing site is surrounded by a variety of walls and fences, which at present offer minimal acoustic screening to the closest residential properties. The filling station forecourt appears to be approximately level with the automotive garage yard set at a slightly lower elevation, which ties in with the slight fall in level of Buckingham Road from its junction with Wilbraham Road.

4.8 The soundscape throughout the surveys was dominated by road traffic, chiefly on Wilbraham Road but also on Buckingham Road. The Scout Hut on Buckingham Road was in use during the evening survey, which resulted in some localised pedestrian activity and some vehicle activity associated with dropping off and collecting participants. Pedestrian activity on Wilbraham Road did not significantly influence the soundscape on Buckingham Road due to the masking effect of the road traffic; conversations were occasionally audible but not dominant. Other sources influencing the soundscape were birdsong, occasional aircraft and in the lulls in road traffic. Refrigeration plant at the existing filling station was just audible at the measurement location.

4.9 Sound level measurements were undertaken at a position on Buckingham Road, which is considered to be representative of the soundscape at the closest residential properties. The location picture, *Figure 1*, at the end of this report shows the measurement position together with the approximate site boundary and the closest potentially sensitive receptors. The proposed site layout is included in *Figure 2*.

4.10 The measurements were taken at a height of approximately 1.2m above ground level. The data consists of fast logged instantaneous $L_{A,F}$ sound pressure levels recorded every one eighth of a second. This method has the advantage of allowing individual events such as vehicles passing by to be clearly identified whilst allowing a longer term $L_{Aeq}$ or other statistical data to be derived from the measurements if appropriate.

4.11 The graphical representation of the data in assists interpretation of the measurements, allowing trends to be easily identified.

## OBSERVATIONS & MEASUREMENTS (cont'd)

4.12 Monitoring was carried out during the later evening period in order to represent the quieter daytime periods. Measurements were undertaken from around 20:30 to 21:00 hours. A second measurement survey was undertaken between approximately 01:15 and 01:40 hours to represent the more sensitive night-time period. The results of these measurements are shown in *Graph 1*.

4.13 *Graph 1* shows that the underlying residual sound level during the latter part of the evening was in the region of 45dB(A) to 50dB(A). Average sound levels were in the region of 55dB$L_{Aeq}$ to 60dB$L_{Aeq}$ at this time. Frequent road traffic generated maximum sound levels at the measurement location in the region of 70dB(A) to 75dB(A).

4.14 The underlying residual sound level during the night-time was in the region of 35dB(A) to 40dB(A) as shown on *Graph 1*, the average sound level fluctuated around approximately 45dB(A) and nearby road traffic generated sound levels at the measurement location in the region of 60dB(A) to 65dB(A).
4.15

# 5 CRITERIA

### World Health Organisation

5.1 The WHO publication 'Guidelines for Community Noise' provides guidance regarding suitable levels of noise that will protect vulnerable groups against sleep disturbance. A steady level of 30dB(A) in bedrooms, with occasional maximum levels of 45dB(A) are identified as being suitable to achieve this, with an assumed difference of approximately 15dB(A) between the noise level outdoors and that resulting in the bedroom, assuming that the bedroom windows are partly open for ventilation. This means that the corresponding targets for the noise level outdoors are steady levels of up to about 45dB(A) and occasional maxima of up to around 60dB(A).

5.2 The more recent WHO guidance 'Night Noise Guidelines for Europe' is more concerned with the longer term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest slightly lower external maximum noise levels of around 57dB(A) outside bedrooms during the night.

### National Planning Policy Framework (NPPF) & Noise Policy Statement for England (NPSE)

5.3 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities

## CRITERIA Cont'd

5.4 Paragraph 123 of NPPF 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.

5.5 The Noise Policy Statement for England (NPSE) sets out the long term vision of Government noise policy by promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

5.6 Paragraph 2.23 of NPSE clarifies the first part of the above excerpt:

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

5.7 Similarly paragraph 2.24 of NPSE clarifies the second part:

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level). It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

5.8 These make it clear that noise must not be considered in isolation but as part of the overall sustainability and associated impacts of the proposed development. There is no benefit in reducing noise to an excessively low level, particularly if this creates or increases some other adverse impact. Similarly, it may be appropriate for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance when considering the overall sustainability of the proposed development.

5.9 NPSE clarifies the difference between NOEL (No Observed Effect Level) and LOAEL as used in Night Noise Guidelines for Europe, which gives values of 30dB(A) and 40dB(A) for the night-time average level measured outside dwellings respectively. This indicates that there may be no significant overall benefit in achieving an average level of less than around 40dB(A) outside dwellings during the night.

## CRITERIA Cont'd

5.10 It should also be considered that in order to make equipment quieter it is often necessary to use larger equipment that operates more slowly and for longer periods of time. This may increase energy consumption and hence the carbon footprint of the equipment. The overall impact of this may outweigh any acoustic benefit of the equipment being slightly quieter.

**BS8233: 1999 Sound insulation and noise reductions for buildings – Code of practice**

5.11 This provides guidance regarding suitable noise levels for different locations such as bedrooms, offices, living rooms, gardens, libraries, churches and factories. For bedrooms, a steady internal level of 30dB(A) represents 'good' conditions for sleeping and 35dB(A) represents 'reasonable' conditions, with individual noise events not exceeding 45dB(A). This is consistent with the current WHO guidance.

5.12 For gardens and balconies it is identified to be desirable that a steady level does not exceed 50dB(A), with an upper limit of 55dB(A) to the steady level of noise.

**BS4142: 1997 Method for Rating industrial noise affecting mixed residential and industrial areas**

5.13 The BS4142 methodology simply compares the Rating Level (average source noise level with a 5dB 'Rating Penalty' if applicable), against the existing Background Level (that is exceeded for 90% of the time – the quietest 10% level) and provides an indication of the likelihood of complaints based upon this differential. If it is more than 10dB then '*there is a likelihood of complaints'*, 5dB is of *'marginal significance'* and -10dB is a *'positive indication that complaints are unlikely*'. This means that there is a difference of 15dB (or even 20dB if there is uncertainty regarding the applicability or otherwise of a Rating Penalty) between the level at which complaints are unlikely and that of marginal significance. Different local authorities can therefore vary in their requirements by around 15dB when applying the same standard to the same situation, depending upon their interpretation of the Standard.

5.14 As the Standard makes clear, it is intended for the assessment of industrial noise. However it is often (mis)applied to many other types of noise. For example, domestic equipment such as bathroom extract fans, boilers, or refrigerators are unlikely to be considered 'industrial' noise sources when considering the sound level produced within the same dwelling or at neighbouring houses. However, this Standard's methodology is often applied to the noise from similar but larger equipment located at commercial premises some distance from dwellings, sometimes even when the resultant sound at the dwellings is similar in character and level to that which would be produced by nearby smaller 'domestic' equipment. Clearly it is not appropriate to apply different assessment methodologies to different sources of noise that produce sound of similar level and character at the same noise receptor.

## CRITERIA Cont'd

5.15 The assessment methodology is based upon the sound levels measured outside the dwelling. Although it is not suitable for the assessment of noise within dwellings, this Standard is often (mis)applied to the assessment of noise during the night, when the primary concern is to ensure that residents are not disturbed when sleeping with open bedroom windows.

5.16 Whilst it may appear reasonable to extrapolate a comparison of the outdoor source and background noise levels to within the property, this is not valid. This approach can lead to a requirement that the source noise be far quieter than levels that represent 'good' acoustic conditions within bedrooms, which will themselves protect residents against sleep disturbance, at times when the residents will be asleep. This also ignores the fact that noise within dwellings comes not only from external noise breaking into the building but also from sources within the dwelling, such as boilers, pumps, refrigerators and fans during the night, together with activity noise during the day and other sources such as televisions, music and radios.

5.17 This approach also considers only the average noise level (plus a 5dB Rating penalty if applicable). This means that occasional loud events are simply assessed in terms of the average noise level plus 5dB(A), which takes only limited account of the maximum level, duration and number of events.

5.18 For example, six events per hour (once every ten minutes) each producing a level of 64dB(A) would have a Rating Level of 41dB(A), as would the same number of events, but each one of five seconds duration and only producing a level of 57dB(A). According to WHO guidance the first would be likely to cause sleep disturbance, whereas the second would not, but a BS4142 assessment would yield the same outcome in both cases, which would be totally dependent upon only the background sound level.

5.19 In a location with a background sound level of 31dB(A) a BS4142 assessment would indicate that this is 'likely to cause complaints'. However, such a location could be in a relatively remote rural area where the events would be readily noticeable within the dwelling (with open windows), or beside a road with vehicles passing every five minutes at relatively high speed, possibly producing maximum levels of over 70dB(A) at the same dwelling, where the events would be relatively insignificant.

**BS5228-1: 2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise**

5.20 This provides a large amount of representative data for the noise associated with various construction activities and different equipment. Guidance is also provided regarding methods of noise control and what may constitute suitable levels of noise.

## CRITERIA Cont'd

5.21 Table E1 *'Example threshold of significant effect at dwellings'* shows levels at which the average noise level including that from construction activities may be considered to become significant, depending upon the level of residual noise (in the absence of construction activity) and the time at which it occurs (day, evening or night). This indicates that levels of up to around 65dB(A) at dwellings during the day, 55dB(A) during the evening and 45dB(A) during the night may not be significant (possibly higher, depending upon the residual sound level). It also clarifies that construction noise is less likely to result in complaints if care is taken to avoid unnecessary noise, reasonable steps are taken to minimise noise, neighbours are kept informed / consulted regarding potentially noisy work, and such work occurs at appropriate times

**Calculation of Road Traffic Noise (CRTN)**

5.22 This provides guidance for the calculation of the noise level that will be produced at a specific location due to the noise from traffic passing along specific road(s). Although this is intended for the calculation of the $L_{A10,18h}$ value, there is a relationship between this and the average ($L_{Aeq}$) value provided that the traffic flow is reasonably steady. The correction factors for the change in noise level due to changes in speed and number of vehicles can be applied to the $L_{Aeq}$ value, although it is possible that the greatest uncertainty in any calculation of changes to the level of road traffic noise may be due to changes to the flow of traffic, rather than those associated with the change in the number of vehicular movements

5.23 The most significant factor is that the average noise level due to road traffic will increase by 3dB(A) for every doubling of the number of vehicles – provided that there are no other changes, such as a variation in the average speed of the vehicles, which is not likely to be the case in practice. The change in sound level is established from the general formula.

$$Lp_2 = Lp_1 + 10 \times \text{Log}_{10} (\Delta E)$$

Where

Lp1 – original noise level (due to road traffic in this case)
Lp2 – noise level after change
ΔE – proportional change in sound energy (a doubling of the number of vehicles doubles the sound energy, a halving of the number of vehicles halves the sound energy)

5.24 For example a fifteen percent increase in road traffic would result in a theoretical increase of 0.6dB(A) in the associated noise by adding 10 x $\text{Log}_{10}$ (1.15) dB to the original noise level.

## CRITERIA Cont'd

### CIBSE & ASHRAE – Guide to Current Practice

5.25 The Chartered Institute of Building Services Engineers (CIBSE) provides guidance for suitable levels of noise from mechanical plant depending upon the use and associated sensitivity of the area to be considered. ASHRAE, which is CIBSE's counterpart in America also provides similar guidance. For the bedrooms of houses in a location such as this the recommended level is around NR25 or possibly NR30 for dwellings close to more significant sources of road traffic noise. Applying a conversion factor of about 6 from an NR value to a dB(A) value and a 'open window' attenuation of 10dB(A) to 15dB(A), this equates to a level of approximately 40dB(A) to 45dB(A) outside the dwellings. However, mechanical plant noise has different frequency components to transportation noise and it may be more prudent to reduce the differential to 13, as a result of which the recommended level of NR25 equates to a free field level of about 38dB(A) outside the dwellings.

### Discussion

5.26 Current planning guidance from the WHO and BS8233 indicate that a steady level of 30dB(A) within bedrooms represents 'good' acoustic conditions. NR25, which is the level recommended by CIBSE for mechanical plant noise within the bedrooms of dwellings such as these, equates to around 30dB(A). Applying a conservative correction for the attenuation provided by windows that are partly open for ventilation gives a corresponding external noise level of around 38dB(A).

5.27 Even during the quieter part of the night this is similar to or lower than, the existing residual sound level at the dwellings in the vicinity of the site. It should be noted that a comparison with the residual average or background sound levels outdoors during the night is of limited relevance because at that time the primary concern is to ensure that residents are not disturbed when sleeping with bedroom windows partly open for ventilation. Provided that it does not result in unsuitable conditions indoors, they are relatively unconcerned about the noise level outdoors at these times. When it is relatively quiet outdoors, it is possible that rather than the external noise level controlling the noise level indoors, this may be affected by noise sources within dwellings such as boilers, pumps, refrigerators, water flowing through pipes & radiators, movement of and within buildings, televisions/radios, conversation, etc.

5.28 The required noise level should be achieved as a 'free field' level outside dwellings with all plant that may operate during the night simultaneously operating at the corresponding maximum capacity. Care should also be taken to ensure that such noise from the plant does not contain any significant acoustically distinguishing characteristics at the dwellings that would otherwise attract a 5dB penalty. In reality all plant will not simultaneously operate at maximum night-time capacity so the actual sound level produced at the dwellings will be somewhat lower than this level. This reduction in the actual sound level from the plant will tend to be greatest during the quietest part of the night when the load on the plant is also likely to be at a minimum.

5.29 In order to ensure that residents are not disturbed by noise from plant during the day it will be appropriate to ensure that noise from plant and similar sources at the filling station does not exceed around 50dB(A) at the nearest noise sensitive locations such as gardens at these times.

## CRITERIA Cont'd

5.30 The WHO guidance regarding occasional maximum sound levels within bedrooms consistent with protecting vulnerable groups against sleep disturbance is more appropriate than the BS4142 methodology which simply considers the average noise level outdoors. This means that the maximum levels of noise associated with these types of sources should not exceed around 57dB(A) to 60dB(A) outside the nearest dwellings during the night.

# 6 ANALYSIS

### General

6.1 The activities associated with and the equipment at the proposed filling station will produce several different types of noise. Each will have different characteristics and so should be considered separately, although the overall effect must also be considered. These sources are:

The movement of vehicles to, around and from the forecourt

Use of the fuel dispensers

Use of the air dispenser

Other fixed plant and equipment

6.2 Noise from the site will predominantly be constrained to trading hours and will generally fluctuate depending on how busy the surrounding area is, for example peak activity would be expected to coincide with busier times on the road network. At less busy times it would be expected that there would be fewer customers using the filling station.

6.3 There will be a small amount of refrigeration and air conditioning plant that will operate on a 24 hour basis, however this can be well controlled.

### Movement of Vehicles

6.4 Vehicles on the site will be travelling relatively slowly in comparison with those directly passing along the adjacent roads. There will also be significantly fewer vehicles using the filling station than the total number of vehicles passing to or from the foodstore car park. In addition it is considered that the filling station will not produce a significant number of "new" vehicle movements for two reasons. Firstly, customers of the foodstore are likely to incorporate a visit to the filling station with the visit to the foodstore. Secondly, the existing filing station is well used and so these vehicle movements and any associated noise is already present in the area.

6.5 This means that individual vehicles on the forecourt will produce lower levels of noise than those passing the site, and the smaller number of these vehicles will produce a lower level of noise than the greater number of passing vehicles. Combining both of these factors shows that the noise level produced by the movement of vehicles on the forecourt will be significantly lower than the level currently produced by vehicles driving past the site to and from the foodstore car park.

## ANALYSIS Cont'd

6.6 Measurements taken at a number of filling stations show that vehicles manoeuvring around a forecourt typically produce a maximum level of around 55dB(A) at a distance of 10m. The corresponding level at the closest receptors 18m away and with no direct line of sight of the vehicles will therefore be approximately 45dB(A). Current guidance from the World Health Organisation's *Guidelines for Community Noise 1999* states that *'To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB$L_{Aeq}$.'* The corresponding maximum level from vehicle movements is somewhat below this average value and will be suitable.

**Use of Fuel Dispensers**

**6.7** The most significant source of impulsive noise on the forecourt tends to be associated with use of the fuel dispensers. Measurements taken elsewhere indicate that this can produce occasional maximum levels of up to approximately 70dB(A) at a distance of 10m from the fuel dispensers. In this case the separation distance between the proposed fuel dispensers and the nearest dwellings will be approximately 17m and there will be substantial acoustic screening provided by the 3m high close boarded fence between the forecourt and the properties. This will lead to occasional maximum levels of approximately 57dB(A) at the dwellings. This is equal to the guidance provided in the WHO publication *Night Noise Guidance for Europe 2009* which states that occasional maximum levels of up to around 57dB(A) outside bedrooms during the night are consistent with protect the health of residents sleeping with open bedroom windows.

**Use Air Dispenser**

**6.8** Measurements at other filling stations indicate that the compressed air facility produce a level of approximately 50dB(A) at a distance of 10m. As these will be approximately 20m from the nearest dwelling with no line of sight, this will equate to a level of approximately 40dB(A) at the dwellings. This is significantly below the daytime guidance levels provided in BS8233 and by the WHO of 50dB(A).

**Fixed Plant and Equipment**

6.9 Current guidance from the Noise Policy Statement for England (NPSE), World Health Organisation (WHO) and BS8233 indicate along with guidance from the Chartered Institution of Building Services Engineers (CIBSE) that it is appropriate to ensure that any plant which operates on a 24 hour basis at the site produces a level not exceeding a level of 38dB(A) at the nearest dwellings during the night. This will ensure that noise from such plant will not disturb residential amenity and will protect health.

## ANALYSIS Cont'd

### Cumulative Noise

6.10 As noted above noise from vehicles manoeuvring on the forecourt will make relatively little difference to the level of noise at the nearest dwellings due to road traffic in the vicinity of the site.

6.11 Plant and activity associated with use of the filling station will contribute to the soundscape at the nearest dwellings. However, these sources are already extensively in use at the existing filling station and automotive garage.

6.12 It is considered that the removal of the automotive garage and the reconfiguration of the site provides an opportunity to reduce the noise emissions from the site and lead to an overall improvement in the soundscape at the closest residential properties.

### Mitigation Measures

6.13 It will be necessary to incorporate some acoustic mitigation measures into the design of the new filling station in order to reduce anticipated sound levels at the closest residential properties to within current guidance levels and to protect residential amenity. The filling station currently benefits from some partial screening by way of the walls and fencing surrounding the site and the automotive garage between the site and the properties on Buckingham Place. This will be maintained or replaced and reinforced where necessary with a a 3m high close boarded timber fence to the north of the forecourt to provide better than direct path, line of sight acoustic screening between the closest residential properties and the various operations at the filling station.

# 7 CONCLUSION

7.1 The proposals are for the effective rationalisation of the site of an existing filling station and associated infrastructure and automotive garage to a filling station and associated infrastructure.

7.2 The majority of the proposed sources of noise are already present on the site in one form or another and so the redevelopment will not significantly affect the soundscape in the area. Indeed there is an opportunity to provide an improved soundscape as a result of the rationalisation.

7.3 The noise produced by the equipment and the activities associated with a filling station have different characteristics. In order to take account of these characteristics, each of these must be considered separately. Additionally the overall effect must also be considered.

7.4 Noise associated with the movement of vehicles to, from and around the forecourt will continue to be insignificant compared to existing road traffic noise and will therefore not disturb residents.

7.5 Levels of noise generated when the fuel nozzle is replaced in the dispenser will be lower than those presently generated by passing road traffic and will be within the guidance levels such that they will not cause sleep disturbance.

7.6 Some items of fixed plant and equipment will operate on a 24 hour basis. This means that the noise level from this equipment must be adequately controlled to prevent the nearby residents being disturbed. Plant has not yet been selected however a night-time limit of 38dB(A) from this equipment, when measured outside the houses, will ensure that residents are not disturbed. By selecting appropriate equipment to control the night-time emissions this should also ensure suitable levels are achieved during the daytime.

7.7 The proposed development will therefore ensure that the amenity of neighbouring residents is properly protected whilst enabling the proposed filling station to operate efficiently.



6th December 2013

**Lee Dursley, BSc(Hons), MIOA, MInstP**
**Acoustic Consultant**



6th December 2013

**Richard A. Collman, BSc. (Jt. Hons), CEng, MIOA**
**Director**

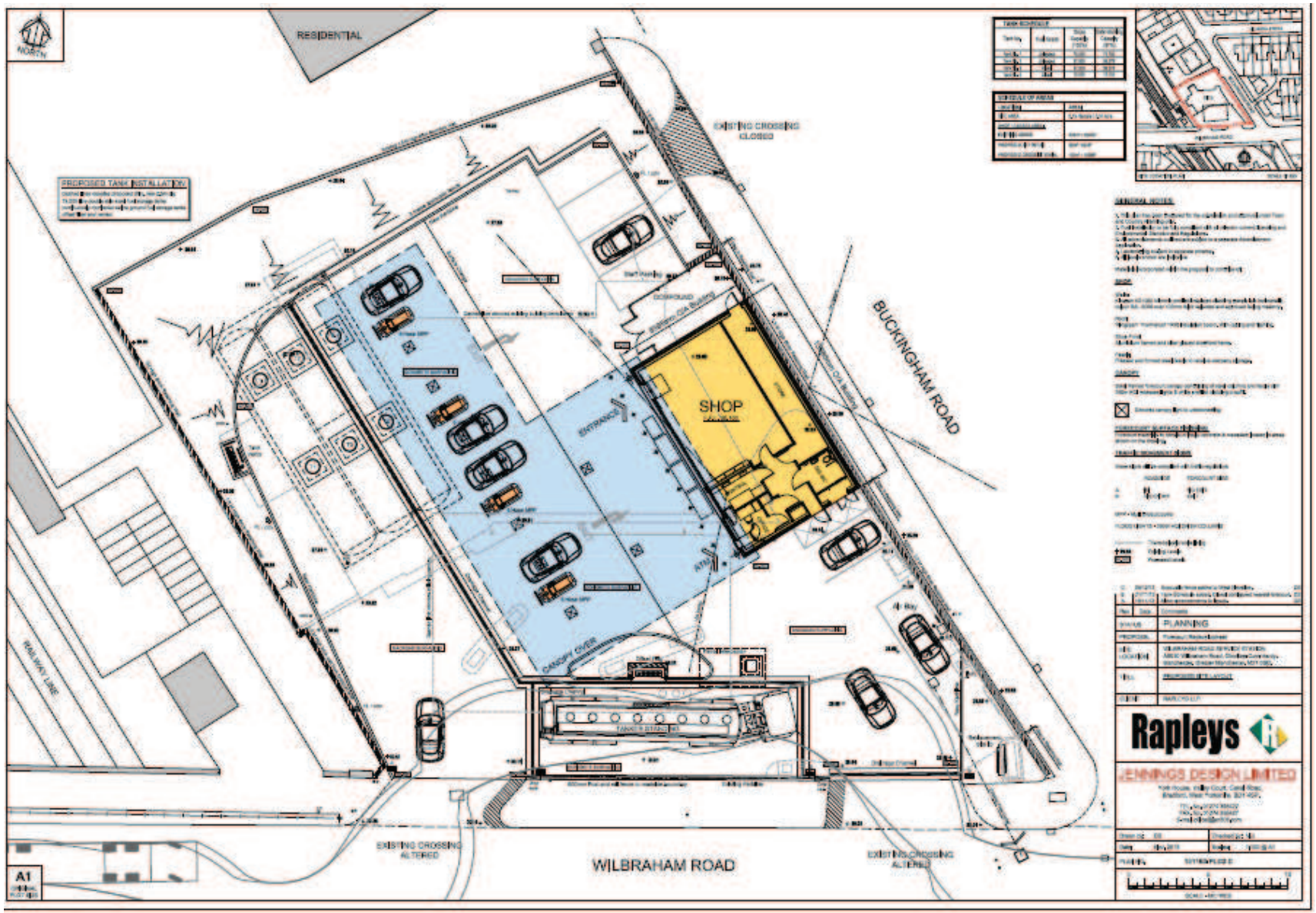
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# APPENDIX 1 – MEASUREMENT LOCATION & SITE LAYOUT

# Figure 1 – Measurement Location

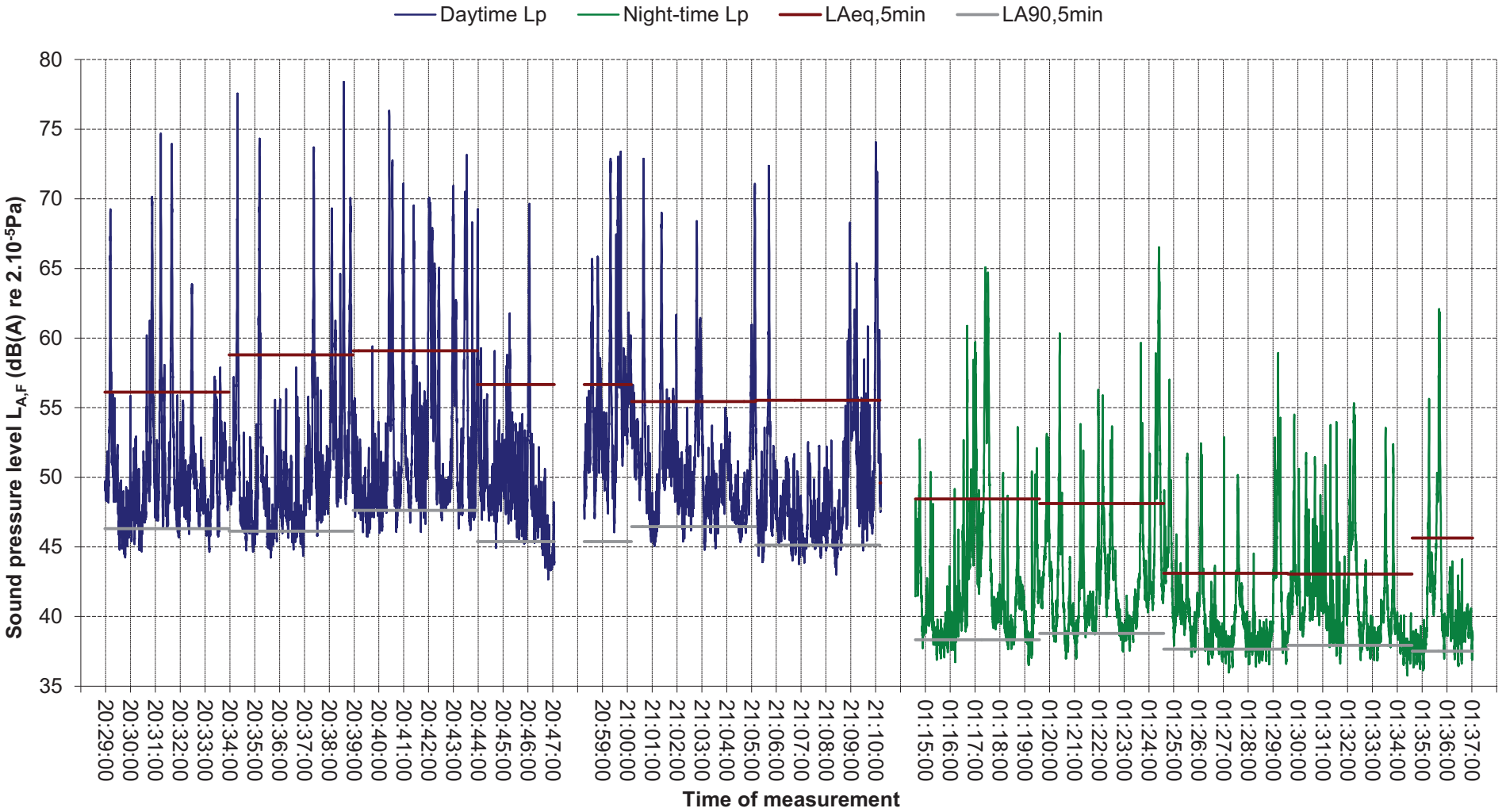


## Figure 2 – Site Layout



# APPENDIX 2 – MEASUREMENT GRAPH

**Graph 1 - Existing ambient sound level in vicinity of residentail properties to the rear of the petrol filling station, measured 16th and 17th July 2013**



# APPENDIX 3 - EXPLANATION OF SOME ACOUSTIC TERMINOLOGY

3.1 Sound is measured in terms of decibels (dB). There are many different methods of assessing the loudness of a sound. The most frequently used is the 'A Weighting', which simulates the effect of the human hearing mechanism. This method is widely used for sound assessment and the resulting level is expressed as dB(A). The table below gives an indication of different sound levels in terms of dB(A).

| Sound Level dB(A) | Sound Source |
|---|---|
| 0 | Threshold of hearing |
| 20 | Recording Studio |
| 40 | Living Room |
| 60 | Conversational Speech |
| 80 | Light Factory Noise |
| 100 | Discotheque |
| 120 | Road Breaker |
| 140 | Threshold of pain |

3.2 For a steady, continuous sound, a change of 1dB(A) is just perceptible to the ear. In the case of intermittent sounds, the change must be at least 3dB(A) to be perceptible. For steady sounds, a difference of 10dB(A) sounds twice as loud.

3.3 Unwanted sounds are classed as noise, these are a fundamental part of life. The level of such noise changes constantly. This may be due to dogs barking, telephones ringing or even during normal conversation. Because of this, some method of quantifying the overall level of noise is required.

3.4 The equivalent continuous sound level ($L_{Aeq}$) is the level averaged over a specified period of time. This is widely used for both measurement and assessment. Because the $L_{Aeq}$ is an average level over a specified period of time, a steady continuous sound and a shorter duration sound at a higher level can have the same $L_{Aeq}$ over the same time period.

3.5 The level exceeded for 90% of the time ($L_{A90}$) is frequently used to determine the level of background noise. It ignores the loudest 90% of the measurements obtained. Therefore, although it does have a useful purpose, it takes no account of what happens for 90% of the time. This parameter together with the $L_{Aeq}$ and the level exceeded for 10% of the time ($L_{A10}$) give a fairly good overview of the prevailing acoustic environment.

3.6 When A weighted, the maximum sound pressure level measured during a period is termed $L_{AMax}$. This gives an indication of the intrusiveness of a noise event, which is lost with the averaging effect of the corresponding $L_{Aeq}$.

## APPENDIX 3 - EXPLANATION OF SOME ACOUSTIC TERMINOLOGY Cont'd

3.7 Different sound sources produce an overall level that depends upon the louder source and the difference in sound level between the two sources. If the difference is within 1dB, they act as identical sources, with the overall level being 3dB greater than the louder source. If the difference is 2dB or 3dB, the overall level is only 2dB greater than the louder source. For example, if a machine produces 84dB and a second machine produces 82dB, the overall sound level will be 86dB. This is summarised in the table below:

| Difference in Levels (dB) | Increase in Level (dB) |
|---|---|
| 0,1 | 3 |
| 2,3 | 2 |
| 4..9 | 1 |
| 10+ | 0 |

3.8 The sound level rises as a point source becomes closer. This increase is 6dB for every halving of distance. The effect is similar to the addition of sound sources, but with changes of 6dB rather than 3dB. A machine that produces 80dB at 200m will produce 86dB at 100m and 92dB at 50m. This effect is summarised in the table below:

| Ratio of Distances (dB) | Increase in Sound Level |
|---|---|
| 2 | 6 |
| 3 | 10 |
| 4 | 12 |
| 10 | 20 |
| 20 | 26 |

3.9 The **A Weighting** system attempts to replicate the way in which the human hearing mechanism works. An A Weighted sound is expressed as a single value in terms of **dB(A)**. This allows the loudness of different sounds to be compared, the louder having a higher level in dB(A).

3.10 Whilst a single figure value is ideal for noise assessment purposes, it is inadequate for noise control requirements. This is because the most appropriate control techniques will be dependent upon the characteristics of the noise.

## APPENDIX 3 - EXPLANATION OF SOME ACOUSTIC TERMINOLOGY Cont'd

3.11 In this case, the noise is analysed in terms of its frequency content, from a low frequency rumble to a high frequency hiss. To achieve this, eight octave bands are normally used. This set of eight values is termed a **sound spectrum** and analyses a sound in terms of frequency content as the table below shows:

| **Octave Band Centre Frequency (Hz)** | **63** | **125** | **250** | **500** | **1k** | **2k** | **4k** | **8k** |
|---|---|---|---|---|---|---|---|---|
| | low frequency | | | | | | | high frequency |

3.12 The A Weighting system simulates the effect of the average human hearing mechanism by weighting each frequency and adding the corresponding levels. In an attempt to improve on this, Beranek developed the Noise Criterion (**NC**) curves. These show equal loudness levels at different frequencies. As such, if a sound spectrum matches a given NC curve e.g. NC 40, all octave bands will sound equally loud. This would equate to a level of approximately 49dB(A).

3.13 Kosten and Van Os then adapted the NC system specifically for room design and produced the Noise Rating (**NR**) system. Broadly speaking the two systems are equivalent. A major advantage of the NC or NR system for noise control purposes is that noise which meets a required curve will not have a significant tonal content, making it much less intrusive.

3.14 While the sound pressure level is useful, this only provides information about the sound level produced by a source at a particular point in space. It cannot immediately let us compare one piece of machinery against another because it depends upon where the meter is located.

3.15 The sound power level is used to describe the sound energy output from a machine, independent of location. This is the amount of energy that the machine converts to sound energy, considered on the decibel scale. There are conversion factors we can use to convert a sound pressure level reading into a power level reading. These conversion factors rely on the surroundings of the machine being reasonably simple. For example, to rely on the conversion factors one would not want buildings or uneven ground in between the plant and the sound level meter.

3.16 Lp denotes the sound pressure level, whereas Lw denotes the sound power level.