MZA ACOUSTICS

MYERS BATCHING PLANT, HUDDERSFIELD

Condition 3 Noise Impact Assessment Report

Document History

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Contents

1. INTRODUCTION

MZA. Acoustics Ltd (MZA) have been appointed by Edward Architects on behalf of Myers ('The Client') to prepare a noise impact assessment to discharge a planning condition relating to the instillation of new concrete plant at the Myers site in Huddersfield (App Number 2024/62/91053/W). Condition 3 relates to acoustic and reads as follows:

> *"Prior to the development hereby approved being brought into use, a noise assessment report by a suitably competent person shall be submitted to and approved in writing by the Local Planning Authority. The report shall include:*
>
> *a) an assessment of all noise emissions from the proposed development;*
>
> *b) details of existing background and predicted future noise levels at the boundary of the nearest noise sensitive premises;*
>
> *c) a written scheme of how the occupants of the above-mentioned noise sensitive premises will be protected from noise from the proposed development including details of all necessary noise attenuation.*
>
> *The development shall not be brought into use until all works comprised within the measures specified in the approved report have been carried out in full and such measures shall be thereafter retained.*
>
> *Reason: To ensure the proposed development does not cause harmful noise pollution within neighbouring noise sensitive locations, in the interest of amenity, to comply with the aims and objectives of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework."*

This report presents a noise impact assessment following the completion of a noise survey at the nearest noise sensitive receptors.

2. SITE DESCRIPTION

2.1 Development Site Location

The Myers site is located off Leeds Road and is approximately 1km to the north of Huddersfield town centre. The Network Rail line lies approximately 150m to the north of site and is used by both Northern Rail and Transpennine Express. The wider site consists of a builders merchants, waste management, site offices and concrete collection.

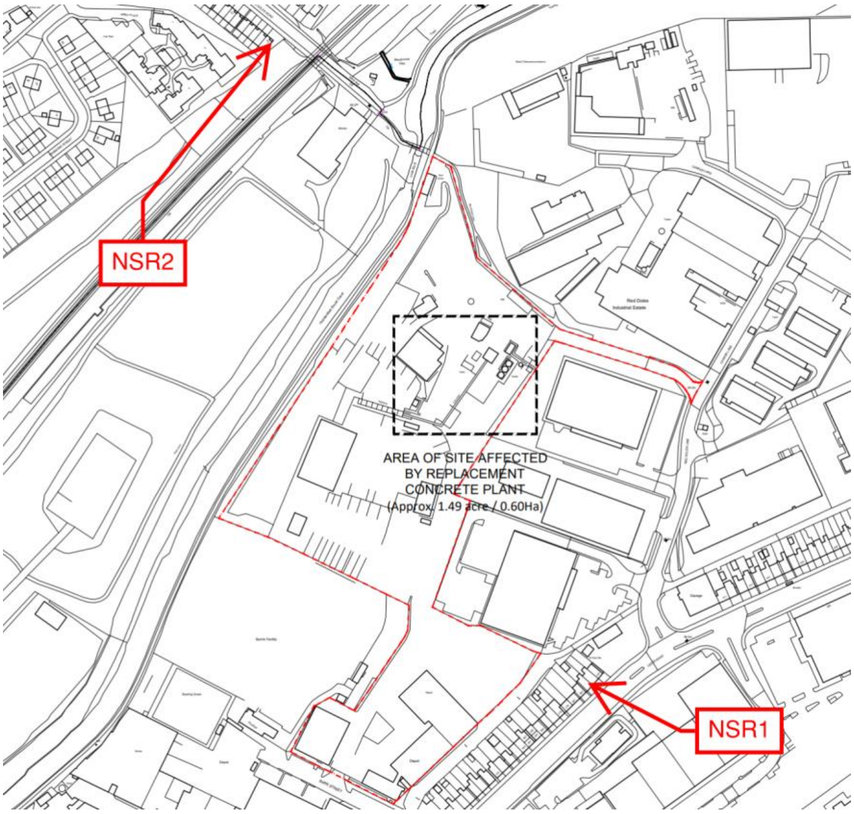

Figure 1 – General Site Location

The concrete plant to which this report relates is located centrally within the wider Myers site as shown on Figure 1.

2.2 Development Proposals

The proposal consists of the demolition and removal of the existing concrete batching plant and supporting equipment including the 3 existing silos, mixing tower and conveyor belt and the supply and instillation of a new concrete batching plant with 5no silos. An elevation of the existing vs proposed is presented below in Figure 2.

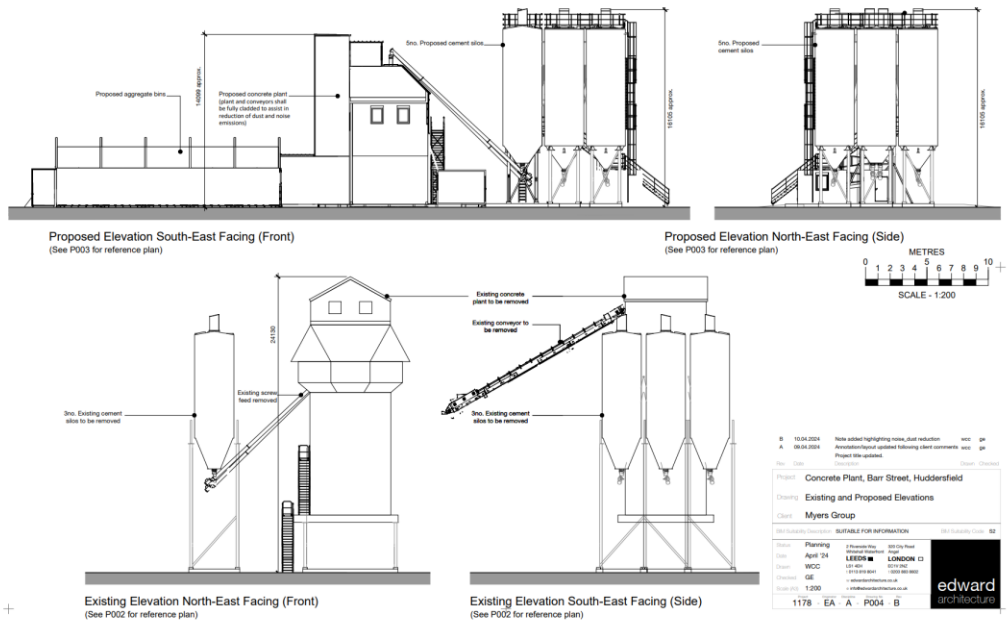

Figure 2-Existing vs proposed elevations (courtesy of Edward Architects)

2.3 Nearby Sensitive Receptors

The nearest residential receptors are highlighted on Figure 1.

NSR1 are houses located on Leeds Road, these are directly adjacent to the builders merchants yard and approximately 220m south from the proposed concrete plant.

NRS2 are houses on Red Doles Lane to the direct north of the train line and 250m north of the proposed concrete plant.

3. NOISE POLICY AND GUIDANCE

3.1 Introduction

The criteria used in this assessment report is directed by Planning Condition 3. Numerical design targets are taken from the West Yorkshire Planning Consultation Guidance Noise & Vibration document dated May 2016. Other technical guidance related to the assessment is presented below.

Further details of relevant policy and assessment guidance documents are presented in Appendix B and are summarised below.

3.1 Technical Guidance

3.1.1 West Yorkshire Planning Consultation Guidance Noise & Vibration May 2016

The document is intended to provide a condensed guide to developers and Environmental Health professionals when reviewing planning applications and making recommendations to Planning Services on matters relating to noise and vibration. It applies to several councils in West Yorkshire including Kirklees Council. Section 4.2 in the document relates to proposed developments containing nose generating uses, this would apply to the proposed development. The figure below presents the relevent extract.

Where applications contain noise sources that may have an impact upon existing noise sensitive uses, the applicant will be required to provide supporting information that will allow this impact to be evaluated. For the purposes of this document, Noise Sensitive Premises is defined as places where the building's occupiers may be resting, sleeping or studying. This includes residential premises, offices, hotels, hospitals, nursing homes and schools. Noise sources including:

- **Internal and external plant;**
- **Air extraction/conditioning;**
- **Industrial activities;**
- **Construction/demolition work;**
- **Delivery of goods or refuse collection;**
- **Transportation within a premises.**

should be assessed using guidelines contained within this section.
Where the potential for noise disturbance exists, a noise impact assessment should be carried out at the façade of the closest noise sensitive premises to demonstrate that a Comparative Criterion has been met:

Recommended Maximum sound levels should be based upon a Comparative Criterion:

- The Rating Level (calculated in accordance to BS 4142: 2014) is at least 10 dB below the existing Ambient noise level (L_{Aeq});
- The Rating Level (calculated in accordance to BS 4142: 2014) is at least 0-5* dB below the exiting Background noise level (L_{A90});
- Between the hours of 19:00 and 07:00, the maximum noise levels (L_{AFmax}) from the guidance document shall not exceed the L_{A90} by more than 10 dB; however, where the existing background noise level is 45 dB LA90 or less, the maximum noise levels shall not exceed 60 dB L_{AFmax}.

Assessment methodology and evaluation shall normally follow the guidance in BS 4142: 2014, 'Method for Rating and Assessing Industrial and Commercial Sound'.

* *Subject to (1) the type of development; (2) the type of noise source, (3) the proposed distance of the noise source to existing noise sensitive properties; (4) the orientation of the proposed development; (5) the sensitivity of the existing noise sensitive properties; (6) the overall context; (7) the time of day; (8) existing background noise levels.*

Figure 3-Planning guidance extract

3.1.2 British Standard 7445-2:1991

BS 7445-2:1991 'Description and Measurement of Environmental Noise - Part 2: Guide to the acquisition of data pertinent to land use' defines parameters, procedures and instrumentation required for noise measurement and analysis. Accordingly, together with associated guidance within the documents below, this Standard has been used to ensure the survey and data are fit for purpose.

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

BS 4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically "the greater this difference, the greater the magnitude of the impact". This difference is then considered as follows:

- A difference of around +10 dB or more is likely to be an indication of a **significant adverse impact**, depending on the context.
- A difference of around +5 dB is likely to be an indication of an **adverse impact**, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a **low impact**, depending on the context."

BS 4142 further states that "where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact" again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that "not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact", thus implying that all sites should be assessed on their own merits and specifics.

The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

- Typical Daytime 07:00 – 23:00 1-hr assessment period
- Typical Night-time 23:00 – 07:00 15-min assessment period

The Standard also outlines methods for defining appropriate "character corrections" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are:

a. the Subjective Method,

b. the Objective Methods for tonality; and,

c. the Reference Method.

It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

Table 1 - BS 4142 Subjective Method rating correction

Level of Perceptibility	Tonal Correction dB	Impulsivity Correction dB	Correction for 'other sound characteristics' dB	Intermittency Correction dB
No Perceptibility	+0	+0	Where neither tonal nor impulsive but clearly identifiable +3	If intermittency is readily identifiable +3
Just Perceptible	+2	+3		
Clearly perceptible	+4	+6		
Highly perceptible	+6	+9		

3.2 Assessment Criteria

The assessment criteria is as follows and is derived from the Local Authority noise criteria presented in Section 3.1.1.

Table 2-Assessment Criteria

Assessment Criteria
The rating level is atleast 10dB below the ambient noise level (LAeq)
The rating level is atleast 0-5dB below the existing background noise level (LA90)

4. BASELINE NOISE SURVEY

4.1 Summary

A baseline environmental noise monitoring survey was undertaken by MZA Acoustics between Tuesday 6th August 2024 and Thursday 8th August 2024 at the same site for a separate application.

Monitoring was undertaken at three locations. Unattended monitoring was undertaken over a 48Hr period at MP1, a location considered to be representative of the closest residential receptors on Leeds Road.

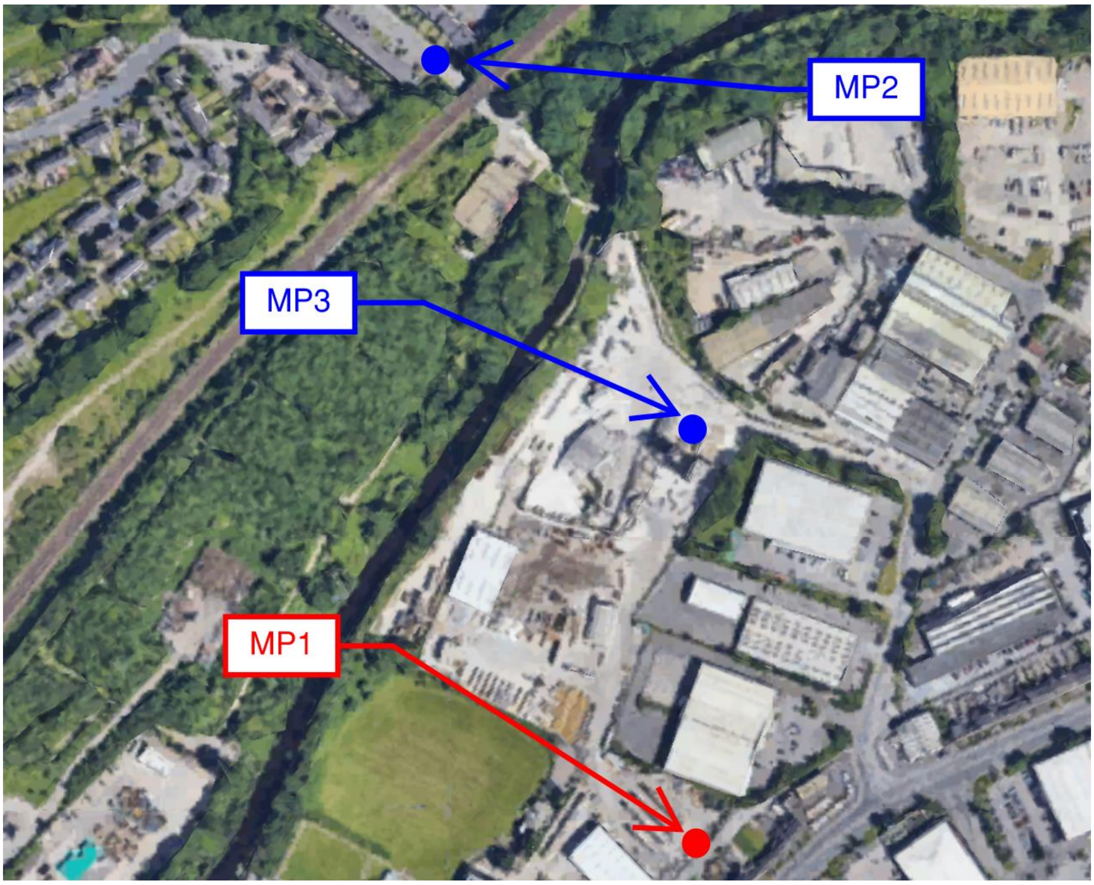

Figure 4-Measurement Locations (Courtesy Google Maps)

Attended measurements were undertaken in a representative location of the receptors on Red Doles Lane at MP2. Short attended measurements of the concrete plant were taken at MP3 approximatley 10m from the mixer loading area.

4.1.1 Unattended Noise Survey at MP1

The table below presents the measured results at MP1 across the full measurement period.

Table 3-MP1 Unattended Summary

Measurement Position	Period	Existing Ambient Noise Level $L_{Aeq,T}$	Measured Background Level L_{A90}
MP1 Houses on Leeds Road	1100-2300 06/08/24	55 dB	42 dB
	2300-0700 06/08/24	46 dB	37 dB
	0700-2300 07/08/24	56 dB	44 dB
	2300-0700 07/08/24	48 dB	33 dB

The local ambient noise climate was described to consist mainly of activity from the adjacent builders merchant yard and also distant road noise from the nearby Leeds Road.

4.1.2 Attended Noise Survey at MP2

Due to site constraints measurements at MP2 were carried out fully attended. The results are presented below in Table 4.

Table 4-MP2 Attended Summary

Measurement Position	Period	Existing Ambient Noise Level $L_{Aeq,T}$	Representative Background Level L_{A90}
MP2 Houses on Red Doles Lane	1230-1330 06/08/24	57 dB	42 dB
	2300-0000 07/08/24	44 dB	41 dB

The local ambient noise climate was described to consist mainly of distant road traffic noise and train passbys during the day. Train passbys were not observed during the night section of the monitoring.

4.1.3 Attended Noise Survey at MP3

Attended measurements at MP3 were taken to capture the current concrete batching plant when in use. The measurement position was approximately 10m from the plant. An image is shown below in Figure 5.

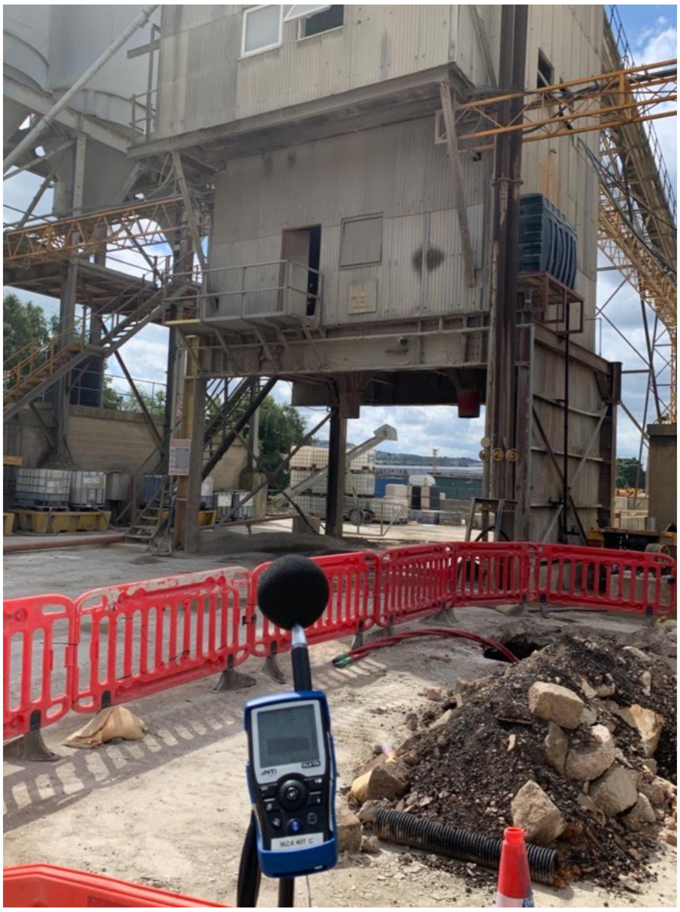

Figure 5-Measurement position MP3

The monitoring captured a full cycle of a cement mixer pulling under the batching plant, being filled and pulling away. The entire process took approximately 10 minutes. The results are presented below in Table 4.

Table 5-MP2 Attended Summary

Measurement Position	Period	Ambient Noise Level $L_{Aeq,T}$	Noise Maxima L_{AMax}
MP3 10m from batching plant	1205-1215 06/08/24	74 dB	84 dB

5. NOISE IMPACT ASSESSMENT

5.1 Background Assessment Levels

It has been confirmed by The Client that all concrete batching plant and assosciated activity is to run no earlier than 0600 and run no later than 1730 on a typical working day.

As the existing concrete batching plant, and other Myers site activities are already in operation between these hours the background noise data for the assessment is taken within "working daytime" hours of 0600-1730. The background noise levels used for this assessment are as follows.

Table 6-Background Levels for Assessment

Time Period	Background Noise level $L_{A90,T}$
NSR1 Leeds Road	
[1]Daytime 0600-1730	47 dB
NSR2 Red Doles Lane	
[2]Daytime 0600-1730	42 dB

[1]Typical LA90 between 0600-1730 [2]Based on Measured L_{A90} of 1Hr attended daytime measurement.

5.2 LIEBHERR Noise Report

MZA Acoustics have been supplied with a noise foreast report from the supplier of the proposed concrete mixing plant LIEBHERR. Detailed calculations are undertaken at varying distances based on the assumption of maximum possible operation of the equiment throughout a 24Hr period. This equates to approximatley 2400m^3 of load per day. Details from the report are presented in Appendix C.

The Client has confirmed that these calculations represent an extreme that would not occur at this site. They have confirmed that a typical day consists of 400m^3 of product, which equates to around 62 cycles. This is approximatley 20% of the useage used in the LIEBHERR report. MZA Acoustics have therefore based the assessment calculations on this assumption.

The table below presents the LIEBHERR noise levels at maximum load, and corresponding predicted noise levels using the Clients actual expected useage (400m^3 of concrete). Note that the values consider hemispherical radiation over flat ground and therefore do not account for screening losses. Considering the multiple geographical and constructed screening elements between the site and receptors a nominal 10dB screening loss is included within the calculation as a conservative assumption, the true screening loss is likely higher due to intervening terrain and buildings.

Table 7-Values from LIEBHERR report corrected to Myers expected useage

Distance	LIEBHERR Maximum Use (2400m^3)	Myers Stated Use (400m^3)	Myers Stated Use with screening losses
50m	72 dB L_{Ar}	65 dB L_{Ar}	55 dB L_{Ar}
100m	61 dB L_{Ar}	54 dB L_{Ar}	44 dB L_{Ar}
200m	54 dB L_{Ar}	47 dB L_{Ar}	37 dB L_{Ar}
300m	50 dB L_{Ar}	43 dB L_{Ar}	33 dB L_{Ar}

5.3 Assessment

The predicted noise level at each receptor is compared to the background sound level during the working daytime below. Both receptors are apporximatley 200m from the development site.

5.3.1 BS 4142:2014 Assessment

The resultant BS 4142 assessment for the daytime operations is presented below. Calculations assume a worst case, with all items of plant operating simultaneously over the full reference time period.

Table 8– BS 4142 Assessment – Working Daytime

Background Noise Level L_{A90}	**Specific Level $L_{Aeq,1\text{-}hr}$**	**Rating Correction**	**Predicted Rating Level $L_{Ar,Tr}$**	**Excess of Rating over the Background**
Leeds Road NSR1				
47 dB	37 dB	+3dB Intermittency	40 dB	-7 dB
Red Doles Lane NRS2				
42 dB	37 dB	+3dB Intermittency	40 dB	-2 dB

At all receptors the level of noise from plant installations is below the background noise level during the daytime. This is an indication of a low adverse impact ans satisfies the assessment citeria set out in Section 3.2.

5.4 **Wider Context**

Noise levels from the concrete batching plant and associated activity are predicted to be below the background noise level at both receptors throughout operational hours. Due to the existing equipment the character of the noise associated with such a development is therefore already part of the area's wider context.

The builders yard directly adjacent to the properties on Leeds Road is expected to remain to be the dominant source of noise at these receptors with the existing ambient daytime noise level at 56dB $L_{Aeq,T}$. The introduction of the new concrete batching plant would incur an expected change in ambient noise level of <0.1dB as the predicted noise level is >10dB below the measured ambient level.

Similarly, to the properties on Red Doles Lane the expected change in noise level would be insignificant as the predicted noise level is >10dB below the measured ambient level.

MZA Acoustics would therefore conclude that the results of the assessment equate to the Lowest Observed Adverse Effect Level.

6. CONCLUSIONS

MZA. Acoustics Ltd (MZA) have been appointed by Edward Architects on behalf of Myers ('The Client') to prepare a noise impact assessment to discharge a planning condition relating to the instillation of new concrete plant at the Myers site in Huddersfield (App Number 2024/62/91053/W).

The noise impact assessment finds that the predicted noise level due to the new concrete batching plant equipment and associated activity is below the background noise level at both receptors.

The lowest observed adverse effect level is therefore expected and assessment criteria is satisfied in line with the requirements of the local planning authority.

It is therefore recommended that Condition 3 can be discharged.

Appendices

Appendix A– Glossary of Acoustic Terminology

Acoustics is the branch of physics concerned with the properties of sound, including ultrasound, infrasound and vibration. A scientist or engineer who works in the field of acoustics is an acoustician or acoustic engineer.

Sound can be measured by a sound level meter or other measuring system. Noise is related to a human response, and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive. Care has been taken in this document to use the most relevant of these terms (whereby 'sound' is used predominantly); however, in most reference documents, and, indeed, generally, 'sound' and 'noise' are used interchangeably. Consequently, just because the term 'noise' is used doesn't necessarily mean a negative effect exits or will occur, and the context of the accompanying text should be taken into account.

Human hearing is able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble), and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain).

The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify sound in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

The weighting mechanism that best corresponds to the response of the human ear (though not necessarily perfectly) is the 'A'-weighting scale. This is widely used for environmental sound measurement, and the levels are denoted as dBA, dB(A) or L_{Aeq}, L_{A90} etc. according to the metric being measured or determined (see the Definitions over leaf).

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. Where other changes occur (associated with the change in sound level), such as additional vehicle movements on a road, which can be seen, then these may result in changes in sound level being more noticeable than they might otherwise be.

Further to such visual clues, and any other non-acoustical factors that affect people's response (such personal characteristics, and social, residential, or environmental factors), the subjective response to a sound is dependent not only upon the sound pressure level and component frequencies, but also its intermittency. Consequently, various metrics have been developed to try and correlate people's attitudes to different sounds with the sound level and its fluctuations. The metrics used in this document, as per the relevant guidance, are defined overleaf.

Airborne Sound	Sound that reaches the point of interest by propagation through air.
Ambient Sound:	Sound from all sources at any given time, form both near and far. Usually measured in terms of L_{Aeq}.
A-Weighting	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Background Sound Level	The A-weighted sound pressure level that can be considered the baseline in the absence of any noise from a specific source of sound under assessment. Measured in terms of $L_{A90, T}$.
Calibration	The measurement system/ chain should be periodically calibrated, within a laboratory, against traceable calibration instrumentation, to either National Standards or as UKAS-Accredited, as required. The calibration of the system should also be checked in the field using a portable calibrator before and after each short-term measurements, and periodically for longer term monitoring.
Class 1	The Class of a sound level meter describes its accuracy as defined by the relevant international standards – Class 1 is more accurate than Class 2. The older standard IEC 60651 referred to the grade as "Type", whereas the new standard IEC 61672 refers to it as the "Class". The most accurate meters used in the field (as opposed to a laboratory) are Class 1. Class 2 meters can be used in some instances; however, MZA Acoustics use Class 1 (or Type 1) meters by default, as required by BS 4142:2014, for example.
Decibel	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds (s1 and s2) is given by 20 log10 (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.
Fast time Weighting (F)	Averaging time used in sound level meters. Defined in BS EN 61672-2:2013 Electroacoustics. Sound level meters. Pattern evaluation tests.
Free-field / Façade	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away.
$L_{AF90, T}$	The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time fast time-weighting (F). Generally used to describe the 'background' sound conditions.
L_{AFmax}	The maximum A-weighted sound pressure level during a given time period. Lmax is sometimes used for the assessment of occasional loud sounds, which may have little effect on the overall L_{eq} noise level, but could still affect the sound environment. Unless described otherwise, it is measured using the fast time-weighting (F).
$L_{eq, T}$	A sound level index called the equivalent continuous sound level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. Where the value is A-weighted, is will be presented '$L_{Aeq,T}$' or 'dBA $L_{eq,T}$', otherwise is should be an un-weighted (or linear) value.
L_p	See Sound Pressure Level.
Noise	Related to human response to sound. Unwanted sound, or sound that is considered undesirable or disruptive.

Octave Band	Frequency ranges in which the upper limit of each band is twice the lower limit. Octave bands are identified by their geometric mean frequency, or centre frequency.
Sound Absorption Coefficient	A measure of how effective a material is at absorbing sound incident to its surface. The index range is between 0 and 1, where 1 indicates a perfectly absorbent material and 0 indicates a perfectly reflective one.
Sound Power	In a specified frequency band, the rate at which acoustic energy is radiated from a source. In general, the rate of flow of sound energy, whether from a source, through an area, or into an absorber.
Sound Power Level	Of airborne sound, ten times the common logarithm of the ratio of the sound power under consideration of the standard reference power of 1 pW. Expressed in decibels.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20 Pa (20×10^{-6} Pascals) on a decibel scale.
Weighted Sound Reduction Index (R_w)	A single-figure quantity which characterises the airborne sound insulating properties of a material or element over a range of frequencies.

Appendix B – National Planning Policy and Guidance

NOISE POLICY STATEMENT FOR ENGLAND (NPSE), 2010

The NPSE also stresses that noise impact should not be treated in isolation from other related factors. At paragraph 2.7 for example it states:

> *'…the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.'*

The NPSE introduces and describes three categories, or levels, describing the presence or absence of noise effects but does not quantify those categories, stating that the corresponding objective levels are likely to be different for different noise sources, receptors and times of the day or night. These categories are:

- **NOEL** – No Observed Effect Level – This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- **LOAEL** – Lowest Observed Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected
- **SOAEL** – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

The NPSE recognised that, at the time of publication, further research was needed into how these categories might be quantified for different scenarios. There is still no robust, universally accepted method of deriving suitable values and a variety of approaches are adopted in different circumstances. The subjective guidance provided in the Planning Practice Guidance (PPG) for noise can be of assistance in deriving suitable values.

The three aims of the NPSE are:

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

PLANNING PRACTICE GUIDANCE – NOISE (PPG-N), 2019

The Government launched the Planning Practice Guidance (PPG) web-based resource in March 2014 and refreshed it in July 2019. The section on noise provides tabulated descriptions of example outcomes of the categories introduced in the NPSE based on the likely average response. It also adds a fourth category termed Unacceptable Adverse Effect (UAE).

The PPG-N describes sound that is not noticeable to be at levels below the NOEL. It describes exposures that are noticeable but not to the extent there is a perceived change in quality of life as below the LOAEL and need no mitigation. With reference to the definition of noise in the

NPSE, such emissions are ‘sound; and not ‘noise’. On this basis, the audibility of sound from a development is not, in itself, a criterion to judge noise effects that is commensurate with national planning policy.

The PPG-N suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPG-N is having to turn up the volume on the television; needing to speak more loudly to be heard; where there is no alternative ventilation, closing windows for some time because of the noise; or, a potential for some reported sleep disturbance. In line with the NPPF and NPSE, the PPG-N states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.

The PPG-N suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the PPG-N are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise present; and/or there is a potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. In line with the NPPF and NPSE, the PPG-N state that effects above the SOAEL should be avoided and that whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.

The guidance in the PPG-N, which is based on that provided in the NPSE, is summarised in the following table.

The PPG-N states that there are many factors which should be considered when determining if noise is of concern; one factor is the number of noise events, the frequency and pattern of occurrence of the noise.

The PPG-N provides further information on the adverse effects of noise and how it can be mitigated. For noise sensitive development, mitigation measures can include: avoiding noisy locations; designing the development to reduce the impact of noise from the local environment, including noise barriers; and optimising the sound insulation provided by the building envelope including through noise insulation.

Perception	Examples of Outcomes	Increasing Effect Levels	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			

Perception	Examples of Outcomes	Increasing Effect Levels	Action
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

BS 4142:2014+A1:2019 METHODS OF RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

BS4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development and/or existing source) at residential NSRs. The specific sound level may then be corrected for the character of the sound, if appropriate, and this is then termed the 'rating level' (denoted as $L_{Ar,Tr}$), whether or not a rating penalty is applied.

With regard to the rating correction, paragraph 9.2 of BS4142:2014+A1:2019 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

Tonality

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

Impulsivity

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

Intermittency

- When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics

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

BS4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. The accompany not to paragraph 8.1.4 states that:

"A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."

Estimating Impact

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance.

Typically, the greater this difference, the greater the magnitude of the impact, while the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

BS4142:2014 recommends the following scale to estimate the impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Whilst there is a relationship between the significance of impacts determined by the method contained within BS4142:2014+A1:2019 and the significance of effects described in the PPG-N, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound which is a key requirement of the Standard.

The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the BS4142:2014 assessment with reference to the examples of outcome described within the PPG-N and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
  - façade insulation treatment;
  - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
  - acoustic screening.

Uncertainty

Uncertainty is an unavoidable feature of measurements in the field, which can be subject to many factors; the weather typically being the most significant of which with respect to the measurement of sound.

Uncertainty is also unavoidable in the prediction of sound levels, where naturally, before the scenario being considered becomes a reality, a number of assumptions need to be relied upon. There is also the uncertainty of people's reactions, which can be influenced by several factors, not just the magnitude or character of the sound in question.

In keeping with the scale of each project, therefore, it is the aim of MZA Acoustics to minimise uncertainty as far as reasonably practicable. With this in mind, and where it is within the control of MZA Acoustics, control measures have been followed, which have been derived from the guidance within BS 4142:2014 and the experience of MZA Acoustics.

Crucially, it has been determined that the existing environmental noise measurements used in the assessment have been reviewed and compared to assess their suitability. This includes the using in calibrated equipment at suitable and representative locations over key periods and avoiding adverse weather conditions.

The assessment predictions have also been undertaken by suitably qualified staff, whilst using the best available information, industry standard calculation methods, and the most applicable calculation procedures.

Notwithstanding this, naturally some uncertainty remains. Given the sheer number of factors involved, however, it is not feasible to place a value on the level of uncertainty, without resulting in an unhelpful range of possible outcomes.

It is the professional position of MZA Acoustics that uncertainty has been kept to a realistic minimum and that the outcome of this assessment is sufficiently representative.

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Measurement		
Only use in calibration Type/Class 1 equipment and check (and record) calibration level before and after measurements	✓	Yes
Measurements were taken using the time and frequency weighting specified by the relevant standard	✓	Yes
Detailed notes were made, including details of the equipment, weather, survey positions (including approximate distances), contributing noise sources, presence of screening etc.	✓	Yes
Take photographs, and record survey locations using GPS if possible	✓	Yes
Avoid standing waves/interference – listen for effects, take spatial average from several locations or conduct a sweep	×	N/A
Take measurements at different distances to establish propagation	×	N/A
Take measurements at different heights where relevant	✓	Yes
Don’t just measure at the “noisiest” parts of site, but establish how “quiet” it is, too, where relevant to the assessment	✓	Yes
Measure under different operating conditions relevant to your assessment / adopt worst case if known	✓	Yes
Measure more than one cycle/ event (ideally at least three)	×	N/A
Determine state of repair of any associated source, where relevant	×	N/A
Use a windshield and avoid windy conditions (i.e. gusts regularly exceeding 5 m/s)	✓	Yes
Avoid wet conditions (particularly in terms of rain on the windshield/mic and on neighbouring surfaces)	✓	Yes

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Avoid electrical and electromagnetic interference (such as from power cables and radio transmitters)	✓	Yes
Avoid extreme temperatures – traffic conditions can be different in freezing conditions, whilst meters can overheat and fail in a case when in direct sunlight during the summer.	✓	Yes
Make measurements during different weather conditions (particularly relevant in terms of wind direction for sites affected by aircraft movements, but also for sites affected by other distant, but significant, sources of noise, in different directions	✓	Yes
Where one source is dominant (such as a main road), as a minimum, measure during conditions favourable to propagation (i.e. when wind direction is within +/-45^{o} of the line between the source and receiver or during temperature inversion, such as on clear calm nights)	✓	Measurements for background noise taken with positive and negative wind propagation.
Avoid tree/leaf (movement) sound where possible – ideally take measurements the same distance from sources of such sound as any receptors of interest	✓	Yes, as much as feasible
Avoid dawn chorus sound where possible – ideally take measurements the same distance from trees and bushes as any receptors of interest	×	N/A
Measure outside the receptor in question where possible; however, it is worst case typically to measure under free-field conditions and apply +3 dB correction to convert to "façade" where applicable – for most planning (new residential development) assessments, free-field is preferable	✓	Measurement taken as close as practicable to nearby residential dwellings in free-field conditions.
Where it is not possible to install a meter outside the receptor in question, install a meter elsewhere and undertake additional attended measurements, either outside the receptor or at a representative location (when not adequately covered by the installed meter)	✓	
Avoid atypical traffic conditions (such as during school holidays and road works – road traffic incidents can significantly affect flows, but which can't be predicted, and their occurrence can't always be established after the survey – check the data for anomalies)	✓	Yes
Avoid presence of you and/or the microphone resulting in atypical conditions (e.g. people stopping to talk, workers on site adjusting their way of working, etc.)	✓	Yes
Data handling		
Download data immediately after survey and process promptly whilst details are fresh in your head	✓	Yes
Use digital transfer methods wherever possible, double check data read-off manually	✓	Yes
Look at the time-history (in as fine a resolution as possible) for any unexpected events – preferably with active spectral data (i.e. in dBTRAIT)	✓	Yes
If removing any data (due to an atypical event, for example), 'save as' a new file and provide a note to the data within the corresponding Excel file	×	N/A
Prediction		

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Use measurement data at different distances to verify propagation	×	N/A
Use measurements at different heights to verify screening effects, where relevant	×	N/A
Use propagation calculation procedure relevant to source and distance	✓	Yes
Use detailed traffic flow data applicable to the assessment methodology	×	N/A
Use detailed sound source data (including octave-bands levels), accounting for size, height and directivity, where known	×	N/A
Use detailed topographical data and base mapping	×	Not modelled
Identify different ground types	×	Not modelled
Apply an order of reflections of at least one	×	Not modelled
Use 3D view feature of the modelling software to check the accuracy of the model	×	Not modelled
Produce contour plots as a further means of identifying any abnormalities or errors in the model	×	Not modelled

Appendix C – Leibherr Calculations

Immission forecast data

Sound propagation in accordance with ISO 9613-2

Basic data			
Plant type	Mobilmix 2,5 A-R/DW	Reference time for evaluation level	24 h
Works/project No.	036-50952	Operation in idle time	0 h
Date	03.02.2017	Supplement for idle times	0 dB
File name	AMC_01.xlsm	Temperature	10 °C
Person in charge	H. Berner	Relative humidity of air	70 %

Conrete volume per day	2400 m³
Proportion of aggregates by mass	2000 kg/m³
Proportion of cement by mass	300 kg/m³

Immission point	IP 1
x [m]:	-50
y [m]:	0
z [m]:	4

Single-point noise sources	Proportion concrete	Total 0	Output 0	Individual amount	Cycle time	Number of cycles	Time of operation	Type	Sound power level L_W	Coordinates x	y	z	sound reduction index R_W	Directivity index D_I	Solid angle coefficient K_0	Shielding angle Start	End	Supplement Idle	sound	impulse	Evaluation level emission Lr,Emission *	Evaluation level immission Lr,Immission
	%					-	h	-	dB(A)	m	m	m	dB(A)	dB(A)	dB(A)	°	°	dB	dB	dB	dB(A)	dB(A)
Batching process	100	2667 m³	150 kg/s				8,89	Stahl	103	-6	0	1	5	0	3			0,0	0	3	96,7	**53,6**
Weigher belt	100	2667 m³	200 kg/s				6,67	Normal	108	-16	0	2	5	0	3			0,0	0	3	100,4	**61,4**
Wheel loader	100	2667 m³		2 m³	15 s	1333	5,56	Laut	105	-20	0	3	0	0	3			0,0	0	6	104,6	**67,0**
Gravel trucks when discharging load	100	2667 m³		22 t	30 s	218	1,82	Normal	105	-20	30	1	0	0	3			0,0	0	6	99,8	**57,1**
Cement silo trucks during pneumatic tra	100	720 t	70 t/h	26 t		28	10,29	LKW	108	17	-6	1,5	0	0	3			0,0	0	0	104,3	**56,5**
Double schaft mixer	100	2400 m³	110 m³/h				21,82	DW 2,5	108	0	0	5	8	0	3			0,0	0	3	102,6	**59,8**
Truck mixers during loading process	100	2400 m³	110 m³/h	8 m³			21,82	Normal	103	0	-5	2	0	0	3			0,0	0	1,5	104,1	**59,9**
Truck mixers during washing process	100			Interim washing period	2 min	300	10,30		100	10	25	1,5	0	0	3			0,0	0	1,5	97,8	**50,4**
				Washing period after end of shift	6 min	3																
																				Summe Punktschallquellen:	**111,2**	**69,8**

Linear noise sources (DIN 18005)		Coordinates of nodal points 1	2	3	4	5	6	7	8	9	Porportion of concrete	Number of journeys	Traffic volume	Number of trucks	Speed 0	Up-hill gradients	Road surface	Sound power level per meter LW'	Supplement Idle	sound	impulse	Evaluation level emission Lr,Emission *	Evaluation level immission Lr,Immission
		m	m	m	m	m	m	m	m	m	%		vehic./h	%	km/h	%	dB	dB(A)	dB	dB	dB	dB(A)	dB(A)
Wheel loader	x	-20,0	-10,0	-20,0																			
during transport	y	30,0	10,0	10,0							100	2667	111,1	100	20	10	1	86,6	0,0	0	0	101,7	**60,4**
	z	1,5	1,5	1,5																			
Gravel trucks	x	25,0	-40,0	-40,0	25,0	25,0																	
during transport	y	30,0	30,0	-30,0	-30,0	30,0					100	436	18,2	100	20	10	1	78,7	0,0	0	0	102,7	**65,3**
	z	1,5	1,5	1,5	1,5	1,5																	
Cement silo trucks	x	40,0	17,0	17,0																			
during transport	y	30,0	30,0	-6,0							100	55	2,3	100	20	10	1	69,8	0,0	0	0	87,5	**38,7**
	z	1,5	1,5	1,5																			
Truck mixers	x	40,0	10,0	0,0																			
during transport	y	30,0	25,0	-5,0							100	600	25,0	100	20	10	1	80,1	0,0	0	0	98,0	**50,8**
	z	1,5	1,5	1,5																			
																					Summe Linienschallquellen	**106,1**	**66,6**

* Lr,Emission: reverence surface 1m² TotalEvaluation level emission Lr,Emission	**112,3**	
TotalEvaluation level immission Lr,Immission		**71,5**

Appendix D – Limitations to this Report

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of MZA Acoustics Limited. MZA Acoustics Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or MZA Acoustics Limited and agree to indemnify MZA Acoustics Limited for any and all loss or damage resulting therefrom. MZA Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations MZA Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

MZA ACOUSTICS

4th Floor, 10 Philpot Lane,
London, EC3M 8AA

M: +44 (0)7990 039 892
T: +44 (0)203 713 8889
ctoher@mzaconsult.co.uk
www.mza-acoustics.co.uk