Noise Impact Assessment of Aggregate Wash Plant and Associated Operations

Client:	Ruttle Plant Hire
Address:	Common Bank Works, Common Bank Lane, Chorley, Lancashire, PR7 1NR
Date:	08/10/2020

Version	1	2	3
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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken to assess the noise emissions from the introduction of aggregate wash plant and associated operations at Common Bank Works, Common Bank Lane, Chorley, Lancashire, PR7 1NR. The measured background sound levels have allowed BS4142:2014 and IEMA noise assessments to be undertaken.

The BS4142 rating noise level is predicted to exceed the background noise level by up to 3.0 dB during operational hours at the closest NSRs (Noise Sensitive Receptors). This shows a possibility of low-level impact when assessed with BS4142 and is classed as 'LOAEL' (Lowest Observed Adverse Effect Level) when assessed in conjunction with the NPPF and NPSE.

An IEMA 'Increase in Ambient Noise Level' assessment has also been undertaken. The results show that the ambient noise level at the most affected NSRs is predicted to rise by 0.2 dB due to the operations of the wash plant. This increase is classed as 'Not Significant', which adds further context to the BS4142 assessment discussed above.

Recommendations and mitigation measures can be found in the body of the report. Written approval of the findings of this report is required from the Environment Agency prior to works commencing.

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the introduction of aggregate wash plant and associated operations ('the Proposed Development') at Common Bank Works, Common Bank Lane, Chorley, Lancashire, PR7 1NR ('the Site').

The applicant is preparing an application for the variation of their Environmental Permit, ref. EPR/FB3209TQ, to present to the Environment Agency and has received pre-app advice.

Accordingly, the following technical noise assessment has been produced to accompany the Application.

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Baseline sound monitoring survey to evaluate the prevailing sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels at the NSR;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, BS4142:2014 and other relevant standards.

1.3 Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

- National Planning Policy Framework (2019)
- Noise Policy Statement for England
- IEMA Guidelines on Noise Impact Assessments
- BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'
- ISO 9613-2 Attenuation of sound during propagation outdoors
- BS EN 12354-4 Building Acoustics

2. Site Description & Background Information

2.1 Site & Surroundings

The site is located on land off Common Bank Lane in Chorley, Lancashire. The immediate surrounding area is a mix of rural and industrial land and the noise environment is of a low to moderate level. The two closest NSRs (Noise Sensitive Receptors) to the site are located approximately 260m and 310m from the western and southern site boundaries respectively. The closest commercial and industrial premises are 'AK Roof Windows Ltd' which operates between 09:00 -18:00, 'Taylor Transformers' which operates between 08:30 – 17:00, and 'Northwest Waterjet' which operates between 08:00 – 17:00.

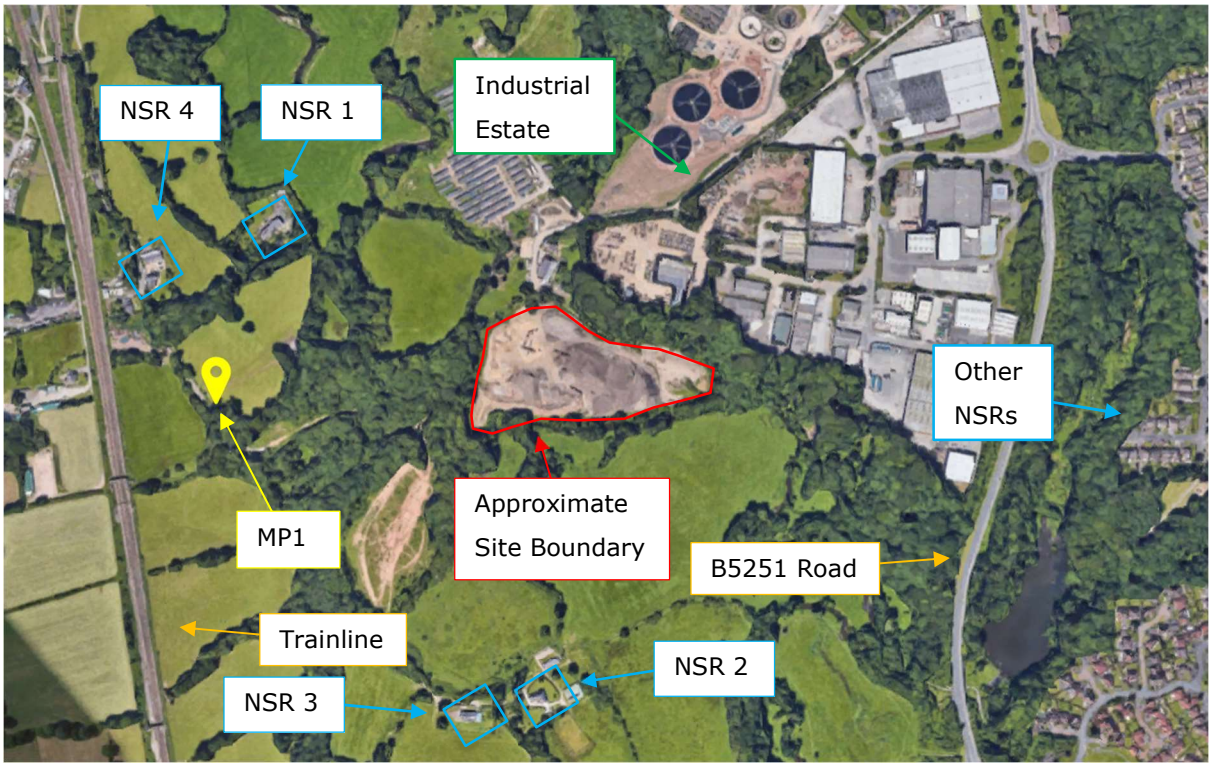


Figure 1.0 – Site and Surroundings

2.2 Background

The site is owned and operated by Ruttle Plant Holdings Ltd and is a waste recycling facility accepting up to 250,000 tonnes of non-hazardous construction, demolition, and excavation material per annum. The material is sorted, stored, and treated to produce soil, soil substitute, and aggregate. The operating hours of the site are 07:00 to 18:00, Monday to Saturday.

The application is to vary the current environmental permit to include aggregate wash plant with associated plant vehicle movements and activities. Due to the proximity of the closest NSRs, the Environment Agency has requested that a Noise Impact Assessment accompany the application.

Given the industrial nature of the surroundings, and the fact that the site is already operating as a recycling facility, it is assumed that the location is suitable for development, provided a 'LOAEL'

(Lowest Observed Adverse Effect Level) or 'NOEL' (No Observed Effect Level) outcome can be achieved at the closest NSRs.

3. Environmental Noise Survey

To characterise the sound profile of the area of the proposed development, a long-term environmental sound survey was carried out from the 24th July 2020 to the 27th July 2020.

3.1 Measurement Methodology

For the long-term sound monitoring, the sound level meter was placed on a lamppost in the vicinity of the closest NSR, approximately 3.5m above ground level with no nearby reflective surfaces. The monitoring position was chosen to collect representative sound levels of the area during the daytime operational periods. This position was also representative of the sound levels at the NSR. The measurement position can be found in Figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC420 Class 1 Sound Level Meter	T246471	≤0.5
CESVA CB006 Class 1 Calibrator	901955	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

As the long-term environmental noise survey was carried out over an un-manned period no localised records of weather conditions were taken, however, during the setup and collection of the equipment the weather was calm with wind speeds less than 5m/s and no precipitation. All measurements have been compared with met office weather data for the area, specifically the closest functioning weather station in Darwen, approximately 13km to the north-east of the site. When reviewing the time history of the noise measurements, any time period that was thought to be affected by the local weather conditions has been omitted. The analysis of the noise data includes statistical and percentile values which aid in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each period during the entire measurement.

Weather Conditions 24/07/2020 – 27/07/2020 – Darwen				
Time Period	**Mean Air Temp (^{0}C)**	**Rainfall mm/h**	**Prevailing Wind Direction**	**Wind Speed (m/s)**
24/07/2020 - 00:00 – 23:59	13.6	0.0 – 2.0	SSW	0.0 – 1.3
25/07/2020 - 00:00 – 23:59	13.6	0.0 – 2.5	SW	0.0 – 2.2
26/07/2020 - 00:00 – 23:59	14.7	0.0 – 3.3	SW	0.0 – 3.5
27/07/2020 - 00:00 – 23:59	13.8	0.0 – 3.3	WSW	0.0 – 3.1

Table 2.0 – Meteorological Data

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period.

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Day 1 – 24/07/2020 – 10:25 - 23:00	53.0	81.0	49.0	55.0
Night 1 – 24/07/2020 – 23:00 – 07:00	50.0	76.0	39.0	54.0
Day 2 – 25/07/2020 - 07:00 – 23:00	55.0	95.0	50.0	57.0
Night 2 – 25/07/2020 – 23:00 – 07:00	44.0	78.0	40.0	47.0
Day 3 – 26/07/2020 - 07:00 – 23:00	54.0	93.0	46.0	56.0
Night 3 – 26/07/2020 – 23:00 – 07:00	49.0	76.0	39.0	53.0
Day 4 – 27/07/2020 - 07:00 – 09:25	55.0	81.0	53.0	56.0

Table 3.0 – Sound Survey Summary Results

3.4.2 Background Sound Level Summary Results

The following table shows a summary of the background sound levels during the operational periods.

Measurement Position MP1				
Operational Hours ('t')	**$L_{A90,t}$**	**Statistically most Repeated $L_{A90,t}$**	**Min. $L_{A90,t}$**	**Max. $L_{A90,t}$**
Day 1 – 24/07/2020 – 10:25 – 18:00	41.0	42.0	37.0	45.0
Day 2 – 25/07/2020 – 07:00 – 18:00	45.0	45.0	42.0	48.0
Day 4 – 27/07/2020 – 07:00 – 09:25	48.0	49.0	47.0	50.0

Table 4.0 – Background Sound Survey Operational Hours Results

3.5 Subjective Impression & Context

Whilst on the site, it was noted that the acoustic environment surrounding the NSRs was of a low to moderate level. The dominant noise sources were found to be noise from nature and the surrounding farmland, and intermittent train pass-bys. The noise emissions from the existing operations at the Ruttle site were not audible at the measurement position, however, the traffic noise from the A49 was faintly perceptible.

3.6 Assumptions

- It is assumed that all plant vehicles will perform each task for a maximum of 30 minutes per 1-hour assessment period (50% on-time).
- It is assumed the aggregate wash plant will run for the full 1-hour assessment period (100% on-time).

3.7 Uncertainty

BS4142:2014 section 10.0 states that uncertainty in the calculation of sound levels during the assessment process can arise from both the measured values and calculation methods.

To ensure the accuracy of the assessment consideration has been taken for the level of uncertainty in the measured data and associated calculations in the proposed methodology used to undertake the assessment. Where the level of uncertainty could affect the conclusion, reasonably practicable steps have been taken to minimise the level of uncertainty. Where the level of uncertainty is excessive, additional measurements and site visits have been conducted to increase the confidence in the results. In all instances the following steps have been taken to address the uncertainty;

1) Measured Values; A detailed understanding of the source of noise under investigation has been conducted including consideration for the complexity, variability over time and location, the character and effect of the residual sound level in comparison with the source, the measurement location, quantity of measurements and distance/intervening ground conditions, measurement time interval and the range of times measurement were taken, the suitability of weather conditions, the level of rounding and the classification of the instrumentation used to conduct the assessment.
2) Calculation Methods; Consideration has been taken for the accuracy of the measured sound levels, the character of the sound emissions in question, the calculation method and the simplification of the real situation to "fit" the modelled situation. Recognised standards and validated methods and processes have been used to establish accurate values during the calculation process.

For the avoidance of doubt, the level of uncertainty will not be quantified. If appropriate consideration is taken for points 1 and 2 during the collection of data and analysis thereof, then the influence of uncertainty in the final result is at its lowest practical value.

4. Noise Assessment

4.1 BS4142:2014 Noise Assessment

In the following section of the report, the noise emissions from the aggregate wash plant and associated operations are assessed. The proposed locations of the wash plant and aggregate storage can be seen in the figure below, however, the proposed configuration of the wash plant varies slightly from the figure shown.

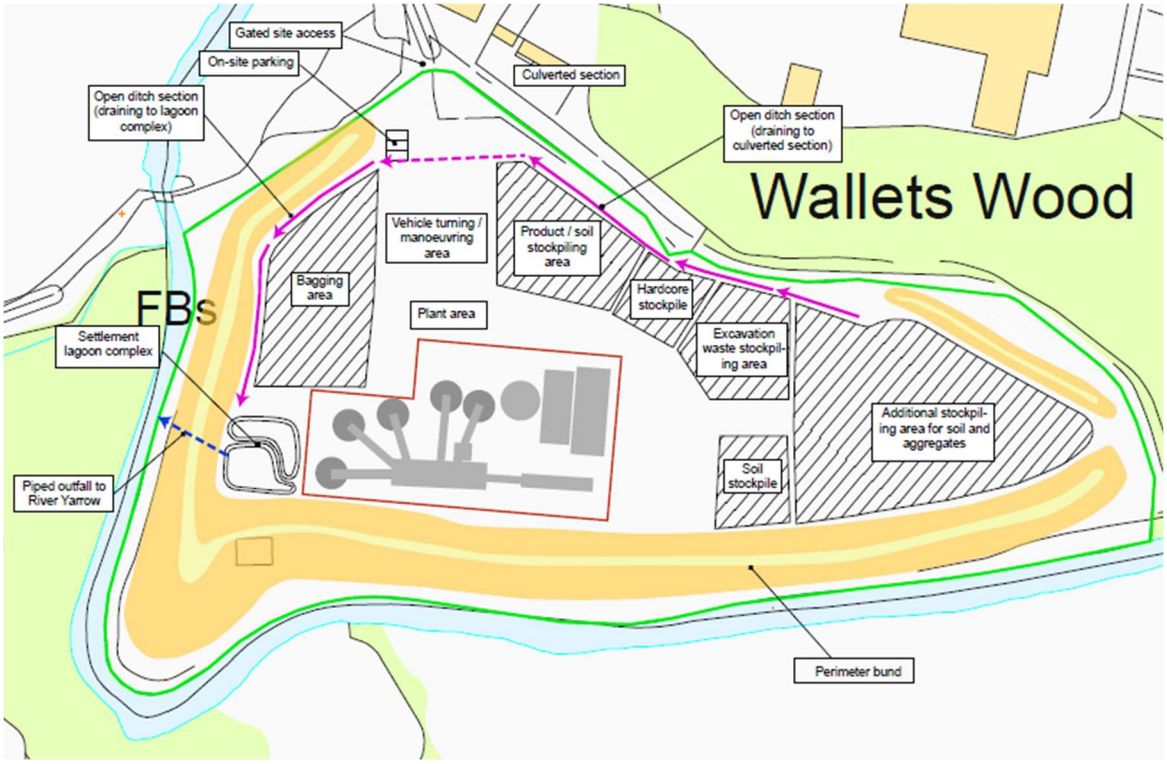


Figure 2.0 – Locations of Site Operations

4.1.1 Specific Sound Level

The main sources of noise associated with the proposed development are as follows:

- 1no. CDE Aggregate Wash Plant
- 1no. Wheeled Loader – Loading the Wash Plant
- 1no. Wheeled Loader – Stockpiling Aggregate Material

Aggregate Wash Plant

The aggregate wash plant is used to wash and separate aggregate material. A picture of an example CDE Global aggregate wash plant unit can be seen in the figure below.

Figure 3.0 – Example Aggregate Wash Plant

Noise measurements of the wash plant were taken by CDE Global in 2013. The average noise emissions for the conveyor belts, Aggmax plant unit, and Evowash system can be seen in the table below. In the absence of specific noise data for the Evowash system, it is assumed that it is a similar noise level to the Aggmax unit. The full measurements taken by CDE Global are shown in Appendix F.

Description	L_p at 1m (dB, $L_{Aeq,t}$)	Calculated L_w (dB)
Conveyer Belt	80.0	91.0
Aggmax Unit	83.0	--
Evowash Unit	83.0	--

Table 5.0 – Wash Plant Noise Levels

Plant Vehicle Operations

To load the wash plant and stockpile the aggregate material, the client has specified 2no. wheeled loader plant vehicles will be used. The sound data for the plant vehicles have been taken from BS5228:2009. The sound power levels, corrected for predicted usage per hour, can be seen in the table below.

Description	L_p at 10m (dB, $L_{Aeq,t}$)	L_p at 1m (dB, $L_{Aeq,t}$)	Calculated L_w (dB)	On-Time (mins/hour)	Corrected L_w (dB)
Wheeled Loader (Loading Hopper)	75.0	95.0	103.0	30	100.0
Wheeled Loader (Stockpiling)	78.0	98.0	106.0	30	103.0
Wheeled Loader (Movement)	76.0	96.0	104.0	30	101.0

Table 6.0 – Plant Vehicle Noise

The positions of the sources can be seen in Appendix F.

The specific sound levels at the NSRs have been calculated using SoundPlan 8.1, which undertakes its calculations in accordance with the guidance given in IS09613 – 1:1993 and ISO9613 – 2:1996.

The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and the receiver is considered to be mostly acoustically 'soft' (0.8).
- The sound levels for the plant vehicles presented above have been inputted into the software.
- The client has specified a 10m tall earth bund has been erected around the new plant units.
- The wash plant has been modelled at heights varying from 0.5m – 9.5m.
- The main body of the Aggmax unit is approximately 4m tall, the main body of the Evowash system is 6m tall.
- The facades of the Aggmax and Evowash units are thought to behave as area noise sources. This is calculated within the SoundPlan software based on the façade noise level assuming $L_w=L_p+10\log(S)$.
- Each section of the wash plant has been modelled as either a line source or an area source depending on its type.
- The noise emissions at 10m have been calibrated to 73 dB as specified by CDE Global.
- It is assumed the Water Tank, Sludge Tank, and Filter Press do not constructively add to the overall noise level.
- The vehicle plant noise emissions have been modelled as line sources at heights of 1.5m.
- The wheeled loader loading material into the hopper is modelled at a height of 6m.
- The grid height of the noise map is set to 1.5m.

The sound map showing the specific sound level emissions from the proposed development during the operational period can be seen in the figure below.

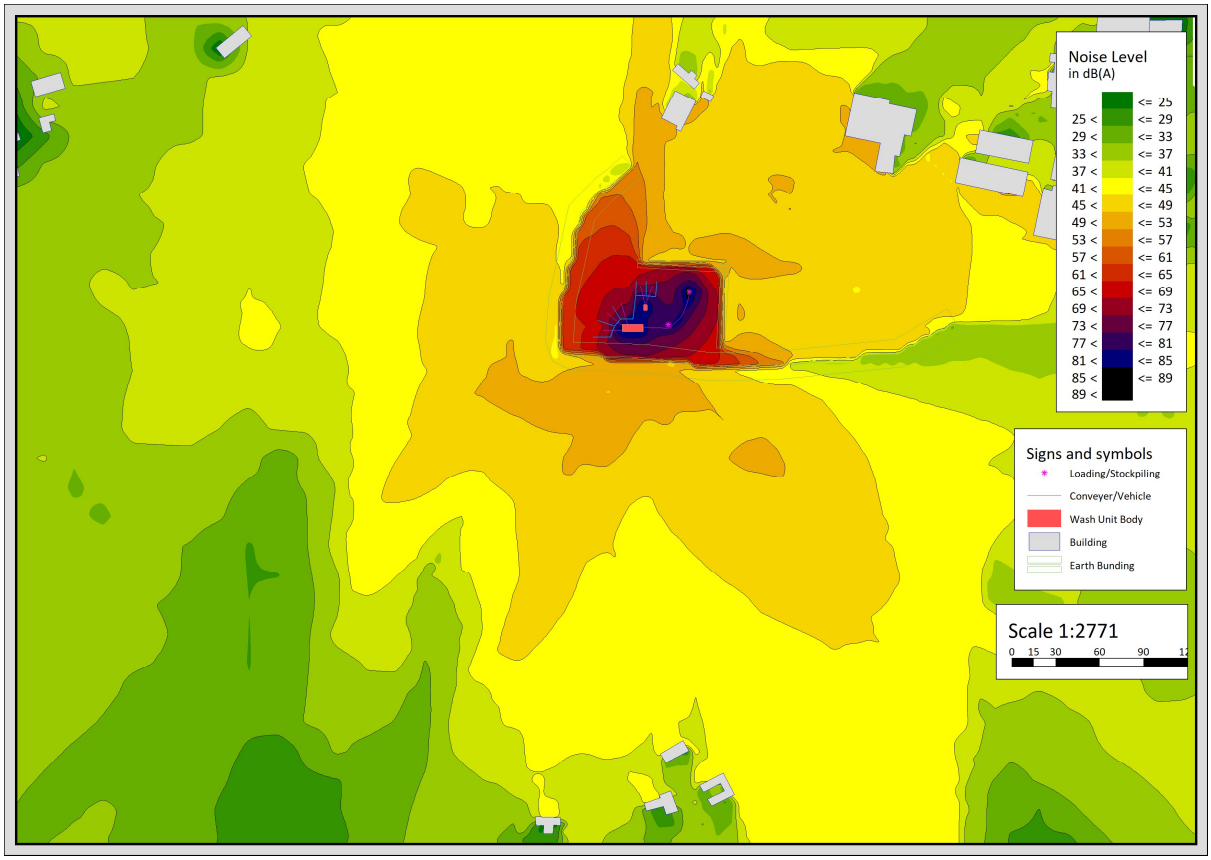


Figure 4.0 – Specific Sound Level Map

A summary of the specific sound levels at the NSRs based on the sound map shown in in the figure above can be seen in the following table.

NSR	Specific Sound Level (dBA)
1	37.0
2	40.0
3	40.0
4	38.0
5 – Closest Unassociated Commercial Office	46.0

Table 7.0 – Specific Sound Level at NSR Summary

4.1.2 Rating Level

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinct against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to 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."

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Time Period	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Day Time	+2	+3	--	--	Impulsive characteristics likely to be perceptible at the NSRs. Possible tonal features of plant and vehicle engines audible at the NSRs.

Table 8.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

NSR	Rating Sound Level (dBA)
1	42.0
2	45.0
3	45.0
4	43.0

Table 9.0 – Summary of Rating Sound Levels

4.1.3 Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in

some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

The table below outlines a summary of the lowest statically most repeated background sound levels of the area measured during the operational period.

Operational Hours ('t')	$L_{A90,t}$	Statistical $L_{A90,t}$	Min. $L_{A90,t}$	Max. $L_{A90,t}$
Day 1 – 24/07/2020 – 10:25 – 18:00	41.0	42.0	37.0	45.0

Table 10.0 – Summary of Background Sound Levels

Discussion:

According to the statistical analysis, the lowest statistically most repeated $L_{A90,t}$ value during the operational period was 42.0 dBA. As can be seen, the range of $L_{A90,t}$ during this period is relatively low, and the statistical value sits towards the middle of the range, thus it is deemed to be 'typical' and will be used in the following assessment.

4.1.4 BS4142 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at the most exposed NSRs. The BS4142:2014 assessment can be seen in the table below.

Results	Noise Level – NSR1 (dB)	Noise Level – NSR2 (dB)	Noise Level – NSR3 (dB)	Noise Level – NSR4 (dB)	Notes
Rating Sound Level	42.0	45.0	45.0	43.0	As shown in Table 9.0
Operational Period Background Sound Level	42.0	42.0	42.0	42.0	As shown in Table 10.0
Exceedance of Rating over Background Sound Level	0.0	+3.0	+3.0	+1.0	Assessment Indicates a Possibility of Low Level of Impact.

Table 11.0 – BS4142:2014 Assessment

Discussion

As can be seen in the assessment above the rating levels at the NSRs exceed the background sound level by up to 3.0 dB during the operational period. This indicates the potential for a low level of impact at the most affected NSRs.

It is important to note that it is stated in BS4142:2014 that when assessing the impact of any noise source it is essential that the context of the assessment and wider area is taken into account. The site is situated in an industrial/commercial area, and as such the local residents will likely have a higher tolerance for this type of industrial noise. Further to this, the site is already operational and as such the installation of the wash plant does not represent the introduction of a new sound source, as it is thought to generate similar noise to that of existing operations. Given this, the proposed

development presents at worst a slight intensification of already existing noise types. Therefore, it can be assumed that the development will cause a low impact.

4.2 Increase in Ambient Noise Level Assessment

To provide further context to the BS4142 assessment above, the expected increase in ambient noise level is also assessed. The specific sound levels associated with the proposed development are logarithmically added to the lowest measured residual sound level at the NSR. The higher the increase in noise level, the higher the impact.

Increase in Ambient Noise Level Assessment	
Description	**Day Time (dB)**
Lowest Measured Ambient Noise Level	53.0
Specific Noise Level	40.0
Resulting Noise Level	53.2
Increase in Noise Level	+0.2
Expected impact	None/Not Significant

Table 12.0 – Increase in Ambient Noise Level Assessment

Discussion

As can be seen in the assessment above the increase in ambient noise level due to the operations at the site is predicted to be approximately 0.2 dB. According to the IEMA 'Guidelines on Noise Impact', this level of increase is 'Not Significant' and again indicates low impact.

NOVA ACOUSTICS

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	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 (s1 / s2). 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 20μPa.
A-weighting, dB(A)	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.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise 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.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Noise Policy Statement for England

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

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. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

IEMA Guidelines on Noise Impact Assessments

The IEMA Guidelines for Environmental Noise Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing several noise indicators such as the LAeq, LAmax and LA90 as a more rigorous approach.

Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis regarding relevant national and local standards.

The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized below:

Effect Descriptors	
Very substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 13.0 – IEMA Guidelines Effect Descriptors

Noise Effect Level		
Time	**Lowest Observed Adverse Effect Level**	**Significant Observed Adverse Effect Level**
07:00 - 23:00	50 dB $L_{Aeq,16\ hour}$	60 dB $L_{Aeq,16\ hour}$
23:00 - 07:00	40 dB $L_{Aeq,8\ hour}$	55 dB $L_{Aeq,8\ hour}$
	60 dB L_{AFMax} (at the facade)	80 dB L_{AFMax} (at the facade)

Table 14.0 – IEMA Guidelines Noise Effect Level

The Guidelines are not prescriptive as to how a noise impact assessment should be carried out, and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

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

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

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

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, and would therefore classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

ISO 9613-2 Attenuation of sound during propagation outdoors

The ISO 1996 series of standards specifies methods for the description of noise outdoors in community environments. Part 2 of ISO 9613 is intended to enable noise levels in the community to be predicted from sources of known sound emission. The method is general in the sense that it may be applied to a wide variety of noise sources, and cover most of the major mechanisms of attenuation.

This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption, ground effect, barriers, and miscellaneous other effects.

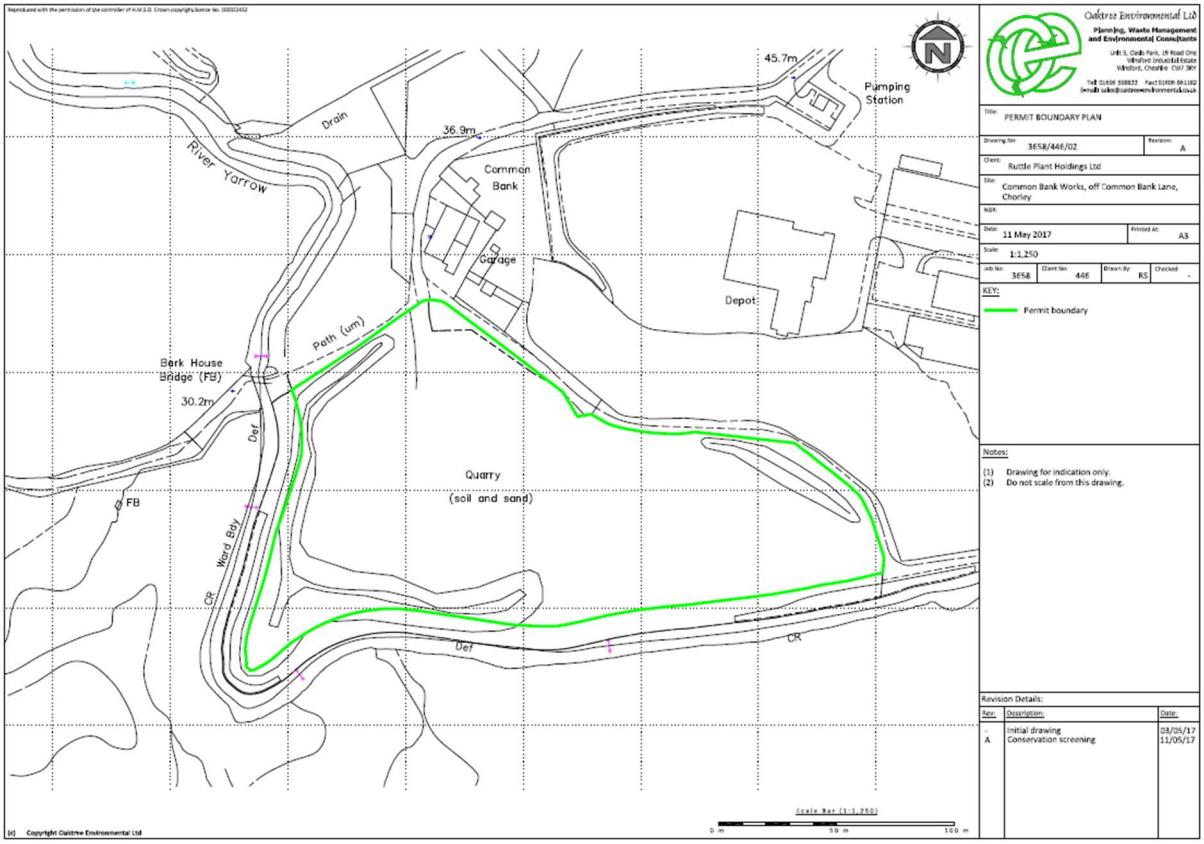
BS EN 12354-4 Building Acoustics

Estimation of acoustic performance of buildings from the performance of elements – Transmission of indoor sound to the outside

This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the relevant elements and openings in the building envelope. These sound power levels, together with those of other sound sources in or in front of the building envelope, form the basis for the calculation of the sound pressure level at a chosen distance from a building as a measure for the acoustic performance of buildings.

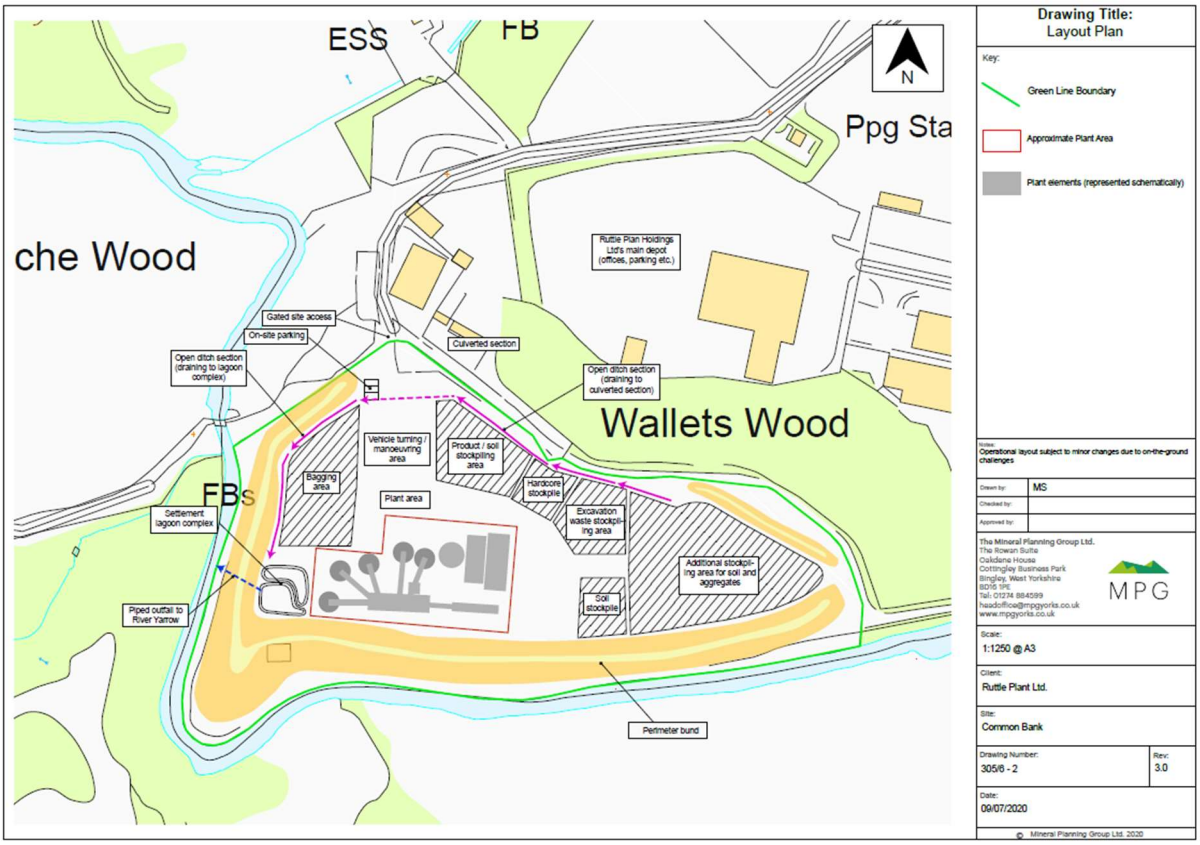
NOVA ACOUSTICS

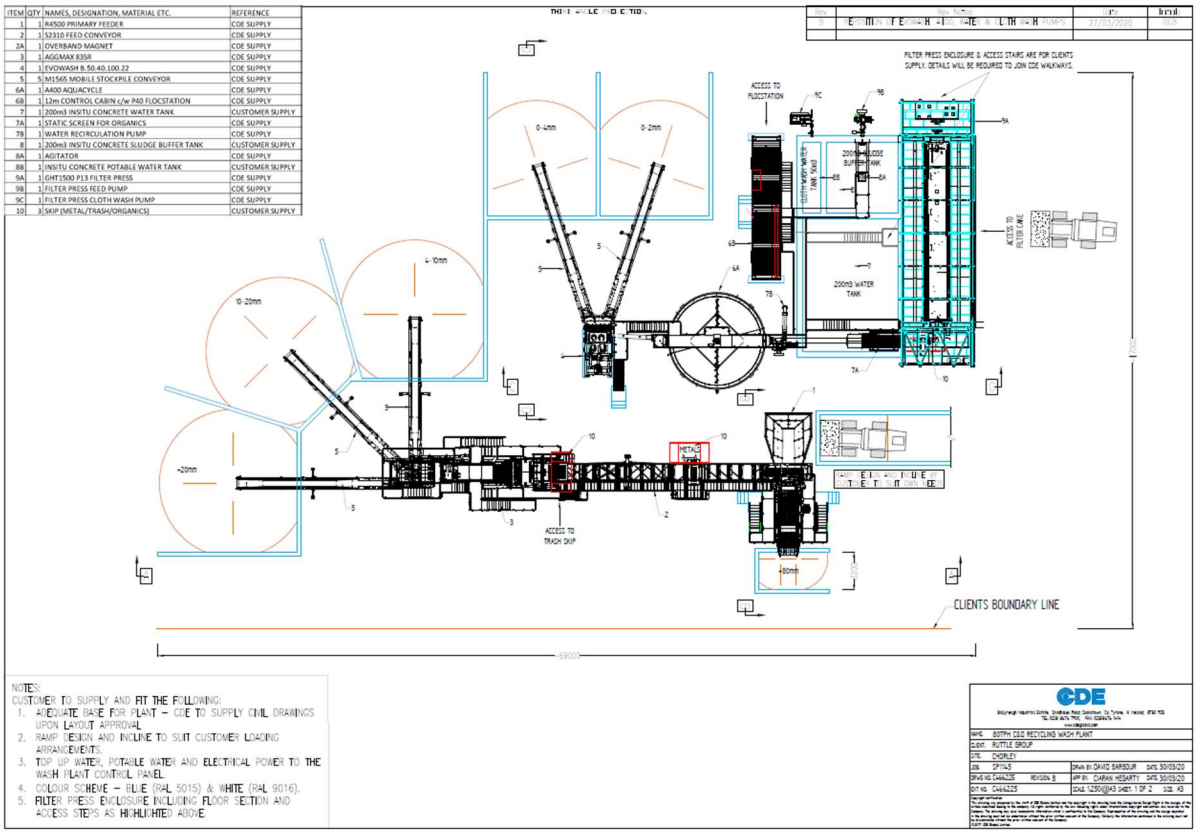
Appendix C – Location Plan



NOVA ACOUSTICS

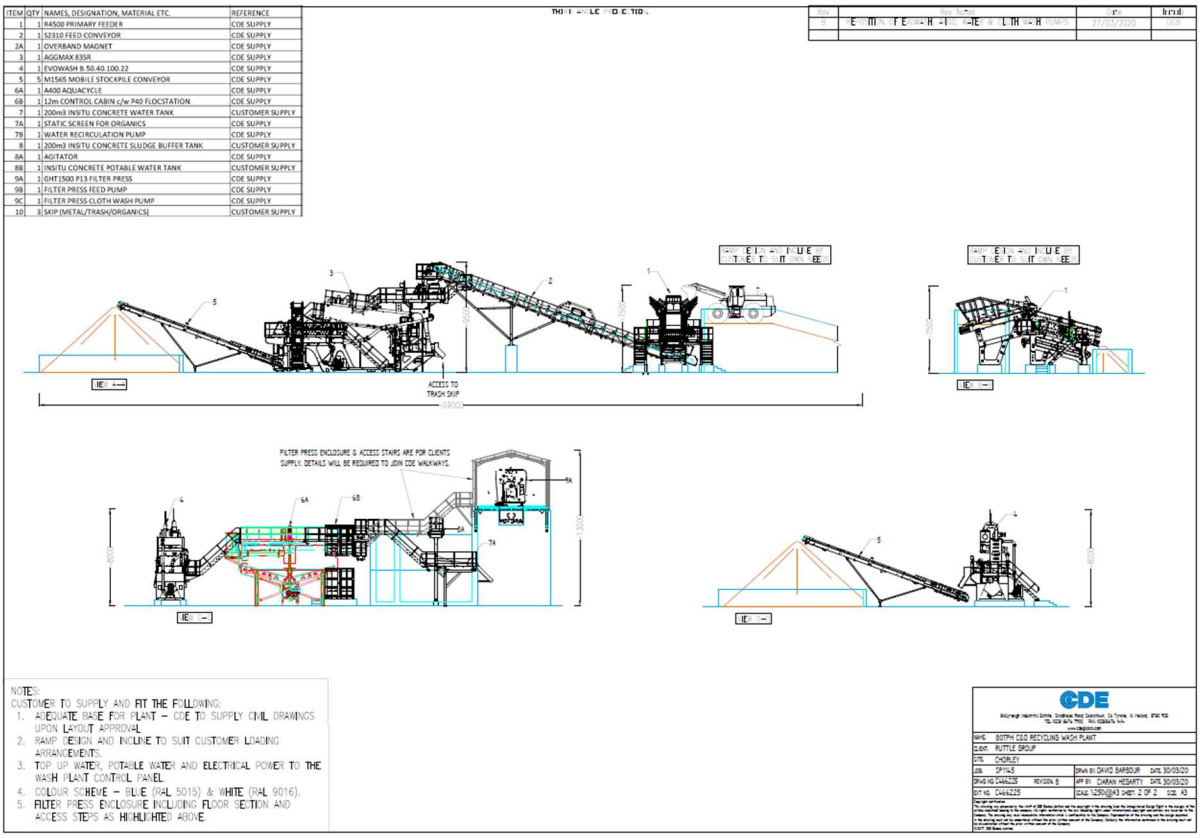
Appendix D – Site Plans





NOVA ACOUSTICS

ITEM	QTY	NAMES, DESIGNATION, MATERIAL ETC.	REFERENCE
1	1	R4500 PRIMARY FEEDER	CDE SUPPLY
2	1	S2310 FEED CONVEYOR	CDE SUPPLY
2A	1	OVERBAND MAGNET	CDE SUPPLY
3	1	AGGMAX 8358	CDE SUPPLY
4	1	EVOWASH B.50.40.100.22	CDE SUPPLY
5	5	M1565 MOBILE STOCKPILE CONVEYOR	CDE SUPPLY
6A	1	A400 AQUACYCLE	CDE SUPPLY
6B	1	12m CONTROL CABIN c/w P40 FLOCSTATION	CDE SUPPLY
7	1	200m3 INSITU CONCRETE WATER TANK	CUSTOMER SUPPLY
7A	1	STATIC SCREEN FOR ORGANICS	CDE SUPPLY
7B	1	WATER RECIRCULATION PUMP	CDE SUPPLY
8	1	200m3 INSITU CONCRETE SLUDGE BUFFER TANK	CUSTOMER SUPPLY
8A	1	AGITATOR	CDE SUPPLY
8B	1	INSITU CONCRETE POTABLE WATER TANK	CUSTOMER SUPPLY
9A	1	GHT1500 P13 FILTER PRESS	CDE SUPPLY
9B	1	FILTER PRESS FEED PUMP	CDE SUPPLY
9C	1	FILTER PRESS CLOTH WASH PUMP	CDE SUPPLY
10	3	SKIP (METAL/TRASH/ORGANICS)	CUSTOMER SUPPLY

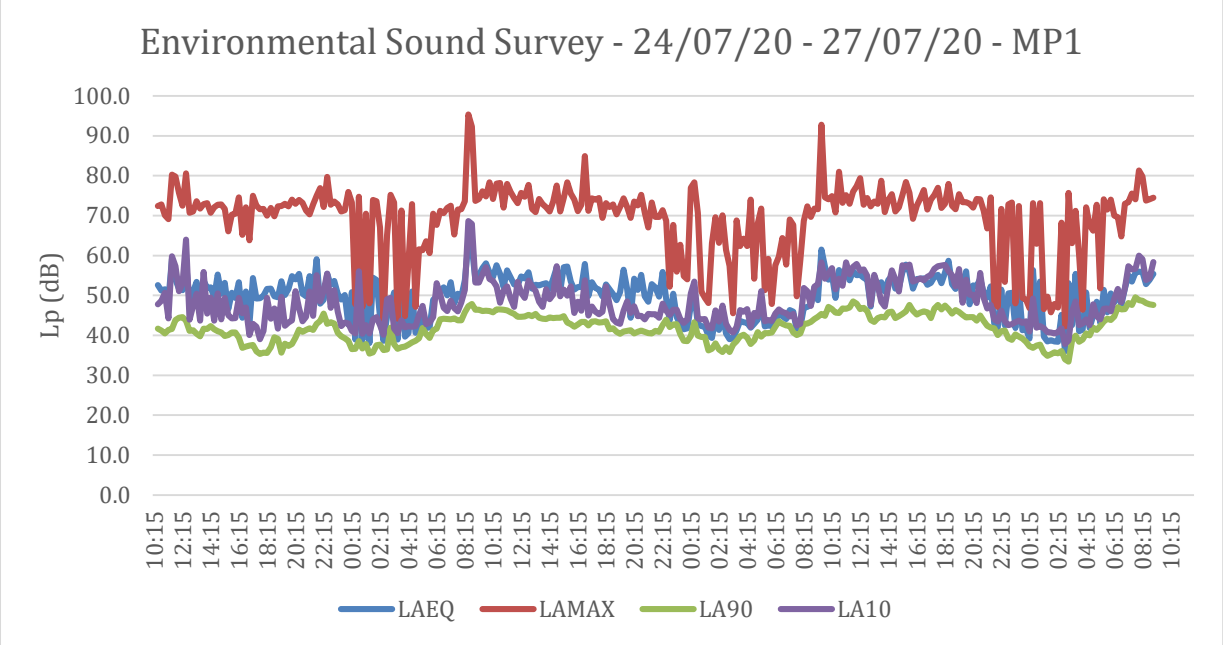


NOTES:
CUSTOMER TO SUPPLY AND FIT THE FOLLOWING:
1. ADEQUATE BASE FOR PLANT – CDE TO SUPPLY CIVIL DRAWINGS UPON LAYOUT APPROVAL.
2. RAMP DESIGN AND INCLINE TO SUIT CUSTOMER LOADING ARRANGEMENTS.
3. TOP UP WATER, POTABLE WATER AND ELECTRICAL POWER TO THE WASH PLANT CONTROL PANEL.
4. COLOUR SCHEME – BLUE (RAL 5015) & WHITE (RAL 9016).
5. FILTER PRESS ENCLOSURE INCLUDING FLOOR SECTION AND ACCESS STEPS AS HIGHLIGHTED ABOVE.

CDE

NAME	BOTTH C&D RECYCLING WASH PLANT
CLIENT	RUTTLE GROUP
SITE	CHORLEY
JOB	CP1145
DRAWING NO	C446225 REVISION B
DIT NO	C446225
DRAWN BY	DAVID BARBOUR DATE 30/03/20
APP BY	CIARAN MEARTY DATE 30/03/20
SCALE	1:250@A3 SHEET 2 OF 2 SIZE A3

Appendix E – Environmental Sound Survey



Appendix F – Manufacturers Data, Calculations and Grid References

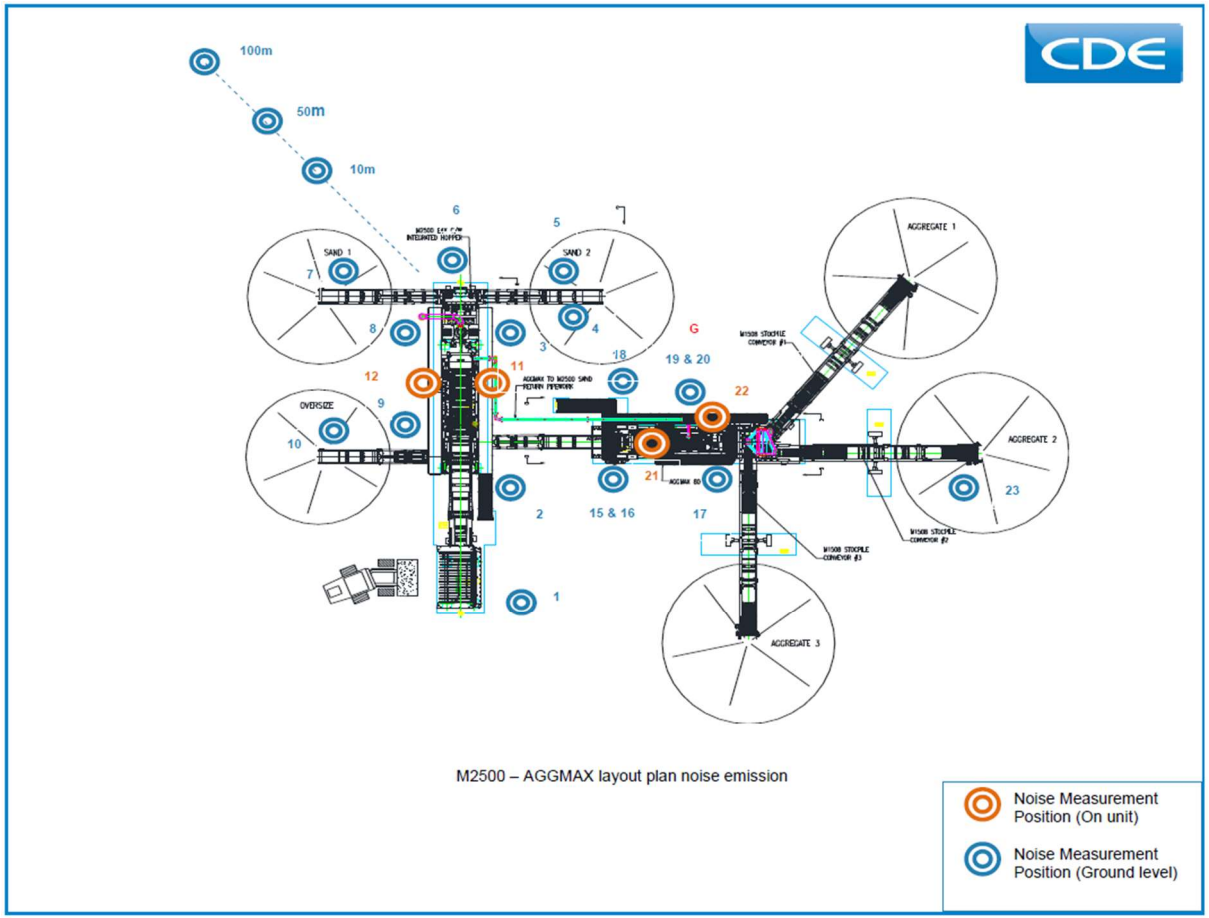


Figure 5.0 – Wash Plant - CDE Global Measurement Locations

Item	Location Number	Position	Distance from Source	Noise Level (dB, $L_{Aeq,t}$)
M2500 E4X	1	Side of Hopper (close to auxiliary hopper)	1m	76.9
M2500 E4X	2	Side Unit	1m	80.6
M2500 E4X	3	Side Unit	1m	81.2
M2500 E4X	4	Conveyor Belt	1m	75.8
M2500 E4X	5	Conveyor Belt	1m	76.6
M2500 E4X	6	End Unit	1m	75.8
M2500 E4X	7	Conveyor Belt	2m	74.6
M2500 E4X	8	Side Unit	1m	84.1
M2500 E4X	9	Side Unit	1m	84.4
M2500 E4X	10	Conveyor Belt	1m	82.3
P2-75	11	On Unit	0.5m	87.1
P2-75	12	On Unit	0.5m	87.7
RX 80	15	Side Unit (non CDE pump operating)	1m	81.9
RX 80	16	Side Unit (without non CDE pump operating)	1m	78.6
RX 80	17	Side Unit	1m	82.4
RX 80	18	Side Unit	1m	82.0

RX 80	19	Side Unit (next to non CDE equipment)	1m	81.8
RX 80	20	Side Unit (next to non CDE equipment)	1m	85.4
RX 80 – Aggregate Screen	21	On Unit	1m	90.8
RX 80 – Aggregate Screen	22	On Unit Side	1m	88.0
M1508	23	Conveyor Belt	1m	81.4

NOVA ACOUSTICS

Calculation area

NAME =Calc Area

_____x_____	_____y_____
355837.33	417569.51
355837.33	417007.83
356717.98	417007.83
356717.98	417569.51

Volume attenuation area

EFF_HEIGHT =10.00
ATTENUATION =0.00
VOLUMETYPE =0
ATTENUATION1 =0.020
ATTENUATION2 =0.020
ATTENUATION3 =0.030
ATTENUATION4 =0.040
ATTENUATION5 =0.050
ATTENUATION6 =0.060
ATTENUATION7 =0.080
ATTENUATION8 =0.090
ATTENUATION9 =0.120
ATTENUATION10 =0.150
MEANTREEDENSITY =0.20
MEANSTEMRADIUS =0.075
BUILDINGAREAFRACTION =0
BUILDINGSURFACEAREA =0.0
HMAX =0.0
AB =0.0
KP =1.25
ALPHA =0.100

_____x_____	_____y_____
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356245.59	417015.97
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356270.44	417049.58
356275.80	417079.78
356283.10	417089.79
356297.41	417079.56
356300.80	417059.35
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356333.49	417015.78
356353.65	417014.85
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356295.53	417176.12
356282.67	417188.72
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Volume attenuation area

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ATTENUATION =0.00
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MEANSTEMRADIUS =0.075
BUILDINGAREAFRACTION =0
BUILDINGSURFACEAREA =0.0
HMAX =0.0
AB =0.0
KP =1.25
ALPHA =0.100

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356640.94	417137.23
356650.60	417165.22
356635.62	417179.79
356612.02	417196.60
356596.95	417202.52
356580.35	417199.09
356550.06	417196.53
356534.17	417192.37
356508.87	417183.99
356488.58	417173.39
356469.13	417172.87
356445.92	417157.98
356432.77	417140.83
356427.95	417162.49
356413.63	417171.29
356373.14	417176.19
356363.97	417176.13
356363.82	417161.00
356388.96	417154.25
356396.80	417146.25
356387.33	417135.54
356377.11	417123.40
356358.29	417114.23
356339.41	417100.73
356324.25	417097.29

Volume attenuation area

EFF_HEIGHT	=10.00
ATTENUATION	=0.00
VOLUMETYPE	=0
ATTENUATION1	=0.020
ATTENUATION2	=0.020
ATTENUATION3	=0.030
ATTENUATION4	=0.040
ATTENUATION5	=0.050
ATTENUATION6	=0.060
ATTENUATION7	=0.080
ATTENUATION8	=0.090
ATTENUATION9	=0.120
ATTENUATION10	=0.150
MEANTREEDENSITY	=0.20
MEANSTEMRADIUS	=0.075
BUILDINGAREAFRACTION	=0
BUILDINGSURFACEAREA	=0.0
HMAX	=0.0
AB	=0.0
KP	=1.25
ALPHA	=0.100

x	y
356368.25	417492.84
356390.30	417520.60
356405.10	417548.43
356402.19	417567.12
356432.26	417567.85
356461.29	417568.58
356491.36	417569.31
356502.71	417565.04
356489.07	417548.60
356477.46	417529.02
356463.83	417513.62
356455.35	417496.08
356443.75	417476.51
356430.06	417455.92
356416.38	417436.37
356407.92	417419.87
356395.54	417426.22
356386.41	417444.97
356386.59	417462.59
356379.52	417480.29
356373.35	417485.53

Volume attenuation area

EFF_HEIGHT	=7.00
ATTENUATION	=0.00
VOLUMETYPE	=2
ATTENUATION1	=0.020
ATTENUATION2	=0.020
ATTENUATION3	=0.030
ATTENUATION4	=0.040
ATTENUATION5	=0.050
ATTENUATION6	=0.060
ATTENUATION7	=0.080
ATTENUATION8	=0.090
ATTENUATION9	=0.120
ATTENUATION10	=0.150
MEANTREEDENSITY	=0.20
MEANSTEMRADIUS	=0.075
BUILDINGAREAFRACTION	=0
BUILDINGSURFACEAREA	=0.0
HMAX	=0.0
AB	=0.0
KP	=1.25
ALPHA	=0.100

x	y
356364.31	417241.63
356371.29	417241.45
356370.62	417220.17
356363.59	417220.15

Ground absorption area

x	y
355825.90	417589.84
355825.90	416993.85
356737.04	416993.85
356737.04	417589.84

Building

HEIGHT	=6.00
REFLOSS	=1.00

x	y	z
356717.75	417562.41	52.58
356729.23	417512.68	52.58
356760.29	417519.83	52.58
356761.13	417516.16	52.58
356746.00	417512.69	52.58
356748.20	417503.17	52.58
356753.78	417504.46	52.58
356756.54	417492.54	52.58
356817.49	417506.60	52.58
356814.57	417519.20	52.58
356863.17	417530.41	52.58
356850.93	417583.21	52.58
356854.75	417584.08	52.58
356853.46	417589.67	52.58
356849.93	417588.86	52.58
356842.83	417619.61	52.58
356812.99	417612.75	52.58
356816.43	417597.81	52.58
356744.16	417581.21	52.58
356746.95	417569.13	52.58

Building

HEIGHT	=6.00
REFLOSS	=1.00

x	y	z
356653.52	417404.82	51.55
356653.86	417409.57	51.55
356659.06	417483.85	51.55
356694.82	417481.35	51.55
356689.28	417402.32	51.55

Building

HEIGHT	=6.00
REFLOSS	=1.00

x	y	z
356649.90	417352.96	51.58
356652.11	417379.70	51.58
356703.17	417375.49	51.58
356700.96	417348.75	51.58

Building

HEIGHT	=6.00
REFLOSS	=1.00

x	y	z
356622.92	417359.06	50.65

x	y	z
356623.76	417370.85	50.65
356620.32	417371.09	50.65
356621.24	417384.05	50.65
356625.11	417383.78	50.65
356625.59	417390.48	50.65
356621.99	417390.74	50.65
356622.40	417396.61	50.65
356651.05	417394.59	50.65
356648.40	417357.26	50.65

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356482.23	417340.20	47.03
356488.47	417369.47	47.03
356513.00	417364.28	47.03
356512.47	417361.81	47.03
356531.14	417357.86	47.03
356527.33	417339.93	47.03
356522.78	417340.90	47.03
356519.60	417325.96	47.03
356516.30	417326.66	47.03
356514.98	417314.87	47.03
356502.71	417315.84	47.03
356506.32	417335.10	47.03

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356571.29	417328.68	48.76
356574.36	417344.09	48.76
356610.69	417336.91	48.76
356607.63	417321.50	48.76

Building

NAME =Building 8
HEIGHT =4.00
REFLOSS =1.00

x	y	z
356603.75	417298.65	47.98
356607.36	417315.56	47.98
356561.09	417325.40	47.98
356557.48	417308.48	47.98

Building

x	y	z
356611.03	417272.39	48.72
356617.73	417304.36	48.72
356623.76	417303.10	48.72
356624.51	417306.70	48.72
356640.16	417303.44	48.72
356645.61	417329.46	48.72
356663.00	417325.84	48.72
356648.42	417256.26	48.72
356630.33	417260.04	48.72
356637.36	417293.58	48.72
356635.05	417294.07	48.72
356629.69	417268.50	48.72

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356622.71	417310.76	50.01
356627.39	417333.61	50.01
356639.90	417331.07	50.01
356635.22	417308.20	50.01

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356689.25	417301.48	51.00
356692.81	417318.82	51.00
356710.96	417315.11	51.00
356707.41	417297.77	51.00

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356679.92	417272.13	50.14
356683.14	417287.43	50.14
356710.37	417281.73	50.14
356707.16	417266.44	50.14

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356692.23	417247.74	48.98
356695.10	417266.35	48.98
356679.26	417268.78	48.98
356676.40	417250.16	48.98

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356366.16	417370.92	35.61
356380.33	417363.74	35.61
356369.81	417343.12	35.61
356366.54	417344.78	35.61
356367.51	417346.68	35.61
356356.62	417352.22	35.61

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356385.37	417370.88	38.35
356383.39	417366.73	38.35
356390.43	417363.38	38.35
356392.41	417367.55	38.35

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356367.90	417389.50	36.95
356364.15	417385.16	36.95
356379.21	417372.22	36.95
356382.82	417376.41	36.95
356379.26	417379.47	36.95
356381.18	417381.69	36.95
356377.20	417385.11	36.95
356375.42	417383.04	36.95

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
356362.60	417467.08	36.22
356372.43	417472.12	36.22
356375.31	417466.51	36.22
356365.48	417461.47	36.22

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
355855.47	417245.54	56.12
355856.36	417238.92	56.12
355853.14	417238.49	56.12
355853.35	417236.92	56.12
355842.95	417235.54	56.12
355842.30	417240.40	56.12
355844.67	417240.71	56.12
355844.23	417244.05	56.12
355846.91	417244.40	56.12
355846.35	417248.63	56.12
355852.11	417249.40	56.12
355852.68	417245.17	56.12

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
355813.24	417209.22	57.28
355812.86	417211.36	57.28
355836.84	417215.56	57.28
355837.83	417209.96	57.28
355813.85	417205.77	57.28
355813.72	417206.49	57.28

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
355813.00	417338.81	54.71
355827.46	417339.11	54.71
355827.66	417329.69	54.71
355813.20	417329.38	54.71

Building

HEIGHT =6.00
REFLOSS =1.00

x	y	z
355833.15	417341.53	54.70
355839.89	417341.67	54.70

```
  355840.05  417334.10       54.70
  355833.31  417333.97       54.70


Building

NAME                    =NSR1
HEIGHT                    =6.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  356052.22  417400.33       39.26
  356070.71  417415.54       39.26
  356076.55  417408.49       39.26
  356058.06  417393.26       39.26


Building

NAME                    =Building 1483
HEIGHT                    =4.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  355925.66  417377.52       51.93
  355945.95  417383.55       51.93
  355949.14  417372.79       51.93
  355928.86  417366.76       51.93


Building

NAME                    =NSR2
HEIGHT                    =6.00
REFLOSS                   =2.00

_____x_____ _____y_____ ___z___
  355933.90  417342.02       51.84
  355931.12  417351.98       51.83
  355941.51  417354.88       51.83
  355942.57  417350.29       51.83
  355938.55  417349.33       51.83
  355939.89  417343.61       51.83


Building

NAME                    =Building 1485
HEIGHT                    =4.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  355898.59  417340.36       53.69
  355906.36  417342.43       53.69
  355908.30  417335.12       53.69
  355900.54  417333.05       53.69


Building

NAME                    =Building 1486
HEIGHT                    =4.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  355908.69  417339.18       53.31
  355917.11  417342.11       53.31
  355918.76  417337.35       53.31
  355910.34  417334.42       53.31


Building

NAME                    =Building 1487
HEIGHT                    =4.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  355883.95  417340.08       54.16
  355889.99  417341.74       54.16
  355892.95  417330.97       54.16
  355886.91  417329.31       54.16


Building

NAME                    =Building 1488
HEIGHT                    =6.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  355908.55  417325.84       52.93
  355914.80  417327.28       52.93
  355918.13  417312.84       52.93
  355911.88  417311.40       52.93


Building

NAME                    =Building 1493
HEIGHT                    =5.00
REFLOSS                   =1.00

_____x_____ _____y_____ ___z___
  356712.79  417419.39       51.05
  356711.78  417400.82       51.05
  356689.83  417401.75       51.05
  356690.36  417419.17       51.05


Industrial building

NAME                    =Plant Body - Aggmax

_____x_____ _____y_____ ___z___
  356330.10  417206.54        0.00
  356344.21  417206.49        0.58
  356344.08  417211.48        0.60
  356329.97  417211.21        0.21


Industrial building

NAME                    =Plant Body - Evowash

_____x_____ _____y_____ ___z___
  356344.66  417220.86        0.00
  356347.04  417220.82        0.04
  356346.86  417224.59       -0.30
  356344.65  417224.67       -0.24


Line source

NAME                    =Conveyer 1

_____x_____ _____y_____ ___z___
  356316.49  417207.45        5.00
  356330.01  417207.46        0.50


Line source

NAME                    =Conveyer 2

_____x_____ _____y_____ ___z___
  356319.55  417219.36        5.00
  356329.85  417210.56        0.50


Line source

NAME                    =Conveyer 3

_____x_____ _____y_____ ___z___
  356329.27  417225.80        5.00
  356333.46  417211.52        0.50


Line source

NAME                    =Conveyer 4

_____x_____ _____y_____ ___z___
  356342.49  417238.04        5.00
  356345.39  417224.99        0.50


Line source

NAME                    =Conveyer 5

_____x_____ _____y_____ ___z___
  356350.50  417237.79        5.00
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  356345.91  417225.03       0.50


Line source

NAME                    =Conveyer 6

_____x_____ _____y_____ ___z___
  356344.87  417209.42       9.00
  356361.54  417208.85       2.00


Line source

NAME                    =Wheeled Loader Movements

_____x_____ _____y_____ ___z___
  356362.03  417209.03       1.50
  356370.06  417216.16       1.50
  356373.74  417224.14       1.50
  356375.78  417230.99       1.50


Noise protection wall

_____x_____ _____y_____ ___z___

REFFLAG                  =  5
WALLHEIGHT                  =2.00
FLOATING                 =  0

  356310.03  417202.92      32.04
  356321.73  417202.93      32.74
  356324.54  417210.31      32.92
  356328.87  417214.94      32.53
  356337.19  417215.12      32.31
  356339.04  417230.82      33.05
  356345.93  417230.75      32.60
  356352.81  417230.29      32.50
  356353.70  417240.81      32.09


Noise protection wall

_____x_____ _____y_____ ___z___

WALLHEIGHT                  =2.00
FLOATING                 =  0
REFFLAG                  =  5

  356313.01  417214.07      31.96
  356324.08  417210.47      32.87


Noise protection wall

_____x_____ _____y_____ ___z___

WALLHEIGHT                  =2.00
FLOATING                 =  0
REFFLAG                  =  5

  356323.51  417223.71      31.50
  356328.56  417215.11      32.42


Noise protection wall

_____x_____ _____y_____ ___z___

WALLHEIGHT                  =2.00
FLOATING                 =  0
REFFLAG                  =  5

  356339.54  417241.08      33.63
  356339.03  417231.18      33.18


Noise protection wall

_____x_____ _____y_____ ___z___

WALLHEIGHT                  =2.00
FLOATING                 =  0
REFFLAG                  =  5

  356346.43  417241.27      32.84
  356346.09  417231.02      32.61


Noise protection berm

_____x_____ _____y_____ ___z___

HEIGHT                   =9.00
SLOPELEFT                   =1.00
SLOPERIGHT                  =1.00
TOPWIDTH                 =1.00

  356343.01  417312.99      32.74
  356334.08  417304.43      32.64
  356324.41  417296.95      31.79
  356310.86  417282.94      31.32
  356305.16  417256.39      31.80
  356298.50  417227.57      31.92
  356296.31  417199.24      32.58
  356325.38  417198.89      32.16
  356348.59  417197.77      32.53
  356389.65  417192.59      31.60
  356435.08  417193.29      32.08
  356516.15  417201.49      31.69

HEIGHT                  =10.00
SLOPELEFT                   =1.00
SLOPERIGHT                  =1.00
TOPWIDTH                 =1.00

  356552.21  417222.18      31.49


Noise protection berm

_____x_____ _____y_____ ___z___

HEIGHT                  =10.00
SLOPELEFT                   =0.25
SLOPERIGHT                  =0.25
TOPWIDTH                 =0.50

  356340.59  417256.00      32.39
  356403.13  417252.52      32.17
  356399.80  417195.29      31.64


Receiver

NAME                    =NSR1
RELHEIGHT1FLOOR                =1.50
FLOORHEIGHT                 =2.50
NUMBERFLOORS                =  2

_____x_____ _____y_____ ___z___
  356073.34  417404.55      39.26


Receiver

NAME                    =NSR2
RELHEIGHT1FLOOR                =1.50
FLOORHEIGHT                 =2.50
NUMBERFLOORS                =  2

_____x_____ _____y_____ ___z___
  355939.81  417342.55       0.17


Receiver

NAME                    =Office
RELHEIGHT1FLOOR                =1.50
FLOORHEIGHT                 =2.50
NUMBERFLOORS                =  1

_____x_____ _____y_____ ___z___
  356562.34  417306.42       1.96


Receiver

NAME                    =Calibration - 10m
RELHEIGHT1FLOOR                =1.50
FLOORHEIGHT                 =2.50
NUMBERFLOORS                =  1
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_____x_____ _____y_____ ___z___
  356337.30  417201.23       1.50


Receiver

NAME                    =Calibration 8, 9, 10
RELHEIGHT1FLOOR                    =1.50
FLOORHEIGHT                =2.50
NUMBERFLOORS                =  1

_____x_____ _____y_____ ___z___
  356328.80  417206.46       1.50


Receiver

NAME                    =Calibration 11, 12
RELHEIGHT1FLOOR                    =1.50
FLOORHEIGHT                =2.50
NUMBERFLOORS                =  1

_____x_____ _____y_____ ___z___
  356332.34  417208.03       4.30


Point source

NAME                    =Wheeled Loader Drop into Hopper

_____x_____ _____y_____ ___z___
  356361.51  417211.35       6.00


Point source

NAME                    =Wheeled Loader Stockpiling

_____x_____ _____y_____ ___z___
  356375.80  417233.44       1.00
```