ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION



# KNOCKHARLEY LANDFILL LTD.

# ENVIRONMENTAL IMPACT ASSESEMNT REPORT (EIAR) FOR THE PROPOSED DEVELOPMENT AT KNOCKHARLEY LANDFILL

## VOLUME 2 – MAIN EIAR

## CHAPTER 9 – NOISE & VIBRATION

## NOVEMBER 2018

Knockharley Landfill Ltd.
Kentstown, Navan,Co.Meath

FEHILY TIMONEY & COMPANY

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# 9 NOISE & VIBRATION

## 9.1 Introduction

This chapter contains the appraisal of potential noise and vibration impacts from the proposed development at Knockharley Landfill, Knockharley, Co. Meath. A description of the proposed development is provided in Chapter 2 – Description of the Proposed Development in Volume 2 of the EIAR. This project description was used to carry out the predictive noise modelling as described in this chapter and to appraise the resultant noise impact.

The operational noise impact appraisal of the proposed development was carried out with reference to the existing Industrial Emissions (IE) licence W146-02 and the *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*, EPA 2016. The construction noise impact appraisal of the proposed development was carried out with reference to *BS 5228-1:2009:A1+2014, Code of practice for noise and vibration control on construction and open sites - Part 1: Noise*.

Vibration relating to the proposed development was appraised by identifying appropriate guidance and evaluation criteria, establishing whether the project has potential to generate vibrational impact from construction activities and from the increase in operational activities and evaluating the resultant impacts.

## 9.2 Potential Noise & Vibration Impacts

### 9.2.1 Summary of the Proposed Development

The existing facility comprises a landfill and ancillary facilities. It is proposed to increase the waste acceptance at the site up to 440,000 tonnes per annum. Further details on the proposed development can be found in Chapter 2 of Volume 2 of this EIAR.



### 9.2.2 Potential Construction Noise Impacts – Direct & Indirect

Noise during the construction phase will arise from the delivery of material to site, site clearance and preparation works, construction of the northern surface water attenuation pond, holding pond, and wetland, construction of IBA cells, construction of buildings, installation of plant, construction of haul roads and service works. The proposed construction will be undertaken in a number of phases but for the purpose of the construction impact assessment a single phase has been modelled.

In practice construction activities may be progressed over a long period if the rate of waste acceptance is lower than the maximum allowable intake. The construction activities and operational activities (discussed in the next section) will occur simultaneously and total noise impact is appraised against noise limit criteria in BS 5228-1:2009+A1:2014.

It is noted that the construction, operation and restoration of the landfill is permitted under the current planning approval and is licensed by the EPA. This application seeks to intensify the existing permitted landfill by increasing the rate of waste acceptance and increasing the height of the landfill. This assessment includes an appraisal of the cumulative noise impact by all activities permitted and proposed.

### 9.2.3 Potential Operational Noise Impacts – Direct & Indirect

Noise during the operational phase will arise from activities during the construction of landfill cells and activities including waste placement. In addition, there is potential for noise to be generated from the IBA weathering area, biological treatment facility, existing landfill gas utilisation plant and site traffic. Traffic movements (notably the HGVs) on the site access road and moving around the site have the potential to generate noise. It is proposed that the facility will operate in accordance with the requirements set out in the existing IE licence W0146-02 (*'Waste shall only be accepted at the facility for disposal at the landfill between the hours of 8.00 to 18.00 Monday to Saturday inclusive' and 'The facility shall only be operated during the hours of 7.30 to 18.30 Monday to Saturday inclusive.'*). The existing landfill gas plant operates continuously as will the biological treatment facility when in use.

### 9.2.4 Potential Vibration Impacts – Direct & Indirect

The potential for vibration at neighbouring sensitive locations during construction and operation is typically limited to excavation works and HGV movements on uneven road surfaces. Considering the distances from the majority of works to the nearest sensitive locations, it is expected that vibration arising from operational and construction activities will not be perceptible at nearby sensitive locations, and any vibration arising from such activities will be significantly below any thresholds for structural damage to property.

## 9.3 Methodology

The methodology adopted for this noise assessment is as follows:

- Review of appropriate guidance, review of IE licence and specification of suitable construction and operational noise criteria;
- Review of historical noise monitoring data;
- Characterisation of the proposed development;
- Prediction of the noise impact associated with the construction and operation of the existing and proposed development, and;
- Evaluation of noise impacts.

### 9.3.1 Relevant Guidance

A list of relevant guidance documents is provided below.



**Noise Standards and Technical Advice:**

- International Standard ISO 9613-2:1996, Attenuation of sound during propagation outdoors, Part 2: General method of calculation[1]
- British Standard BS 4142:2014, Methods for rating and assessing industrial and commercial sound
- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), Environmental Protection Agency, January 2016
- Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector – Waste Transfer and Materials Recovery, Environmental Protection Agency, December 2011
- Calculation of Road Traffic Noise (CRTN), Department of Transport Welsh Office, HMSO 1988
- Highways Agency, Design Manual for Roads and Bridges HD213/11, Volume 11, Section 3, Part 7, Revision 1
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004, Transport Infrastructure Ireland
- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014, Transport Infrastructure Ireland
- County Meath Noise Action Plan 2013, Summary Document

The EPA draft guidance documents 2015 and 2017 relating to the preparation of EIAR have been considered in the preparation of this EIAR.

- Guidelines on Information to be contained in Environmental Impact Assessment Reports, Draft EPA, 2017
- Advice Noes for Preparing Environmental Impact Statements, Draft, EPA, 2015

[1] Prediction modelling recommended in Management Techniques of Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector – Waste Transfer and Materials Recovery, EPA 2011

### 9.3.2 Study Area

The landfill is located in Knockharley, Navan, Co. Meath and is located on a 135.2 hectare site. The existing landfill footprint is positioned near the centre of the landholding. It is located in the townland of Knockharley, approximately 10 km east of Navan Town.

The site is currently operating as a landfill. The current planning permission permits the development of approximately 25 ha of landfill cells. The landfill is being developed in seven phases. To date, four phases of the seven planned cell phases have been fully constructed. Landfilling activities are currently taking place in Phase 4. Phase 5 is under construction.

An aerial view of the site is presented in Figure 1.2 in Chapter 1 Introduction of this EIAR. The location of the existing noise monitoring locations in accordance with the licence is provided in Table 9.1 and are shown on Drawing No. LW14-821-01-P-0050-001 Existing Environmental Monitoring Locations in Volume 4 of this EIAR.

**Table 9.1: Boundary Noise Monitoring Locations**

| Monitoring Location | Easting | Northing | Description |
|---|---|---|---|
| N1 | 297290 | 267999 | Situated at the northern boundary of the site, adjacent to a minor road and a number of residences. |
| N2 | 297901 | 267565 | Situated to the east of the site, north of the site access road, adjacent to a minor road at the rear of a residence. |
| N3 | 297858 | 267207 | Situated to the east of the site, south of the site access road, to the rear of two residences. |
| N4 | 296921 | 267882 | Situated on the northern boundary of the site, adjacent to a minor road and a number of residences. |



The closest inhabited residential dwellings are located to the northern and eastern site boundaries. For the purpose of the impact assessment, 72 no. receptors were modelled, and these are identified in Figure 9.1. The co-ordinates and Figure 9.1 are presented in Appendix 9.1.

## 9.4 Evaluation Criteria

### 9.4.1 Construction Noise Criteria

There is no statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. In the absence of specific noise limits, appropriate emission criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise.

BS 5228-1:2009+A1:2014 contains a number of methods for the assessment of the significance of noise effects. The *ABC Method* from BS 5228-1:2009+A1:2014 is used to derive appropriate noise limits for the proposed development. The threshold limits as defined in Table 9.2 based on existing ambient levels, which if exceeded, indicate a significant effect.

**Table 9.2: Example Threshold of Significant Effect at Dwellings**

| Assessment category and threshold value period ($L_{Aeq}$) | Threshold Value, in decibels (dB) | | |
|---|---|---|---|
| | Category A [A)] | Category B [B)] | Category C [C)] |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |
| Evenings and weekends [D)] | 55 | 60 | 65 |
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00) | 65 | 70 | 75 |

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.



For the appropriate period (e.g. daytime) the ambient noise level is determined and rounded to the nearest 5dB. The noise environment at noise monitoring location N2 is similar to noise environment at the closest residential dwelling and the ambient noise levels measured at noise monitoring location N2 are used to determine the appropriate construction noise limit for the proposed development.

The ambient (free-field) noise level at noise monitoring location N2 ranged between 51 and 58 dB $L_{Aeq}$ (See Section 9.5 for further details on historic noise levels). A correction of +3dB was added to the noise levels to convert free-field noise levels to façade noise levels. The ambient façade noise level when rounded to the nearest 5dB is a maximum of 60 dB $L_{Aeq}$. The nearest residential dwellings to the proposed development are afforded Category A designation (65 dB $L_{Aeq,1hr}$ during daytime periods).

Section 9.6.1 provides the detailed appraisal of construction activity in relation to this site. If the modelled total noise level (including construction noise and operational noise) exceeds the appropriate category value (e.g. 65 dB $L_{Aeq,1hr}$ during daytime periods) then a potential significant effect is predicted.

## 9.4.2 Operational Noise Criteria

### Existing Industrial Emissions Licence Compliance

Schedules C.1, D.1 and D.4 of the Industrial Emissions (IE) licence includes noise limits, noise emission criteria and monitoring requirements. The details of these schedules are reproduced in Table 9.3, Table 9.4 and Table 9.5.

Noise monitoring is undertaken during daytime periods only as landfilling activities do not occur during night-time periods.

### Table 9.3: IE Licence (W0146-02) Noise Emission Limits (Table C.1 –Licence)

| Daytime dB(A) $L_{Aeq}$ (30 minutes) | Night-time dB(A) $L_{Aeq}$ (30 minutes) |
|---|---|
| 55 | 45 |

### Table 9.4: Noise Monitoring Frequency and Technique (Table D.4.1)

| Parameter | Monitoring Frequency | Analysis Method/Technique |
|---|---|---|
| $L(A)_{EQ}$ [30 minutes] | Quarterly | Standard[Note1] |
| $L(A)_{EQ}$ [30 minutes] | Quarterly | Standard[Note1] |
| $L(A)_{EQ}$ [30 minutes] | Quarterly | Standard[Note1] |
| Frequency Analysis (1/3 Octave band analysis) | Quarterly | Standard[Note1] |

Note 1: "Internal Standards Organisation ISO 1996: Acoustics – Description and Measurement of Environmental noise. Parts 1, 2 and 3.



If planning permission is granted for the proposed development, an updated licence will be required. In line with NG4, a new evening period (19:00 to 23:00) will form part of the updated licence. A summary of the expected revised operational noise limits and their associated periods are presented in Table 9.5.

### Table 9.5: Expected Operational Noise Emission Limits

| Period | Noise Limit |
|---|---|
| Daytime (07:00 to 19:00 Hrs) | 55 dB(A) $L_{Ar,T}$ |
| Evening-time (19:00 to 23:00 Hrs) | 50 dB(A) $L_{Ar,T}$ |
| Night-time (23:00 to 07:00 Hrs) | 45 dB(A) $L_{Aeq,T}$ |

### Traffic Noise Criteria

There is no existing legislation that limits environmental noise levels from traffic to a particular value. The County Meath Noise Action Plan 2013 – Summary Document identifies the N2 National Primary route as eligible for noise mapping as part of the Environmental Noise Regulations (Statutory Instrument No. 140 of 2006). The noise action plan includes a set of guideline values are proposed as onset limits for the prioritisation of noise management relating to road traffic noise. Onset levels for noise mitigation measures are 70 dB(A) $L_{den}$ and 57 dB(A) $L_{night}$ and the onset levels for measures to preserve the existing noise situation as 55dB(A) $L_{den}$ and 45dB(A) $L_{night}$.

The proposed development at Knockharley Landfill has potential to result in increased traffic to and from the landfill. The increase the traffic as a result of the proposed development has potential to impact on residences and it is important to assess any potential impact. Traffic noise impact is assessed with respect to the Highways Agency in the UK who published the Design manual for roads and bridges HD 213/11 Volume 11, Section 3, Part 7 Revision 1 – Noise and vibration. The Highways Agency's document presents details on the classification of magnitude of noise impacts in the short term (e.g. when a project is opened) and long term (typically 15 years after project opening). A change in road traffic noise of 1 dB in the short term is the smallest that is considered perceptible. In the long term, a 3 dB change us considered perceptible. The significance that can be attached to changes in noise levels (perceptible to human beings) applies to traffic noise is shown in Table 9.6 overleaf. However, the changes are subjective and will vary among individuals.

**Table 9.6: Classification of Magnitude of Noise Impacts in the Long Term (Highways Agency, UK)**

| Magnitude of Impact | Noise Change, $L_{A10\ (18\ hour)}$ | |
|---|---|---|
| | Short Term | Long Term |
| No Change | 0 | 0 |
| Negligible | 0.1 – 0.9 | 0.1 – 2.9 |
| Minor | 1 – 2.9 | 3 – 4.9 |
| Moderate | 3 – 4.9 | 5 – 9.9 |
| Major | 5+ | 10+ |



### 9.4.3 Scoping and Consultation Requirements

Requirements from the scoping and consultation process are presented in Chapter 5. A summary of noise appraisal requirements from the HSE, TII and the public consultation event are outlined below.

The Health Service Executive had the following comments:

- Baseline noise monitoring and noise assessment modelling to assess the impact of noise from the construction and operational phases should be carried out, with results displayed in the EIS, as well as analysis on their significance and potential cumulative effects.
- Mitigation measures should be outlined.

A noise impact assessment for the proposed operation and construction phases is detailed later in this section. As part of the IE Licence (W0146-02), quarterly noise monitoring is required and historic noise levels from 2015 to 2018 have been used to outline the baseline noise environment. A summary of the historic noise measurements is presented in Section 9.5.

Transport Infrastructure Ireland had the following comments:

The developer should have regard, *inter alia*, to the following:

- The EIAR should consider the Environmental Noise 2006 Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (1st Rev, National Roads Authority, 2004))

The noise impact assessment considers the noise impact from traffic generated by the proposed development. This aspect is assessed in Section 9.6.3.

*Consultation with the Public*

A public information event was held on Monday 14th November 2016 at Knockharley Landfill. The public raised the issue of potential noise impact. The proposed development recognises the concerns of neighbours and has proposed mitigation measures to reduce any potential noise impact from the proposed development.

## 9.5 Receiving Environment

### 9.5.1 Historical Noise levels

The noise sources around the site are typically rural with more noticeable traffic noise from the N2 National Primary route to the east of the site. Historical noise monitoring results indicate an occasional noise from overhead aircraft.

Quarterly noise monitoring is ongoing in accordance with the IE licence and it is undertaken at four boundary locations shown in Table 9.1 and on Drawing No. LW14-821-01-P-0050-001 Existing Environmental Monitoring Locations in Volume 4 of this EIAR.

The historical monitoring data is presented in Table 9.7. Monitoring locations N1 and N4 are located on the road running parallel to the northern boundary. The noise sources in this area are traffic audible from the N2 National Primary route and local traffic, occasional overhead aircraft and rural background sources such as birdsong. Site noise is typically not audible at these locations.

Monitoring location N2 is located along the eastern boundary of the site. The main noise sources audible at this location are traffic from the N2 National Primary route, local traffic and rural noise sources as before. Site noise is occasionally audible, typically truck movements on the access road and reversing sirens.

Monitoring location N3 is also located on the eastern boundary south of monitoring location N2. Similar noise sources to those recorded at monitoring locations N1 and N4 are audible at monitoring location N3. Site noise is also audible at this location.

In the period 2015 to Q3 2018, there have been no exceedances of the daytime noise limit at the facility.

## Table 9.7: Historical Daytime Noise Levels Reported for Licence Compliance

| Year | Site Boundary Locations | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N1 | | | | N2 | | | |
| | Northern boundary of site | | | | Eastern boundary of site | | | |
| | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ | Specific $L_{Aeq}$* | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ | Specific $L_{Aeq}$* |
| 2015 Q1 | 46 | 41 | 33 | <33 | 57 | 47 | 39 | <39 |
| 2015 Q2 | 53 | 51 | 36 | <<36 | 51 | 49 | 38 | <<38 |
| 2015 Q3 | 50 | 45 | 37 | <<37 | 57 | 51 | 42 | <42 |
| 2015 Q4 | 55 | 50 | 43 | <43 | 58 | 55 | 47 | <47 |
| 2016 Q1 | 53 | 49 | 40 | 40 | 55 | 51 | 43 | 43 |
| 2016 Q2 | 53 | 51 | 41 | 41 | 55 | 53 | 46 | 46 |
| 2016 Q3 | 49 | 47 | 39 | <39 | 53 | 49 | 44 | <44 |
| 2016 Q4 | 52 | 48 | 38 | <39 | 54 | 53 | 45 | <45 |
| 2017 Q1 | 55 | 49 | 39 | 39 | 57 | 55 | 44 | <44 |
| 2017 Q2 | 56 | 54 | 39 | <39 | 52 | 54 | 48 | 47 |
| 2017 Q3 | 47 | 42 | 36 | <36 | 53 | 47 | 38 | <38 |
| 2017 Q4 | 51 | 49 | 38 | <38 | 55 | 45 | 36 | <55 |
| 2018 Q1 | 54 | 49 | 41 | 39 | 58 | 54 | 46 | 45 |
| 2018 Q2 | 53 | 54 | 45 | <45 | 56 | 54 | 47 | 26 |
| 2018 Q3 | 51 | 45 | 36 | <36 | 54 | 49 | 40 | <40 |

| Year | N3 | | | | N4 | | | |
|---|---|---|---|---|---|---|---|---|
| | Eastern boundary of site | | | | Northern boundary of site | | | |
| | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ | Specific $L_{Aeq}$* | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ | Specific $L_{Aeq}$* |
| 2015 Q1 | 42 | 44 | 38 | 38 | 49 | 42 | 30 | <30 |
| 2015 Q2 | 45 | 48 | 40 | <32 | 45 | 48 | 34 | <<34 |
| 2015 Q3 | 43 | 43 | 33 | 33 | 49 | 47 | 36 | <<36 |
| 2015 Q4 | 48 | 50 | 45 | <<45 | 55 | 49 | 42 | <42 |
| 2016 Q1 | 48 | 42 | 33 | 33 | 48 | 42 | 33 | 33 |
| 2016 Q2 | 48 | 50 | 45 | 45 | 50 | 48 | 37 | 35 |
| 2016 Q3 | 45 | 47 | 43 | <43 | 52 | 47 | 36 | <36 |
| 2016 Q4 | 50 | 52 | 47 | <47 | 54 | 46 | 39 | <39 |
| 2017 Q1 | 48 | 50 | 38 | 38 | 53 | 48 | 34 | 38 |
| 2017 Q2 | 50 | 52 | 46 | 50 | 50 | 48 | 38 | <38 |
| 2017 Q3 | 46 | 49 | 41 | <41 | 47 | 44 | 35 | <35 |
| 2017 Q4 | 48 | 50 | 45 | 45 | 48 | 43 | 32 | <32 |
| 2018 Q1 | 45 | 47 | 43 | 45 | 51 | 48 | 41 | 42 |
| 2018 Q2 | 50 | 52 | 46 | <46 | 53 | 49 | 43 | <43 |
| 2018 Q3 | 45 | 47 | 42 | <42 | 48 | 44 | 34 | <34 |

Note 1: * - '*Specific $L_{Aeq}$: Level considered attributed to source under consideration, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra and near field correction if applicable.*' Extract from '*2015 Q1 environmental noise survey at Knockharley Landfill Ltd., Navan, Co. Meath – Waste licence W0146-02 dba report 012.1.1', Damian Brosnan Acoustics*

### 9.5.2 History of Noise Compliance, Non-Compliances and Complaints

All non-compliances or complaints are reported to the EPA. The following describes the summary of noise compliance, non-compliances or complaints for the period 2015 to 2018:

- **2015:** The boundary noise levels measured were compliant with the daytime noise limit and no noise complaints were received during 2015.
- **2016:** The boundary noise levels measured were compliant with the daytime noise limit. During 2016 there were 8 noise related complaints from 6 separate households. All complaints were investigated and closed off on EDEN (the EPA web-portal for licensee reporting).
- **2017:** The boundary noise levels measured were compliant with the daytime noise limit. During 2017 there were 14 noise/vibration related complaints. The complaints originated from two households. All complaints were investigated and closed off on EDEN.
- **2018:** At time this chapter was prepared, boundary noise levels for Q3 2018 were available and the boundary noise levels measured were compliant with the daytime noise limit. As of the 12th November 2018 there were four noise/vibration related complaints. The complaints originated from three households and two of the households who made complaints also made complaints in 2017. All complaints were investigated and closed off on EDEN.

## 9.6 Summary of Potential Impacts

The potential impacts during the construction and operational phase are discussed in following sections. Noise sensitive locations within 500m of the development boundary were appraised. If the noise limits can be met at noise sensitive locations within 500m of the proposed development, compliance at more distant (i.e. greater than 500m) noise sensitive locations can be inferred. Figure 9.1 presents the locations of the nearest noise sensitive locations and details on the co-ordinates of the noise sensitive locations and both are presented in Appendix 9.1.



### 9.6.1 Potential Impacts during Construction Phase

The predicted construction noise levels at the nearest noise sensitive locations were calculated using data sourced from BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 Noise. The standard sets out sound power levels and $L_{Aeq}$ noise levels of plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations.

For the purpose of this assessment, it has been conservatively assumed that mobile plant will be operating simultaneously and for a percentage on-time[2] of 80%, except for the tipper trucks tipping material where a percentage on-time of 20% is modelled due to short duration of this activity. The reality is that some of the plant will only operate intermittently. The ground cover between the facility and noise sensitive locations is acoustically soft ground (G=1). However, a conservative ground cover of G=0.75 was used in the construction noise model. Roads, hardstands and other acoustically hard or reflective surfaces were modelled with a ground cover of G=0. For each construction activity, the location of mobile plant was selected such that the distance between the mobile plant and the nearest receptor was at a minimum. The parameters outlined above are conservative making the noise modelling assessment a conservative exercise.

Construction activities were assessed against noise limit criteria in BS 5228-1:2009+A1:2014[3]. The construction work will be confined to 07:30 to 18:30 Monday to Saturday unless otherwise approved by the relevant regulatory authorities.

To evaluate the noise during the construction phase of the development, it is necessary to define the various activities that will be undertaken. It is proposed to develop the facility in 4 construction phases as outlined in Chapter 2 Details of the Proposed Development in Volume 2 of this EIAR.

[2] Percentage on-time - percentage of the assessment period for which the activity takes place.

[3] Predicted construction noise levels are façade noise levels as per BS5228-1:2009+A1:2014. Façade noise levels include reflection from the building façade. Façade noise level = Free-field noise level + 3dB

However, for noise modelling, a worst-case construction scenario was selected. Details of the construction activities and phasing are as follows:

- Construction of IBA Cells 29 & ½ of 32
- Construction of IBA Facility Building
- Construction of Substations
- Construction of Biological Treatment Plant
- Construction of Leachate Management Facility
- Construction of Leachate Lagoon
- Construction of Surface Water Attenuation Pond, Holding Pond and Wetland

In addition to on-site construction works, the construction of some elements of the proposed development will lead to construction related traffic (HGV and LGV) on the existing public road network over the duration of the construction works. Further details on traffic appraisal can be found in Chapter 8 Roads, Traffic and Transportation in Volume 2 of this EIAR.

The construction activities and waste management activities will occur simultaneously, and the cumulative noise impact from the construction activities and the ongoing operations at Knockharley landfill are appraised against noise limits from BS 5228-1:2009+A1:2014.



## Site Traffic

To assess the impact of the additional construction related traffic on the existing road network, it is first required to estimate the amount of construction traffic that will be generated (trip generation) because of the project. Detailed information on construction traffic is presented in Chapter 8 Roads, Traffic and Transportation of Volume 2 of this EIAR. To summarise, additional light goods vehicles travelling to and from the site during the construction phase would be expected to peak during the morning (arrival of contractors at the site) and evening (departure of contractors from the site) and will not be a continuous source of noise emissions from the site during a typical working day. The impact from construction personnel movements to and from the site is expected to be low.

Construction related traffic will vary throughout the works depending on the nature of works being undertaken in a given week. For the noise appraisal, a worst case busiest period has been assumed. Construction traffic movements are expected to peak at 25 trips per day (i.e. delivery of construction materials). This is based on figures presented in Chapter 8 Roads, Traffic and Transportation of Volume 2 of this EIAR and represent the upper value of HGV generation. The additional traffic on the N2 National Primary Route will result in a negligible increase in noise levels at noise sensitive locations. Furthermore, the noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to operational hours 07:30 to 18:30 and exclude Sundays in line with the existing IE licence W0146-02, unless specifically agreed otherwise.

## Construction of IBA Cells

It is proposed to develop five dedicated IBA cells (no. 29 through no. 33) for the acceptance and placement of IBA material only. Construction of Cell 29 and ½ Cell 32 will form part of the construction works, the remaining cells will form part of the operational works. Construction of new cells will require overburden to be stripped from each of the cells using tracked excavators and dozers. Some of the overburden material will need to be screened and it is proposed that a mobile screening unit is located within the cell footprint. There is also a requirement to roll and compact the cell floor and a vibratory roller will be used. There will also be a requirement to import stone for the drainage layer and a water bowser may be used intermittently to suppress dust.

Material to be used for the construction of screening berms will be loaded into articulated dump trucks and transported to the berm location (construction of screening berms is discussed below). Table 9.8 presents the assumed plant required for cell construction.

## Table 9.8: Cell Construction – Assumed Plant and Predicted Noise Levels

| Plant | BS 5228 Ref. | Activity |
|---|---|---|
| Tracked excavator (x4) | C.8.12 | Cell Excavation and loading of material |
| Articulated dump truck * (x2) | C.8.16 | Distribution of material (IBA Cells four two-way trips per hour) |
| Dozer (x2) | C.8.17 | Cell excavation and distribution of material |
| Conveyor drive unit | C10.20 | Conveyor for screener |
| Water bowser (discharging) | C.6.37 | Spraying water |
| Screen Stockpiler | C.10.15 | Screening material |
| Lorry* | C11.9 | Delivery of Material (Two two-way trips per hour) |
| Articulated dump truck (tipping fill) | C.2.32 | Tipping fill at cell |
| Vibratory roller * | C.5.21 | Rolling and compaction |
| * Drive-by maximum sound pressure level in $L_{max}$ (octave bands) and $L_{Amax}$ (overall level) | | |

The nearest occupied dwelling is approximately 190 m from the cell 29. The predicted noise levels are below the construction noise limit of 65 dB $L_{Aeq,1hr}$ with the cumulative noise levels of all activities of 62 dB $L_{Aeq,1hr}$.



### Construction of Buildings

The construction of a number of buildings will occur during the construction phase of the proposed development. These include the IBA Facility building, biological treatment facility and two substations. It is expected that the works will be progressed on a phased basis and plant will move around the site. The construction works will be progressed in a number of phases:

- Site clearance
- Preparation and pouring of foundations and floor areas
- Preparation of subbases, hardstanding areas and pouring of concrete
- Erection of steel work

For the purpose of this assessment, the noise sensitive locations nearest to each of the buildings are assessed. Table 9.9 presents the assumed plant required for the different construction phases of the proposed buildings to be constructed on site.

## Table 9.9: Construction of Buildings – Assumed Plant

| Phase | Plant | BS 5228 Ref. | Activity |
|---|---|---|---|
| Site Preparation | Tracked excavator (22t) | C2.3 | Clearing Site |
| | Articulated Dump Truck * | C2.33 | Delivery and removal of material (7 two-way trips per hour) |
| | Dozer (20t) | C2.12 | Ground excavation/ earthworks |
| | Tracked Excavator (25t) | C2.19 | Ground excavation/ earthworks |

| Phase | Plant | BS 5228 Ref. | Activity |
|---|---|---|---|
| Preparation and pouring of Foundations | Wheeled Loader (23t) | C10.4 | Loading sand / soil |
| | Mobile telescopic crane (80t) | C4.39 | Lifting reinforcing steel |
| | Concrete mixer truck & concrete pump | C4.28 | Concrete mixer truck (discharging) & concrete pump (pumping) |
| | Articulated dump truck (tipping fill) (23t) | C2.32 | Tipping Fill (20% percentage on time) |
| | Articulated dump truck* (23t) | C2.33 | Delivery and removal of material (maximum of 7 two-way trips per hour) |
| | Lorry * | C11.9 | Delivery of material (maximum of 2 two-way trips per hour) |
| Preparation of subbases and hardstanding's and pouring of concrete | Tracked Excavator (25t) | C2.19 | Ground excavation/earthworks |
| | Articulated Dump Truck (23t) | C2.32 | Tipping Fill |
| | Dozer (14t) | C5.12 | Spreading chipping/fill |
| | Vibratory roller | C5.21 | Rolling and Compaction |
| | Concrete mixer truck & concrete pump | C4.28 | Concrete mixer truck (discharging) & concrete pump (pumping) |
| | Lorry * | C11.9 | Delivery of material (maximum of 2 two-way trips per hour) |
| Erection of steel work, block work and installation of concrete slabs | Mobile telescopic crane (80t) | C4.39 | Lifting steel |
| | Lorry * | C11.9 | Delivery of material (maximum of 2 two-way trips per hour) |
| * Drive-by maximum sound pressure level in $L_{max}$ (octave bands) and $L_{Amax}$ (overall level) | | | |



The nearest occupied dwelling to the IBA facility building is approximately 420 m away with cumulative noise levels from all activities of 56dB $L_{Aeq,1hr}$. The nearest occupied dwelling to the proposed biological treatment facility is approximately 340 m away with cumulative noise levels from all activities of 56dB $L_{Aeq,1hr}$. The nearest occupied dwelling to the substations is approximately 290 m away with cumulative noise levels from all activities of 56dB $L_{Aeq,1hr}$. In all instances, the predicted noise levels are below the construction noise limit of 65 dB $L_{Aeq,1hr}$.

## Construction of Leachate Management Facility

The leachate management facility comprising 5 no. bunded above ground tanks for leachate (raw, treated and concentrated), 6 no. of modular containerised plant units for leachate treatment, 3 no. of bunded storage tanks for dosing and other compounds and a loading area for 2 no. 25 tonne articulated tankers. The predicted noise from the construction of 3 no. leachate lagoons is discussed later in this chapter. As part of the leachate management facility, it is proposed prepare a hardstanding area with a number of concrete pads for the bunded tanks and the containerised leachate processing modular units. Table 9.10 presents the assumed plant required during the different construction phases. The nearest occupied dwelling is approximately 250 m from the proposed leachate management facility. The predicted noise levels are below the construction noise limit of 65 dB $L_{Aeq,1hr}$ with the cumulative noise levels of all activities of 59 dB $L_{Aeq,1hr}$.

## Table 9.10: Construction of Leachate Management Facility – Assumed Plant and Predicted Noise Levels

| Phase | Plant | BS 5228 Ref. | Activity |
|---|---|---|---|
| Site Preparation | Tracked excavator (22t) | C2.3 | Clearing Site |
| | Articulated Dump Truck * | C2.33 | Delivery and removal of material (15 trips per hour) |
| | Dozer (20t) | C2.12 | Ground excavation/ earthworks |
| Preparation of hardstanding areas | Tracked Excavator (25t) | C2.19 | Ground excavation/earthworks |
| | Articulated Dump Truck (23t) | C2.32 | Tipping Fill |
| | Dozer (14t) | C5.12 | Spreading chipping/fill |
| | Vibratory roller | C5.21 | Rolling and Compaction |
| Preparation and pouring of Foundations | Tracked Excavator (25t) | C2.19 | Ground excavation/ earthworks |
| | Wheeled Loader (23t) | C10.4 | Loading sand / soil |
| | Mobile telescopic crane (80t) | C4.39 | Lifting reinforcing steel |
| | Concrete mixer truck & concrete pump | C4.28 | Concrete mixer truck (discharging) & concrete pump (pumping) |
| | Articulated dump truck (tipping fill) (23t) | C2.32 | Tipping Fill (20% percentage on time) |
| | Articulated dump truck* (23t) | C2.33 | Delivery and removal of material (2 trips per hour) |
| Pouring of bunded walls | Concrete mixer truck & concrete pump | C4.28 | Concrete mixer truck (discharging) & concrete pump (pumping) |
| Installation of containers, storage tanks and electrical and mechanical plant | Mobile telescopic crane (80t) | C4.39 | Lifting containers and storage tanks |
| | Telescopic handler | C4.54 | Lifting pumps into position |
| | Angle grinder (grinding steel) | C4.93 | Miscellaneous |
| * Drive-by maximum sound pressure level/ sound power level | | | |



### Construction of Leachate Lagoon, Attenuation Pond, Holding Pond and Wetland

The construction of the leachate lagoon, holding pond and the attenuation pond will require the excavation of material and installation of a composite barrier, comprising a 2 mm HDPE membrane on a 1 m clay layer. Construction of the wetland will require the excavation, distribution and placement of material. The assumed plant required for the construction of the leachate lagoons, the attenuation pond, holding pond and wetland are presented in Table 9.11. The nearest occupied dwelling to the leachate lagoons is approximately 350 m away and the predicted noise level is below the construction noise limit of 65 dB $L_{Aeq,1hr}$ with the cumulative noise levels of all activities of 53 dB $L_{Aeq,1hr}$. The nearest occupied dwelling to the attenuation pond is approximately 260 m away and the predicted noise level is below the construction noise limit of 65 dB $L_{Aeq,1hr}$ with the cumulative noise levels of all activities of 55 dB $L_{Aeq,1hr}$.

The nearest occupied dwelling to the wetland is approximately 260 m away and the predicted noise level is below the construction noise limit of 65 dB $L_{Aeq,1hr}$ with the cumulative noise levels of all activities of 50 dB $L_{Aeq,1hr}$.

### Table 9.11: Construction of Leachate Lagoon, Attenuation Pond and Wetland – Assumed Plant and Predicted Noise Levels

| Construction Activity | | Plant | BS 5228 Ref. | Activity |
|---|---|---|---|---|
| Leachate Lagoon, Holding Pond and Attenuation Pond | | Tracked Excavator (25t) | C2.19 | Ground excavation/ earthworks |
| | Wetland | Tracked Excavator | C10.2 | Face shovel extracting/loading dump trucks |
| | | Articulated dump truck * | C2.33 | Distribution of material (6 trips per hour) |
| | | Articulated dump truck (tipping fill) | C.2.32 | Tipping fill |
| | | Tracked excavator | C.2.19 | Placement of material |
| | | Dozer (14t) | C5.12 | Spreading fill |
| | | Vibratory roller | C5.21 | Rolling and Compaction |
| * Drive-by maximum sound pressure level in $L_{max}$ (octave bands) and $L_{Amax}$ (overall level) | | | | |



The cumulative construction impacts, and operational impacts were appraised, and it was found that the predicted noise impacts are compliant with the 65 dB $L_{Aeq,1hr}$ noise limit derived from BS 5228-1:2009+A1:2014. For the purpose of this assessment, a conservative assumption was made that mobile plant will operate for a percentage on-time of 80% unless stated otherwise. For the purpose of the noise impact assessment, mobile plant is located such that the distant between the respective construction activity and the nearest receptor is at a minimum. In practice, all mobile plant will not operate simultaneously and the distance between the plant and the nearest receptor will often be greater than the distances used in the noise model. Hence, it is expected that the potential noise impact will be lower than that modelled.

## 9.6.2 Potential Impacts during Operation – Direct & Indirect

The operating hours of the facility i.e. waste acceptance and processing hours will remain as per those currently allowed for under W0146-02 Monday to Saturday.

The noise sources associated with the operation of the development currently include:

- delivery of waste material to the facility (day time only)
- transportation of waste material around the facility (day time only)
- waste placement
- placement of daily cover, intermediate cap and final cap
- construction of cells
- leachate management system
- Landfill Gas Engines and Flares

The additional noise sources associated with the operation of the proposed development include:

- an increase in the delivery of waste material to the facility (day time only)
- activity at the biological treatment facility (waste acceptance day time only)
- an increase in the transportation of waste material around the facility (day time only)
- IBA handling and placement (day time only)
- construction of berms
- tree felling

## Noise Prediction Modelling - Overview

The predicted noise levels associated with stationary or minimal movement sources, as well as on-site traffic movements, at the site were predicted according to the International Standard ISO 9313-2: 1996 *Acoustics -Attenuation of sound outdoors - Part 2: General Method of Calculation* and using Brüel & Kjær Predictor software.

This noise propagation model allows for octave band calculation of noise from multiple sources, including diffraction and reflection around buildings, terrain and ground effects. This allows all significant noise sources and propagation effects to be accounted for in the model.

The modelling assumes that all plant will be operating simultaneously. It has been assumed that all stationary plant will operate 100% of the time, mobile plant will operate 80% of the time except for tipper trucks where the tipping of material will be for a short duration. The reality is that many of the noise sources will only operate intermittently versus the quasi continuous assumption used in the noise model. This makes the noise modelling assessment a conservative exercise.



The geographical features of the area, including existing buildings, all noise sources and propagation effects were accounted for in the model. This includes site structures and neighbouring dwelling buildings. The ground factor ranges from 0 for hard reflective surfaces to 1 for soft porous surfaces. Roads, hardstanding's and IBA cells were modelled as hard surfaces. Other surfaces can be described as porous surfaces and would have a ground factor akin to 1. However, a conservative ground factor of 0.75 was used to model the porous surfaces. Atmospheric conditions of 10 ˚C and 70 % humidity were used as they represent a reasonably low level of air absorption. In absence of representative spectral data, an air absorption rate corresponding to the 250 Hz octave band was used. 72 no. receptors were modelled. Receptor heights of 1.5 m were modelled for dormer bungalows and bungalows, and a receptor height of 4 m was modelled for two-storey dwellings.

## Noise Prediction Modelling – Site Noise Sources

Each of the potential noise sources on the site were identified and reference sound power data or sound pressure level data assigned. The data has been sourced from literature, FT file measurements from similar sites/ equipment and BS 5228-1:2009+A1:2014.

An estimate has been made for the acoustic performance of the building shell, based on FT file measurements and published data.

### *Site Noise Sources*

The landfill has been accepting waste since 2004 and there are a number of existing on-site noise sources associated with the operation of the landfill including cell construction, landfill waste acceptance and placement, capping of cells, leachate tankering and operation of a gas plant. As part of the proposed development the existing activities will continue and there will be some additional and redeployment of resources. The existing operation of the landfill as well as the proposed development and the associated noise sources are described below.

*Tree Felling*

The construction of the permitted landfill cells, development of the proposed IBA Facility and surface water management infrastructure require the excavation of soil. It will be used to create screening berms. The proposed development will require the felling of approximately 12.5 ha. of commercial forestry currently in place within the boundary of the existing site. The felling of commercial forestry will occur irrespective of whether the development proceeds but for completeness it has been considered as part of the operational impacts.

It is assumed that an average of approximately 25 tonnes of timber can be transported per truck. Therefore, approximately 15 trips will be required per hectare to transport the timber and brash off site, which amounts to approximately 188 trips for the 12.5 ha felling required.

It is proposed that tree felling will occur over a number of years. Drawing No, LW14-821-01-P-0050-003 Existing Forestation, Proposed Felling & Compensatory Planting in Volume 4 of this EIAR presents the areas of forestry to be felled. The total felling time is expected to be 8 no. weeks in total. However, felling will be on a phased basis and areas of forestry will be felled ahead of the installation of screening berms. Felling will occur between September and February, and it is expected that the construction of cells and berms will occur outside of this time period.

A noise model has been prepared to predict the expected noise emissions from tree felling activities. Table 9.12 presents the assumed plant required for felling of trees.

### Table 9.12: Tree felling – Assumed Plant and Predicted Noise Levels

| Plant | BS 5228 Ref. | Activity |
|---|---|---|
| Harvester § | D2.14 | Harvesting trees |
| Forwarder µ | C4.53 | Moving felled trees |
| Lorry * | C11.9 | Transporting timber and brash off site (2 two-way trips per hour) |
| * Drive-by maximum sound pressure level in $L_{max}$ (octave bands) and $L_{Amax}$ (overall level)<br>§ - Excavator BS 5228 Ref C2.5<br>µ - Lorry with lifting boom – C4.53 | | |



*Construction of Screening Berms*

Screening berms will mitigate against potential noise impacts or visual impacts from the proposed development. Material excavated as part of cell construction and other construction works will be transported using articulated dump trucks to the berm locations. Screening berms A and B will be constructed first to protect noise sensitive receptors. The construction sequencing of the screening berms is as follows (Refer to Drawing No. LW14-821-01 P-0050-011 Cut/Fill Phasing Plan in Volume 4 of this EIAR:

- Berms to the east and north of IBA area (Berm A), and to the southwest of the site (Berm B).
- Berm to west of site (Berm C)
- Berm to west of site (Berm D)
- Berm to west of site (Berm E)

The assumed plant required for the construction of screening berms is presented in Table 9.13. Note: the articulated dump truck movements partly associated with this activity are captured in the cell construction phase of the developments.

### Table 9.13: Construction of Screening Berms – Assumed Plant and Predicted Noise Levels

| Plant | BS 5228 Ref. | Activity |
|---|---|---|
| Articulated dump truck (tipping fill) | C.2.32 | Tipping fill |
| Tracked excavator | C.2.19 | Placement of material |
| Dozer | C.2.12 | Distribution of material |

Construction of Cells

Future cell construction within the currently permitted development will continue to be constructed in the same manner as cells currently constructed. As of January 2018, Cells 1 through 16 (See Drawing LW14-821-01-P-0000-002 in Volume 4 of this EIAR) have been constructed, Cells 17 and 18 are under construction and Cells 19 through 28 have yet to be constructed.

The proposed changes to the operation of the landfill under this application include the intensification of landfilling, and the operation of 2 no. active faces within the permitted landfill development, one for non-stabilised waste and one for stabilised and inert waste.

It is proposed to develop five dedicated IBA cells (no. 29 through no. 33) for the acceptance and placement of IBA material only. Construction of cells 29 and ½ of 32 were assessed against BS 5228-1:2009+A1:2014 as they form part of the construction works of the proposed development. The construction of cells will occur on a phased basis. The proposed construction sequence is presented in Chapter 2 Proposed Development in Volume 2 of this EIAR. The process involved in the construction of new cells is described in 9.6.1.

Table 9.14 presents the assumed plant required for cell construction.



### Table 9.14: Cell Construction – Assumed Plant and Predicted Noise Levels

| Plant | BS 5228 Ref. | Activity |
|---|---|---|
| Tracked excavator (x4) | C.8.12 | Cell Excavation and loading of material |
| Articulated dump truck * (x2) | C.8.16 | Distribution of material (Landfill Cells 7 trips per hour and IBA Cells four trips per hour) |
| Dozer (x2) | C.8.17 | Cell excavation and distribution of material |
| Conveyor drive unit | C10.20 | Conveyor for screener |
| Water bowser (discharging) | C.6.37 | Spraying water |
| Screen Stockpiler | C.10.15 | Screening material |
| Lorry* | C11.9 | Delivery of Material (Two two-way trips per hour) |
| Articulated dump truck (tipping fill) | C.2.32 | Tipping fill at cell |
| Vibratory roller * | C.5.21 | Rolling and compaction |
| * Drive-by maximum sound pressure level in $L_{max}$ (octave bands) and $L_{Amax}$ (overall level) | | |

*Waste Placement Operations*

For the purposes of the modelling the noise impact from the proposed development, it is assumed that waste placement will occur in three cells simultaneously: (1) Cells 29-33 placement of IBA, (2) Cells 17-21 (excluding Cell 20) for the landfilling of non-stabilised waste, i.e. that with a biodegradable fraction and (3) Cell 20 and 22-28 for placement of stabilised, bulky and inert waste Table 9.15 presents a list of the plant associated with the placement of waste.

## Table 9.15: Waste Placement Operations – Noise Sources

| Noise Source | Number | Hours of Operation | Location | Sources of Data |
|---|---|---|---|---|
| **Landfilling of non-stabilised waste** | | | | |
| Lorry * (Transport of waste to cell) | 40 trips per day | 08:00 -18:00 | Haul route to cell | BS 5228-1 C11.9 |
| Ejector Trailer (Noise from Donkey Engine) § | - | 07:30 -18:30 | Cells 20 & 22 - 28 | BS 5228-1 C4.84 |
| Tracked Excavator | 1 | 07:30 -18:30 | Cells 20 & 22 - 28 | BS 5228-1 C8.10 |
| Dozer | 1 | 07:30 -18:30 | Cells 20 & 22 - 28 | BS 5228-1 C8.9 |
| Waste Compactor | 1 | 07:30 -18:30 | Cells 20 & 22 - 28 | BS 5228-1 C8.1 |
| **Landfilling of stabilised, bulky and inert waste** | | | | |
| Tipper Lorry * (Transport of waste to cell) | 8 trips per day | 08:00 -18:00 | Haul route to cell | BS 5228-1 C8.20 |
| Tractor (towing trailer) * (Transport of waste to cell) | 9 trips per day | 07:30 -18:30 | Haul route to cell | BS 5228-1 C4.75 |
| Tipping Fill | - | 07:30 -18:30 | Cells 17 - 19 & 21 | BS 5228-1 C2.32 |
| Tracked Excavator | 1 | 07:30 -18:30 | Cells 17 - 19 & 21 | BS 5228-1 C8.10 |
| Dozer | 1 | 07:30 -18:30 | Cells 17 - 19 & 21 | BS 5228-1 C8.9 |
| Waste Compactor | 1 | 07:30 -18:30 | Cells 17 - 19 & 21 | BS 5228-1 C8.1 |
| **IBA Placement µ** | | | | |
| Articulated dump truck * | 23 trips per day | 08:00 -18:00 | Haul route between IBA weathering area and Cells 29 - 31 | BS 5228-1 C2.33 |
| Articulated dump truck (tipping fill) | - | 07:30 -18:30 | Cells 29 - 31 | BS 5228-1 C2.32 |
| Vibratory Roller | 1 | 07:30 -18:30 | Cells 29 - 31 | BS 5228-1 C5.21 |
| Dozer | 1 | 07:30 -18:30 | Cells 29 - 31 | BS 5228-1 C8.9 |
| * Drive-by maximum sound pressure level/ sound power level<br>§ Noise emissions from donkey engine modelled as diesel engine<br>µ Acceptance of IBA material is modelled as part of the IBA handling operations | | | | |

IBA Facility Building

It is proposed to construct an IBA facility building primarily to mitigate against leachate generation in the weathering phase. The building may also be used to facilitate IBA processing trials such as screening, washing and metal recovery). This building will be constructed within cell 32 as part of the construction phase of the overall development. The proposed building is 75 m in length, 75 m in width and up to 15 m in height, of portal frame construction, with metal cladding around the top 3 meters. The building façades will predominantly be open and for the purpose of this assessment it has been assumed that there is no attenuation from the roof structure. Table 9.16 presents a list of the plant associated with the proposed IBA facility building.

### Table 9.16: IBA Facility Building– Noise Sources

| Noise Source | Number | Hours of Operation | Location | Sources of Data |
|---|---|---|---|---|
| **IBA Weathering** | | | | |
| Lorry * (Transport of IBA to Weathering area) | 23 trips per day | 08:00 -18:00 | Haul route to IBA weathering area | BS 5228-1 C8.20 |
| Tipping Fill | - | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C2.32 |
| Tracked Excavator | 1 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.1 |
| Wheeled Loader | 2 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.4 |
| **IBA Processing Trials** | | | | |
| Articulated dump truck * µ | 23 trips per day | 07:30 -18:30 | Haul route between IBA weathering area and Cells 29 – 31 | BS 5228-1 C2.33 |
| Screener / Stockpiler | 1 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.14 |
| Conveyor Drive Unit | 3 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.21 |
| Feed Hopper | 1 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.22 |
| Tracked Excavator | 1 | 07:30 -18:30 | IBA Weathering Area | BS 5228-1 C10.2 |
| Eddy Current Separator | 1 | 07:30 -18:30 | IBA Weathering Area | - |
| Drum Separator (Magnetic) | 3 | 07:30 -18:30 | IBA Weathering Area | - |
| * Drive-by maximum sound pressure level/ sound power level<br>µ Articulated dump truck movements between the IBA weathering facility and landfill cells was modelled as part of landing filling operations<br>§ Noise data not available and modelled a maximum of 105 dB | | | | |



*Biological Treatment Facility*

It is proposed to develop a purpose built aerobic biological treatment facility as part of the overall development. A sketch of the proposed facility is shown in Figure 2.10 in Chapter 2 Proposed Development of Volume 2 of this EIAR. The main noise sources associated with the proposed biological treatment facility will be located internally.

The sound power pressure levels and sound power levels of individual noise sources associated with the proposed biological treatment facility were sourced from British Standard 5228-1:2009+A1:2014 'Code of Practice for noise and vibration control on construction and open sites Part 1: Noise' and Bruel & Kjaer Source DB software. Table 9.17 presents a list of the plant associated with the proposed biological treatment facility. The A-weighted octave band sound power level data for each of the noise sources is presented in Table 9.18.

### Table 9.17: Biological Treatment Facility – Noise Sources

| Noise Source | Number | Hours of Operation | Location | Sources of Data |
|---|---|---|---|---|
| **Mobile Sources** | | | | |
| Transfer trailers input – Travel to and from facility* | 9 trips per day | 08:00 -18:00 | Outside | BS 5228-1 C8.20 |
| Transfer trailers input – Tipping Fill | 9 trips per day | 08:00 -18:00 | Within Facility | BS 5228-1 C2.32 |
| Tractor (towing trailer) – Travel to and from landfill cells* | 9 trips per day | 08:00 -18:00 | Outside | BS 5228-1 C4.75 |
| Wheel loaders | 2 | 08:00 -18:00 | Within Facility | BS 5228-1 C10.4 |
| **Fixed Sources** | | | | |
| Ventilation Blower | 2 | Full time | Within Facility | Source DB |
| Composting Pressure Blowers | 12 | Full time | Within Facility | Source DB |
| Percolate tank purge blower | 2 | Full time | Within Facility | Source DB |
| Biofilter pump | 1 | Full time | Submersible within tank within facility | Source DB |
| * Drive-by maximum sound pressure level/ sound power level | | | | |



### Table 9.18: Biological Treatment Facility - Sound Power Level – $L_{WA}$, dB(A)

| Equipment | A-weighted Octave Band Centre Frequency (Hz) | | | | | | | | | Overall $L_{WA}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Transfer trailers input – Travel to and from facility * | - | 89.8 | 93.9 | 93.4 | 98.8 | 102 | 102.2 | 99 | 93.9 | 107.5 |
| Transfer trailers input – Tipping Fill | - | 81.8 | 87.9 | 92.4 | 94.8 | 97 | 95.2 | 92 | 84.9 | 102.0 |
| Tractor (towing trailer) – Travel to and from landfill cells * | - | 94.8 | 97.9 | 95.4 | 100.8 | 101 | 101.2 | 93 | 85.9 | 107.2 |
| Wheel loaders | - | 88.8 | 98.9 | 104.4 | 99.8 | 104 | 103.2 | 98 | 88.9 | 109.9 |
| Ventilation Blower | 47.8 | 60.8 | 68.8 | 78.8 | 81.8 | 75.8 | 73.8 | 65.8 | 50.8 | 84.8 |

| Equipment | A-weighted Octave Band Centre Frequency (Hz) | | | | | | | | | Overall $L_{WA}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Composting Pressure Blowers | 42.8 | 55.8 | 63.8 | 73.8 | 76.8 | 70.8 | 68.8 | 60.8 | 45.8 | 79.8 |
| Percolate tank purge blower | 47.8 | 60.8 | 68.8 | 78.8 | 81.8 | 75.8 | 73.8 | 65.8 | 50.8 | 84.8 |
| Biofilter pump | - | 68.8 | 76.9 | 84.4 | 88.8 | 91 | 92.2 | 89 | 80.9 | 96.9 |
| * Drive-by maximum sound pressure level/ sound power level | | | | | | | | | | |

The reverberant noise level from all plant operating within the biological treatment facility was calculated using the data presented in Table 9.18. It has been conservatively assumed that the absorption characteristics of the internal surface of the biological building are the same as those for concrete. The building is constructed from a range of materials including poured concrete, standard industrial lightweight panel (Kingspan AWP/60) and metal sheeting for roller shutters. Table 9.19 presents the attenuation due to construction materials. The façades are composed of a combination of materials and an average attenuation for each façade and roof was calculated, and this was used to calculate the breakout noise from the building.

### Table 9.19: Attenuation due to construction materials

| Attenuation | Data Source | Octave Band Centre Frequency (Hz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| AWP/60 no lining | Manufacturer | - | 15 | 16 | 19 | 23 | 26 | 22 | 39 | 39* |
| Concrete wall | Noise Modelling Software Database | 30 | 35 | 40 | 44 | 49 | 53 | 57 | 57 | 57 |
| Metal façade 1mm steel | Noise Modelling Software Database | 4 | 9 | 14 | 16 | 20 | 25 | 29 | 29 | 29 |
| * - Assumed based off the acoustic performance frequency trends of other similar materials | | | | | | | | | | |



*Landfill Gas Engines and Flares*

Four landfill gas engines and three landfill gas flares are currently installed and operational. Details on the plant are presented in Table 9.20. There are no proposed changes to the landfill gas plant. The sound power levels from the plant are presented in Table 9.21.

### Table 9.20: Engine and Flare Sound Power Levels

| Noise Source | Number | Hours of Operation | Location | Source |
|---|---|---|---|---|
| Biogas Engine | 4 | Full time | Insulated Containers to within gas compound | Manufacturers datasheet and file Measurements CHP Engine (Finning Ireland / Bioverda Greenstar TG 2016-3-1256(01)) |
| Biogas Engine Exhaust | 4 | Full time | Insulated Containers to within gas compound | Manufacturers datasheet and File Measurements CHP Engine (Finning Ireland / Bioverda Greenstar TG 2016-3-1256(01)) |
| Flare | 3 | Full-time | Gas compound | File Measurements |

## Table 9.21: Landfill Gas Engines and Flares - Sound Power Level – $L_{WA}$, dB(A)

| Equipment | Octave Band Centre Frequency (Hz) | | | | | | | | | Overall $L_{WA}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| CHP Engine | 55.9 | 82.3 | 96.4 | 106.9 | 106.1 | 107.5 | 108.6 | 110.2 | 110.5 | 116.5 |
| CHP Exhaust | - | 57.8 | 77.9 | 91.4 | 91.8 | 93 | 95.2 | 89 | 79.9 | 99.6 |
| Flare | - | 65 | 70 | 72 | 73 | 70 | 65 | - | - | 77.9 |

The landfill gas engines are located within insulated containers. Table 9.18 presents the typical façade sound insulation. The breakout noise was calculated and each of the engines was modelled as a point source in the noise model. The noise emissions from the exhausts were also modelled as point sources. The manufacturers' data with silencers and other noise attenuating technology was adjusted such that the noise levels from the actual operational plant were aligned with the predicted noise levels.

There are no proposed changes to the existing landfill gas plant. The predicted noise levels are as per measurements adjacent to the gas plant and historic measurements previously undertaken at noise monitoring locations. Noise monitoring results were compliant with daytime licence levels during the period 2015 to Q1 2018.

*Leachate Management Facility*

There is an existing leachate storage lagoon in the facility. Electric pumps are located at the low point of cells and leachate is pumped from the side riser sumps to the perimeter leachate collection rising main. The leachate collection rising main, which will ultimately be laid around the entire perimeter of the landfill, discharges to the leachate lagoon.



As part of the proposed development it is planned to construct a leachate management facility to store and pre-treat the leachate generated by the landfilling activities, biological treatment and from IBA. The leachate management facility will consist of a small number of electric pumps and aerators. These will operate within the storage tanks and containerised units and the noise contribution will be negligible beyond the leachate management area.

Leachate generation in 2017 was 16,753 $m^3$. At peak operations in the proposed development, leachate generation is predicted to be 45,000 $m^3$ per annum. Leachate tankers will transfer stored and pre-treated leachate off-site to a wastewater treatment plant. This will generate 7 trips a day between the weighbridge and the leachate management facility.

*Traffic on site (Access Road)*

Traffic movements on site were modelled from the site entrance on the N2 National Primary route to the weighbridge. Traffic movements from the weighbridge to other part of the sites were considered as part of the other activities discussed above. Table 9.22 presents the traffic movements and assumed plant/vehicles. These were combined to give an overall sound power level which was used to model the noise impact along the access road. The average daily HGV traffic generation of 78 trips is based upon the assumption that the export of any potential recovered materials e.g. IBA for a re-use trials, will be by backhaul. The impact of the traffic on site (i.e. from weighbridge to waste infrastructure) is not considered on its own but as part of the overall impact from the proposed development.

## Table 9.22: Traffic Movement Noise Sources

| Waste Stream | Hours of Operation | Annual Vehicle Trips | | | Daily Trips | Sources of Octave Band Data |
|---|---|---|---|---|---|---|
| | | Waste Inbound Trips | Bi-product Outbound Trips | Total Trips | | |
| Incinerator Bottom Ash | 08:00 – 18:00 | 5,556 | -- | 5,556 | 23 | C11.9 |
| Non-hazardous Soil & Stones and C&D Waste | 08:00 – 18:00 | 2,174 | -- | 2,174 | 8 | C8.20 |
| Residual MSW | 08:00 – 18:00 | 6,087 | -- | 6,087 | 23 | C8.20 |
| Residual Fines | 08:00 – 18:00 | 2,391 | -- | 2,391 | 9 | C8.20 |
| Bulky Waste/Street Cleanings | 08:00 – 18:00 | 1,957 | -- | 1,957 | 8 | C8.20 |
| **Total Waste Streams** | 08:00 – 18:00 | **18,164** | **--** | **18,164** | **71** | Combined |
| Leachate Disposal | 08:00 – 18:00 | -- | 1,667 | 1,667 | 7 | C4.15 |
| Timber and brash | 08:00 – 18:00 | -- | 15/an | 15/an | 0 | |
| Cover Material (Provisional) | 08:00 – 18:00 | (2,174) | -- | (2,174) | (7) | C11.9 |



### Noise Prediction Modelling - Results

For the purpose of this assessment, predicted operational noise levels were calculated at 72 no. receptor locations and assessed against operational noise criteria described in Section 9.4.2. However, one of the receptor locations (R44) is unoccupied and is not considered a noise sensitive location and it has not been appraised. It has been assumed that all stationary plant will operate 100% of the time, mobile plant will operate 80% of the time except for the trucks tipping material which operates for 20% of the time. A receptor height of 1.5 m was modelled bungalows, and receptor heights of 1.5 m[4] and 4 m[5] was modelled for dormer bungalows and two storey dwellings. Both daytime and night-time scenarios were modelled.

#### *Daytime*

During daytime periods, twelve scenarios were assessed to reflect the dynamic nature of the waste management facility and associated activities. The purpose of modelling a high number of scenarios was to ensure that the worst case at various different stages throughout the lifetime of this development were modelled. The noise models assessed scenarios where the given activities were likely to be at their worst. Hence, this assessment is conservative, and these noise levels are maximum predicted noise levels and not likely to be achieved in practice. All scenarios modelled include existing on-site noise sources associated with the operation of the landfill including cell construction, landfill waste acceptance and placement, capping of cells, leachate tankering and operation of the landfill gas plant.

[4] A receptor height of 1.5 m equates to ground floor level

[5] A receptor height of 1.5 m equates to first floor level

Scenarios 2 to 8 also include activities associated with the biological treatment facility, leachate management facility and IBA facility. Specific details unique to each scenario are as follows:

**Scenario 1**
- Existing Activity (Cell 15 and 16)

**Scenario 2a**
- Existing Activity (Cell 15 and 16)
- Construction of Cell 28
- Tree felling (Areas b1, b2, b3, b6, b8, b9, b10 and b11 as per Drawing No. LW14-821-01-P-0050-003 Existing Forestation, Proposed Felling and Compensatory Planting in Volume 4 of this EIAR)

**Scenario 2b**
- Existing Activity (Cell 15 and 16)
- Construction of Cell 28
- Construction of Screening Berms (Berm A and B)

**Scenario 3a**
- Landfilling Activity (Cell 19 and 20)
- Construction of Cell 28
- Tree felling (Areas b1, b2, b3, b6, b8, b9, b10 and b11 as per Drawing No. LW14-821-01-P-0050-003 Existing Forestation, Proposed Felling and Compensatory Planting in Volume 4 of this EIAR)

**Scenario 3b**
- Landfilling Activity (Cell 19 and 20)
- Construction of Cell 28
- Construction of Screening Berms (Berm A and B)

**Scenario 4a**
- Landfilling Activity (Cell 22 and 28). IBA placement Cell 29
- Construction of Cell 26
- Tree felling (Area b7)
- Construction of Screening Berm (Berm C)

**Scenario 4b**
- Landfilling Activity (Cell 22 and 28). IBA placement Cell 29
- Construction of Cell 27
- Tree felling (Area b7)
- Construction of Screening Berm (Berm C)

**Scenario 5a**
- Landfilling Activity (Cell 22 and 28. IBA placement Cell 29)
- Construction of Cell 25
- Tree felling (Area b5)
- Screening Berm (Berm D)

**Scenario 5b**
- Landfilling Activity (Cell 22 and 28.IBA placement Cell 29)
- Construction of Cell 30
- Tree felling (Area b5)
- Screening Berm (Berm D)

**Scenario 6**
- Landfilling Activity (Cell 22 and 28. IBA placement Cell 29)
- Construction of Cell 30
- Tree felling (Area b4)
- Construction of Screening Berm (Berm E)

**Scenario 7**
- Landfilling Activity (Cell 23 and26. IBA placement Cell 31)

**Scenario 8**

- Landfilling Activity (Cell 23 and24. IBA placement Cell 33)

### *Night-time*

During night-time periods, waste placement activities and ancillary works cease, and static plant such as pumps and blowers in the biological treatment facility and the landfill gas plant remain operational. These sources were modelled and assessed against the evening and night-time noise limits. A single scenario was modelled.

Table 9.23 and 9.24 present the predicted noise levels from the twelve daytime scenarios at ground floor and first floor level (where applicable), respectively. Grey shaded cells indicate an exceedance of the licence daytime noise level (55 dBA).

## Table 9.23: Predicted Operational Daytime Noise Levels at Ground Floor Level

| Receptor ID | Predicted $L_{Aeq,\ 30min}$ Noise Level for a range of Daytime Scenarios | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2a | 2b | 3a | 3b | 4a | 4b | 5a | 5b | 6 | 7 | 8 |
| R1 | 33.8 | 38.7 | 38.8 | 41.9 | 41.9 | 42.4 | 42.8 | 43.2 | 42.1 | 44.1 | 38.1 | 38.8 |
| R2 | 35.1 | 39.5 | 39.4 | 42.4 | 42.4 | 43.4 | 43.7 | 44.0 | 43.1 | 44.6 | 38.1 | 38.7 |
| R3 | 34.3 | 39.8 | 39.7 | 43.0 | 43.0 | 43.8 | 44.2 | 44.6 | 43.5 | 45.7 | 37.5 | 39.1 |
| R4 | 33.8 | 39.4 | 39.3 | 42.7 | 42.6 | 43.5 | 43.9 | 44.1 | 43.1 | 45.0 | 37.7 | 38.6 |
| R5 | 34.8 | 40.8 | 40.8 | 44.8 | 44.8 | 45.5 | 46.0 | 46.3 | 45.0 | 47.6 | 39.5 | 40.6 |
| R6 | 38.5 | 43.9 | 43.8 | 46.4 | 46.3 | 46.1 | 46.9 | 47.8 | 45.7 | 49.8 | 42.0 | 41.9 |
| R7 | 42.6 | 48.2 | 48.1 | 49.8 | 49.7 | 49.3 | 50.6 | 50.5 | 48.6 | 50.0 | 44.7 | 45.1 |
| R8 | 43.3 | 49.2 | 48.9 | 50.7 | 50.5 | 49.9 | 51.2 | 50.6 | 49.0 | 50.1 | 44.9 | 45.3 |
| R9 | 40.0 | 46.5 | 45.7 | 48.4 | 47.9 | 48.8 | 51.3 | 51.1 | 49.0 | 49.9 | 44.1 | 45.5 |
| R10 | 38.9 | 47.7 | 47.2 | 48.9 | 48.5 | 48.5 | 48.4 | 49.4 | 46.7 | 47.5 | 44.9 | 43.9 |
| R13 | 45.4 | 51.9 | 53.8 | 53.1 | 52.7 | 52.6 | 53.4 | 51.7 | 51.2 | 51.8 | 46.6 | 46.2 |
| R14 | 39.5 | 48.2 | 48.0 | 50.2 | 50.0 | 50.0 | 49.0 | 48.8 | 48.7 | 49.0 | 43.5 | 42.5 |
| R15 | 45.4 | 52.8 | 51.7 | 54.1 | 53.3 | 53.1 | 53.5 | 52.1 | 51.8 | 52.3 | 45.6 | 45.9 |
| R16 | 45.3 | 53.0 | 51.8 | 54.2 | 53.3 | 53.2 | 53.5 | 52.1 | 52.0 | 52.4 | 45.7 | 46.6 |
| R17 | 46.2 | 53.4 | 52.0 | 54.4 | 53.3 | 53.2 | 53.7 | 52.3 | 52.0 | 52.4 | 45.7 | 45.6 |
| R18 | 43.9 | 52.5 | 50.6 | 53.0 | 51.3 | 51.4 | 51.0 | 50.0 | 49.7 | 50.4 | 44.8 | 45.0 |
| R19 | 42.7 | 52.3 | 50.6 | 53.2 | 51.9 | 50.9 | 51.1 | 50.3 | 49.8 | 50.9 | 44.2 | 45.3 |
| R20 | 40.5 | 47.6 | 46.6 | 49.2 | 48.6 | 48.1 | 48.6 | 48.0 | 48.0 | 48.5 | 43.0 | 42.2 |
| R21 | 39.6 | 47.3 | 46.5 | 49.1 | 48.5 | 48.1 | 48.1 | 47.8 | 48.0 | 48.4 | 43.2 | 42.5 |
| R22 | 38.7 | 46.9 | 46.2 | 48.9 | 48.4 | 48.5 | 47.9 | 47.9 | 48.0 | 48.6 | 43.4 | 43.2 |
| R23 | 38.6 | 46.1 | 46.3 | 48.2 | 48.4 | 48.3 | 48.1 | 47.9 | 48.0 | 48.4 | 43.7 | 43.5 |
| R24 | 32.9 | 39.6 | 39.5 | 42.7 | 42.6 | 43.8 | 43.6 | 43.5 | 43.9 | 43.8 | 40.1 | 39.9 |
| R25 | 33.6 | 40.0 | 39.8 | 42.6 | 42.5 | 43.1 | 43.1 | 43.0 | 43.0 | 43.1 | 39.4 | 39.5 |
| R26 | 35.2 | 43.0 | 43.1 | 44.9 | 45.0 | 44.1 | 43.9 | 43.7 | 44.2 | 44.4 | 40.9 | 40.6 |
| R27 | 39.1 | 46.1 | 46.6 | 47.5 | 47.9 | 46.6 | 46.9 | 46.2 | 46.6 | 46.9 | 43.0 | 42.6 |
| R28 | 39.5 | 46.0 | 46.4 | 47.3 | 47.7 | 46.5 | 47.0 | 46.2 | 46.5 | 46.7 | 43.0 | 42.6 |
| R29 | 38.2 | 46.1 | 46.2 | 47.5 | 47.6 | 46.8 | 47.0 | 46.2 | 46.2 | 46.9 | 42.6 | 42.5 |
| R30 | 37.5 | 44.3 | 44.6 | 46.7 | 46.8 | 46.9 | 46.5 | 46.5 | 47.0 | 47.4 | 43.3 | 42.9 |
| R31 | 38.7 | 45.5 | 45.6 | 47.4 | 47.5 | 46.5 | 46.6 | 46.2 | 46.7 | 47.0 | 42.9 | 42.8 |

| Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level for a range of Daytime Scenarios | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2a | 2b | 3a | 3b | 4a | 4b | 5a | 5b | 6 | 7 | 8 |
| R32 | 36.2 | 44.5 | 44.1 | 47.0 | 46.8 | 46.7 | 46.1 | 45.9 | 46.7 | 47.1 | 43.9 | 42.9 |
| R33 | 39.2 | 45.7 | 46.5 | 48.6 | 49.0 | 48.0 | 47.9 | 47.5 | 48.7 | 48.3 | 44.5 | 43.9 |
| R34 | 35.3 | 43.2 | 43.8 | 46.6 | 46.9 | 46.5 | 46.2 | 46.0 | 46.7 | 46.3 | 42.8 | 42.2 |
| R35 | 35.3 | 40.3 | 44.2 | 44.6 | 46.4 | 43.9 | 43.8 | 43.7 | 45.9 | 45.1 | 41.8 | 40.7 |
| R36 | 40.6 | 46.9 | 48.5 | 48.9 | 50.0 | 48.1 | 47.6 | 47.4 | 47.5 | 47.8 | 44.9 | 42.6 |
| R37 | 38.7 | 43.5 | 44.5 | 46.9 | 47.4 | 46.7 | 46.4 | 46.4 | 47.2 | 46.9 | 44.2 | 42.8 |
| R38 | 42.2 | 49.5 | 50.1 | 51.2 | 51.6 | 49.6 | 49.0 | 48.9 | 49.7 | 49.8 | 46.7 | 46.2 |
| R39 | 41.8 | 48.4 | 49.6 | 48.8 | 50.0 | 47.5 | 47.4 | 47.2 | 47.4 | 47.4 | 45.1 | 44.0 |
| R40 | 40.8 | 45.8 | 46.9 | 48.2 | 48.9 | 48.8 | 48.5 | 48.4 | 49.3 | 49.5 | 45.7 | 45.5 |
| R41 | 41.5 | 48.2 | 50.0 | 49.7 | 51.0 | 48.3 | 47.8 | 47.6 | 48.2 | 48.4 | 45.5 | 45.6 |
| R42 | 41.5 | 47.5 | 48.5 | 49.1 | 49.8 | 48.6 | 48.2 | 48.1 | 48.9 | 48.8 | 45.5 | 45.3 |
| R43 | 44.0 | 53.9 | 57.1 | 54.6 | 57.4 | 50.8 | 50.6 | 50.5 | 50.7 | 51.0 | 49.0 | 47.0 |
| R45* | 48.0 | 53.9 | 57.3 | 54.3 | 57.5 | 51.2 | 51.0 | 51.0 | 51.3 | 51.5 | 51.0 | 51.0 |
| R46* | 45.6 | 49.7 | 52.7 | 50.8 | 53.3 | 49.6 | 49.4 | 49.2 | 49.5 | 49.8 | 49.8 | 49.2 |
| R47* | 45.5 | 46.5 | 47.6 | 47.6 | 48.5 | 47.7 | 47.6 | 47.6 | 48.0 | 47.9 | 49.2 | 48.9 |
| R48 | 45.3 | 48.4 | 51.0 | 49.7 | 51.8 | 49.3 | 49.1 | 49.0 | 49.6 | 49.5 | 49.5 | 49.1 |
| R49* | 45.1 | 47.8 | 50.2 | 49.3 | 51.1 | 49.1 | 48.9 | 48.9 | 49.4 | 49.3 | 49.3 | 49.0 |
| R50 | 37.8 | 45.1 | 45.6 | 47.9 | 48.1 | 47.7 | 47.2 | 47.0 | 47.7 | 47.8 | 43.7 | 43.7 |
| R51 | 43.7 | 45.1 | 46.3 | 46.5 | 47.4 | 47.1 | 47.0 | 46.9 | 47.4 | 47.3 | 48.3 | 46.8 |
| R52 | 42.3 | 43.6 | 44.6 | 45.0 | 45.7 | 45.5 | 45.5 | 45.3 | 45.7 | 45.6 | 46.3 | 46.1 |
| R53 | 42.7 | 43.9 | 45.0 | 45.2 | 46.0 | 45.5 | 45.4 | 45.3 | 45.7 | 45.6 | 46.1 | 46.3 |
| R54 | 35.6 | 38.0 | 38.6 | 40.0 | 40.4 | 40.8 | 40.7 | 40.5 | 40.5 | 40.4 | 39.2 | 39.0 |
| R55 | 30.8 | 33.4 | 34.3 | 36.0 | 36.6 | 38.3 | 38.2 | 37.8 | 38.0 | 37.9 | 37.4 | 37.2 |
| R56 | 33.9 | 36.0 | 36.9 | 38.4 | 38.9 | 39.7 | 39.7 | 39.4 | 39.5 | 39.5 | 39.4 | 40.6 |
| R57 | 35.7 | 37.0 | 37.6 | 38.8 | 39.2 | 39.9 | 39.8 | 39.6 | 39.8 | 39.8 | 39.6 | 39.6 |
| R58 | 35.6 | 37.0 | 37.6 | 38.7 | 39.2 | 39.8 | 39.7 | 39.5 | 39.7 | 39.7 | 39.5 | 39.5 |
| R59 | 36.4 | 41.0 | 42.1 | 43.1 | 43.8 | 42.9 | 42.7 | 42.7 | 43.7 | 43.5 | 42.4 | 41.8 |
| R60 | 35.4 | 40.9 | 41.5 | 43.3 | 43.6 | 43.1 | 42.9 | 42.9 | 43.8 | 43.6 | 41.0 | 41.2 |
| R61 | 39.7 | 45.2 | 46.6 | 47.1 | 48.1 | 45.9 | 45.7 | 45.6 | 46.7 | 46.5 | 44.7 | 44.7 |
| R62 | 39.2 | 44.5 | 45.8 | 46.4 | 47.3 | 45.3 | 45.0 | 44.9 | 46.0 | 45.8 | 44.3 | 44.1 |
| R63 | 40.3 | 45.1 | 46.5 | 46.8 | 47.8 | 45.8 | 45.5 | 45.4 | 46.1 | 46.3 | 44.7 | 44.2 |
| R64 | 40.7 | 45.2 | 46.6 | 46.9 | 47.9 | 45.9 | 45.6 | 45.6 | 46.3 | 46.5 | 44.6 | 44.3 |
| R65 | 39.3 | 43.1 | 44.6 | 45.2 | 46.2 | 45.2 | 44.9 | 44.7 | 45.5 | 45.6 | 43.7 | 43.5 |
| R66 | 40.4 | 41.4 | 42.6 | 41.4 | 42.6 | 37.0 | 35.5 | 35.0 | 39.3 | 39.4 | 43.8 | 43.5 |
| R67 | 43.8 | 45.4 | 46.3 | 46.9 | 47.5 | 46.8 | 46.6 | 46.5 | 47.2 | 47.1 | 46.2 | 45.9 |
| R68 | 43.9 | 45.6 | 46.7 | 46.9 | 47.8 | 46.5 | 46.4 | 46.3 | 46.9 | 46.8 | 46.1 | 45.8 |
| R69 | 45.0 | 46.9 | 47.2 | 48.2 | 48.5 | 47.8 | 47.6 | 47.5 | 48.0 | 47.9 | 46.7 | 46.6 |
| R70 | 48.5 | 49.1 | 49.4 | 49.6 | 49.8 | 49.5 | 49.5 | 49.5 | 49.7 | 49.6 | 49.3 | 49.3 |
| R71 | 31.2 | 33.8 | 34.5 | 36.6 | 36.9 | 37.6 | 37.5 | 37.3 | 37.9 | 37.7 | 35.9 | 36.7 |
| R72 | 36.0 | 37.8 | 39.1 | 39.7 | 40.6 | 40.2 | 40.0 | 39.9 | 40.5 | 40.4 | 39.6 | 39.8 |

R11, R12 and R44 are unoccupied derelict dwellings and they are located within the landownership boundary. These receptors are not noise sensitive locations and have not been assessed.
R45, R46, R47 and R49 are located within the landownership boundary.

## Table 9.24: Predicted Operational Daytime Noise Levels at First Floor Level

| Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level for a range of Daytime Scenarios | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2a | 2b | 3a | 3b | 4a | 4b | 5a | 5b | 6 | 7 | 8 |
| R1 | 34.7 | 40.0 | 40.1 | 43.9 | 43.9 | 44.4 | 44.7 | 45.0 | 44.2 | 45.6 | 39.2 | 39.2 |
| R4 | 35.3 | 40.9 | 40.8 | 44.7 | 44.6 | 45.3 | 45.6 | 45.8 | 44.9 | 46.3 | 38.8 | 39.0 |
| R16 | 46.0 | 53.8 | 52.7 | 55.2 | 54.4 | 54.3 | 54.6 | 53.3 | 53.6 | 54.0 | 46.3 | 47.4 |
| R17 | 46.8 | 54.1 | 52.8 | 55.3 | 54.4 | 54.4 | 54.8 | 53.4 | 53.1 | 54.0 | 46.3 | 46.4 |
| R19 | 43.8 | 53.1 | 51.5 | 54.1 | 52.9 | 52.1 | 52.3 | 51.2 | 50.6 | 51.7 | 44.7 | 46.4 |
| R22 | 39.9 | 48.1 | 47.4 | 49.9 | 49.5 | 49.5 | 49.2 | 49.1 | 49.1 | 49.6 | 43.8 | 43.9 |
| R24 | 36.4 | 43.9 | 43.9 | 45.4 | 45.4 | 46.1 | 45.4 | 45.0 | 45.2 | 45.3 | 40.9 | 41.3 |
| R25 | 36.7 | 44.0 | 43.6 | 45.4 | 45.0 | 44.6 | 44.9 | 43.9 | 43.3 | 44.2 | 39.6 | 40.3 |
| R26 | 36.0 | 44.1 | 44.2 | 46.1 | 46.2 | 45.2 | 45.5 | 44.7 | 45.1 | 45.4 | 41.5 | 41.2 |
| R30 | 38.6 | 45.9 | 46.0 | 48.3 | 48.4 | 48.4 | 48.2 | 48.0 | 48.3 | 48.7 | 44.0 | 43.8 |
| R31 | 39.4 | 46.5 | 46.6 | 48.3 | 48.4 | 47.5 | 47.6 | 47.0 | 47.4 | 47.8 | 43.6 | 43.6 |
| R32 | 37.5 | 45.7 | 45.5 | 48.5 | 48.4 | 48.5 | 48.1 | 47.6 | 48.1 | 48.0 | 44.5 | 43.9 |
| R38 | 43.1 | 50.7 | 51.1 | 52.1 | 52.5 | 50.6 | 50.1 | 50.0 | 50.6 | 50.8 | 47.5 | 47.3 |
| R40 | 41.7 | 47.1 | 48.1 | 49.3 | 50.0 | 50.1 | 49.9 | 49.8 | 50.5 | 50.7 | 46.8 | 46.7 |
| R41 | 42.4 | 49.2 | 50.7 | 50.6 | 51.8 | 50.2 | 49.8 | 49.7 | 50.1 | 50.3 | 46.9 | 47.0 |
| R42 | 42.5 | 48.5 | 49.5 | 50.0 | 50.8 | 49.7 | 49.4 | 49.3 | 49.9 | 49.9 | 46.3 | 46.7 |
| R54 | 37.5 | 39.9 | 40.5 | 41.9 | 42.3 | 42.8 | 42.7 | 42.6 | 42.7 | 42.6 | 41.3 | 41.0 |
| R55 | 33.0 | 35.9 | 36.6 | 38.8 | 39.2 | 40.4 | 40.4 | 40.0 | 40.3 | 40.2 | 39.8 | 39.6 |
| R59 | 37.6 | 42.4 | 43.2 | 44.2 | 44.8 | 44.5 | 44.3 | 44.3 | 44.9 | 45.0 | 43.1 | 42.5 |
| R60 | 36.4 | 42.2 | 42.6 | 44.4 | 44.7 | 44.4 | 44.1 | 44.1 | 44.8 | 44.8 | 41.8 | 42.2 |
| R63 | 41.9 | 46.4 | 47.5 | 47.9 | 48.7 | 47.0 | 46.7 | 46.6 | 47.2 | 47.4 | 45.6 | 45.5 |
| R64 | 42.2 | 46.6 | 47.6 | 48.0 | 48.8 | 47.1 | 46.8 | 46.8 | 47.3 | 47.6 | 45.7 | 45.7 |
| R65 | 41.1 | 44.6 | 45.8 | 46.3 | 47.2 | 46.3 | 46.1 | 46.0 | 46.6 | 46.8 | 44.6 | 45.2 |
| R69 | 45.4 | 47.6 | 47.8 | 49.0 | 49.1 | 48.5 | 48.3 | 48.2 | 48.6 | 48.7 | 47.1 | 46.9 |
| R71 | 33.2 | 36.2 | 37.1 | 39.3 | 39.8 | 40.1 | 39.9 | 39.8 | 39.4 | 40.3 | 38.5 | 39.0 |
| R11 is an unoccupied derelict dwelling and it is located within the landownership boundary. This receptor is not a noise sensitive location and has not been assessed. | | | | | | | | | | | | |

In general, the predicted noise levels are below the daytime noise limit in the licence. However, there are 2 no. scenarios (2b and 3b) where the predicted noise levels are above the daytime noise limit at a 2 no. noise sensitive receptors (ground floor level). One of these noise sensitive receptors is within the landownership boundary. Scenario 3a shows predicted noise levels above the daytime noise level at 2 no. receptors at first floor level. These exceedances must be considered in the context that the noise predictions assumed the worst-case scenario in terms of distance from the plant to the nearest noise sensitive locations and simultaneous operation of activities. In practice, not all activities will occur simultaneously, and it is likely that activities may occur more intermittently than was modelled and the noise impact from the proposed development will be lower than the predicted noise levels presented above.

Scenario 2b represents a situation with cell construction, construction of Berm A and B, ongoing landfilling activities and the operational landfill gas plant. Scenario 3b is similar to scenario 2b with the addition of noise emissions from the IBA facility, leachate management facility and activities associated with the biological treatment facility.

The ground floor exceedances are predominantly due to the construction of nearby earth berms. The earth berms are being installed to mitigate against any future potential impacts from the proposed development and they shall be constructed when material is made available. The overall duration for the construction of each of Berms A and B is estimated at 2-3 weeks, however this may be spread out over a longer period. In some instances, during the construction of the earth berms, plant will be close to nearby noise sensitive locations. Once the construction of earth berm activities that are close to the noise sensitive locations cease, the noise emissions from the rest of the proposed development will be below the daytime noise limit. It is expected that the maximum noise levels predicted will be for a short duration and given the positive impact the earth berms will have on noise sensitive locations; this short term negative impact is deemed to be reasonable, given the net positive outcome because of the construction of the earth berm.

Scenario 3a represents a situation with the construction of a new cell, felling of forestry and operation of landfill, IBA facility, leachate management facility, biological treatment facility and the landfill gas plant. As previously noted, the forestry to be felled is commercial forestry and it will be felled irrespective of whether this development proceeds. For completeness, the impacts from felling of forestry is included as part of the noise impact assessment as the felling of the commercial forestry is required to construct the earth berms.



The predicted noise levels for scenario 3a exceed the noise limit at 2 no. noise sensitive locations at first floor level. There are no exceedances at ground floor level. The level of exceedance is negligible and will be for a short duration. Felling will occur on a phased basis and the maximum noise levels predicted will be for a short duration (less than 1 weeks).

These works will ultimately serve to protect the noise sensitive locations in the long term but given the close proximity of these activities to some of the noise sensitive locations there is potential for short term elevated noise levels. In the long term, once these activities are completed, no significant effects are predicted.

Table 9.25 and 9.26 present the predicted noise levels during evening and night-time periods ground floor and first floor level (where applicable), respectively. The predicted noise levels are below the evening and night-time noise limits as per the IE Licence and no significant effect are predicted.

### Table 9.25: Predicted Operational Evening and Night-time Noise Levels at Ground Floor Level

| Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level | Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level |
|---|---|---|---|
| R1 | 22 | R37 | 25.3 |
| R2 | 23.3 | R38 | 27.2 |
| R3 | 22.1 | R39 | 26.4 |
| R4 | 21.5 | R40 | 28.2 |
| R5 | 22.2 | R41 | 26.7 |
| R6 | 23.4 | R42 | 26.9 |
| R7 | 24.4 | R43 | 31.5 |

| Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level | Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level |
|---|---|---|---|
| R8 | 24.5 | R45 | 37.3 |
| R9 | 24.8 | R46 | 32.6 |
| R10 | 27.1 | R47 | 39.9 |
| R13 | 24.1 | R49 | 38.8 |
| R14 | 25.2 | R50 | 26.2 |
| R15 | 25.2 | R51 | 39.6 |
| R16 | 25.2 | R52 | 38.5 |
| R17 | 25 | R53 | 38.5 |
| R18 | 26.4 | R54 | 29.8 |
| R19 | 24.8 | R55 | 30 |
| R20 | 24.8 | R56 | 30.4 |
| R21 | 24.7 | R57 | 32.7 |
| R22 | 24.6 | R58 | 32.7 |
| R23 | 22.3 | R59 | 26.3 |
| R24 | 25 | R60 | 25.2 |
| R25 | 23 | R61 | 28.5 |
| R26 | 24.3 | R62 | 27.4 |
| R27 | 24.2 | R63 | 29 |
| R28 | 24.2 | R64 | 29.1 |
| R29 | 24.6 | R65 | 26.9 |
| R30 | 24.3 | R66 | 27.7 |
| R31 | 27.2 | R67 | 29.6 |
| R32 | 27.4 | R68 | 29.5 |
| R33 | 25.3 | R69 | 28.5 |
| R34 | 25.6 | R70 | 28.1 |
| R35 | 26.8 | R71 | 26.7 |
| R36 | 22 | R72 | 27.8 |
| R48 | 38.6 | | |
| R11, R12 and R44 are unoccupied derelict dwellings and they are located within the landowner boundary. These receptors are not noise sensitive locations and have not been assessed. R45, R46, R47 and R49 are located within the landowner boundary. | | | |

**Table 9.26: Predicted Operational Evening and Night-time Noise Levels at First Floor Level**

| Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level | Receptor ID | Predicted $L_{Aeq, 30min}$ Noise Level |
|---|---|---|---|
| R1 | 23 | R40 | 28.2 |
| R4 | 21.6 | R41 | 26.7 |
| R16 | 25.2 | R42 | 26.9 |
| R17 | 25.2 | R54 | 32.1 |
| R19 | 26.4 | R55 | 31.3 |
| R22 | 24.8 | R59 | 27.5 |
| R24 | 22.5 | R60 | 26.4 |
| R25 | 22 | R63 | 30.6 |
| R26 | 23.1 | R64 | 30.8 |
| R30 | 24.7 | R65 | 27.6 |
| R31 | 24.4 | R69 | 29.8 |
| R32 | 28 | R71 | 28.1 |
| R38 | 28.2 | | |
| R11 is an unoccupied derelict dwelling and it is within the landowner boundary. This receptor is not a noise sensitive location and has not been assessed. | | | |



### 9.6.3 Noise Impacts due to off-site traffic

The potential traffic noise impacts have been assessed with respect to the Highways Agency's Design manual for roads and bridges HD 213/11 Volume 11, Section 3, Part 7 Revision 1 – Noise and vibration.

The proposed development will result in an increase in traffic levels along the N2 National Primary Route and the dedicated access road as detailed in the Chapter 8 Roads, Traffic & Transportation in Volume 2 of this EIAR.

The anticipated daily number of vehicles accessing the facility will be on average 156 HGV movements (78 trips) during the daytime. Peaks of 34 HGV movements during 11:00-12:00 hrs are predicted. This includes both existing landfill traffic and the traffic associated with the proposed development.

In 2016, the N2 National Primary Route had an AADT[6] of 8,812 with daily HGV traffic of 1,022. The addition of 60 no. 2-way HGV movements (30 trips) per day will see this daily HGV traffic rise by 5.9% to 1,082 during the operational phase of the development.

The predicted noise from road traffic was modelling using CRTN[7]. When the predicted operational traffic flow is added to the existing baseline traffic flow, the baseline noise level shows a negligible[8] increase in predicted traffic noise level.

[6] Annual average daily traffic

[7] Calculation of Road Traffic Noise (CRTN), Department of Transport Welsh Office, HMSO 1988

[8] The classification of magnitude of noise impacts in the long term was sourced from *Highways Agency, Design Manual for Roads and Bridges HD213/11, Volume 11, Section 3, Part 7, Revision 1* (Table 9.6)

### 9.6.4 Cumulative Impacts

**Cumulative Operational Impacts**

All waste management activities associated with the existing and proposed development and on-site HGV movements were considered in the noise model therefore cumulative impacts from site activities have been considered already.

The noise impacts due to off-site traffic with and without the proposed development have been considered.

Cumulative impacts as discussed in Section 1.7 of Chapter 1 Introduction of Volume 2 of the EIAR. None of these proposed developments are close enough to result in a cumulative noise impact.

## 9.7 Mitigation Measures

### 9.7.1 Mitigation Measures during Construction

The noise impact for construction works traffic will be mitigated by restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise.

The construction works on-site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014, and the noise control measures set out in Appendix 2.0 Construction Environmental Management Plan (CEMP) in Volume 3 of this EIAR.

The hours of construction activity will be limited to avoid unsociable hours. Construction operations shall be restricted to between 07:30 hours and 18:30 hours Monday to Saturday in accordance with the IE licence, unless specifically agreed otherwise.



Mitigation measures shall be implemented to reduce impacts related to construction noise and vibration. BS 5228-1:2009+A1:2014 provides a detailed list of mitigation measures to minimise the noise impact from construction activities and these recommendations should be implemented:

- It is recommended that construction activities shall be carried out during normal working hours;
- A site representative responsible for matters relating to noise should be appointed; and
- Noise monitoring at noise sensitive locations should be performed during critical periods.

There are many general measures that will be taken to reduce noise levels:

- Avoid unnecessary revving of engines and switch off equipment when not required;
- Keep internal haul routes well maintained and avoid steep gradients;
- Select equipment conforming to international standards on noise and vibration;
- Select equipment with quiet and low vibration emissions, and ensure equipment is regularly maintained ensuring it operates in an efficient manner. If possible, all mechanical plant will be fitted with effective exhaust silencers;
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers; and
- Locate equipment as far away as noise sensitive receivers as possible within constraints of the site.

### 9.7.2 Mitigation Measures during Operation

The noise prediction results from the different scenarios demonstrate the dynamic nature of the waste management activities in the proposed development. The predicted noise levels are below the evening and night-time noise limits at all receptor locations and no additional mitigation measures are required.

In most scenarios modelled and at the majority of receptors, the predicted noise levels are below the daytime noise limit. However, there are 3 no. scenarios (2b, 3a and 3b) where the predicted noise levels are above the daytime noise limit at 4 no. receptors (2 no. ground floor receptors and 2 no. first floor receptors). One of the receptors is within the ownership boundary. These exceedances are predominantly attributed to felling of trees (1-week duration) and construction of earth berms A and B (2-3 weeks each). These works will ultimately serve to protect the noise sensitive locations in the long term but given the close proximity of these activities to some of the noise sensitive locations there is potential for short term elevated noise levels. In addition to the mitigation measures specified during construction, noise impacts will be mitigated where reasonably practicable by:

- Planning of Berm A and B construction phase to take account of potential short-term noise impacts, including starting closest to receptor and building away to mitigate potential ongoing berm construction noise impact;
- Orientating plant to minimise the noise impact on nearby receptors where practicable;
- Erection of temporary noise barriers where practicable to provide acoustic screening;
- Ensuring that noisy plant and equipment are not used for long periods of time and at inappropriate times;
- Phasing of works and reduce percentage on-time to lower the noise impact;
- Carrying out regular monitoring of noise levels as per requirements of the licence. Carry out additional monitoring during critical periods; and
- Investigate and record noise complaints and take action to mitigate where levels are above the licence limit as is the case as part of the current operations at Knockharley landfill.



The above mitigation measurements will also be implemented for the wider development to minimise the noise impact from the proposed development.

In addition to the above mitigation measurements, a number of earth berms will be constructed. The construction of Berm A will be carried out first due to the long term positive impact for receptors to the east and north east of the proposed development. The areas on site were material will be excavated to construct the berm are shown in Drawing No, LW14-821-01-P-0050-011 Cut/Fill Phasing Plan in Volume 4 of this EIAR. The material excavated from site to be used for construction of Berm A will be sourced where practical from locations on site as far away from noise sensitive receptors. The construction of Cell 29 will commence after the construction of Berm A.

In addition to the above, the programme for construction and filling of cells was developed to minimise noise impacts were practicable. Cells 27, 28 and 29 will be filled in a manner that minimises the noise impact by starting closest to receptors and moving away so that the filled cells will also be used as berms to minimise the noise impact on nearby receptors.

With mitigation measures, the temporary noise impact from the felling of trees and construction of Berm A and B are expected to be below the noise limit. The operational noise impact from the remainder of the proposed development will also be below the daytime noise limit.

## 9.8 Residual Impacts

For the majority of scenarios modelled and the majority of receptors, the predicted noise levels are below the daytime noise limit. However, there are 3 no. scenarios (2b, 3a and 3b) where the predicted noise levels are above the daytime noise limit at a total of 4 no. receptors, one of which is within the landownership boundary. The exceedances are at a limited number of noise sensitive locations and are attributed to short term activities: felling of trees and construction of earth berms A and B.

With the implementation of the identified noise mitigation measures, the predicted noise impact will be below the daytime noise limit and there will be no residual impact.

The predicted noise levels during evening and night-time periods are below the noise limits and there are no residual impacts.

Construction activities are expected to be below the construction noise limit of 65 dB $L_{Aeq,1hr}$ at noise sensitive locations. Cumulative construction and operational activities are also expected to be below the construction noise limit of 65 dB $L_{Aeq,1hr}$ at noise sensitive locations. However, mitigation measures will be employed to minimise the noise impact.

## 9.9 Monitoring

Monitoring of noise levels on site will be a requirement of the IE licence for the site. These limits will be applied from the commencement of waste acceptance during the operational phase of the development. Noise monitoring will be undertaken during the construction phase in adherence with the procedure identified in Appendix 2.0 CEMP in Volume 3 of this EIAR.

## 9.10 Conclusion & Summary

Operational noise levels were predicted for activities associated with the proposed development. As part of the proposed development the existing activities will continue on site. The proposed development will result in increased noise levels at nearby noise sensitive locations during daytime periods. There will also be increased traffic volumes on the N2 National Primary Route with an expected increase of 30 HGV trips per day.

For most of the scenarios modelled and the majority of receptors, the predicted noise levels are below the daytime noise limit. However, there are 3 no. scenarios (2b, 3a and 3b) where the predicted noise levels are above the daytime noise limit at a total of 4 no. receptors, one of which is a within the landownership boundary. These exceedances are predominantly attributed to felling of trees (1week duration) and construction of earth berms A and B (2-3 weeks duration for each berm). These works will ultimately serve to protect the noise sensitive locations in the long term but given the proximity of these activities to some of the noise sensitive locations there is potential for short term elevated noise levels. These will be mitigated were reasonably practicable and it is expected that with the implementation of the identified noise mitigation measures, the predicted noise impact will be below the daytime noise limit and there will be no residual impact.

The predicted noise levels are expected to be compliant with the evening and night-time noise limit criteria for all noise sensitive locations during the operational phase.

Construction noise levels were predicted and the predicted noise levels from each activity as well as the cumulative noise level from construction and operational phases are below the 65 dB $L_{Aeq,1hr}$ noise limit.

Monitoring of noise emissions will be undertaken during the construction phase in keeping with the procedures outlined in Appendix 2.0CEMP in Volume 3 of this EIAR, while the facility licence will require the monitoring of noise emissions at identified intervals to ensure compliance with limit values applied therein.

Vibration arising from operational and construction activities will not be perceptible at nearby sensitive locations, and any vibration arising from construction activities will be significantly below any thresholds for structural damage to property. Hence, no significant vibration impacts are expected.

## 9.11 References

International Standards Organisation, ISO 1996-2:2017, Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels

British Standards Institute, BS 5228 Part 1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 1 Noise, 2009 +2014

Environmental Protection Agency, Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector: Waste Transfer and Materials Recovery, December 2011

Environmental Protection Agency, Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), January 2016

International Organisation for Standardisation, ISO 9613-2:1996 Attenuation of sound during propagation outdoors, Part 2: General method of calculation

Calculation of Road Traffic Noise (CRTN), Department of Transport Welsh Office, HMSO 1988

Design Manual for Roads and Bridges HD213/11, Volume 11, Section 3, Part 7, Revision 1, Highways Agency