CHAPTER 8

AIR QUALITY

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INTRODUCTION

Background

8.1 This chapter of the Environmental Impact Assessment Report (EIAR) deals with the issue of air quality. It primarily addresses potential dust related impacts from the proposed development and operation of an inert soil and stone recovery facility and landform restoration using inert materials at Halverstown, Kilcullen Co. Kildare.

8.2 The proposed sand pit restoration scheme and inert soil recovery facility at Halverstown, Kilcullen, Co. Kildare provides for:

- Use of imported approximately 1,200,000 tonnes of imported inert natural materials, principally excess soil, stones and/or broken rock to fill and restore a disturbed landform created by previous extraction of sand and gravel and to improve lands currently in agricultural use;
- Use of existing and/or previously approved site and services infrastructure including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, hardstand areas, fuel storage tanks, waste inspection and quarantine facility and covered shed;
- Separation of any construction and demolition waste (principally concrete, metal, timber, PVC pipes and plastic) inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities;
- Temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site;
- Restoration of the excavated landform (including placement of cover soils and seeding) to its original woodland ,grassland/tillage habitat.

8.3 The lands will be filled using only inert soil materials imported from external, pre-approved development sites. No peat, contaminated soils or non-hazardous waste will be accepted at the proposed recovery facility. The layout of the existing site is shown on Figures 1.2 and 1.3.

8.4 It is envisaged that the following wastes (EWC codes) will be deposited (or recovered) at the facility:

- 17 05 04 Soil and stones other than those mentioned in 17 05 03;
- 17 05 06 Dredging spoil other than those mentioned in 17 05 05;
- 20 02 02 Soil and stone from municipal facilities.

Scope of Work / EIA Scoping

8.5 The main focus of the assessment is the potential impact on local amenity from fugitive dust emissions from the following activities :

- importation of soil and stone from external sources (construction sites);
- separation of any construction and demolition waste (inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities);
- placement of quantities of imported inert soil and stones within the proposed infill areas within the existing site;
- stockpiling, placement and compaction of inert materials.

8.6 The principal air quality impact associated with the proposed recovery facility operation through deposition is fugitive dust emission. Dust emissions are likely to arise during:

- trafficking by heavy goods vehicles (HGVs) over unpaved surfaces;
- stockpiling, handling and compaction of inert soil and stone material;
- placement of inert materials.

8.7 With respect to the potential for air quality impacts, the key objective at the application site is to manage activities in order to ensure that air emissions are prevented where possible and the effects of any residual releases are minimised.

8.8 This chapter describes and assesses the existing air quality baseline characteristics of the local area. Estimated air emissions arising from the proposed recovery facility are then applied to these baseline conditions and the resulting air quality impacts assessed. Mitigation measures are identified where required, to eliminate and reduce these impacts insofar as practical.

8.9 The following sections of this report describe the potential air quality impacts associated with activities within the proposed development. The following issues are addressed separately:

- relevant legislation, standards and guidance;
- baseline conditions pertaining to the measured (or estimated) existing air quality levels around the proposed facility;
- methodology used to assess the potential impacts of the activities at the proposed recovery facility on air quality at local properties;
- assessment of the impacts;
- description of mitigation measures that are incorporated into the construction, design and operation of the scheme to eliminate or reduce the potential for air quality impacts; if required;
- summary of cumulative impacts;
- summary of any residual impacts;
- monitoring proposals.

Consultations / Consultees

8.10 A pre-planning consultation meeting was also held between officials of Kildare County Council and the applicant as part of this planning application (Ref. No. PP3710).

Contributors / Author(s)

8.11 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Kilsaran Concrete. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA (Environmental Engineering).

Limitations / Difficulties Encountered

8.12 This assessment is compiled on the basis of published regional and local data, guidance documents, and site-specific field surveys. No difficulties were encountered in compiling the required information.

REGULATORY BACKGROUND

8.13 The following sections describe the main legislative policy requirements in respect of air quality associated with the proposed development.

Legislation

Air Quality Standards

8.14 The Government's policy on air quality within Ireland is set out in the Air Quality Standards (AQS) Regulations 2011. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the EPA Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 33 of 1999). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I.no. 58 of 2009).

8.15 The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in Ireland.

8.16 The AQS sets standards and objectives for ten priority pollutants. Standards establish concentrations of pollutants in the atmosphere which can broadly be taken to provide a certain level of environmental quality. Objectives are policy targets, often expressed as maximum concentrations, not to be exceeded (either without exception, or with a limited number of exceedances within a specified timescale).

8.17 Under the AQS, the following pollutants are monitored and controlled :

- nitrogen oxides;
- sulphur dioxide;

- carbon monoxide;
- ozone;
- particulate matter (PM10, PM2.5 and black smoke);
- benzene and volatile organic compounds;
- heavy metals; and
- polycyclic aromatic hydrocarbons.

8.18 These pollutants are monitored at 32 stations across the country and together they form the national ambient air quality network. A summary of relevant air quality limit values in relation to human health are presented in Table 8.1. Air quality limit values in relation to vegetation protection are presented separately in Table 8.2.

8.19 The air quality monitoring network is coordinated and managed by the EPA, as the National Reference Laboratory for air quality. The results of the monitoring are compared to limit values set out in EU and national legislation on ambient air quality. As was recommended in the 2011 Review of the Environmental Protection Agency, map-based assessments are prepared and published by the EPA.

Table 8.1
Relevant Air Quality Limit Values for Protection of Human Health

Human Health	Limit or Target Value			Information and Alert Thresholds (where applicable)		Long Term Objective
Pollutant	Averaging Period	Value	Maximum Number of Allowed Occurrences	Period	Threshold value	
Nitrogen Dioxide (NO_2)	Hour Year	200 µg/m^3 40 µg/m^3	18 0	1 hour alert	400 µg/m^3 Exceeded for 3 consecutive hours	
Sulphur Dioxide (SO_2)	Hour Day	350 µg/m^3 125 µg/m^3	24 3	1 hour alert	500 µg/m^3 Exceeded for 3 consecutive hours	
Particulate matter with aerodynamic diameter of less than 10µm (PM_{10})	Day Year	50 µg/m^3 40 µg/m^3	35 0			
Particulate matter with aerodynamic diameter of less than 2.5µm ($PM_{2.5}$)	Year	25 µg/m^3 20 µg/m^3 (ECO)				8.5 to 18 µg/m^3

Table 8.2
Summary of Air Quality Limit Values: Protection of Vegetation

Vegetation	Critical Level or Target Value		Long-term Objective	
Pollutant	Averaging Period	Value	Value	Date
Nitrogen dioxide (NOx)	Calendar year	30 µg/m^3		
Sulphur Dioxide (SO2)	Calendar year and winter (October to March)	20 µg/m^3		

Planning Policy and Development Control

National Planning Framework

8.20 The National Planning Framework 2040 (published in February 2018) is a national planning framework for Ireland. The framework provides the policies for all regional and local plans. In the framework, the extractive industries are recognised as important for the supply of aggregates and construction materials to variety of sectors. It emphases that the planning process will play a key role in realising the potential of the extractive industries and protecting reserves of aggregates and minerals. Aggregates and minerals will continue to be enabled where this is compatible with protection of the environments.

8.21 There are no specific policies in relation to noise emissions and vibrations in NPF for construction aggregates. The general objective is to facilitate the development while at the same time protect the environment.

Local Planning Policy – Kildare County Development Plan

8.22 The current Kildare County Development Plan which was adopted March 2017 includes a number policies and objectives for the planning and sustainable development of the County from 2017 to 2023.

Guidelines

Extractive Industry Relevant Guidelines

8.23 In 1996, the Irish Concrete Federation (ICF), the trade body representing the interests of quarry operators and producers of construction materials, published the ICF Environmental Code which provided guidance for its members on best practice in the environmental management of quarries. The document was subsequently updated in 2005.

8.24 Section 261 of the Planning and Development Act 2000 (as amended), which regulates a significant proportion of established quarry development, came into effect in April 2004. The Department of Environment planning guidelines for the extractive industry 'Quarries and Ancillary Activities – Guidelines for Planning Authorities' (DoEHLG 2004) were published around the same time.

8.25 Separately, in 2006, the EPA published its Environmental Management Guidelines for Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

Guidance Relating to Dust

8.26 Fractions of dust greater than 10 µm (micrometres) in diameter are not covered within the Air Quality Standards and typically relate to nuisance effects.

8.27 A range of monitoring techniques exists for dust deposition rates (i.e. Bergerhoff and Frisbee gauges). Extractive industry standard criteria levels for the gravimetric assessment of dust deposition which are generally used across extractive industry in Ireland include the DoEHLG (2004) planning guidelines for the extractive industry, the ICF Guidelines (2005) and EPA (2006) Environmental Management Guidelines.

8.28 The Guidelines recommend the use of the Bergerhoff method for measuring dust deposition. In line with this approach, the guidelines recommend the TA Luft dust deposition limit value of 350 mg/m^2/day (total dust deposition averaged over a 30 day period), measured at site boundaries.

8.29 When the rate of accumulation of this coarser fraction of dust (referred to as deposited dust) is sufficiently rapid to cause fouling or discolouration, then it is generally considered to introduce a nuisance. The point at which an individual perceives dust deposition as a nuisance and causes a complaint is highly subjective.

8.30 The action of wind over dry ground will carry dust particles into the air. Although large emissions of dust occur naturally, man-made dust events are caused by a range of activities including agriculture, road traffic, construction works (including the handling and storage of soils or C&D wastes) and by vehicles using paved and unpaved haul roads.

8.31 For operations involving the mechanical break up of solids, the most common concern regarding dust emissions is the potential nuisance effect from the larger fractions of dust.

Dust and Ecological Receptors

8.32 A majority of the research on the effects of particulate matter on vegetation has focussed on the chemical effects of alkaline dusts. A summary of a review of available research on behalf of the UK's Department for the Environment Transport and Regions (DETR) concluded that:

"*the issue of dust on ecological receptors is largely confined to the associated chemical effect of dust, and particularly the effect of acidic or alkaline dust influencing vegetation through soils.*"

8.33 An Interim Advice Note (IAN) prepared as a supplement for Volume 11, Section 3, part 1 of the UK DMRB (Design Manual for Roads and Bridges) and now incorporated into HA207/07) suggests that only dust deposition levels above 1,000mg/m^2/day are likely to affect sensitive ecological receptors. This level of dust deposition is approximately five times greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. It states that most species appear to be unaffected until dust deposition rates are at levels considerably higher than this.

UK Planning Guidance on Assessment of Mineral Dust Impacts

8.34 Guidance on the assessment of the impacts of extractive operations on air quality has been prepared by the Institute of Air Quality Management (IAQM). This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely

to be significant and therefore require no further assessment. Where assessment that is more detailed is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

8.35 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are to be acceptable under planning policy

Air Quality and Health Effects

8.36 Two recent EPA reports, *Air Quality in Ireland 2015*[1] and *Ireland's Environment, An Assessment 2016* [2]detail the main air quality trends based on monitoring from the national ambient air quality network. There are monitored exceedances of the WHO guideline values for ozone, PM_{10} and $PM_{2.5}$ at a number of sites though there are no current exceedances of the lower (less protective) EU standards at the existing monitoring locations in Ireland. The reports also highlight the main challenges of reducing air pollution from key sources such as particulate matter emissions from solid fuel burning (e.g. peat, coal and wood) in the residential sector and NOx emissions from vehicles in the transport sector.

8.37 A summary of relevant Air Quality limit values in relation to human health was presented previously in Table 8.1.

RECEIVING ENVIRONMENT

Study Area

8.38 The proposed recovery facility is located approx. 4.5km to the south of Kilcullen village, approx. 1km to the west of the M9 motorway. The site is accessed through the existing Kilsaran Concrete Facility entrance located on the western side of the R448 Regional Road (the old N9 National Primary Road).

8.39 The site was previously in use as a sand and gravel pit with features typical of an extractive operation including stockpiles and silt storage areas. It is proposed to locate the waste recovery facility within the void created by sand and gravel extraction and agricultural lands located to the Northeast of the pit void – refer to Figure 2.1.

8.40 The site is located in a rural area with residential development generally consisting of one-off housing and ribbon development along the local road network. Land use in the area is mainly agriculture and sand and gravel extraction. The application site adjoins Kilsaran's existing concrete manufacturing facility to the north. A restored sand and gravel pit operated by Kilsaran is located to the northwest of the site – refer to Figure 1.3.

[1] Environmental Protection Agency, 2016. Air Quality in Ireland 2015 - Key Indicators of Ambient Air Quality. Available at:https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20Report%202015.pdf

[2] Environmental Protection Agency, 2016. Ireland's Environment, An Assessment 2016. Available at: http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf

Baseline Study Methodology

8.41 The application site and surrounding area fall into Air Quality Zone D, categorised as rural locations throughout Ireland. No monitoring in the vicinity of the site is routinely undertaken for air pollutants regulated under the Air Quality Standards Regulations (S.I. No. 180 of 2011).

8.42 The closest air quality monitoring location to the proposed recovery facility, and in a similar Zone D area, is located in Emo, approximately 20km west of the application site. The closest PM_{10} monitoring in Zone D is carried in Kilkitt, County Monaghan. As such, it is considered the most appropriate dataset available for assessment of relevant baseline concentrations in the study area.

8.43 For rural areas, such as those surrounding the application site, the primary source of deposited dust would be local agricultural or rural based activities. As there are no major sources of deposited dust in close proximity to the proposed development, baseline levels of particulates would therefore be expected to be low.

Sources of Information

8.44 A desk study was carried out to examine all relevant information relating to air quality conditions around the application site. Met Eireann, the National Meteorological Service data was consulted in relation to the climate / weather data in respect of the study area. Information published on the EPA website in respect of air quality was reviewed.

8.45 Information published on its website by the National Parks and Wildlife Service (NPWS) (part of the Department of the Environment, Community and Local Government, DoECLG), in respect of designated ecological sites, protected habitats and species was also reviewed, together with Ordnance Survey maps and aerial photography.

Field Survey

8.46 Site-specific dust monitoring is currently carried out at the existing waste recovery facility in compliance with Condition no. 23 of Plan File Ref. No. 15/189 and WFP-KE-16-0085-01.

Background Air Quality

8.47 Recent annual mean concentrations monitored at Kilkitt, County Monaghan (published on the EPA website) are presented in Table 8.3 below.

Table 8.3
Background PM_{10} Background Concentrations - Kilkitt

Year	Annual Mean (µg/m^3)	Number of Days >50µg/m^3
2015	9	2
2014	9	1

8.48 Table 8.3 illustrates that PM_{10} concentrations monitored at the Kilkitt monitoring site are below the annual mean Air Quality Standards (AQS) of 40µg/m^3 and comply with the requirement that a 24-hour mean of 50µg/m^3 should not be exceeded more than 35 times in a calendar year.

Meteorology: Dispersion of Emissions

8.49 The most important climatological parameters governing the atmospheric dispersion of particles are as follows:

- wind direction: determines the broad transport of the emission and the sector of the compass into which the emission is dispersed; and
- wind speed will affect ground level emissions by increasing the initial dilution of particles in the emission. It will also affect the potential for dust entrainment.

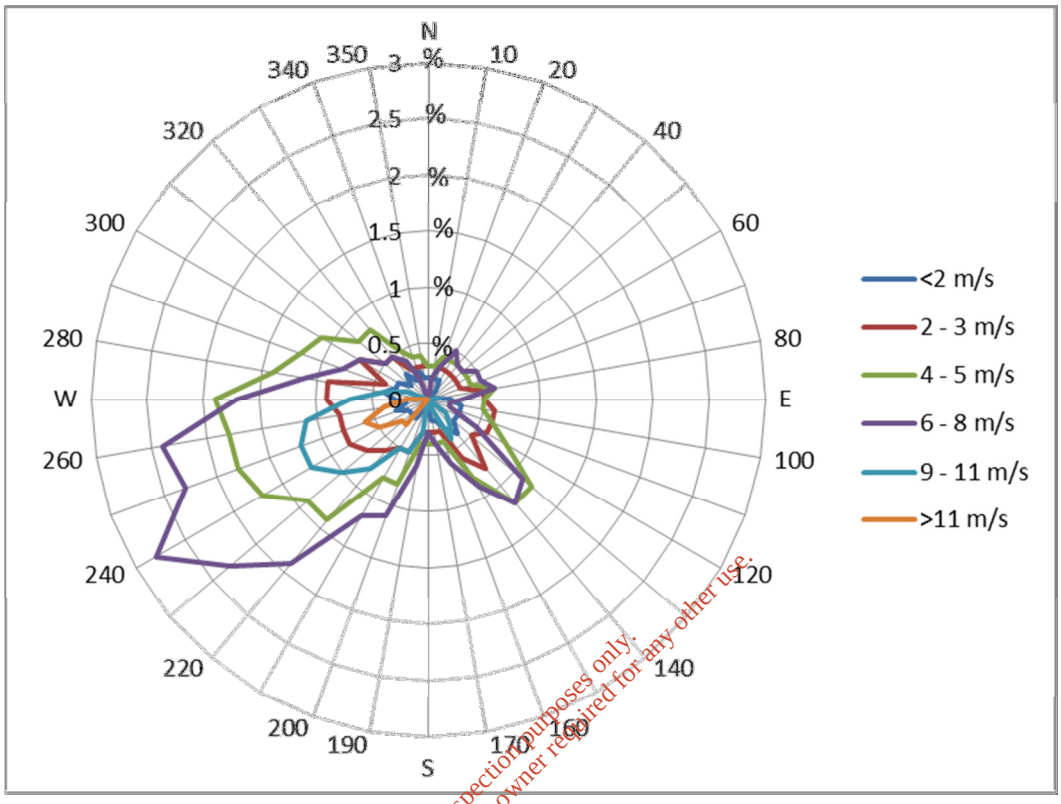
8.50 Rainfall is also an important climatological parameter in the generation of dust; sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. Rainfall greater than 0.2mm per day is sufficient to suppress dust emissions.

Local Wind Speed and Direction Data

8.51 The closest weather station with sufficient records of wind direction and wind speed considered representative of conditions experienced at the application site is Baldonnel (Casement) Aerodrome Meteorological Station, which is located approximately 30 km to the northeast of the application site.

8.52 A windrose for the average conditions recorded at Baldonnel (Casement) Aerodrome, over a ten year period, is presented in Figure 8.2. The predominant wind direction is from the southwestern quadrant.

Figure 8.1
Windrose for Baldonnell (Casement) Aerodrome Meteorology Station



Rainfall data

8.53 Relevant rainfall data applicable to the site has been obtained from the Irish Meteorological Service website for the Baldonnel (Casement) Aerodrome station, approximately 30 km north-east of the application site. The annual average days with rainfall greater than 0.2 mm is 183 days per year. Natural dust suppression (from rainfall) is therefore considered to be effective for 50% of the year.

Sensitive Receptors

Ecological Receptors

8.54 The application site is not subject to any statutory nature conservation designation – refer to Section 4: Biodiversity. Based on the nature, size and scale of the planned development, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 sites is up to a maximum radius of 2km from the application site unless there are any potential source-pathway-receptor links between the proposed development at Halverstown and Natura 2000 site(s) beyond this distance.

Human Receptors

8.55 Sensitive locations are those where people may be exposed to dust from the planned site activities. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas, and food retailers.

8.56 Receptors have been identified within a 1km distance of the overall planning application boundary. This is a cautious approach, as the dust generating activities are located at greater distances within the site. These receptors are listed in Table 8.4 and their locations are indicated in Figure 8.1. As housing is clustered in some areas, receptors have been identified at the nearest location to the application site boundary.

8.57 There are 32 sensitive receptors identified within the 1km study area of the planning application area. A summary of the closest dust sensitive receptors in each direction surrounding the planning application area and their respective proximity to the nearest dust generating activity within the site is presented in Table 8.4 below.

Table 8.4
Dust Sensitive Receptors within 1km

Receptor Reference	Receptor	Sensitivity	Distance (m) / Direction from application boundary
R1	Residential	Medium	50(E)
R2	Residential	Medium	80(SE)
R3	Residential	Medium	50(S)
R4	School	Medium	243(SE)
R5	Residential	Medium	120(NE)
R6	Residential	Medium	101(NE)
R7	Residential	Medium	162(NE)
R8	Residential	Medium	155(SE)
R9	Residential	Medium	151(S)
R10	Residential	Medium	435(E)
R11	Residential	Medium	412(E)
R12	Residential	Medium	422(E)
R13	Residential	Medium	457(E)
R14	Residential	Medium	453(SE)
R15	Residential	Medium	547(SE)
R16	Residential	Medium	438(N)
R17	Residential	Medium	454(N)
R18	Residential	Medium	517(N)
R19	Residential	Medium	552(N)
R20	Residential	Medium	591(N)
R21	Residential	Medium	638(N)
R22	Residential	Medium	652(N)
R23	Residential	Medium	792(N)
R24	Residential	Medium	351(W)

Receptor Reference	Receptor	Sensitivity	Distance (m) / Direction from application boundary
R25	Residential	Medium	461(W)
R26	Residential	Medium	531(W)
R27	Residential	Medium	594(W)
R28	Residential	Medium	664(W)
R29	Residential	Medium	565(W)
R30	Residential	Medium	691(W)
R31	Farm	Medium	920(S)
R32	Residential	Medium	50(SE)
R33	Residential	Medium	510(SE)

IMPACT ASSESSMENT - METHODOLOGY

Evaluation Methodology

8.58 Particulate matter arising from activities at the application site has the potential to affect existing sensitive receptors in the area due to a potential increase in airborne dust deposition.

8.59 The significance of impacts due to emissions from the application site are dependent upon the magnitude of the emissions, the prevailing meteorological conditions for the location, and the proximity of sensitive locations to the emission sources.

8.60 Each of the activities associated with this application have been assessed for potential air quality impacts including:

- emission from separation of soil and stone, soils placement and storage (including trackout);
- PM10 contribution from operational activities;
- traffic exhaust emissions.

8.61 The methodology used in the impact assessment is presented in the sub-sections below. They also provide an explanation of the significance criteria to describe the impact of the planned development on air quality.

8.62 For the purposes of the environmental assessment of releases of dust from construction and mineral activities, the classification of PM_{10} and 'deposited dust' are typically applied. The impacts associated with PM_{10} are related to potential health impacts while deposited dust is related to potential nuisance effects. The assessment of the potential impacts of each fraction has, therefore, been undertaken separately.

Significance Criteria

8.63 The following air quality specific significance criteria have been used to assess the significance of air quality impacts in preference to overall descriptors of significance. No similar Irish Guidance is available.

8.64 To determine the significance of particulate matter effects associated with the development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in environment, and are classified as per Table 8.5 below (and IAQM Construction Dust Guidance[3]).

Table 8.5
Methodology for Defining Sensitivity to Dust and PM_{10} Effects

Sensitivity of Area	Examples Human Receptors	Ecological Receptors[(a)]
Very High	Very densely populated area More than 100 dwellings within 20m Local annual mean PM_{10} concentrations exceed the AQS. Works continuing in one area of the site for more than 1-year	European Designated sites
High	Densely populated area. 10-100 dwellings within 20m of site. Local annual mean PM_{10} concentrations close to the AQS (36 – 40µg/m^3)	Nationally Designated sites
Medium	Suburban or edge of town Less than 10 receptors within 20m Local annual mean PM_{10} concentrations below the AQS (30 – 36µg/m^3)	Locally designated sites
Low	Rural area; industrial area No receptors within 20m Local annual mean PM_{10} concentrations well below the AQS (<30µg/m^3) Wooded area between site and receptors	No designations
Notes: (a)-Only applicable if ecological habitats are present which may be sensitive to dust effects.		

8.65 Table 8.6 illustrates how the interaction of magnitude and sensitivity results in the significance of an environmental effect, with the application of mitigation measures as per the IAQM Construction Dust Guidance.

Table 8.6
Impact Significance Matrix – Dust Effects (With Mitigation)

Sensitivity of Surrounding Area	Risk of Site Giving Rise to Dust or PM_{10} Effects High	Medium	Low
Very High	Slight Adverse	Slight Adverse	Negligible
High	Slight Adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

[3] http://www.iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf

Trackout - Methodology

8.66 The Institute of Air Quality Management (IAQM) assessment of risk is determined by considering the predicted change in conditions as a result of the planned development. There is risk for potential dust effects arising from trackout (haulage).

8.67 Based on the scale and nature of the works including areas, and operations at the site, a dust emission class is defined for the trackout. The dust emission class is then used to determine the risk categories presented below. These risk categories determine the potential risk of dust soiling effects, assuming no mitigation measures are applied.

8.68 Table 8.7 illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from *trackout movements*.

Table 8.7
Determination of Risk Category from Trackout Movements

Distance to Nearest Receptor		Dust Emission Class		
Human	Ecological	Large	Medium	Small
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20 – 50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50 – 100	20 – 100	Low Risk Site	Low Risk Site	Negligible

8.69 Mitigation measures are recommended based on the evaluation of risk in accordance with the IAQM Dust and Air Emissions Mitigation Measures Guidance.

Importation of Soil - Methodology

8.70 A staged approach has been adopted; this ensures that the approach taken for the assessment of risk is proportional to the risk of an unacceptable impact being caused. As such, where a simple review of the situation shows that risk of a health or nuisance impact is negligible, this will be sufficient. In cases where the risk cannot be regarded as insignificant, a more detailed assessment may be required, such as a quantitative screening assessment or an advanced dispersion modelling exercise as appropriate.

8.71 Guidance on the assessment of the impacts of extractive operations on air quality has been prepared by the Institute of Air Quality Management (IAQM). This guidance uses a simple distance-based screening process to identify those operations where the dust impacts are unlikely to be significant and therefore require no further assessment. Where assessment that is more detailed is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate risk of impacts and effects.

8.72 The predicted scale of dust effects may be classified as either 'significant', or not 'significant'. Where effects are predicted to be 'significant', further mitigation is likely required before the proposals are to be acceptable under planning policy.

8.73 A semi-quantitative assessment of fugitive dust emissions from the proposed facility has been undertaken. The assessment has been undertaken by constructing a conceptual model that takes into consideration the potential sources, surrounding receptors, and the pathway between source and receptor in order to assess the magnitude of risk of impact on local amenities.

8.74 The distance from the source to the sensitive receptor is crucial. The initial risk screening stage (Tier 1) focuses upon the potential for dust generation at the site and the distance between

source and receptors. In Tier 1 of the assessment, a representative selection of dust sensitive receptors in each direction of the application site is identified within the 500m study area.

8.75 Further assessment (Tier 2) is considered to be required for those receptors within 500m of dust generating activities. Receptors within 500m of dust generating processes progress onto a Tier 2 assessment.

8.76 Tier 2 involves identifying source-pathway-receptor linkages and a semi-quantitative assessment of the likelihood and magnitude of any effects that could be associated with each pollutant linkage. This assessment takes account of:

- wind direction and speed data (to estimate frequency of exposure);
- proximity to source (to estimate magnitude of exposure);
- sensitivity of receptor; and
- occurrence of natural dust suppression (rainfall patterns).

8.77 This information is used to inform a semi-quantitative assessment of the likely magnitude of impact and is based upon professional experience of the assessor as the issue of dust nuisance on local receptors is a subjective issue, where public perception on what constitutes 'acceptable' levels varies from one person to the next. Assigning significance to nuisance impacts is qualitative and involves a judgement based on the likely magnitude, frequency, duration and reversibility (or recovery) of the impact. In this context, significant impact is taken to mean what is generally not publicly acceptable and desirable.

8.78 Note that the following assessment **does not take into account any established or planned mitigation measures** being / to be implemented at the recovery facility. These currently include the provision of additional landscaping and a range of dust suppression measures (refer to the section on Mitigation Measures later in this Chapter).

8.79 Following presentation of the results of the risk assessment, mitigation measures are detailed and the residual impact assessed. The detailed methodology used within the assessment is described in detail in Appendix 8.A.

PM10 Contribution – Methodology

8.80 In terms of whether the PM_{10} concentration in the local area is likely to exceed the AQS, the following information has been reviewed:

- existing PM_{10} concentrations;
- expected additional contribution of PM10 from increased site activities at the recovery facility.

8.81 In terms of estimating the potential magnitude of impact from increased site activities, a UK edition of the LAQM Technical Guidance (LAQM.TG(03)) states that fugitive dust from stockpiles, and quarry operations (similar development to the proposed inert waste facility) can potentially contribute up to 5µg/m^3 towards annual mean background concentrations of the coarse fraction (2.5 – 10µm diameters) of particulates in the immediate area.

8.82 Given the nature and scale of existing activities, the potential PM_{10} impact of soil intake is considered to be similar or lower. However, to ensure a robust assessment of potential PM_{10} impacts, the upper limit of 5µg/m^3 has been applied to represent the development contribution to annual ambient PM_{10} concentrations. This value has then been added to existing background levels to assess whether the Air Quality Standards objective is likely to be exceeded.

Traffic Emissions - Methodology

8.83 Atmospheric emissions related to site proposals are primarily associated with the exhaust emissions from heavy duty vehicles (HDVs). The decision as to whether an assessment of potential impact is required is based upon the criteria set out in the Design Manual for Roads and Bridges (DMRB).

8.84 The criterion for assessment of air quality contained within the latest DMRB guidance (207/07) focuses on roads with relatively high changes in flows or high proportion of HDV / HGV traffic. Affected roads are defined as those that meet any of the following criteria:

- road alignment will change by 5m or more; or
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) movements or more; or
- HDV / HGV flows will change by 200 AADT or more; or
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20km/hr or more.

8.85 It is estimated that the proposed waste recovery operation is considered likely to give rise to a total of 59 No. HGV trips per day. Accounting for the current 4-5No. HGV trips per day associated with the permitted waste importation the proposed development is forecast as likely to give rise to an additional 55 HGV trips per day. There will be no changes to road alignment or existing average or peak hour speeds.

8.86 On this basis there is no requirement for a Traffic Emissions assessment.

ASSESSMENT OF IMPACTS

Trackout - Assessment

8.87 In the course of activities at the recovery facility, incoming / outgoing HGV traffic will follow established haul routes within Halverstown site, much of which are paved around the site entrance / egress and the shared infrastructure area (where the site office, welfare facilities, staff canteen, weighbridge, wheelwash etc. are located). Given that HGVs travel over a relatively limited length of unpaved haul road in the centre of the quarry and over paved roads around its access / egress point, the trackout dust risk category is considered to be 'negligible'.

8.88 A summary of the determined risk category for proposed operation identified is presented in Table 8.8.

Table 8.8
Soils Intake Activities : Risk of Particulate Emissions

Source	Risk of Dust Soiling Effects	Ecological Effects
Trackout	Negligible	Negligible

8.89 While the overall risk category has been assessed as 'negligible', if the activities were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in dust nuisance immediately around the application area. However, these are not considered to be significant given the limited duration of such meteorological conditions and the limited change in the extent and scale of proposed activities.

Importation of Soils – Assessment

8.90 An overview of the sources and processes associated with the facility activities, and their respective potential for particulate dust emissions is presented in Table 8.9 below.

Table 8.9
Facility Activities: Sources of Particulate Emissions

Activity	Source	Emission Potential	Comments
Separation of Soils	Excavator / Dozer/ HDV	High - dry or fine materials during strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity.
		Low – coarse or wet materials during conditions of low wind speed	
Soils Stockpiling	Excavator / Stockpiles	High - dry or fine materials during strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity.
		Low – coarse or wet materials during conditions of low wind speed	
Handling & Compaction of Soils	Excavator/ Dozer	High - dry or fine materials during strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity.
		Low – coarse or wet materials during conditions of low wind speed	

8.91 Table 8.10 identifies receptors within the 500m study area around the application site. There are 18 receptors rated as being of medium sensitivity within 500m of the site boundary.

8.92 Using the tiered assessment methodology outlined previously, receptors located within 500m have progressed to a Tier 2 assessment as they are considered to have a greater risk of dust impact

8.93 Each receptor identified in Table 8.10 is assessed against the frequency of exposure and the distance from the source to the receptor (i.e. the pathway). The methodology applied is described in detail in Appendix 8-A.

8.94 The frequency of exposure of each receptor is based upon the frequency of winds capable of carrying dust particles blowing in the direction, from the source to the receptor, on days when

rainfall does not inhibit dust from becoming airborne. Representative data on the local wind climate is therefore required for this section of the assessment.

8.95 The potential for the generation of airborne dust will increase with wind speed, with winds greater than 3 m/s capable of carrying airborne dust . A wind rose for the application site is presented in Figure 8.2 from the Baldonnel Airport Meteorological Station. It shows the frequency of winds at wind speeds of greater than 2 m/s, with the individual frequencies for each 10 degree compass sector used within the assessment.

8.96 Wind speeds over 2 m/s were used for the purposes of this impact assessment, as this is how the data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason therefore, the impact assessment presented herein is conservative.

Table 8.10
Receptors Progressing to Tier 2 Assessment

Receptor Reference	Receptor	Sensitivity	Distance (m) / Direction from Application Area
R1	Residential	Medium	50(E)
R2	Residential	Medium	80(SE)
R3	Residential	Medium	50(S)
R4	School	Medium	243(SE)
R5	Residential	Medium	120(NE)
R6	Residential	Medium	101(N)
R7	Residential	Medium	162(N)
R8	Residential	Medium	155(SE)
R9	Residential	Medium	151(S)
R10	Residential	Medium	435(E)
R11	Residential	Medium	412(E)
R12	Residential	Medium	422(E)
R13	Residential	Medium	457(E)
R14	Residential	Medium	453(SE)
R16	Residential	Medium	438(N)
R17	Residential	Medium	454(N)
R24	Residential	Medium	351(W)
R25	Residential	Medium	461(NW)
R32	Residential	Medium	50 (SE)

8.97 A summary of the risk assessment of dust impacts from sources within the proposed development is presented in Table 8.11 below.

Table 8.11
Dust Risk Assessment (Without Mitigation Measures)

Receptor	Distance from Site Activities (approx.)(m)	Relevant Wind Direction (^{0})	Potential Exposure Duration (adjusted for dry days only)[a]	Relative Wind / Distance Rank	Multiplied Rank	Risk Evaluation (Without Mitigation)
R1	50(E)	200-350	28.85	6/8	48	Moderate Adverse
R2	80(SE)	290-0	2.1	1/8	8	Acceptable
R3	50(S)	340-40	1.65	1/8	8	Acceptable
R4	243(SE)	290-340	0.1	1/4	4	Insignificant
R5	120(NE)	190-230	16.65	6/5	30	Moderate Adverse
R6	101(N)	190-230	16.65	6/5	30	Moderate Adverse
R7	162(N)	190-230	16.65	6/5	30	Moderate Adverse
R8	155(SE)	290-340	2.1	1/5	5	Insignificant
R9	151(S)	340-10	0.7	1/5	5	Insignificant
R10	435(E)	270-310	3.25	2/2	4	Insignificant
R11	412(E)	270-310	3.25	2/2	4	Insignificant
R12	422(E)	270-310	3.25	2/2	4	Insignificant
R13	457(E)	280-310	2.3	1/2	2	Insignificant
R14	453(SE)	280-310	2.3	1/2	2	Insignificant
R16	438(N)	200-220	12.7	5/2	10	Acceptable
R17	454(N)	190-210	9.05	4/2	8	Acceptable
R24	351(W)	110-140	1.65	1/3	3	Insignificant
R25	461(NW)	110-140	1.65	1/2	2	Insignificant
R32	50(SE)	290-0	2.1	1/8	8	Acceptable

[a] Based on the frequency of moderate to high winds (≥2 m/s) which would cause dust emissions to travel in the *direction of the receptor. Adjusted for natural suppression due to 183 days with rainfall over 0.2mm (Factor = 0.5)*

This assessment does not take into account proposed mitigation measures that include provision of perimeter landscape proposals, dust suppression measures etc., refer to Mitigation Measures section

Refer to Figure 8.1 for Receptor Locations / Appendix 8.A for Dust Risk Assessment Methodology

8.98 From Table 8.11, it is observed that the risk of impact from dust emissions associated with the facility at Halverstown site (without any mitigation measures in place) generally varies from insignificant to acceptable at assessed receptors within 500 meters of the dust generating activities. Risk of impact from dust emissions at receptors R1, R5, R6 andR7 was assessed to be moderate adverse without the proposed mitigation measures.

Ecological Receptors

8.99 The application site is not subject to any statutory nature conservation designation and there are no protected sites in radius of 2 km from the application site.

8.100 Based on the nature, size and scale of the planned activity at Halverstown, it is considered that the maximum distance for which the project should be evaluated in terms of Natura 2000 sites is up to a maximum radius of 2km from the application site, unless, there are any potential source-pathway-receptor links between it and any Natura 2000 site(s) beyond this distance.

8.101 At a distance greater than 2km and in the absence of any potential source-pathway-receptor link, it is considered that no Natura 2000 sites would be affected by any direct loss of habitat or impacted upon by the effects of dust deposition or traffic emissions.

8.102 Studies have indicated that fugitive dust is typically deposited within 100 to 200m of the source, the greatest proportion of which, comprising larger particles (greater than 30 microns) is deposited within 100m. Where large amounts of dust are deposited on vegetation over a long time-scale (a full growing season for example) there may be some adverse effects upon plants restricting photosynthesis, respiration, and transpiration.

8.103 Based on the above, it is concluded that the planned activity at Halverstown will have an insignificant dust deposition impact on ecological receptors.

Human Receptors

8.104 Using a screening assessment tool, the Air Quality Assessment (outlined in Appendix 8.A) considers that there is generally an insignificant to acceptable risk that dust may cause an impact at sensitive receptors within 500m of the source of the dust generated activities. Risk of impact from dust emissions at receptors R1, R5, R6, R7 was assessed to be moderate adverse.

8.105 Note that this assessment does not take into account implementation of mitigation measures within the proposed development that include provision of perimeter screening berms, dust suppression measures etc. (outlined in the Mitigation Measures section below). This assessment is considered to be conservative on the basis of the relatively moderate wind speeds which formed the basis of the risk evaluation.

Traffic Emissions - Assessment

8.106 For the purposes of assessment, the projected additional traffic movements associated with the development is predicted to be 55 AADT HDVs, with no significant changes to either road alignment or speed.

8.107 Therefore, as none of the changes to the surrounding local road network meet any of the traffic / alignment criteria set out in HA 207/07, then the impact of the proposed intensification in recovery activity and HGV traffic movements can be considered to be 'negligible' in terms of local air quality and no further air quality assessment is deemed necessary.

8.108 On this basis, the impact of the facility from the change of HDVs can be screened out and combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the HGV movements are not considered to have potential to contribute to local air pollution.

PM_{10} Contribution from Facility Operations - Assessment

8.109 In terms of PM_{10}, the maximum annual mean measured baseline background concentration was 9µg/m³ in 2014 and 2015 at Kilkitt monitoring station. Therefore, the potential contribution up of 5µg/m^3 towards annual mean background concentrations of the coarse fraction (2.5 – 10µm

diameters) of particulates (in the immediate area of the site) is considered to be insignificant and well below the annual objective of 40µg/m³ for human health air quality limit.

8.110 Therefore, the potential impacts in relation to increase in ambient PM_{10} concentrations beyond the development site boundary can be classified as 'negligible', given the limited duration of meteorological conditions and the limited extent of the extent and scale of proposed recovery activities.

Cumulative / Synergistic Impacts

8.111 In essence, cumulative impacts are those which result from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed development. Therefore, the potential impacts of the proposed development cannot be considered in isolation but must be considered in addition to impacts already arising from existing or planned development.

8.112 Adjacent to the proposed development there is a concrete manufacturing plant. There is no visible airborne emission from the concrete manufacturing plant; plant is fitted permanent bag filter and suction fans which prevent emissions.

8.113 There are no other significant sources of emission to air within close proximity to the site and therefore no potential for significant cumulative impacts has been identified.

8.114 The cumulative impact of the proposed development and the concrete manufacturing plant will be insignificant.

Interaction with Other Impacts

8.115 The potential impact on air quality by the project on sensitive receptors including sensitive ecological receptors and people living in the area has been fully assessed in this chapter. The overall impact of the project on these receptors is further considered in Chapter 4 Population and Human Health and Chapter 5 Biodiversity.

MITIGATION MEASURES

8.116 A range of mitigation measures are recommended for Halverstown facility operations. Specific mitigation measures are listed in Table 8.12 below.

Table 8.12
Particulate Emission Mitigation Measures

Source	Emission Potential	Recommended Mitigation Measures	Effectiveness
HGV	High – dry or fine material during strong windy weather	Minimise drop heights when handling materials. Soils placed directly into screening berms or in progressive works. Avoid working in adverse/ windy conditions.	High
	Low – material of high moisture content during conditions of low wind speed	Minimise drop heights when handling material, protection from wind where possible.	High

Source	Emission Potential	Recommended Mitigation Measures	Effectiveness
Onsite Vehicles	High when travelling over un-surfaced and dry site roads.	Minimise distances of onsite haul routes.	High
		Use of water sprays / tractor & bowser to moisten surfaces during dry weather.	High
		Restrict vehicle speeds through signage / staff training.	High
		Location of haul routes away from sensitive receptors.	High
Road Vehicles (transfer offsite)	Low / Moderate on paved road surfaces	Use of road sweeper to reduce the amount of available material for re-suspension.	Moderate / High
		Maintain the paved access road.	High
Stockpiles	High when dry or fine material being stored or handled during strong windy weather	Seed surfaces of completed mounds / bunds of top soil.	High
		Limit mechanical disturbance.	High
Moderate to Acceptable Risk Receptors	High – during dry and strong windy weather	Retention of hedgerows	High
		Avoid working in adverse weather conditions	High
			High

RESIDUAL IMPACT ASSESSMENT

8.117 With the range of mitigation measures to be implemented and design measures to be incorporated into the working scheme, it is considered that the risk of dust impact at receptors from the proposed development reduces further.

8.118 After an assessment of potential adverse effects produced by the development it was concluded that there would be no significant adverse air quality effects for both human and ecological receptors (screened out) which cumulatively would not hinder the site or the surrounding area. Overall, the effects of the proposed development on air quality have been considered to be negligible to acceptable.

8.119 A summary of the residual dust risk impact assessment is provided in Table 8.13.

Table 8.13
Residual Dust Risk Assessment (With Mitigation Measures)

Receptor Reference	Risk Evaluation
R1	Acceptable
R2	Insignificant
R3	Insignificant
R4	Insignificant
R5	Acceptable
R6	Acceptable
R7	Acceptable
R8	Insignificant
R9	Insignificant
R10	Insignificant
R11	Insignificant
R12	Insignificant
R13	Insignificant

Receptor Reference	Risk Evaluation
R14	Insignificant
R16	Insignificant
R17	Insignificant
R24	Insignificant
R25	Insignificant
R32	Insignificant

8.120 On the basis of the assessment presented above, it is concluded that the proposed development, with the range of mitigation measures to be implemented and design measures incorporated into the working scheme, will not have a dust deposition impact on any assessed receptors.

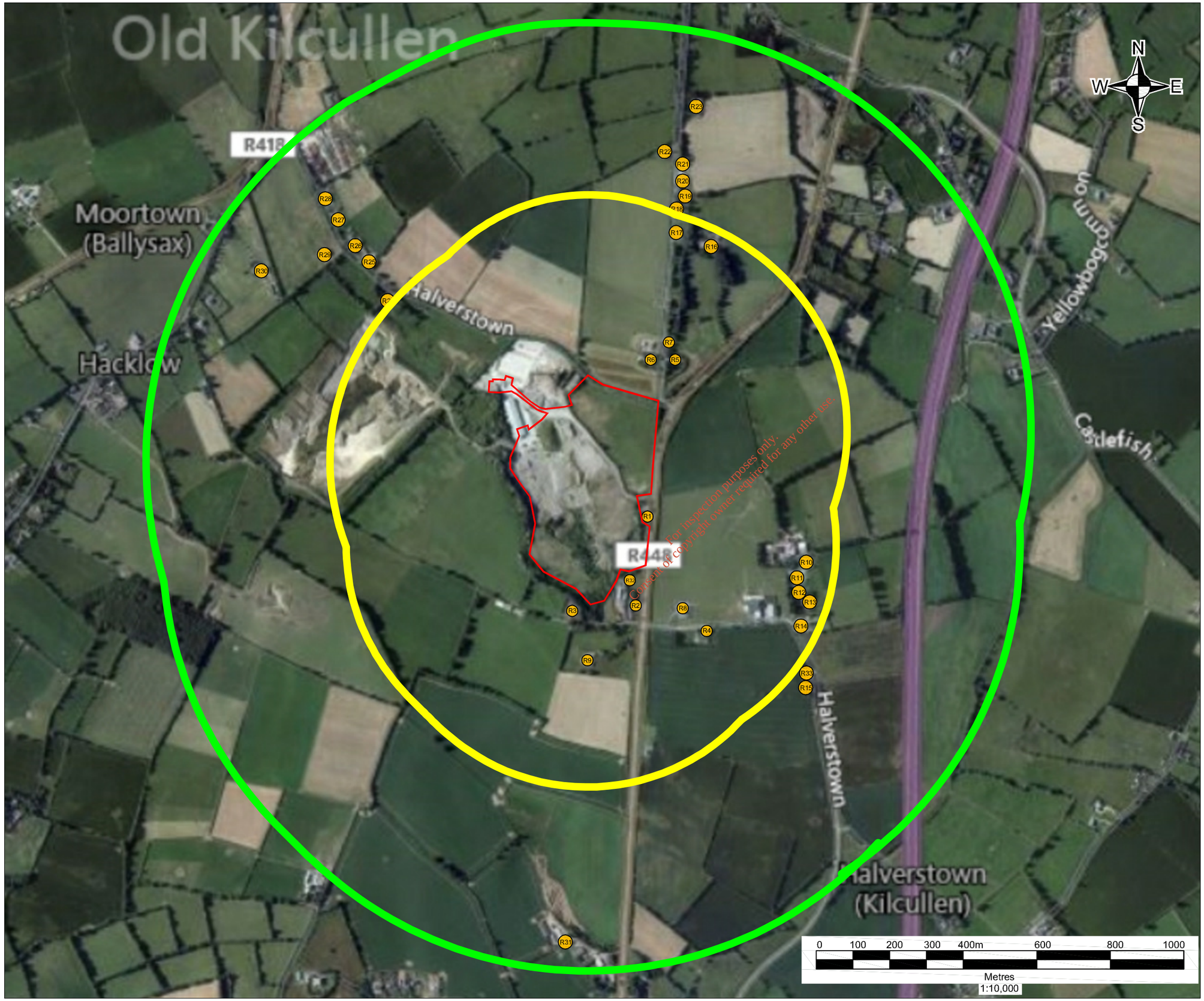
MONITORING

8.121 Dust deposition monitoring shall be undertaken at the application site for the duration of facility activities using standard dust monitoring method (involving the Bergerhoff Instrument).

8.122 Results of dust monitoring shall be submitted to the Kildare County Council on a regular basis for review and record purposes.

FIGURES

Figure 8.1: Local Receptors



NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000718 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

- PLANNING APPLICATION AREA (c. 17.5 Ha.)
- R — LOCAL RECEPTORS
- 500 METER OFFSET
- 1 KM OFFSET

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KILSARAN CONCRETE

Proposed Waste Recovery Facility
Halverstown, Co. Kildare

LOCAL RECEPTORS

FIGURE 8.1

Scale	Date
1:10,000	MARCH 2018

171012.501.00036.00054.Air Quality EIAR Rev0.dwg

APPENDIX 8.A

DUST RISK SCREENING ASSESSMENT METHODOLOGY

The methodology applied in the assessment is a semi-quantitative risk assessment methodology, in which the probability of an impact occurring and the magnitude of the impact, if it were to occur, are considered. This methodology is the Tier 2 assessment of the dust assessment methodology. In the event that identified dust sensitive receptors are not screened out within Tier 1, this approach provides a mechanism for identifying the areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the development, (i.e. the assessment does not take account of existing mitigation in place at the quarry.).

The magnitude of the potential risk at each receptor is classified depending on the frequency of exposure and the distance from the site to the receptor. Frequency of exposure is represented by the percentage of moderate to high winds (over 3m/s) from the direction of the site.

The screening assessment tool assesses the significance of the distance from site and the frequency of exposure of each receptor by assigning a ranked number. Receptors with a higher potential for dust impacts would therefore result in a higher value whilst receptors with lower potential would expect to carry a lower value. The value corresponding to an evaluation of risk is a product of the significance of the distance and frequency of exposure, each is assigned a value representing its significance. The multiplication of the two values assigned gives a total, which is then corresponded to a qualitative term of risk magnitude.

Frequency of Exposure Criterion

The potential for any site to emit dust is greatly influenced by weather. Increased wind speed increases the potential for the generation of airborne dust due to the suspension and entrainment of particles in airflow. A worst-case situation would be strong, warm, drying winds which increase the rate at which dust is lifted from an untreated surface and emitted into the air. Wind can also have the effect of spreading dust over a large area. Conversely, rainfall decreases dust emissions, due to both surface wetting and increasing the rate at which airborne dust is removed from air. An article on dust generation from quarry operations[4] suggests that rainfall of greater than 0.2mm per day is considered sufficient to effectively suppress windblown dust emissions.

The frequency of exposure to dust emissions represents the percentage of time that wind speeds capable of carrying airborne dust (greater than 3m/s) are blowing from the site to the direction of the receptor. Frequencies are calculated based on meteorological data. For screening assessment wind speeds greater than 2m/s were considered as this is how data on percentage occurrence of wind frequency and wind speed is calculated and presented by Met Eireann. For this reason, the assessment is considered to be conservative.

For the screening assessment, a value of 1mm would be used for the criteria to classify days as 'dry' or 'wet'; five times the recommended value, using annual average rainfall data. The average number of days when rainfall exceeds 1.0mm would be provided for each month, and calculated over the year to provide an average.

[4] Leeds University. Good Quarry. http://www.goodquarry.com/article.aspx?id=55&navid=2

The resulting frequency of moderate to high wind speeds with the potential of carrying airborne dust towards receptors would then be classified into the criteria in Table 8.A-1 with the respective rank value assigned.

Table 8.A- 1
Frequency of Exposure – Risk Classification

Risk Category	Criteria
1	Frequency of winds (>2 m/s) from the direction of the dust source on dry days are less than 3%
2	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 3% and 6%
3	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 6% and 9%
4	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 9% and 12%
5	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are between 12% and 15%
6	The frequency of winds (>2 m/s) from the direction of the dust source on dry days are greater than 15%

Distance to Source Criterion

In assessing dust impacts, the distance from the source to the sensitive location is crucial, as airborne and deposited dust tend to settle out close to the emission source. Smaller dust particles remain airborne for longer, dispersing widely and depositing more slowly over a wider area.

Guidance indicates that larger dust particles (greater than 30µm) will largely deposit within 100m of sources. Smaller particles (less than 10µm) are only deposited slowly. Concentrations decrease rapidly on moving away from the source, due to dispersion and dilution.

To allow for this effect of distance, buffer zones are often defined by mineral planning authorities around potentially dusty activities to ensure that sufficient protection is provided. They have not been established in any rigorous scientific way, but usually range from 50m to 200m. The 1995 UK DoE Guidance on dust from surface mineral working's, however, recommends a stand-off distance of 100-200m from significant dust sources (excluding short-term sources), although it is recognised that these distances can be reduced if effective mitigation measures are identified and implemented. In terms of identifying sensitive locations therefore, and to represent an extreme worst case scenario, consideration only needs to be given to sensitive receptors within 500m of the site boundary. Receptors at a distance greater than 500m have therefore been screened out in Tier 1 of the assessment.

The criteria for classifying the distance from receptor to source and thus assigning a rank value has therefore been based on the various references to dust behaviour described above. The rank classifications are presented below in Table 8.A-2. A risk category is maintained for receptors in excess of 500m for circumstances where although a receptor is beyond 500m from the dust source, its sensitivity for example is sufficient for it to be taken onto a Tier 2 assessment.

Table 8.A- 2
Distance to Source – Risk Classification

Risk Category	Criteria
1	Receptor is more than 500m from the dust source
2	Receptor is between 400m and 500m from the dust source
3	Receptor is between 300m and 400m from the dust source
4	Receptor is between 200m and 300m from the dust source
5	Receptor is between 100m and 200m from the dust source
8	Receptor is less than 100m from the dust source

Sensitivity of Receptors

Sensitive locations are those where the public may be exposed to dust from the site. Locations with a high sensitivity to dust include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive include schools, residential areas and food retailers. Table 8.A-3 below[5] shows examples of dust sensitive facilities.

Table 8.A- 3
Examples of Dust Sensitive Facilities

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and clinics	Schools and residential areas	Farms
Retirement homes	Food retailers	Light and heavy industry
Hi-tech industries	Greenhouses and nurseries	Outdoor storage
Painting and furnishing	Horticultural land	
Food processing	Offices	

Evaluation of Risk

Once a rank value has been assigned to the frequency of exposure and distance to source, an overall risk can be evaluated by combining the two risk categories, along with consideration of the sensitivity of the receptor. For low sensitivity receptors the risk of dust impact are considered to be significantly lower than for medium and high sensitive receptors. Therefore, a factor of 0.5 would be applied to the final risk evaluation ranking.

For each receptor, the relative magnitude of risk is given by identifying which of the score categories in Table 8.A-4 it falls into. This final evaluation represents the risk of dust impacts prior to control and mitigation measures being employed on site.

[5] **Ireland M. (1992)** "Dust: Does the EPA go far enough?", Quarry Management, pp23-24.

Table 8.A- 4
Risk Evaluation Ranking (Without Mitigation)

Magnitude of Risk	Score
Insignificant	7 or less
Acceptable	8 to 14
Slight Adverse	15 to 24
Moderate Adverse	24 or more

CHAPTER 9

CLIMATE

CONTENTS

TABLES

INTRODUCTION

9.1 This chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, provides supporting information to accompany Planning and Waste Licence Applications to Kildare County Council & the Environment Protection Agency by Kilsaran Concrete. It primarily addresses potential climate related impacts from the proposed operation of an inert waste recovery facility and landform restoration at Halverstown, Co. Kildare.

9.2 The proposed waste recovery facility at Halverstown, Kilcullen, Co. Kildare provides for:

- Use of imported approximately 1,200,000 tonnes of imported inert natural materials, principally excess soil, stones and/or broken rock to fill and restore a disturbed landform created by previous extraction of sand and gravel and to improve lands currently in agricultural use;
- Use of existing and/or previously approved site and services infrastructure including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, hardstand areas, fuel storage tanks, waste inspection and quarantine facility and covered shed;
- Separation of any construction and demolition waste (principally concrete, metal, timber, PVC pipes and plastic) inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities;
- Temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site;
- Restoration of the excavated landform (including placement of cover soils and seeding) to its original woodland / grassland habitat.

9.3 The lands will be filled using only inert soil materials imported from external, pre-approved development sites. No peat, contaminated soils or non-hazardous waste will be accepted at the proposed recovery facility. The layout of the existing site is shown on Figures 1.2 and 1.3.

9.4 It is envisaged that the following wastes (EWC codes) will be deposited (or recovered) at the facility:

- 17 05 04 Soil and stones other than those mentioned in 17 05 03.
- 17 05 06 Dredging spoil other than those mentioned in 17 05 05
- 20 02 02 Soil and stone from municipal facilities

9.5 Further information on the site infrastructure, operations, environmental management systems, and controls at the established waste permit facility is provided in the Chapter 2 of this EIAR.

Scope of Work

9.6 The following sections of this Chapter describe the potential climate change impacts associated with the proposed development. The following issues are addressed separately:

- climate change legislative framework/policy context;
- analysis of evolving environmental baseline trends;
- identifying climate change concerns in relation to proposed development;
- assessing effects;
- identifying mitigation measures;
- identifying monitoring and adaptive management.

Consultations / Consultees

9.7 A pre-planning consultation meeting was also held between officials of Kildare County Council and the applicant as part of this planning application (Ref. No. PP3710).

Author(s)

9.8 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Kilsaran Concrete. The lead consultant for the study was Aldona Binchy MSc. (Eng) PIEMA (Environmental Engineering).

Difficulties Encountered

9.9 There are no published guidelines or established methodologies in Ireland for assessment of climate change impacts associated with the extractive or waste industry sectors.

LEGISLATIVE FRAMEWORK / POLICY CONTEXT

Adaptation to Climate Change

9.10 The DECLG published a National Climate Change Adaptation Framework (NCCAF) in December 2012[1]. The publication of the NCCAF was the first step in developing a comprehensive national

[1] http://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Climate-Change-Adaptation-Framework.aspx

policy position within which adaptation measures to address the impacts of climate change could be taken and planned. This non-statutory, but Government approved, framework mandated the development and implementation of sectoral adaptation plans and local government adaptation strategies which, together, would form part of the national response to the impacts of climate change.

9.11 The inert waste / soil recovery sector was not identified under the National Adaptation Framework (NAF) to prepare sectoral adaptation plans in line with the requirements of the Climate Action and Low Carbon Development Act.

9.12 The policy in relation to climate adaptation, first set out in the NCCAF, was subsequently restated in the National Policy Position on Climate Change (2014)[2]. The National Policy Position provides a high-level policy direction for the adoption and implementation of plans to pursue the transition to a low carbon, climate resilient and environmentally sustainable economy by 2050 (known as the "national transition objective").

9.13 On the 10 December 2015, the Climate Action and Low Carbon Development Act 2015 [3]was enactmed; the 2015 Act identified and provided for the development and submission to Government of national mitigation and adaptation plans. It also established the institutional and governance framework within which these plans can be developed and implemented on a cyclical basis.

9.14 Under section 5 of the 2015 Act, the Minister for Communications, Climate Action and Environment must submit to Government for approval, a National Adaptation Framework (NAF), which must be reviewed not less than once in every five year period. The NAF must specify the national strategy for the application of adaptation measures in different sectors and by local authorities in their administrative areas in order to reduce the vulnerability of the State to the negative effects of climate change and to avail of any positive effects that may occur. The 2015 Act also provides that relevant Ministers will be required to develop sectoral adaptation plans which will specify the adaptation policy measures the Minister in question proposes to adopt.

9.15 The Climate Change Advisory Council [4](CCAC) was established by Ministerial Order on 18 January 2016 under section 8 of the Climate Action and Low Carbon Development Act 2015. The Council, which is independent in the performance of its functions, provides advice and recommendations to, *inter alia*, the Minister for Communications, Climate Action and Environment in relation to the preparation of the NAF; the making by a relevant Minister of a sectoral adaptation plan; and the approval by the Government of a NAF. In addition, the Council has a number of reporting obligations, including with regard to 'Annual' and 'Periodic Reviews' of progress towards meeting the national transition objective; it also established an Adaptation Committee in 2016 to focus

[2] http://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Policy-Position.aspx

[3] http://www.irishstatutebook.ie/eli/2015/act/46/enacted/en/html

[4] http://www.climatecouncil.ie/

specifically on adaptation related matters. A summary of adaptation to climate change actions in Ireland is presented in **Table 9-1**.

Table 9- 1
Summary of Adaptation to Climate Change Actions in Ireland[5]

Item	Status	Programs
National Climate Adaptation Strategy	Non-Statutory Framework adopted. Legislation enacted. Statutory Framework in development.	National Climate Change Adaptation Framework Climate Action and Low Carbon Development Act 2015 Consultation on development of statutory National Adaptation Framework
Action Plans	Sectoral Adaptation Plans in development. Local authority plans in development.	Local Authority Adaptation Strategy Development Guidelines (2016) Local Authority Adaptation Support Tool
Impacts, Vulnerability and Adaptation Assessments	National Vulnerability Assessment	2012 National Climate Change Vulnerability Scoping Study Climate Change Impacts on Biodiversity in Ireland (2013) Climate change Impacts on Phenology in Ireland(2013) COCOADAPT (2013) 2013 HydroDetect Project Robust Adaptation to Climate Change in the Water Sector in Ireland (2013) Ensemble of Regional Climate Projections for Ireland(2015) Urb-ADAPT
Research Programs	EPA Research Programme (Climate Pillar)	http://www.epa.ie
Climate services / Met Office	Established	http://www.met.ie
Web Portal	Established	http://www.climateireland.ie
Monitoring, Indicators, Methodologies	In development	
Training, Education	Ongoing / in development	http://www.climateireland.ie

Green House Gas Emissions

9.16 Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change.

[5] http://climate-adapt.eea.europa.eu/countries-regions/countries/ireland

Paris Agreement

9.17 In December 2015, an ambitious global agreement on climate change was agreed in Paris. The Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. It aims to increase global ability to adapt to the adverse impacts of climate change and to foster climate resilience and low Green House Gas (GHG) emissions development, in a manner that does not threaten sustainable food production. It also seeks to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century. The Paris Agreement entered into force on 4 November 2016.

9.18 The Paris Agreement aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs) which will increase in ambition over time. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. This is a binding EU target of an overall EU reduction of at least 40% in greenhouse gas emissions by 2030 compared to 1990 levels. The target will be delivered collectively by the EU with reductions in the Emissions Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005 respectively.

Kyoto Protocol (2008 – 2012)

9.19 The EPA has overall responsibility for the national greenhouse gas inventory in Ireland's national system, which was established in 2007 under Article 5 of the Kyoto Protocol[6]. The EPA's OCLR[7] performs the role of inventory agency in Ireland and undertakes all aspects of inventory preparation and management as well as the reporting of Ireland's submissions annually in accordance with the requirements of Decision 280/2004/EC and the UNFCCC.

9.20 Under the Kyoto Protocol, Ireland currently accounts for GHG emissions. Under the Kyoto Protocol, Ireland is required to limit total national greenhouse gas emissions to 314.2M tonnes of CO2eq over the five year period 2008 – 2012 which is equivalent to 62.8M tonnes of CO2eq per annum. The Kyoto Protocol limit is calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61M tonnes of CO2eq following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the UNFCCC.[8]

[6] http://unfccc.int/kyoto_protocol/items/2830.php

[7] http://www.epa.ie/mobile/about/org/oclr/

[8] http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/nc6_br1_ire.pdf

EU 2020 Targets for non-ETS sector emissions[9]

9.21 Under the EU Commission's Climate and Energy Package, Ireland is required to deliver a 20% reduction in non-ETS greenhouse gas emissions by 2020 (relative to 2005 levels). In addition, Ireland also has binding annual emission limits for the period 2013-2020 to ensure a gradual move towards the 2020 target. The non-ETS sectors cover those sectors that are outside the EU Emissions Trading Scheme and includes agriculture, transport, built environment (residential, commercial/institutional), waste and non-energy intensive industry. Member States are permitted to meet their annual targets through a number of mechanisms which include carry forward of a quantity of its annual emission allocation from the following year, use of transfers from other Member States and the limited use of international credits from project activities as long as certain criteria are met.

Catchment Flood Risk Assessment and Management (CFRAM) Programme[10]

9.22 The current Catchment Flood Risk Assessment and Management (CFRAM) Programme (see www.cfram.ie) is the mechanism through which many of the adaptation to climate change actions will be implemented, including embedding adaptation into the development of capital projects and the long-term of flood risk management in Ireland. The future scenario flood maps produced under the CFRAM Programme will facilitate this approach, inform other sectors, and provide a valuable resource for local adaptation planning and sustainable land use management and planning.

EIA Directive 2014/52/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment

9.23 Directive 2014/52/EU[11] of the European parliament and of the council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. The Directive requires to be transposed by 16 May 2017, necessitating changes in laws, regulations, and administrative provisions across a number of legislative codes. Key Changes introduced by the 2014 Directive in Annex IV (information referred to in article 5(1) – Information for the Environmental Impact Assessment Report) include information on the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change to be included in the Environmental Impact Assessment Report.

[9] http://www.epa.ie/climate/emissionsinventoriesandprojections/nationalemissionsprojections/

[10] https://www.cfram.ie/

[11] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052

Guidelines

Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment[12]

9.24 These Guidelines give recommendations on how to integrate climate change and biodiversity in Environmental Impact Assessment (EIA). The need for action on climate change and biodiversity loss is recognised across Europe and around the world. Guidelines contain an explanation why climate change and biodiversity are so important in EIA and present the relevant EU-level policy background, provide advice on how to integrate climate change and biodiversity into selected stages of the EIA process. The annexes provide sources of further reading and links to other relevant information, data, and tools.

Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017)[13]

9.25 This Guidance provides information to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and no statutory Environmental Impact Assessment (EIA). It complements IEMA's earlier guide on Climate Change Resilience and Adaptation and builds on the Climate Change Mitigation and EIA overarching principles. The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive.

Climate Change and Major Projects[14]

9.26 Guidance for assessing vulnerability and risk from Climate Change for major projects funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

EVOLVING BASELINE

Climate Environmental Baseline

Regional Context

9.27 Observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising sea level are unequivocal evidence of warming of the climate system

[12] http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf

[13] https://www.iema.net/policy/ghg-in-eia-2017.pdf

[14] https://ec.europa.eu/clima/sites/clima/files/docs/major_projects_en.pdf

globally. Global mean temperature has increased by 0.8°C compared with pre-industrial times for land and oceans, and by 1.0°C for land alone. Most of the observed increase in global average temperatures is very likely due to increases in anthropogenic greenhouse gas concentrations.

9.28 Landmasses are expected to warm more than the oceans, and northern, middle and high latitudes more than the southern latitudes. Despite possible reductions in average summer precipitation over much of Europe, precipitation amounts exceeding the 95th percentile are very likely in many areas, thus episodes of severe flooding may become more frequent despite the general trend towards drier summer conditions. In an ensemble-based approach using outputs from 20 global climate models (GCMs), the Mediterranean, northeast and northwest Europe are identified as warming hot spots but with regional and seasonal variations in the pattern and amplitude of warming. Regional climate models (RCMs) also project rising temperatures for Europe until the end of the 21st century, with an accelerated increase in the second half of the century. For precipitation, the larger-scale summer pattern shows a gradient from increases in Northern Scandinavia to decreases in the Mediterranean region. By contrast, increases in wintertime precipitation primarily north of 45°N are a consistent feature of RCM projections over Europe, with decreases over the Mediterranean. Overall, then, there are consistent projections of change for northern and northwest Europe.

9.29 Ireland has a typical maritime climate, with relatively mild and moist winters and cool, cloudy summers. The prevailing winds are south-westerly in direction. The climate is influenced by warm maritime air associated with the Gulf Stream which has the effect of moderating the climate, and results in high average annual humidity across the country. The area of least precipitation is along the eastern seaboard of the country, in the rain shadow of the Leinster uplands.

9.30 Mean seasonal temperature will change across Ireland. A number of studies have applied selected IPCC Special Reports on Emissions Scenarios (SRESs) to model climatic changes across Ireland at a regional scale. Despite the different methods and scenario combinations used, there is agreement in projected changes in temperature for Ireland. However, there are more disparities in the magnitude and sign for the precipitation changes projected for the island.

9.31 Table 9-2 summarises climate impact projections for Ireland, estimates of projections confidence are derived from published projection data from the Local Authority Adaptation Strategy Development Guidelines:

Table 9- 2
Climate Impacts Projections: 30-year overview[15]

Variable	Summary	Confidence	Projected changes

[15] Local Authority Adaptation Strategy Development Guideline, EPA 2016

Variable	Summary	Confidence	Projected changes
Sea Levels Rise	Strong increase	High	Projections of sea level rise to 2100 suggest a global increase in the range of 0.09-0.88m with a mean value OF 0.48. For 2050, it is reasonable to assume a sea level rise in the region of 25 cm above present levels. It should be noted that due to an as yet limited understanding of some of the important effects that contribute to rates of increase, these estimates of sea level rise may prover optimistic , and estimates of up to 4-6 m have been projected by some models.
Storm surge	Strong increase	Medium	An increase in the numbers of intense cyclones and associated strong winds are expected over the north- east Atlantic. By the 2050s, storm surge heights in the range of 50-100cm are expected to increase in frequency for all coastal areas with exception of the southern coast.
Costal Erosion	Moderate increase	Low	Currently approximately 20% of Ireland's coastline is at risk of costal erosion, particularly areas of the south and east coast and also in isolated areas on the west coast. Rates of increase will be determined by local circumstances; however, it is expected that areas of the south-west are likely to experience the largest increase.
Cold Snaps/ Frost	Moderate decrease (winter/night)	High	By mid-century, minimum temperatures during winter are projected to increase by ~2^{0}C in the southeast and ~2.9^{0}C in the north. This change will results in fewer frost days and milder nigh-time temperatures.
Heatwaves	Strong increase (summer)	High	Seven significant heatwaves (defined as 5+ days@>25^{0}C) have been recorded in Ireland over the past 30 years, resulting in approximately 300 excess deaths. By mid-century, a projected increase in summer maximum daily temperature of approximately 2^{0}C will likely intensify heatwaves, with maximum temperatures increasing and heatwave duration lengthening.
Dry Spells	Strong increase (summer)	Medium	There have been seven periods of insignificant rainfall in Ireland in the past 40 years. Of these, the events of 1976 and 1995 were the most severe, averaging 52 and 40 days in duration respectively across Irish rainfall stations. An approximate 20% decrease in summer precipitation receipts in many areas is strongly indicated under a high emissions scenario. This decrease is likely to results in progressively longer periods without significant rainfall, posing potentially severe challenges to water sensitive sectors and regions.

Variable	Summary	Confidence	Projected changes
Extreme Rainfall	Strong increase (winter)	Low	Heavy precipitation days (in which more than 20mm of rainfalls) are likely to increase in frequency in winter. By the 2050s an increase in the number of heavy precipitation days of around 20% above the level of 1981-2000 is projected under both low-medium and high emissions scenarios. This may have serious consequences for flood risk in sensitive catchments.
Flooding	Moderate increase (winter)	Low	An Irish Reference Network of hydrometric stations has been established to assess signals of climate charge in Irish hydrology. This network has detected an increasing trend in high river flows since 2000. Projections of future flows are beset by uncertainty at the catchment scale, but a broad signal of wetter winters and drier summers is evident across a number of independent studies.
Wind Speed	Minor increase (winter)	Medium	Observed wind speed over Ireland has not changed significantly in recent times, but it is anticipated that the distribution of wind will alter slightly in future, with winters marginally windier and summers marginally less so. Though the average wind speed is anticipated to change in only a minor way over the coming decades, the frequency of extreme windstorms is expected to increase due to alternations in the origin and track of tropical cyclones.

Local Context

9.32 A weather station close to the application site with sufficient duration of recorded data and considered representative of conditions experienced at the application site is Dublin Airport Meteorological Station, which is located approximately 50 km to the north east of the application site.

9.33 The moderating influence of the Atlantic Ocean is felt throughout Ireland. The annual mean temperature for different areas in Ireland varies between mountainous regions, lowlands and the coast. Mean daily maximum temperatures are typically between 8.1 to 19.5°C and mean daily minimum temperatures are typically between 2.3 to 11.7°C for the area surrounding Dublin Airport, see **Table 9-3**.

9.34 The east of Ireland, which is sheltered from Atlantic frontal systems, is sunnier than the west. The sunniest months are May and June. The mean daily duration recording of sunshine for the area around Dublin Airport is 3.9 hours. December is the dullest month, with 1.7 hours of mean daily duration. May is the sunniest month, with 6.2 hours of mean daily duration, explained largely by its long days and finer weather.

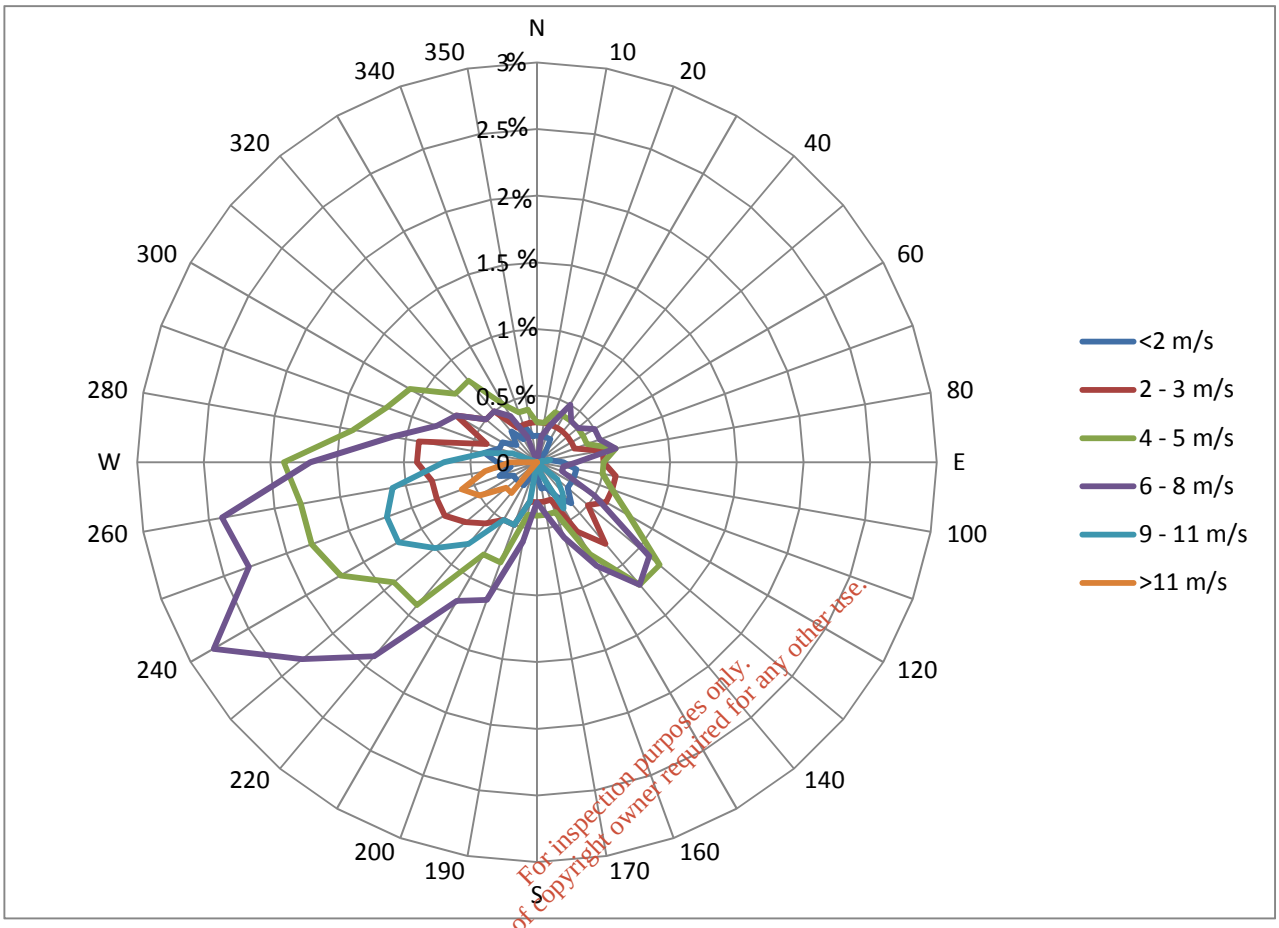
Table 9- 3
Dublin Airport 1981-2010 Temperature Averages

Temperature (degrees Celsius)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Max	8.1	8.3	10.2	12.1	14.8	17.6	19.5	19.2	17	13.6	10.3	8.3	13.3
Mean Daily Min	2.4	2.3	3.4	4.6	6.9	9.6	11.7	11.5	9.8	7.3	4.5	2.8	6.4
Mean Temperature	5.3	5.3	6.8	8.3	10.9	13.6	15.6	15.3	13.4	10.5	7.4	5.6	9.8

9.35 Results from the synoptic meteorological station at Dublin Airport, located approx. 40km north east of the application site over the period 1990-2010, indicate that the main wind direction is from a west and south-westerly direction, with an annual incidence of 48% for winds between 200° and 280°. The lowest frequency is for winds blowing from the north and northeast direction.

9.36 A windrose for the wind data recorded at Dublin Airport station is presented in **Figure 9-1** for the period 1990-2000 inclusive.

Figure 9-1
Windrose for Dublin Airport Meteorology Station



9.37 During the period 1981-2010, long-term monthly rates of precipitation were between 48.8mm and 79mm at the Dublin Airport station, with winter months receiving the heaviest amounts. The mean of the Met Eireann records indicate that average annual rainfall around the application site is approximately 758mm / year. The average rainfall data indicates that the greatest daily total (73.9mm) fell in the month of June refer to **Table 9-4**.

Table 9- 4
Average Precipitation Dublin Airport (mm) 1981-2010

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Monthly Total	62.6	48.8	52.7	54.1	59.5	66.7	56.2	73.3	59.5	79	72.9	72.7	758
Greatest Daily Total	27.1	28.1	35.8	30.4	42.1	73.9	39.2	72.2	40.6	53.2	62.8	42.4	73.9

IMPACT ASSESSMENT

Methodology

9.38 In Ireland some sectors have independently begun the process of identifying key vulnerabilities for their activities. The report by the Irish Academy of Engineering, Ireland at Risk Critical Infrastructure – Adaptation for Climate Change (The Irish Academy of Engineering, 2009) and the report by the Heritage Council and Fáilte Ireland (the National Tourism Development Authority), Climate Change, Heritage and Tourism, Implications for Ireland's Coast and Inland Waterways (ed. Kelly and Stack, 2009) are examples of initiatives of this kind.

9.39 Other research work on adaptation in specific sectors has been carried out or commissioned by other Government Departments/bodies such as the OPW, CoFoRD (programme of competitive forest research for development research programme, etc. (e.g. CLIMADAPT).

9.40 A National Climate Change Vulnerability Scoping study (Sweeney and Coll, 2012) was undertaken to identify first generation vulnerabilities for Ireland based on a sensitivity analysis across key sectors. The analysis identified a clustering of impacts and their importance in relation to an assessment of likely resilience by sector. The assessment methodology used was an impacts-first, science-first classical approach. The priority sectors identified are: biodiversity and fisheries; water resources and the built coastal environment; forestry and agriculture. As each sector develops its sectoral adaptation plan (under the Climate Action and Low Carbon Development Act 2015), detailed vulnerability and risk analysis will be required. Some preliminary work has been undertaken on costing the impacts of climate change in Ireland. This is now being supported by more detailed analysis of the current and future costs of flood risk management.

9.41 The implementation of adaptation is being supported by the development of a suite of guidelines, tools and approaches. These include the Local Authority Adaptation Strategy Development Guideline; and the Irish climate information platform “Climate Ireland”, which includes data,

information, tools and approaches for local level adaptation decision making. Work is ongoing to develop sectoral decision making tools and supports.

9.42 The EPA is currently funding a research project called Urb-Adapt which aims to identify the impact of climate change on Dublin city and surrounding towns within the greater Dublin region. The project aims to identify possible risks to the population living in that area and future risks posed to it by the changing climate.

9.43 There are no specific tools developed for assessing climate change for extraction/waste industry sites. The Climate Change and Major Project guideline on how to make vulnerable investments resilient to climate change provides methodology for undertaking a vulnerability and risk assessment.

9.44 Climate change adaptation and mitigation shall be integrated in the preparation and approval of proposed development. Adaptation seeks to ensure adequate resilience of proposed development to the adverse impacts of climate change based on vulnerability. Mitigation seeks to reduce the emissions greenhouse.

Project Vulnerability

9.45 The aim of the vulnerability assessment is to identify the relevant climate hazards for the project at the foreseen location. Main steps include identifying and combining the sensitivity and exposure of the project which will describe the vulnerability, the risk will be defined as likelihood and impact. Adaptation through project options, appraisal, and planning will depend on the assessed project vulnerability and risk.

9.46 Timescale for the project vulnerability and risk assessment shall correspond to the lifespan of the project. During the lifespan, there could be significant changes in frequency and intensity of weather events due to climate change, which should be taken into account.

9.47 The scale for accessing likelihood analysis of a climate hazard is presented in **Table 9-5**.

Table 9- 5
Scale of Likelihood of Climate Hazard

Term	Qualitative	Quantitative
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to Occur	50%
Likely	Likely to Occur	80%
Almost certain	Very likely to occur	95%

9.48 Example of scale for accessing potential impact of a climate hazard is presented in **Table 9-6**.

Table 9- 6
Example Table of Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational					
Safety and Health					
Environment					
Social					
Financial					
Reputation					

9.49 Example of accessing the sensitivity of project to climate hazards is presented in **Table 9-7**.

Table 9- 7
Example Table Sensitivity of Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heath	Drought	Wildfire Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
On site assets									
Inputs - Water									
Inputs - Energy									
Outputs - product									
Transport links									

9.50 Example of accessing exposure of project to climate hazards is presented in **Table 9-8**.

Table 9- 8
Example Table of Exposure of the Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
Current Climate									
Future Climate									

9.51 Example of vulnerability of project to climate hazards is presented in **Table 9-9.**

Table 9- 9
Example Table of Vulnerability analysis of project to climate hazards

Sensitivity	Exposure (Current & Future climate)		
	Low	Medium	High
Low			
Medium			
High			

Green House Gases Emissions

9.52 All projects have the potential for a number of greenhouse gas emissions to atmosphere during the construction, operational and decommissioning phase of the development. Direct GHG Emissions are caused by operational activities, and project decommissioning. The indirect GHG emissions are due to increased demand for energy; and indirect GHG activities which are linked to the implementation of the proposed project which include transport, office space heating of buildings or loss of habitats that provide carbon sequestration, (e.g. through land-use change).

9.53 Currently in Ireland there is no set methodology on evaluating significance criteria or defined threshold for GHG Emissions for soil recovery facilities. Due to the inconsistences between the different methods and their assumptions for assessment, there is no single agreed method by which to assess a project carbon budget. The application of the method will depend on the type and scale of the project.

9.54 Due to lack of methodology assessment guidelines this GHG emissions assessment is based on whether the proposed development's GHG emissions cumulatively represent a considerable contribution to the global atmosphere and if the proposed development will replace existing development & have a higher GHG profile.

9.55 Where the GHG emissions cannot be avoided, the mitigation should aim to reduce the development emissions at all stages.

Assessment

Project Vulnerability

9.56 The aim of the vulnerability assessment is to identify the relevant climate hazards for the project at the foreseen location. A likelihood analysis of the Halverstown site to climate hazards is presented in **Table 9-10**.

9.57 The Halverstown application site has been assessed to be likely effected by extreme rainfall, flood, flash flood, storms and winds. Moderately affected cold spells and snow, and unlikely affected by landslides, freeze –thaw damage. The Halverstown site will not be affected by rising sea level heat, drought, wildlife fires.

Table 9- 10
Analysis of Likelihood of Climate Hazards at Halverstown Recovery Facility

	Extreme rainfall, flood , flash flood	Heat	Drought	Wildlife fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
Rare		√		√					√
Unlikely						√		√	
Moderate							√		
Likely	√				√				
Almost certain									

9.58 **Table 9-11** shows the climate hazard impact analysis of the project. It assesses what the major impacts of the climate hazards will have on health and safety and environment and financial areas, climate hazards with moderate impacts on the asset damage, engineering, operational, social and reputation areas.

Table 9- 11
Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational			√		
Safety and Health				√	
Environment				√	
Social			√		
Financial				√	
Reputation			√		

9.59 In **Table 9-12** below sensitivity of the project to climate hazard was assessed. It was assessed that on site assets, energy inputs and transport links are of high sensitivity from extreme rainfall, flood, flash floods, storms and winds; water inputs will be sensitive to droughts. Energy inputs will be highly sensitive to storms and winds. Onsite assets will be medium sensitive to cold spells and snow, freeze –thaw damage. Transport links will be medium sensitive to storms and winds.

Table 9- 12
Sensitivity of Project to Climate Hazards

	Extreme rainfall, flood , flash flood	Heath	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
On site assets	High	Low	Low	Low	High	Low	Medium	Medium	Low
Inputs - Water	Low	Low	High	Low	Low	Low	Low	Low	Low
Inputs - Energy	High	Low	Low	Low	High	Low	Low	Low	Low
Outputs - product	Low	Low	Low	Low	Low	Low	Low	Low	Low
Transport links	High	Low	Low	Low	Medium	Low	Low	Low	Low

9.60 In **Table 9-13** exposure of the project to current and future climate hazards was assessed. In current climate the exposure of the project to extreme rainfall, flood, flash flood, storms and winds have been assessed to be medium. The project was assessed to have high exposure to rainfall, flood, flash flood, storms and winds have been assessed to be high.

Table 9- 13
Exposure of the Project to Current and Future Climate Hazards

	Extreme rainfall, flood, flash flood	Heat	Drought	Wildlife Fires	Storms and Winds	Landslides	Cold Spells and Snow	Freeze –thaw damage	Rising sea levels
Current Climate	Medium	Low	Low	Low	Medium	Low	Low	Low	Low
Future Climate	High	Low	Low	Low	High	Low	Low	Low	Low

9.61 **Table 9-14** show project vulnerability analysis of the project to climate hazards; it combines the sensitivity and the exposure analysis. The project was assessed to be most sensitive to extreme rainfall, flood, flash flood, storms and winds.

Table 9- 14
Vulnerability Analysis of Project to Climate Hazards

Sensitivity	Exposure (Current & Future climate)		
	Low	Medium	High
Low	Rising sea levels, Freeze – thaw damage, Landslides, Drought, Heat		
Medium		Cold Spells and Snow Wild Fires	
High			Extreme rainfall, flood , flash flood, Storms and winds

9.62 Based on the project vulnerability assessment measures to improve the resilience of the project to extreme rainfall, flood, flash flood, storms, and winds are required.

Greenhouse Gas Emissions

9.63 For the purpose of this assessment, GHG emissions have been calculated for the proposed project. Total GHG emissions for the proposed development are presented in Table 9-15.

Table 9- 15
Yearly GHG Emissions Calculations for Halverstown

Type	Value	Conversion factor	Calculated	Total CO_2e kg for Halverstown
Diesel (L)	75,900	2.60016[1]	197,352.14	197,352.14

1 Conversion factor for 2017 for Scope 1 Protocol for fuels: diesel.

9.64 A total of 19.7 CO2e tonnes will be produced at the proposed soil recovery facility during the year. When compared to Irelands 2016 emissions values of 61.19 million tonnes of CO2e emissions at Halverstown represent 0. 0004653 % of those values.

9.65 Based on the scale and extent of activities at Halverstown GHG emissions are assessed as not making a significant contribution to or impact on the global atmosphere over the life time of the project.

MITIGATION AND ADAPTATION

9.66 Mitigation is designed to increase the resilience of the project, or wider environmental receptors, to climate change and should focus on increasing its capacity to absorb climate related shocks.

Project Adaptation against Expected Climate Change Effects

9.67 In the context of climate change adaptation to increase adaptive capacity of the Halverstown Waste Recovery Facility, disaster risk reduction strategies shall be developed with a view to reducing vulnerability and increase resilience of the development. Significant incidents related to the climate change that have affected operation of the Halverstown Recovery Facility shall be recorded for future analysis.

Proposed Reduction of GHG Emissions

9.68 Kilsaran Concrete shall adopt GHG monitoring programme at Halverstown Waste Recovery Facility. Based on the GHG monitoring results Kilsaran shall establish short, medium, and long-term objectives and targets for GHG reduction programme.

MONITORING

Project Adaptation against Expected Climate Change Effects

9.69 A framework and set of indicators shall be developed to assess project preparedness for adaptation against climate change. Provision shall be made for a periodic review of plans and the

allocation of reporting responsibilities for a regime to measure and evaluate progress on adaptation. This process shall include updates from implementation of the adaptation plans on regular basis.

GHG Emissions

9.70 Monitor, report and review GHG reduction progress.

CHAPTER 10

NOISE AND VIBRATION

CONTENTS

TABLES

FIGURES

INTRODUCTION

Background

10.1 This chapter of the Environmental Impact Assessment Report (EIAR) deals with the issue of noise and vibrations. It primarily addresses potential noise and vibrations related impacts from the proposed development and operation of a waste recovery facility and landform restoration using inert materials at Halverstown, Kilcullen Co. Kildare.

10.2 The proposed development at Halverstown, Kilcullen, Co. Kildare provides for:

- Use of existing and/or previously approved site and services infrastructure including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, hardstand areas, fuel storage tanks, waste inspection and quarantine facility and covered shed;
- Separation of any construction and demolition waste inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities;
- Temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site;
- Restoration of the excavated landform (including placement of cover soils and seeding) to its original woodland / grassland habitat and agricultural after use.

10.3 The lands will be filled using only inert soil materials imported from external, pre-approved development sites. No peat, contaminated soils or non-hazardous waste will be accepted at the proposed recovery facility. The layout of the existing site is shown on Figures 1.2 and 1.3.

10.4 It is envisaged that the following wastes (EWC codes) will be deposited (or recovered) at the facility:

- 17 05 04 Soil and stones other than those mentioned in 17 05 03;
- 17 05 06 Dredging spoil other than those mentioned in 17 05 05;
- 20 02 02 Soil and stone from municipal facilities.

10.5 An operational vibration assessment has not been undertaken as previous SLR experience, and that of the Applicant, in restoration of sand and gravel pits to date indicates that little or no vibration arises from activities of this nature and, as such, no vibration assessment is required.

10.6 In order to assist the understanding of acoustic terminology and the relative change in noise, a glossary of terms and phrases, which specifically relate to this chapter, is provided in Appendix 10-A.

Scope of Work / EIA Scoping

10.7 The following sections of this EIAR Chapter describe the potential noise impacts associated with the proposed development. The following issues are addressed separately:

- methodology used to assess potential noise impacts from activities at properties (dwellings and farms) and sensitive ecological receptors;
- baseline conditions pertaining to existing background and ambient noise levels around the project site;
- noise impact evaluation criteria;
- prediction of the noise levels and identification of potential impacts;
- assessment of severity of impacts, with reference to the evaluation criteria;
- description of mitigation measures that will be incorporated into the design and operation of the scheme to eliminate or minimise the potential for noise impact;
- a summary of any residual impacts; and
- monitoring proposals.

Consultations / Consultees

10.8 A pre-planning consultation meeting was also held between officials of Kildare County Council and the applicant as part of this planning application (Ref. No. PP3710).

Contributors / Author(s)

10.9 SLR Consulting Ireland undertook the impact assessment presented in this chapter on behalf of Kilsaran Concrete. The lead consultant for the study was Aldona Binchy MSc. Eng PIEMA (Environmental Engineering).

Limitations / Difficulties Encountered

10.10 This assessment is compiled on the basis of published guidance documents, and site-specific field surveys. No difficulties were encountered in compiling the required information.

REGULATORY BACKGROUND

10.11 The following sections describe the main legislative policy requirements in respect of noise associated with the proposed development.

10.12 Currently, there is no national or regional legislation which specifically addresses noise from the waste recovery facility. However, there are a number of guidance documents that are relevant in the context of noise action planning.

Planning Guidelines

10.13 The current Kildare County Development Plan which was adopted March 2017 includes a number policies and objectives for the planning and sustainable development of the County from 2017 to 2023.

EPA Noise Guidance for Scheduled Activities (NG4)

10.14 The Environmental Protection Agency's (EPA) 2016 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' sets out scope, content, and methodology for scheduled / licensed industrial and waste activities in Ireland.

10.15 In accordance with the NG4 guidance, it is necessary to designate the noise environment at each sensitive receptor location as a 'Quiet Area', a 'Low Background Noise Area' or 'Not an Area of Low Background Noise'. To be categorised as a 'Quiet Area' the following criteria must be met:

- at least 3km from urban areas with a population > 1,000 people;
- at least 10km from any urban areas with a population > 5,000 people;
- at least 15km from any urban areas with a population > 10,000 people;
- at least 3km from any local industry;
- at least 10km from any major industry centre;
- at least 5km from any National Primary Route; and
- at least 7.5km from any motorway or dual carriageway.

10.16 If any of the above criteria are not met, then it is necessary to undertake a baseline noise survey of the existing daytime, evening, and night-time noise environments in order to establish whether the receptor is located in a 'Low Background Noise Area' or 'Not an Area of Low Background Noise'.

10.17 The noise criteria for these designations are shown in Table 10-1 below. For an area to be designated as an area of low background noise (LAF 90), the daytime, evening, and night-time noise limits must all be met.

Table 10 - 1
NG4 Noise Criteria for Area Designation

Designation	Day $L_{AF\ 90}$ dB	Evening $L_{AF\ 90}$ dB	Night $L_{AF\ 90}$ dB
Low Background Noise Area	≤ 40	≤ 35	≤ 30
Not an Area of Low Background Noise	≥ 41	≥ 35	≥ 31

10.18 The procedure outlined in the NG4 Guidance document then sets out a methodology to determine an acceptable noise limit at a receptor location. This noise limit is termed the noise rating level (or LAr,T) and includes, if necessary, a plus 5dB tonal penalty, or a plus 5dB impulsive penalty. If a noise source is both tonal and impulsive however, only one adjustment should be made.

10.19 In order to determine whether or not a 5dB tonal penalty should be applied, it is necessary to obtain third octave frequency data of the noise source in question. The NG4 guidance states that:

10.20 *'... the time average sound pressure level in the one-third-octave band of interest should exceed the time-average sound pressure levels of both adjacent one-third-octave bands by some constant level difference'.* The appropriate level differences vary with frequency. They should be greater than or equal to the following values in both adjacent one-third-octave bands:

- 15dB in low-frequency one-third-octave bands (25Hz to 125Hz);
- 8dB in middle-frequency bands (160Hz to 400Hz); and
- 5dB in high-frequency bands (500Hz to 10,000Hz).'

10.21 In order to determine whether or not a 5dB impulsive penalty should be applied to a noise source, it is necessary to establish whether or not the noise in question may be 'described as something with a thumping, banging, or impact noise that is clearly audible above everything else.'

10.22 The permitted rating noise level in each designated area is shown in Table 10 - 2.

Table 10 - 2
NG4 Permitted Rating Noise Levels

Designation	Daytime Noise Criterion, dB $L_{Ar,T}$	Evening Noise Criterion, dB $L_{Ar,T}$	Night-Time Noise Criterion, dB $L_{Ar,T}$
Quiet Area	Noise from the licensed site to be at least 10dB below the average daytime background noise level measured during the baseline noise survey	Noise from the licensed site to be at least 10dB below the average evening background noise level measured during the baseline noise survey	Noise from the licensed site to be at least 10dB below the average night-time background noise level measured during the baseline noise survey
Areas of Low Background Noise	45.0	40.0	35.0
All Other Areas	55.0	50.0	45.0

British Standard 5228: 2009+A1:2014

10.23 British Standard 5228-1:2009+A:2014 Noise and vibration control on construction and open sites, Part 1: Noise (BS5228) sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities. It can be used to predict noise levels arising from the operations of proposed mineral extraction sites and associated / ancillary production activities. BS5228 also sets out tables of sound power levels generated by a wide variety of mobile equipment.

10.24 Noise levels generated by site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the “on-time”;
- the distance between the noise source and the receptor, known as the “stand-off”;
- the attenuation due to ground absorption or barrier screening effects; and
- any reflections of noise due to the presence of hard vertical faces (ie. walls).

Guidelines for Noise Impact Assessment (IEMA)

10.25 The Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA) are generally recognised as established good practice standards for scope, content, and methodology of noise impact assessment.

10.26 These guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. These guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor,

based upon the specific evidence and likely subjective response to noise. An example impact scale offered by the IEMA guidelines is shown in Table 10-3:

Table 10 - 3
Example Impact Scale from the Change in Sound Levels (IEMA)

Long-Term Impact Classification	Short-Term Impact Classification	Sound Level Change dB L_{pAeqT} (+ive or -ive) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3.0 dB and < 5 dB
Moderate	Major	≥ 5.0 dB and < 10 dB
Major		≥ 10.0

10.27 The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB is generally considered to be the smallest change in environmental noise that is perceptible to the human ear under most normal conditions. A 10dB change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

10.28 To determine the overall noise impact, the magnitude and sensitivity Noise Effects Descriptors are presented in Table 10-4.

Table 10 - 4
Noise Effects Descriptors (IEMA)

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

10.29 As recognised in the IEMA guidance, there are however many factors which affect people's perception and their responses to noise. Guidance on assessment of the magnitude of noise impact and the significance of the effects are presented in Table 10-5.

Table 10 - 5

Relationship between Noise Impact, Effect and Significance (IEMA)

Magnitude (Nature of Impact)		Description of Effect (on a specific sensitive receptor)	Significance
Substantial	Beneficial	Receptor Perception = Marked Change Causes a material change in behaviour and/ or attitude, e.g. individuals begin to engage in activities previously avoided due to preceding environmental noise conditions. Quality of life enhanced due to change in character of the area.	More Likely to be Significant (Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect) ↕ (Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect) Less Likely to be Significant
Moderate		Receptor Perception = Noticeable Improvement Improved noise climate resulting in small change in behaviour and/or attitude, e.g. turning down volume of television; speaking more quietly; opening windows. Affects the character of the area such that there is a perceived change in the quality of life.	
Slight		Receptor Perception = Just Noticeable Improvement Noise impact can be heard, but does not result in any change in behaviour or attitude. Can slightly affect character of the area but not such that there is a perceived change in quality of life.	
Negligible		N/A = no discernible effect on receptor	Not Significant
Slight	Adverse	Receptor Perception = Non-intrusive Noise impact can be heard, but does not cause change in behaviour or attitude, e.g. turning up volume of television, speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.	Less Likely to be Significant Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect) ↕ Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect) More Likely to be Significant
Moderate		Receptor Perception = Intrusive Noise impact can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awaking sleep disturbance. Affects the character of area such that there is a perceived change in the quality of life.	
Substantial		Receptor perception = Disruptive Causes material change in behaviour and /or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to change in character of area.	
Severe		Receptor Perception = Physically Harmful Significant Changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or psychological effects, e.g. regular sleep deprivation / awakening ; loss of appetite, significant , medically definable harm, e.g. auditory and non-auditory.	Significant

Design Manual for Roads and Bridges

10.30 The Design Manual for Roads and Bridges (DMRB) considers the following criterion to determine 'affected roads' which have the potential to impact at surrounding receptors:

- road alignment will change by 5m or more;
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more;
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more;
- daily average speed will change by 10km/hour or more; or
- peak hour speed will change by 20km/hour or more.

AQTAG09 - Guidance on Effects of Industrial Noise on Wildlife

10.31 AQTAG09 (Air Quality Technical Advisory Group 09) guidance provides guidance to assist planning and/or licensing officials handling pollution prevention and control applications for industrial installations on relevant noise emissions and relates these to the requirements of the Habitats Regulations.

10.32 The Habitats Directive (92/43/EEC) specifies that, where specific noise from industry, measured at the habitat / nest site is below the levels in Table 10-6, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded, a more detailed noise assessment will be required.

Table 10 - 6
Specific Noise Levels at Habitat / Nest Site

Parameter	Noise Level, dB
$L_{Amax,F}$	80
$L_{Aeq,1hr}$	55

NOISE AND HUMAN HEALTH

10.33 Environmental noise exposure response relationships and thresholds for health endpoints for industry are not available at European or Irish level in legislation or guidelines.

WHO Environmental Noise Guidelines

10.34 World Health Organisation (WHO) Europe is currently in the process of developing the WHO Environmental Noise Guidelines for the European Region as a regional update to the WHO Community Noise Guidelines. The Guidelines will include a review of evidence on the health effects of environmental noise to incorporate significant research carried out in recent years. The health outcomes for which the evidence will be systematically reviewed include: sleep disturbance, annoyance, cognitive impairment, mental health and wellbeing, cardiovascular diseases, hearing impairment and tinnitus and adverse birth outcomes.

10.35 The guidelines will assess several environmental noise sources such as aircraft, rail, road, wind turbines and personal electronic devices. The document will also consider specific settings such as residences, hospitals, educational settings and public venues. In addition, the guidelines will review the evidence on health benefits from noise mitigation and interventions to decrease noise levels. The guidelines will focus on the WHO European Region and provide guidance to its Member States that is compatible with the noise indicators used in the European Union (EU) Directive on Environmental Noise.

10.36 The 2002 EU Directive introduced annual average indicators of noise exposure (Lden and Lnight) as long-term exposure indicators, which differ from those used in the earlier WHO Guidelines for Community Noise (1999).

Good Practice Guide on Noise Exposure and Potential Health Effects

10.37 The guidelines present current knowledge about the health effects of noise associated with road traffic, railway and aircraft. The emphasis is first of all to provide end users with practical and validated tools to calculate health impacts of noise in all kinds of strategic noise studies such as the action plans required by the Environmental Noise Directive and/or environmental impact assessment reports.

10.38 This guidelines describe noise indicators such as Lden and Lnight, regardless of any weighing factors, describe the noise exposure situation. The link between exposure and outcome (other terms: endpoint, reaction, response) is given by reasonably well established exposure-response curves which are derived from research into noise effects that can be used for impact assessment.

10.39 The effects of noise on health and well-being with sufficient evidence is presented in Table 10-7.

Table 10 - 7
Effects of Noise on Health and Wellbeing with Sufficient Evidence

Effect	Dimension	Acoustic indicator*	Threshold**	Time domain
Annoyance disturbance	Psychosocial, quality of life	L_{den}	42	Chronic
Self-reported sleep disturbance	Quality of life, somatic health	L_{night}	42	Chronic
Learning, memory	Performance	L_{eq}	50	Acute, chronic
Stress hormones	Stress Indicator	L_{max} L_{eq}	n/a	Acute, chronic
Sleep (polysomnographic)	Arousal, motility, sleep quality	$L_{max, indoors}$	32	Acute, chronic
Reported awakening	Sleep	SEL_{indors}	53	Acute
Reported Health	Wellbeing clinical health	L_{den}	50	Chronic
Hypertension	Physiology somatic health	L_{den}	50	Chronic
Ischaemic heart diseases	Clinical health	L_{den}	50	Chronic

* L_{den} and L_{night} are defined as outside exposure levels. L_{max} may be either internal or external as indicated.

** Level above which the effects start to occur or start to rise above background.

RECEIVING ENVIRONMENT

Study Area

10.40 The proposed waste recovery facility is located approx. 4.5km to the south of Kilcullen village, approx. 1km to the west of the M9 motorway. The site is accessed through the existing Kilsaran Concrete Facility entrance located on the western side of the R448 Regional Road (the old N9 National Primary Road).

10.41 The site was previously in use as a sand and gravel pit with features typical of an extractive operation including stockpiles and silt storage areas. It is proposed to locate the waste recovery facility within the void created by sand and gravel extraction, and to improve an area of low agricultural value – refer to Chapter 2.

10.42 Sand and gravel extraction was first established at this site at Halverstown in the early 1940's, pre dating implementation of the Planning Act in 1964. This pre-1964 authorised area has been fully exhausted of sand and gravel reserves since prior to 1988, with the northern area continuing to be used for concrete block manufacturing activities. The southern area, where it is proposed to locate the waste recovery facility, was previously used for sand and gravel extraction, a storage area and for silt settlement ponds.

10.43 The site is located in a rural area with residential development generally consisting of one-off housing and ribbon development along the local road network. Land use in the area is mainly agriculture and sand and gravel extraction. The application site adjoins Kilsaran's existing concrete manufacturing facility to the north. A restored sand and gravel pit operated by Kilsaran is located to the northwest of the site – refer to Figure 1.3.

Sources of Information

10.44 Baseline information was gathered through a combination of desk-based study, site visit, and technical assessments consistent with current standard methodologies and published best practice guidelines, in order to provide relevant data to allow an assessment of likely significant effects of the proposed development on sensitive receptors within the zone of influence.

Baseline Study Methodology

10.45 Environmental noise surveys were carried out to capture typical background noise levels at the noise-sensitive receptors closest to the application site. The methodology of the surveys and the results are set out below. The weather conditions during the survey periods were acceptable for noise monitoring, being generally dry with little or no wind.

10.46 The measurements were carried out using a Larson Davis 831 Type 1 sound level meter (serial number A0527). The sound level meter was calibrated before the measurements, and its calibration checked after, using a Larson Davis Cal200 field calibrator (serial number 6970). No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

10.47 At the measurement positions, the following noise level indices were recorded:

- LAeq,T is the A-weighted equivalent continuous noise level over the measurement period, and effectively represents an "average" value.
- LA90,T is the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe the background noise.
- LA10,T is the A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe traffic noise.

10.48 Environmental noise surveys were undertaken by SLR Consulting Ireland staff at the nearest noise sensitive receptors to the application site on 10 June 2015. Noise measurements were undertaken over 1 hour period during the daytime (07:00 to 19:00). The monitoring periods chosen are considered to give representative daytime noise levels at each noise sensitive location.

10.49 During the surveys, the sound level meter was located in free-field conditions (i.e. at least 3.5m from the nearest vertical reflecting surface, with the microphone approximately 1.5m above ground level).

10.50 All noise levels are recorded in 'A-weighted' decibels, dB(A). A-weighting is the process by which noise levels are corrected to account for the non-linear frequency response of the human ear. All noise levels are quoted in dB(A) relative to a sound pressure of 20µPa.

Field Survey / Monitoring

10.51 The noise monitoring locations used for the purposes of the baseline noise survey on 10 June 2015, shown in Figure 10-1, comprise the following :

- N1: to the south east of the proposed facility;
- N2: to the north east of the proposed facility;
- N3: to the north west of the proposed facility;
- N4: to the west of the proposed facility.

10.52 The noise monitoring locations listed above are considered representative of the nearest noise sensitive locations (receptors) to the application site, as described below:

- Location N1 is representative of the residential properties located to south east of the proposed facility;
- Location N2 is representative of the residential properties located to the north east of the proposed facility;
- Location N3 is representative of the residential properties located to the north west of the proposed facility;
- Location N4 is representative of the residential properties located to the west of the proposed facility.

10.53 Noise monitoring results for the baseline survey on 10th June 2015 are provided in Table 10-8; summary of noise climate is provided in Table 10-9:

Table 10 - 8
Summary of Measured Noise Levels, Free Field dB

Location	Receptors	Date	Time	$L_{Aeq,T}$	L_{A10}	L_{A90}
N1	R1, R2, R3, R4, R32	10/06/15	8:04 - 9:04	75	80	52
N2	R5, R6, R7	10/06/15	9:10 - 10:10	54	56	41
N3	R24 – R29	10/06/15	10:37 - 11:37	47	50	37
N4	R31	10/06/15	11:51 - 12:52	64	64	39

Table 8.3 - 9
Summary of Noise Climate

Location	Photo	Noise Climate Description
Weather Conditions During Survey:		Sunny, No Clouds. Temperature 15-18^{0}C. Wind Speed up to 2.1 m/s. Wind Direction: NE.
N1		Measured baseline noise levels at N1 were mainly dominated by road traffic noise sources on the adjacent R448, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated. Recorded noise levels reflect the morning traffic on the R448.
N2		Measured baseline noise levels at N2 were mainly dominated by road traffic noise sources on the adjacent line, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated. Traffic noise from R448 also audible.
N3		Measured baseline noise levels at N3 were mainly dominated by natural noises, and farm animals' noises from surrounding fields. Car passed noise meter to access the farm.

Location	Photo	Noise Climate Description
N4		Measured baseline noise levels at N4 were mainly dominated by road traffic noise sources on the adjacent R418, natural noises, and farm animals' noises from surrounding fields when noise from the traffic abated.

10.54 On the basis of the data presented in Table 10-9 above, and that the site is located within 1 km of a motorway, it is concluded that all the locations may be designated as 'all other areas' in accordance with standards set out in the EPA's NG4 Guidance.

Sensitive Receptors

10.55 Sensitive locations are those where people may be exposed to noise from the existing or planned activities. The closest receptors to the application site have been identified (refer to Figure 10-1). This is a cautious approach, as noise generating activities are located at greater distances within the site. The relevant receptors are listed in Table 10-10 and their locations are shown in Figure 10-1.

10.56 There are 18 sensitive receptors identified within the 500m study area of the application site. A summary of the closest sensitive receptors in each direction surrounding the planning application area and their respective proximity to the nearest noise generating activity within the site is presented in Table 10-10 below.

Table 10 - 10
Receptors within 500m

Receptor Reference	Receptor	Sensitivity	Distance (m) / Direction from site activities
R1	Residential	Medium	50(E)
R2	Residential	Medium	80(SE)
R3	Residential	Medium	50(S)
R4	School	Medium	243(SE)
R5	Residential	Medium	120(NE)
R6	Residential	Medium	101(N)
R7	Residential	Medium	162(N)
R8	Residential	Medium	155(SE)
R9	Residential	Medium	151(S)
R10	Residential	Medium	435(E)
R11	Residential	Medium	412(E)
R12	Residential	Medium	422(E)
R13	Residential	Medium	457(E)
R14	Residential	Medium	453(SE)
R16	Residential	Medium	438(N)
R17	Residential	Medium	454(N)
R24	Residential	Medium	351(W)
R25	Residential	Medium	461(NW)
R32	Residential	Medium	50(SE)

IMPACT ASSESSMENT

Evaluation Methodology

10.57 To determine the noise impact arising from soil intake at the proposed recovery facility, SLR Consulting Ireland carried out a noise prediction assessment, whereby resultant noise levels were calculated at the noise sensitive receptors (residences) within 500m of the site shown on Figure 10-1.

10.58 Operational LAr, 1hr noise predictions at each receptor location are based on the prediction protocol for fixed plant contained within ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation'. The noise assessment methodology used was based on BS5228: Part 1 (2009)+ A1:2014 "Code of Practice for Noise and Vibration Control on Construction and Open Sites''

10.59 The following noise sources have been considered in the noise assessment for the recovery facility operations :

- Dozer;

- Hydraulic Excavator;
- HGV truck.

10.60 For the purposes of this assessment, it is assumed that all of the noise sources are active and arise continuously and simultaneously during assessment hours. For the purposes of this impact assessment, a reduction of -10 dB(A) has been assumed for partial noise screening as the attenuation path difference arising (between the noise source and receptors). For the purposes of this assessment, it is assumed that all of the noise sources are active for 20 % time at the application site. The soil deposition activity by the HGV will not occur at the site boundary, the excavator and dozer will not be working simultaneously and the compaction of soil close to the site boundary will be carried intermittently. On this basis, it is considered that the noise impact assessment presented herein is conservative and represents a worst-case scenario. Detailed noise assessment calculations are provided in Appendix 10-B.

10.61 The operational LAr, 1hr noise predictions at each receptor location are presented in Table 10-11 below. The table also shows the comparison between the predicted operational LAr, 1hr noise level and the noise limit at each receptor during each time-period.

Table 8.3 - 11
Operational Noise Levels : Recovery Facility

Location	Receptors	Period	Noise Limit $L_{Aeq, 1hr}$ dB(A)	Operational* $L_{Ar, 1hr}$ dB(A)	Difference
N1	R1	Daytime	55.0	50	-5
N1	R2	Daytime	55.0	45	-10
N1	R3	Daytime	55.0	50	-5
N1	R4	Daytime	55.0	36	-19
N1	R32	Daytime	55.0	50	-5
N2	R5	Daytime	55.0	43	-12
N2	R6	Daytime	55.0	44	-11
N2	R7	Daytime	55.0	40	-15
N1	R8	Daytime	55.0	40	-15
N1	R9	Daytime	55.0	41	-14
N1	R10	Daytime	55.0	31	-24
N1	R11	Daytime	55.0	32	-23
N1	R12	Daytime	55.0	32	-23
N1	R13	Daytime	55.0	31	-24
N1	R14	Daytime	55.0	31	-24
N2	R16	Daytime	55.0	31	-24
N2	R17	Daytime	55.0	31	-24
N3	R24	Daytime	55.0	33	-22
N3	R25	Daytime	55.0	31	-24

* Operational Noise Level= Predicted Noise Level

10.62 As can be seen from the above Table, the EPA NG4 daytime noise criterion limits arising specifically from recovery operations at the proposed facility at Halverstown are comfortably satisfied at all nearby noise sensitive locations.

10.63 To identify the potential impact of recovery activity at the proposed facility, predicted specific LAeq, 1hr dB(A) noise levels have been logarithmically added to existing ambient noise levels. The cumulative levels have been compared to the existing ambient noise levels at each of the noise sensitive locations for each time-period. The cumulative assessment is presented in Table 10-12 below.

Table 10 - 12
Cumulative Operational Noise Levels: Recovery Facility

Location	Receptors	Period	Existing Baseline $L_{Aeq,T}$ dB(A)	Operational $L_{Ar,\ 1hr}$ dB(A)*	Cumulative $L_{Aeq,\ T}$ dB(A)	Difference
N1	R1	Daytime	75	50	75	0
N1	R2	Daytime	75	45	75	0
N1	R3	Daytime	75	50	75	0
N1	R4	Daytime	75	36	75	0
N1	R32	Daytime	75	50	75	0
N2	R5	Daytime	54	43	54	0
N2	R6	Daytime	54	44	54	0
N2	R7	Daytime	54	40	55	0
N1	R8	Daytime	75	40	75	0
N1	R9	Daytime	75	41	75	0
N1	R10	Daytime	75	31	75	0
N1	R11	Daytime	75	32	75	0
N1	R12	Daytime	75	32	75	0
N1	R13	Daytime	75	31	75	0
N1	R14	Daytime	75	31	75	0
N2	R16	Daytime	54	31	54	0
N2	R17	Daytime	54	31	54	0
N3	R24	Daytime	47	33	47	0
N3	R25	Daytime	47	31	47	0

*Operational Noise Level = Predicted Noise Level

10.64 With reference to the *Guidelines for Noise Impact Assessment* produced by the Institute of Environmental Management and Assessment (IEMA), the cumulative noise impact from the recovery facility operations at all receptors is determined to be NEGLIGIBLE.

10.65 In view of the above findings, it is considered that mitigation measures to reduce the noise impacts of plant associated with the planned activities recovery facility are not strictly necessary.

Noise Exposure and Potential Health Effects

10.66 To determine the potential health effects noise impact arising from the planned recovery facility, SLR Consulting Ireland carried out a calculation of Lden for operational noise, whereby the

resultant noise levels were calculated at the nearest noise sensitive receptors (residences) shown on Figure 10-1.

10.67 The operational Lden noise predictions at each receptor location are based on predicted operational noise level at the application site boundary (as indicated in Figure 10-1) rather than from the noise source. On this basis, it is considered that the potential health effects presented herein is conservative.

10.68 The operational Lden noise prediction for receptor location is presented in Table 10-13 below. The table also shows the comparison between the predicted operational Lden noise level and the prescribed noise threshold for reported health effects.

Table 10 - 13
Health Effects Noise Levels Screening Summary : Recovery Facility

Receptors	Period	Reported Health Effects Threshold L_{den} dB	Operational L_{den} dB	Difference
R1	Daytime only	50	50	0
R2	Daytime only	50	45	-5
R3	Daytime only	50	50	0
R4	Daytime only	50	36	-14
R5	Daytime only	50	43	-7
R6	Daytime only	50	44	-6
R7	Daytime only	50	40	-10
R8	Daytime only	50	40	-10
R9	Daytime only	50	41	-9
R10	Daytime only	50	31	-19
R11	Daytime only	50	32	-18
R12	Daytime only	50	32	-18
R13	Daytime only	50	31	-19
R14	Daytime only	50	31	-19
R16	Daytime only	50	31	-19
R17	Daytime only	50	31	-19
R24	Daytime only	50	33	-17
R25	Daytime only	50	31	-19
R32	Daytime only	50	50	0

10.69 It can be seen from the above figures that the operational noise arising specifically from proposed activity at Halverstown is comfortably below the Reported Health Effects Threshold at all nearby noise sensitive locations.

'Do Nothing' Scenario

10.70 At present the noise environment within the study area is dominated by road traffic noise emanating from the R448. Locally, natural sounds such as farmyard animals or barking dogs, agriculture activities are also audible.

10.71 Over time, it is anticipated that the volume of road traffic, in the area will increase as economic activity increases and that this in turn is likely to lead to a gradual, likely audible increase in ambient and background noise levels.

MITIGATION MEASURES

10.72 Where necessary, the three established strategies for impact mitigation are avoidance, reduction and remedy. Where it is not possible or practical to mitigate all impacts, then the residual impacts must be clearly described in accordance with the system for impact description set out in the EPA Guidelines. The adoption of Best Practicable Means is generally considered to be the most effective means of controlling noise emissions.

10.73 Notwithstanding the findings of the impact assessment presented above, which determined that the proposed recovery activities at Halverstown will have negligible noise impact, and in line with practice at other Kilsaran facilities, the following best practice measures will continue to be implemented wherever practicable at Halverstown to minimise the potential noise impact of on-site recovery activities:

Phasing

- Infill operations will be carried out on a phased basis, commencing at the areas in closest proximity to neighbouring residences – refer to Figure 2.1. This will ensure any potential impact on these residences from noise associated with the development will be short term in nature.

Screening

- existing screening berms and screen planting around the planned waste recovery facility will be retained to act as acoustic barriers. Berms and landscaping should be inspected on a regular basis and maintained as necessary.

Plant

- all mobile plant used at the development will have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments thereof;
- all plant items will be properly maintained and operated according the manufacturers' recommendations, in such a manner as to avoid causing excessive noise (i.e. all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained);
- all plant will be fitted with effective exhaust silencers which are maintained in good working order to meet manufacturers' noise rating levels. Any defective silencers will be replaced immediately.

Traffic

- all deliveries will be programmed to arrive during working hours only;
- care should be taken when unloading vehicles to reduce or minimise potential disturbance to local residents;

- access / internal haul roads will be kept clean and maintained in a good state of repair, i.e. any potholes are filled and large bumps removed, to avoid unwanted rattle and "body-slap" from heavy goods vehicles;

- delivery vehicles waiting within the facility will be prohibited from leaving their engines running and there should be no unnecessary revving of engines.

10.74 Experience from other waste recovery facilities has shown that by implementing these measures, typical noise levels from construction works and/or recovery operations can bring about a reduction of up to 5dB(A) in ambient noise levels.

RESIDUAL IMPACT ASSESSMENT

10.75 The worst-case noise assessment has shown that in accordance with the scale in the Guidelines for Noise Impact Assessment produced by the Institute of Environmental Management and Assessment (IEMA) the cumulative long term noise impact from plant associated with the development at all receptors is NEGLIGIBLE.

10.76 Table 10-14 summarises the impacts and mitigation measures for operational plant noise at each of the noise sensitive receptor considered.

Table 10 - 14
Operational Noise Summary Table

Receptors	Increase in $L_{Aeq, 1hr}$ dB(A) Noise Level from Operations	Impact	Mitigation
R1	0	Negligible	Not Required
R2	0	Negligible	
R3	0	Negligible	
R4	0	Negligible	
R5	0	Negligible	
R6	0	Negligible	
R7	0	Negligible	
R8	0	Negligible	
R9	0	Negligible	
R10	0	Negligible	
R11	0	Negligible	
R12	0	Negligible	
R13	0	Negligible	
R14	0	Negligible	
R16	0	Negligible	
R17	0	Negligible	
R24	0	Negligible	
R25	0	Negligible	
R32	0	Negligible	

INTERACTION WITH OTHER IMPACTS

10.77 The potential impact of noise generated by the recovery activity on sensitive receptors including sensitive ecological receptors and people living in the area has been assessed in this Chapter of the EIAR. The impact of the proposed development activity on these receptors is further considered in Chapter 3 'Population and Human Health' and Chapter 4 'Biodoversity'.

CUMULATIVE IMPACTS

10.78 There are no cumulative noise impacts arising from the proposed recovery activities within Halverstown.

10.79 Given the proximity of Halverstown to national and regional road infrastructure, ambient noise levels from road traffic are considerably elevated and will tend to dominate other noise sources.

10.80 Noise levels arising from proposed recovery activities will not have the potential to increase the existing ambient noise levels in the vicinity of Halverstown.

MONITORING

10.81 Noise monitoring will be undertaken around the application site. Noise monitoring locations shall be reviewed and revised where and as/when necessary. The results of the noise monitoring shall be submitted to the Kildare County Council on a regular basis for review and record purposes following intensification of recovery activities.

FIGURES

Figure 10-1: Local Receptors

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000718 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

- PLANNING APPLICATION AREA (c. 17.5 Ha.)
- R — LOCAL RECEPTORS
- 500 METER OFFSET
- 1 KM OFFSET
- N — NOISE MONITORING LOCATION

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KILSARAN CONCRETE

Proposed Waste Recovery Facility
Halverstown, Co. Kildare

LOCAL RECEPTORS

FIGURE 10.1

Scale: 1:10,000

Date: MARCH 2018

171012.501.00036.00054.Noise EIA Rev0.dwg

NOISE: APPENDIX 10 – A

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

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

Table 10.A
Noise Levels Commonly Found In the Environment

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

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

APPENDIX 10- B NOISE ASSESSMENT

Receptor	Activity L_{Aeq} (dB) at 10m Distance		Reflection dB(A)	Screening dB(A)	Soil Deposition Activity Distance (m)	Noise Attenuated with Distance dB(A)	Activity L_{Aeq} (dB)		Operational Noise Levels dB(A)	Duration of Activity 20%	Operational Noise Levels dB(A)
	HGV	Dozer					HGV	Dozer			
R1	75	74	+3	−10	50	14	54	53	57	-7	50
R2	75	74	+3	−10	94	19	49	48	52	-7	45
R3	75	74	+3	−10	50	14	54	53	57	-7	50
R4	75	74	+3	−10	243	28	40	39	43	-7	36
R5	75	74	+3	−10	120	21	47	46	50	-7	43
R6	75	74	+3	−10	101	20	48	47	51	-7	44
R7	75	74	+3	−10	162	24	44	43	47	-7	40
R8	75	74	+3	−10	155	24	44	43	47	-7	40
R9	75	74	+3	−10	151	23	45	44	48	-7	41
R10	75	74	+3	−10	435	33	35	34	38	-7	31
R11	75	74	+3	−10	412	32	36	35	39	-7	32
R12	75	74	+3	−10	422	32	36	35	39	-7	32
R13	75	74	+3	−10	457	33	35	34	38	-7	31
R14	75	74	+3	−10	453	33	35	34	38	-7	31
R16	75	74	+3	−10	438	33	35	34	38	-7	31
R17	75	74	+3	−10	454	33	35	34	38	-7	31
R24	75	74	+3	−10	351	31	37	36	40	-7	33
R25	75	74	+3	−10	461	33	35	34	38	-7	31
R32	75	74	+3	-10	50	14	54	53	57	-7	50

CHAPTER 11

MATERIAL ASSETS

CONTENTS

INTRODUCTION

Background

11.1 This chapter of the Environmental Impact Assessment Report (EIAR) relates to the potential effects of the proposed sand pit restoration scheme and inert soil recovery facility at Halverstown, Kilcullen, Co. Kildare on Material Assets.

11.2 The proposed development provides for:

- use of imported approximately 1,200,000 tonnes of imported inert natural materials, principally excess soil, stones and/or broken rock to fill and restore a disturbed landform created by previous extraction of sand and gravel and to improve lands currently in agricultural use;
- use of existing and/or previously approved site and services infrastructure including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, hardstand areas, fuel storage tanks, waste inspection and quarantine facility and covered shed;
- separation of any construction and demolition waste (principally concrete, metal, timber, PVC pipes and plastic) inadvertently imported to site prior to removal off-site to authorised waste disposal or recovery facilities;
- temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site;
- restoration of the excavated landform (including placement of cover soils and seeding) to its habitat, rough grazing and tillage.

11.3 For further detail of the proposed development and the application site context, refer to Chapter 2 of this EIAR.

Scope of Work / EIA Scoping

11.4 According to the EPA (EPA (2003) Advice Notes on Current Practice:

> *"Resources that are valued and that are intrinsic to specific places are called 'material assets'. They may be of either human or natural origin and the value may arise for either economic or cultural reasons".*

11.5 Under Schedule 6 of the Planning and Development Regulations (2001) as amended, material assets also refers to architectural and archaeological heritage and cultural heritage.

11.6 The EPA guidelines in relation to the preparation of EIAR[1] note the following in respect of material assets:

[1] Environmental Protection Agency (2017). *Guidelines on the Information to be contained in Environmental Impact Assessment Reports*.

"Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure."

11.7 The specific headings in the guidelines in relation to material assets refer to built services, roads and traffic and waste management.

11.8 Chapter 14 of this EIAR addresses transport and traffic and chapter 12 addresses architectural heritage, archaeological heritage and cultural heritage separately to this chapter.

11.9 This material assets impact assessment comprises the consideration of existing resources pertinent to the proposed development and the application area that are not addressed elsewhere in this EIAR and the likely development impacts on those resources. On this basis, this chapter addresses built services and waste management. Built services are understood to refer to electricity, telecommunications, gas, water supply infrastructure and sewerage.

Consultations / Consultees

11.10 Consultation was not undertaken in the preparation of this chapter of the EIAR.

Contributors / Author(s)

11.11 This chapter of the EIAR was prepared by Aoife Byrne, who is an Associate Planner with SLR Consulting Ireland. Aoife is a Chartered Town Planner and has worked previously on several extractive industry planning applications and EIARs.

Difficulties Encountered

11.12 No limitation or difficulties were encountered in the preparation of this chapter of the EIAR.

REGULATORY BACKGROUND

Guidelines

11.13 As outlined above, this chapter of the EIAR has been prepared on the basis of the draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports by the EPA (2017).

Technical Standards

11.14 There are no technical standards relevant to this section of the EIAR.

RECEIVING ENVIRONMENT

Study Area

11.15 The application area is located south of Kilcullen and is located within the townland of Halverstown and the Electoral Division of Kilcullen. The settlement of Kilcullen is located c. 4.5km to the north and Calverstown is located 1.7km to the south-west. The site is bounded to the north by L6083 local road, by the R448 regional road to the east and by farmland interspersed with one-

off housing and agricultural buildings to the south and west. The application site is accessed off an existing entrance onto the R448.

11.16 The application site comprises the exiting sand and gravel pit, an area of previously undeveloped farmland, the existing access road, the existing weighbridge, the existing wheelwash, an existing area of hardstanding, part of an existing building and the existing office and welfare facilities.

11.17 The study area relates to those dwellings and buildings on the roads surrounding the application site.

Baseline Study Methodology

11.18 The baseline study comprises a desk-top review of online and published resources, information provided by the applicant and information contained in the other chapters of this EIAR. Ordnance Survey maps and aerial photography were also examined.

Sources of Information

11.19 Baseline information was obtained from the following sources:

- Myplan.ie (http://myplan.ie/index.html);
- Kildare County Development Plan 2017 - 2023;
- the environmental topic chapters of this EIAR;
- OS Maps;
- aerial photographs;
- openstreetmap.org.

Site Context

11.20 The application site is located within an existing sand and gravel pit with associated concrete block manufacturing to west of the R448 and to the south of Kilcullen and is surrounded by largely agricultural land interspersed with one-off houses and agricultural buildings. As per Figure 4.1 of this EIAR, there are 17 no. receptors (mainly dwellings) within 500m of the application site and 33 no. receptors (mainly dwellings) within 1000m of the site.

Built Services

11.21 Electrical power is currently provided to the application site via mains supply. Electricity is the principal source of energy for office lighting and heating.

11.22 It is envisaged that site based staff overseeing filling and recovery operations at the application site will be contactable by mobile phone only and that email and broadband connections to the site office will be provided via a mobile (4G) network.

11.23 An existing septic tank is located on the landholding and outside of the application area Effluent from the tank is discharged to ground via a percolation area.

11.24 Potable water is provided to the site via a pre-existing groundwater supply well in the block yard that is located outside of the application area. Residences in the vicinity of the site are on mains water supply.

Waste Management

General Waste Management

11.25 Waste oils, batteries, tyres, domestic waste and scrap metal are stored on site in designated areas and collected and recycled or disposed of by an authorised waste contractor.

Inert Waste Management

11.26 Some 3.34ha of the former sand and gravel pit at Halverstown is already the subject of a planning permission (planning ref. 15/189) and a waste permit (ref. WFP KE 16 0085 01) relating to the recovery of inert soil and stone.

11.27 The procedure for material to be recovered by deposition is as follows:

- All inert soil and stone imported to the facility is weighed at the proposed weighbridge. Details of each waste consignment brought to the site is recorded on the site register and includes, as a minimum all information required by the waste facility permit issued by Kildare County Council;
- All waste contractors bringing material to the recovery facility must hold a valid waste collection permit.
- Visual inspection of imported waste materials is undertaken by the applicant's site staff as inert waste materials are imported and end-tipped across the proposed facility. If subsequently, there is any concern about the nature of the materials imported to site, they will be re-loaded onto HGV trucks and re-directed to the waste inspection and quarantine facility for closer examination and inspection. The waste inspection and quarantine area comprises a roll over tarpaulin cover on a concrete slab.
- Should inspection or testing of suspect soil waste at the inspection and quarantine facility identify any non-inert material which cannot be accepted or recovered at the facility, it is segregated and temporarily stockpiled (quarantined) pending removal off-site by permitted waste collectors to an authorised waste disposal or recovery facility.
- The inert waste is deposited directly on the area to be restored, if possible, to avoid double handling. If necessary due to operational reasons, the material may be stockpiled prior to deposition.

Local Receptors

11.28 The application site is surrounded by agricultural land that is interspersed with one-off housing and agricultural buildings.

11.29 The closest residential dwellings to the application area include a dwelling located beside the site entrance, which is not occupied and is owned by the applicant and a group of houses to the south

of the boundary. There is an agricultural building located to the south of the application area. A primary school is located on the L089 to the east of the R448 and approximately 243m from the application area.

11.30 Figure 4.1 of this EIAR identifies residential properties and community facilities within the locality and shows 500m and 1 km offsets from the application boundary.

IMPACT ASSESSMENT

Evaluation Methodology

11.31 The evaluation of effects on built services and waste comprises a qualitative assessment based on the quantitative and qualitative analysis of potential effects on the environment undertaken in other chapters of this EIAR. The assessment also takes into account a review of relevant literature and professional judgement in relation to impacts on built services and waste.

Built Services

Construction Stage Impacts

11.32 The initial phase of operations will require:

- the removal of scrub and vegetation from the western part of the infill area;
- the placement of hardstanding materials for the proposed temporary internal haul road;
- topsoil stripping from the northern infill area.

11.33 The septic tank and percolation area and the water supply well are located outside of the application area and therefore there will be no effects on the wastewater treatment system or water supply during the construction stage – refer to EIAR Figure 7.1.

11.34 There are overhead powerlines traversing the application site. These will be relocated in consultation with the ESB. It is expected that effects would be short-term, temporary and slight in its effects.

Operational Stage Impacts

11.35 During the operational stage, inert soil and stone will be placed within the application site.

11.36 The septic tank and percolation area and water supply well are located outside of the application area and, therefore, there will be no direct effects on the wastewater treatment system or water supply during the operational stage.

11.37 As outlined above, any relocation or works relating to the overhead powerlines will be conducted in consultation with the ESB. It is expected that effects would be short-term, temporary and slight in its effects.

Post-Operational Stage Impacts

11.38 During the post-operational stage, no further inert soil and stone material will be accepted on site and activities would be limited to aftercare of the restored areas.

11.39 The septic tank and percolation area and the water supply well are located outside of the application area and, therefore, there will be no effects on the wastewater treatment system or water supply during the post- operational stage.

11.40 At this stage in the development, the overhead powerlines would have already been relocated in consultation with the ESB. No further activities that would have the potential the impact on the overhead powerlines would be undertaken during this stage. It is not anticipated that there would be any effects on built services during this phase of the development.

Waste

Construction Stage Impacts

11.41 As outlined above, there are exiting waste management arrangements in place at the overall site in relation to general waste. These arrangements will remain in place for the duration of the construction stage. The general waste generated by this operation will be limited to the waste generated by the employee operating the facility.

11.42 Other waste generated during this stage will largely comprise vegetation that is removed from the application site. Topsoil will be stored for use later in the final stage of operations.

11.43 Any waste generated through the removal of vegetation will be removed off site by a licensed contractor.

11.44 The volume of waste to be generated will be relatively small and will be appropriately handled. It is considered, therefore, that the impact of waste generation during this stage will be short-term, temporary and moderate.

Operational Stage Impacts

11.45 During the operational stage, inert soil and stone will be placed within the application site. Waste generation will be limited to general waste.

11.46 The imported soil and stone material will be the subject of an acceptance procedure and any unsuitable waste or other material will be quarantined prior to removal off site by a licenced contractor.

11.47 It is considered, therefore, that the generation of waste will be medium term, temporary and slight in its effects.

Post-Operational Stage Impacts

11.48 During the post-operational stage, no further inert soil and stone material will be accepted on site and any risk of importing unsuitable material onto the site will be eliminated. Any waste generated on the site will be limited to general waste produced by any employees that engaged in aftercare on an intermittent basis over a two to three year period. Any such waste will be handled in accordance with the established practices on site and will be removed by a licenced contractor.

11.49 It is considered, therefore, that the generation of waste during this period will be short-term, temporary and slight in its effects.

Unplanned Events (i.e. Accidents)

11.50 According to the EPA guidelines, unplanned events, such as accidents, can include "spill from traffic accidents, floods or land-slides affecting the site, fire, collapse or equipment failure on the site". The 2014 EIA directive refers to "major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes)". In addition, the EPA guidelines note that "Some types of factors are particularly vulnerable to unplanned events that have the potential to cause significant sudden environmental effects".

11.51 In this instance, the vulnerability of the proposed development to accidents, unplanned events or natural disasters is relatively limited owing to the relatively simple nature of the development works, the established nature of the techniques and procedures to be followed, the material to be handled on site and the relatively rural location of the proposed works.

11.52 Unplanned events in relation to the proposed development could potentially relate to:

- instability following the placement of materials;
- spill from traffic accidents;
- flooding.

11.53 It is considered that the material assets as outlined in this chapter are not particularly vulnerable to such unplanned events and would be unlikely to cause significant, sudden environmental effects in respect of built services or waste.

Cumulative / Synergistic Impacts (if any)

11.54 A search of the Kildare County Council online planning search facility indicates that there are no other planned developments in the vicinity of the application site in the townlands of Oldkillcullen, Yellowbogcommon, Castlefish, Kilgowan, Calverstown and Moortown that have been granted planning permission in the last five years[2] and have the potential to have any significant adverse cumulative impacts on the local environment.

11.55 It is considered that the environmental factors outlined by this chapter of the EIAR would not have the potential for significant cumulative impact in conjunction with material assets.

Transboundary Impacts (If any)

11.56 It is not anticipated that the impacts of the proposed development would have any significant transboundary effects on material assets.

[2] Online search using townland names conducted on the 3rd October 2017 for the period 3rd October 2012 to the 3rd October 2017 and on the 22nd March 2018 for the period 3rd October 2017 to the 22nd March 2018.

Interaction with Other Impacts (if any)

11.57 It is not anticipated that the effects of the proposed development on material assets would interact significantly with other impacts.

'Do-nothing Scenario'

11.58 In a 'do-nothing scenario', the previously permitted recovery, recycling and other operations at the Kilsaran site would continue, but the bulk of the former sand and gravel pit would not be restored to an appropriate landform. This would represent a neutral and permanent effect.

11.59 A 'do-nothing scenario' would not result in any significant adverse impact in relation to built services and on-site waste generation and the effect of a 'do-nothing scenario' would be neutral in relation to these factors.

11.60 However, an alternative location would be required for the recovery of inert soil and stones. It is generally acknowledged that sand and gravel pits are a suitable location for the recovery of soil and stone and an alternative location may not provide the benefits of an improved landform and of restoring a former sand and gravel pit.

MITIGATION MEASURES

Construction and Operational Stage

11.61 As outlined above, overhead powerlines comprise the only built services within the application site that would be directly affected by the proposed development. Any works undertaken in relation to the powerlines would be conducted in consultation with the ESB. No additional mitigation measures are proposed in relation to built services.

11.62 As outlined above, imported inert waste will be managed in accordance with a handling procedure prior to placement on the site. Relatively small volumes of general waste and waste comprising vegetation are expected to be generated by the proposed development. Any such waste would be stored appropriately and removed off site by a licenced contractor. Aside from the implementation of established good practice and housekeeping, no additional mitigation measures are proposed in relation to waste management.

Post – Operational Stage

11.63 Volumes of waste generated during the post operation stage are expected to low. Any such waste will be handled in accordance with the established practices on site and will be removed by a licenced contractor. Aside from the implementation of established good practice and housekeeping, no additional mitigation measures are proposed in relation to waste management.

RESIDUAL IMPACT ASSESSMENT

Construction Stage

11.64 As no additional mitigation measures are proposed, the residual effects of the development on waste and built services are predicted to be as per the impact assessment outline above.

Operational Stage

11.65 As no additional mitigation measures are proposed, the residual effects of the development on waste and built services are predicted to be as per the impact assessment outline above.

Post – Operational Stage

11.66 As no additional mitigation measures are proposed, the residual effects of the development on waste and built services are predicted to be as per the impact assessment outline above.

MONITORING

11.67 No environmental monitoring is proposed in respect of material assets.

REFERENCES

Kildare County Council (2017), Kildare County Development Plan 2017 - 2023

CHAPTER 12

CULTURAL HERITAGE

CONTENTS

INTRODUCTION

Background

12.1 This Environmental Impact Assessment Report (EIR) Chapter prepared on behalf of Kilsaran Concrete has been undertaken to assess the significant effects, if any, on the cultural heritage, archaeology and architecture which may occur because of the proposal to develop an inert soil & stone waste recovery facility on land in the townland of Halverstown, Kilcullen, Co. Kildare. The area of the proposed development comprises lands previously used for sand and gravel extraction (in the western part of the application area) and lands currently in agricultural use (in the north-eastern part of the application area).

12.2 A wide variety of paper, cartographic, photographic and archival sources was consulted. All the lands of the application area were visually inspected.

Methodology

12.3 This study, which complies with the requirements of Directive EIA 2014/52/EU, is an assessment of the known or potential cultural heritage resource within a specified area and includes the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment. It consists of a collation of existing written and graphic information in order to identify the likely context, character, significance and sensitivity of the known or potential cultural heritage, archaeological and structural resource using an appropriate methodology (EPA 2002 and 2003).

12.4 The study involved detailed investigation of the cultural heritage, archaeological, architectural and historical background of the application area and the surrounding area. The overall study area extends 1km from the application area and is presented in Figure 12-1.

12.5 This area was examined using information from:

- The Record of Monuments and Places (RMP) for County Kildare
- Kildare County Development Plan 2017-23
- The Sites and Monuments Record
- The National Inventory of Architectural Heritage
- Aerial photographs
- Excavations reports
- Cartographic sources
- Documentary sources

12.6 Field assessments were carried out on the 9th May 2016 and 5th February 2018 to identify and assess any unknown archaeological sites, structures and previously unrecorded features and possible finds within the application area.

12.7 An impact assessment and mitigation strategy has been prepared. The assessment has been undertaken to assess the significant effects, if any, on the cultural heritage, archaeology and architecture which can reasonably be expected to occur because of the proposal to recover inert soil in the application area, while a mitigation strategy has been designed to remedy any significant adverse effects on cultural heritage.

12.8 The assessment was prepared by Dr. Charles Mount who has more than twenty years of cultural heritage assessment experience. He holds B.A., M.A. and Ph.D. degrees in archaeology as well as a professional diploma in EIA and SEA Management and is a board member of the Institute of Archaeologists of Ireland and a member of the Discovery Programme.

THE EXISTING ENVIRONMENT

The Landscape

12.9 The application area is located in central Co. Kildare, south-west of Kilcullen, just to the west of the N9, in the townland of Halverstown, on OS six-inch sheet No. 28. It is situated in flat to undulating lowland. The soils of the area are generally grey brown podzolics with brown earths, gleys and basin peat and the parent material is limestone morainic gravels and sands (Gardiner and Radford 1980). The site was previously in use as a sand and gravel pit and it is proposed to locate the waste recovery facility within the void created by sand and gravel extraction and on lands currently in agricultural use.

Historical and Archaeological Background

12.10 The following is a summary of the archaeological and historical development of the study area and the main types of sites, monuments and structures that are known from the surrounding area. The purpose of this approach is to place the types of sites, monuments and structures in the study area in a cultural and chronological context to assist the assessment.

12.11 The application area is situated in the townland of Halverstown, the civil parish of Kilcullen and the barony of Kilcullen. Note the original spellings of placenames recorded in source material are retained in the text

The Prehistoric Period

12.12 There is evidence of Bronze Age activity in the study area in Halverstown townland to the north-west of application area where three crouched burials, one associated with a bowl food vessel, were found during quarrying in 1939 (Price 1938; KD028-054). To the south of the application area a stone cist containing three cremated individuals was found during quarrying in 1938 (Raftery 1940; KD028-055). Four more inhumation burials found Kilgowan townland to the south-east of the application area in 1984 have not been dated and could be of Bronze Age or later date. Burnt mounds in Kilgowan (E004387 and E004390) and Old Kilcullen townlands (E002887) and pits found in Kilgowan townland (E004389) to the east and north-east of the application area date generally to the prehistoric period.

The Medieval Period

12.13 In the Early Medieval period the study area was situated in the kingdom of Iarthar Liphi which was ruled by the Uí Muiredaig sept (MacCotter 2008, 178-9). In the Early Medieval period settlement is often indicated by the presence of enclosed farmsteads known as Ringforts which are sometimes associated with underground chambers known as souterrains. A souterrain was identified in Halverstown to the east of the application area in 2011 and the placename raheen in Kilgowan townland may indicate a levelled ringfort in Kilgowan, a townland to the south of the application area.

12.14 Following the conquest of Leinster by the Anglo-Normans after 1176 Walter de Ridelisford was granted the lands of the Uí Muiredaig known as O Morethi by the Lord of Leinster and he parcelled these lands out to a number of sub lords (Orpen 1911-20 I, 386).

The Post-Medieval Period

12.15 In 1641 Halverstown was held by Sir William Parsons and he retained it in 1670 (downsurvey.tcd.ie). Halverstown came into the hands of the Purcell family in the eighteenth century and in the nineteenth century Peter Purcell, a founder of the Royal Agricultural Society of Ireland, who ran a stage coach company and became Chairman of the Dublin and Cashel railway Company in 1844 lived at Halverstown House which has been demolished (Smyth 1847, 353-4).

BUILDINGS

Designated structures

12.16 The Kildare County Development Plan 2017-23 and the Record of Protected Structures was examined as part of the baseline study for this chapter of the EIAR. The review established that there are no structures within the application area listed in the Record of Protected Structures. There are also no structures in the study area listed in the Record of Protected Structures.

Non-designated structures

12.17 The National Inventory of Architectural Heritage (NIAH) which is maintained by the Department of Culture, Heritage and the Gaeltacht was examined as part of the baseline study for this section of the EIAR. The review established that there are no structures within the application area listed in the NIAH. There are also no structures in the study area listed in the NIAH.

Field inspection

12.18 On the 9th May 2016 fieldwork was carried out to identify any additional non-designated structures in the vicinity of the application area. This involved assessing all upstanding Structures that are marked on the 1939-40 edition of the six-inch Ordnance Survey mapping within 100m of the application area (see Fig. 12-1). There is one structure in the vicinity of the application area. This structure is situated on the N9 road c.44m south of the site entrance and 10m east of the proposed development and will not be impacted by the proposed development.

No.	1
Structure type	School House converted to house
Townland	Halverstown
Designation	None
Data source	1939-40 edition of the six-inch Ordnance Survey mapping
Perceived Significance:	None
Type of impact:	None
Significance & quality of impact	None
Description	Marked on OS 1st edition map as Halverstown National School. Detached five bay single-storey former early nineteenth century school. With central three-bay projecting gabled entranceway and two square-headed openings either side with brick relieving arches and replacement uPVC windows. Render has been removed from front to expose stonework. Tiled gabled roof with three brick chimneys.
Mitigation proposal	No mitigation required
Photos:	See Plate 12-1

ARCHAEOLOGICAL ASSESSMENT

Recorded Monuments

12.19 Examination of the Record of Monuments and Places indicates that the application area intrudes into the zones of notification of two Recorded Monuments that no longer exist. KD028-054 was the site of thee crouched inhumation burials found and removed during quarrying in 1939, and KD028-055 was the site of a Bronze Age cist burial found and removed during quarrying in 1938 (see Fig. 12.1 and Appendix 12-A).

12.20 The application area was previously in use as a sand and gravel pit and it is proposed to partly locate the waste recovery facility within the void created by sand and gravel extraction. Inspection of the part of the zones of notification of the sites of KD028-054 and KD028-055 within the application area indicates that these areas have been quarried to subsoil levels (see Section 12.32 & Plate 12-6). Therefore, there will be no direct or indirect impact on the site of KD028-054 or KD028-055.

12.21 The remaining Recorded Monuments in the study area are considered to be too far distant to be directly or indirectly impacted by the proposed development.

Undesignated monuments

12.22 Examination of the Archaeological Survey database indicated that there is one undesignated monument located within the study area KD032-054 Kilgowan Burial (Appendix 12-B). This is the site where four burials were uncovered during quarrying in Kilgowan townland to the south of the application area in 1984. The site of these burials will not be directly or indirectly impacted by the proposed development.

Cartographic Sources

12.23 The Ordnance Survey 1st and 3rd edition six-inch maps and the first edition 25-inch maps of the area were examined. This analysis did not indicate any previously unrecorded archaeological sites or cultural heritage material in the application area or vicinity.

Place name evidence

12.24 The place names were extracted from the cartography in order to facilitate the search for structures and monuments and small finds, to help identify any unrecorded monuments or structures, to search for any published papers and documents related to the study area and to assist in the study of the historical development of the area. The place names were looked up in the Placenames Database of Ireland at Logainm.ie

Baronsland	The land of the Baron
Calverstown	Town of the Calfe family
Cartersbog	Bog belonging to the Carter family

Glebe South	Church lands
Halverstown	The town of Halver family
Kilgowan	The smith's wood
Killinane	St. Finan's church
Old Kilcullen	Church of Cullen
Yellowbogcommon	Yellow bogland

12.25 The placenames do not indicate any additional heritage sites within the study area. The church at Old Kilcullen is outside the study area and there is no church known at Killinane.

Aerial photography

12.26 Ordnance Survey aerial photography taken in 1995, 2000 and 2005, Google Earth imagery from 2003, 2009, 2011, 2013 and 2016, Microsoft Bing imagery from 2011 and SLR drone imagery from November 2016 were examined. The examination did not identify any additional archaeological or cultural heritage material in the application area.

12.27 An oval cropmark that appears in the field outside and to the east of the application area is visible on the OSI 1995 and 2005 photography and the Bing imagery. This feature is indicated on the first edition 25-inch map and the 1939-40 six-inch map as a water pond.

Other Sources

12.28 Examination of archaeological corpus works on prehistoric artefacts (Harbison 1969, Eogan 1983, 2000, Kavanagh 1991, Simpson 1990), and pottery (O'Riordain and Waddell 1993) and Iron Age material (Raftery 1984) did not reveal any additional material in the study area.

Archaeological investigations

12.29 Examination of the Excavations Bulletin at Excavations.ie indicated that there have been eight archaeological investigation carried out in the study area which have uncovered prehistoric and medieval pits, bunt mounds, a souterrain, limekiln and post-medieval ditches. The summaries are presented below (refer to Figure 12.1):

HALVERSTOWN AND KILGOWAN Burnt mounds, medieval pits and ditches E4373; A058
Testing was undertaken within the footprint of the proposed M9 Kilcullen Service Area in the townlands of Halverstown and Kilgowan. The assessment was undertaken on behalf of the National Roads Authority and took place between 30 May and 3 June 2011.

A total of 8,304 linear metres were excavated within the footprint of the proposed service area. Six archaeological sites were discovered during the course of the works (Kilgowan 1-5 and Halverstown 1).

Halverstown 1 consisted of a series of pits and linear features, a heavy charcoal staining and evidence of in situ burning. Kilgowan 1 comprised a subcircular burnt mound measuring 17.4m east–west by 16.8m. Kilgowan 2 consisted of a series of pits and linear features containing medieval pottery identified on top of a gravel/sand ridge. Kilgowan 3 consisted of two east/west-aligned linear ditches running across a gravel ridge. Medieval pottery sherds were recovered from the fills of one of the ditches. Kilgowan 4 consisted of five isolated small pits, a possible post-hole and a small pit/post-hole located across one field. One of the pits contains small sherds of prehistoric pottery. Kilgowan 5 consisted of a subcircular burnt mound.
These sites were excavated by Tim Coughlan between July and October 2011 (below, Nos 360 and 362–6; E4385; E4390).

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

HALVERSTOWN 1 Souterrain and associated features E004385 (refer to Figure 12.1)
Halverstown 1 was discovered during testing undertaken by James Kyle (above, E4373) within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated on behalf of the National Roads Authority in July 2011.

Halverstown 1 comprised the remains of an earth-cut souterrain consisting of an entrance passage/creep and a main chamber area that was probably divided into two separate rooms. Posts along the sides of the souterrain would have supported a roof. A number of further pits and post-holes, thought to be contemporary, were located to the north of the souterrain.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

KILGOWAN 1 Burnt mound E004387
Kilgowan 1 was discovered during testing undertaken by James Kyle (above, No. 359; E4373) within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated, on behalf of the National Roads Authority, in July 2011.

Kilgowan 1 comprised a burnt mound made up of heat-shattered stone and charcoal-rich soil. The site was largely levelled through ploughing. The burnt mound measured 15.9m x 15.9m x 0.35m and sealed four earth-cut pits and two troughs.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

KILGOWAN 2 Limekiln and medieval pits E004387
Kilgowan 2 was discovered during testing undertaken by James Kyle (above, No. 359; E4373) within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated, on behalf of the National Roads Authority, in July 2011.

Kilgowan 2 comprised a limekiln, a mortar wall foundation and several pits and ditches, some of which contained medieval pottery. The limekiln was stone-lined and was made up of a main chamber 3.3m in diameter with an entrance to the north.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

KILGOWAN 3 Medieval pit and post-medieval ditches E004388

Kilgowan 3 was discovered during testing undertaken by James Kyle (above, No. 359; E4373) within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated, on behalf of the National Roads Authority, in July 2011.

Kilgowan 3 comprised a medieval gravel extraction pit, measuring 7.75m east–west by 4.6m by 0.8m deep, and four post-medieval ditches.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

KILGOWAN 4 Prehistoric pits E004389
Kilgowan 4 was discovered during testing undertaken by James Kyle (above, No. 359; E4373) within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated, on behalf of the National Roads Authority, in July 2011.

Kilgowan 4 comprised six pits, a post-hole and seven post-/stake-holes spread over an area measuring 120m north-south by 90m. Four pits and a post-hole were isolated, while two pits and seven post-/stake-holes were clustered together. An area of approximately 30m² was stripped around each feature or group of features.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

KILGOWAN 5 Burnt mound E004390
Kilgowan 5 was discovered during testing by James Kyle (above, No. 359; E4373) undertaken within the footprint of the M9 Kilcullen Service Area in May and June 2011. The site was excavated, on behalf of the National Roads Authority, in July 2011.

Kilgowan 5 comprised a burnt mound made up of heat-shattered stone and charcoal-rich soil. The site was largely levelled through ploughing. The burnt mound measured 15.75m x 15.5m x 0.41m and sealed four earth-cut troughs, four pits and a small number of stake-holes.

Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow

OLD KILCULLEN Spread of burnt-mound material E002887
This site was excavated as part of the N9/N10 Kilcullen to Waterford scheme, Phase 3: Kilcullen to Carlow. A small spread of burnt-mound material was identified during testing by CRDS Ltd. Resolution of the site was undertaken in October 2007. An area measuring 100m2 was stripped of topsoil. No additional features were identified during this excavation. Post-excavation analysis is ongoing and should provide suitable material for radiocarbon dating and archaeobotanical analysis.
Headland Archaeology Ltd, Unit 1, Wallingstown Business Park, Little Island, Cork.

Field Inspection

12.30 Field inspections were carried out on the 9th May 2016 and 5th February 2018. This involved an inspection of all the lands in the application area (see Fig. 12-1). The fieldwork areas are numbered on Plate 12-2. The site was previously in use as a sand and gravel pit and it is proposed to locate part of the waste recovery facility within the void created by sand and gravel extraction and part in agricultural land.

12.31 Area 1 is a large pentagonal-shaped field of sloping pasture. The field is enclosed in places by banks, ditches, hedges walls and wire. There was no visible indication of any cultural heritage material (Plate 12-3).

12.32 Area 2 has been extracted to subsoil levels. There was no visible indication of any cultural heritage material (Plate 12-4 & 12-5). At south area 2 extends into part of the zone of notification of RMP site KD028-055. The area is the north-sloping floor of the old quarry which has been extracted to subsoil levels and is overgrown. There was no visible indication of any cultural heritage material (Plate 12-6).

IMPACT OF THE PROPOSED DEVELOPMENT

Direct Impacts

12.33 There are no direct impacts on any known items of cultural heritage, archaeology or buildings of heritage interest in the application area or the vicinity

Indirect Impacts

12.34 There are no indirect impacts on any known items of cultural heritage, archaeology or buildings of heritage interest in the application area or the vicinity

Interaction with Other Impacts

12.35 No interaction with other any other impact has been identified.

Do Nothing Impacts

12.36 No do nothing impact has been identified.

Worst Case Impact

12.37 In the worst-case scenario soil stripping land within the application area in Area 1 may impact previously unknown subsurface archaeological deposits or artefacts without preservation by record taking place.

PROPOSED MITIGATION MEASURES

Direct Impacts

12.38 Due to the possibility of the survival of previously unknown subsurface archaeological deposits or finds within the unstripped part of the application area in Area 1 any soil-stripping in this area should be archaeologically monitored.

Indirect Impacts

12.39 No indirect impacts have been identified and no mitigation measures are required

Residual Impacts

12.40 No residual impacts have been identified.

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FIGURES

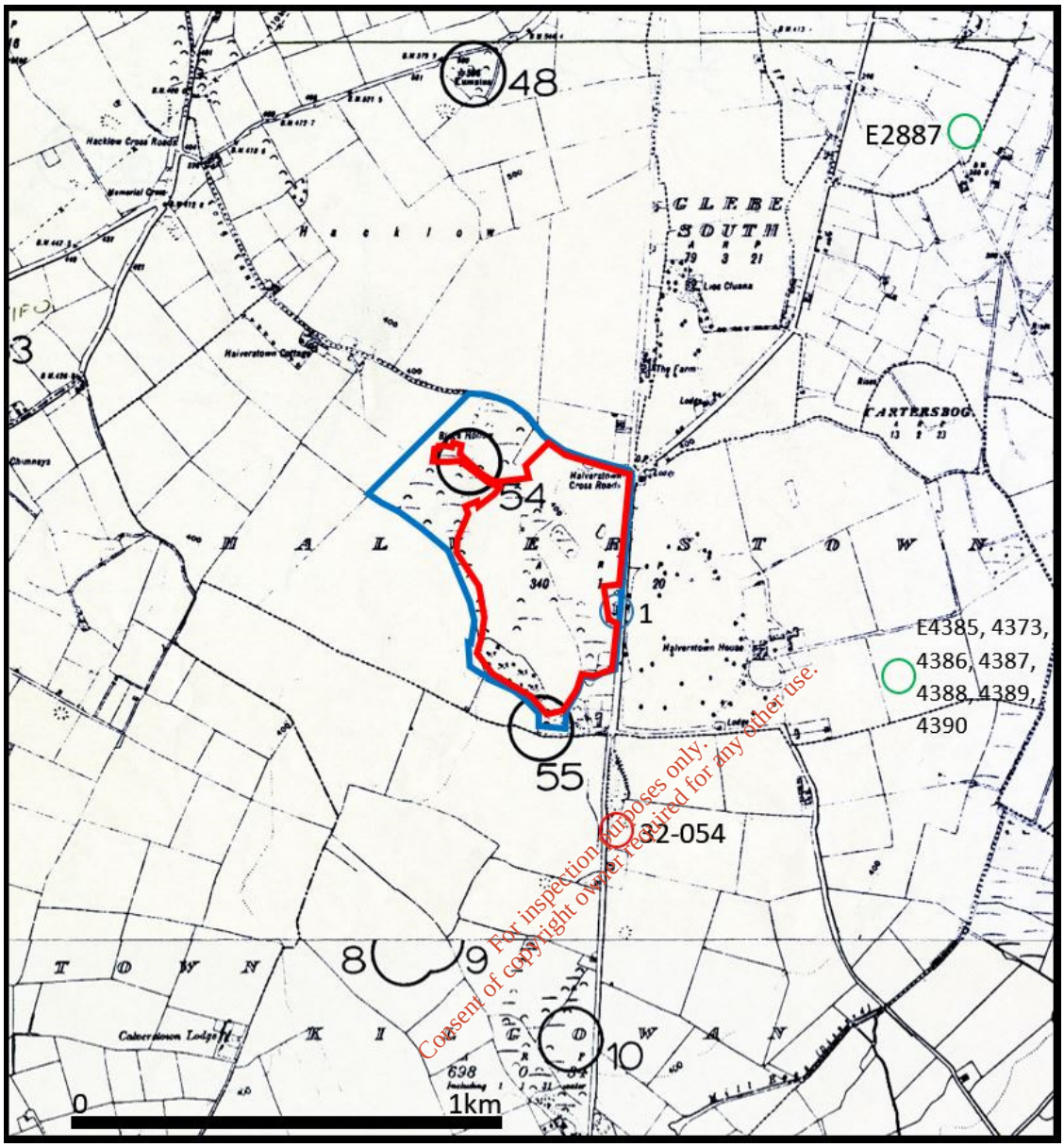


Figure 12-1: The study area superimposed on the Record of Monuments map for Co. Kildare. The landholding is outlined in blue and application area is outline in red. Recorded Monuments are indicated with black circles. Monuments in the Archaeological Survey database are indicated with red circles. Sites excavated in the study area are indicated with green circles. Any upstanding structures on the 1939-40 edition of the six-inch Ordnance Survey map within 100m of the application area is indicated with a blue circle.

PLATES

Plate 12-1: Structure 1 looking south-west.

Plate 12-2: View of the application area (within the red line) from Bing maps with the fieldwork areas numbered.

Plate 12-3: Panoramic view of area 1 looking south-east.

Plate 12-4: View of area 2 looking south.

Plate 12-5: View of area 2 looking south-east.

Plate 12-6: View of area 2 at the location of RMP sKD028-055 looking north.

APPENDICES

Appendix 12-A: Recorded Monuments in the Study Area

KD028-054 Halverstown Burial

In 1939, Three crouched inhumation burials were found in a gravel ridge: (1) a pit containing the contracted inhumation of a middle-aged adult female; (2) the crouched inhumation of a young adult male, facing E, accompanied by a bowl food vessel placed upright behind the skull, and (3) the crouched inhumation of an adult male, facing E, accompanied by an ox femur. This area has been completely quarried.

KD028-055 Halverstown Cist

In 1938, a short rectangular cist (L c. 0.6m; Wth c. 0.38m; H 0.46m) was found in a sand pit. It contained the cremated remains of an adult female, a foetus and three teeth of a year-old child. (Price 1938, 293-4).

KD032-0008 Kilgowan Enclosure

In level tillage. The western of two nearby sites (KD032-008---- and KD032-009----) visible on a 1969 aerial photograph (CUCAP AYL 90) as the cropmark of a fosse enclosing a circular area (est. max diam. c. 25m). Probably a ringbarrow or ringditch.

KD032-0009 Kilgowan Enclosure

In level tillage. The eastern of two nearby sites (KD032-008---- and KD032-009----) visible on a 1969 aerial photograph (CUCAP AYL 90) as the cropmark of a fosse enclosing a circular area (est. max diam. c. 25m), with a possible entrance causeway at NW. Probably a ringbarrow or ringditch.

KD032-0010 Kilgowan Enclosure

The placename 'Raheens' ("little rath(s) or fort(s)") is marked on the 1st ed. (1839) of the OS 6-inch map towards the N end of Kilgowan townland. The land in this general area has been levelled and improved and no visible trace of any monuments survive.

Appendix 12-B: Monuments listed in the Sites and Monuments Record in the Study Area

KD032-054 Kilgowan Burial

In 1984, human remains were discovered after the removal of a gravel ridge during a road-widening project, and were investigated ex situ by NMI staff. A minimum of four individuals were present, at least three adults and a possible adolescent. The precise original location of the burials was not determined.

CHAPTER 13

LANDSCAPE

CONTENTS

INTRODUCTION

Background

13.1 This Chapter of the EIAR documents the assessment of landscape and visual effects arising from the proposed waste recovery facility development at Halverstown, Kilcullen, Co. Kildare.

13.2 Halverstown Waste Recovery Facility is located south of the settlement of Kilcullen on the R448 road in the south eastern part of Co. Kildare. The existing facility consists of a large extracted area, as well as a number of associated manufacturing facilities, and office buildings. This planning application concerns the infilling of the exhausted sand and gravel pit together with adjacent agricultural lands, located to the north east, with inert waste and the ultimate restoration of the application site to natural habitat / agricultural use. Further details on the proposed development are contained in Chapter 2 of this EIAR.

13.3 Landscape and visual effects are independent but related issues. Landscape effects are concerned with changes in the landscape, its character and quality, while visual effects relate to the appearance of these changes and the resulting effect on visual amenity. Wherever possible, identified effects are quantified, however the nature of landscape and visual impact assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, the appraisal of sensitivity and the prediction of magnitude of change and significance of effects have been assessed with reference to criteria defined in the methodology preceding the baseline and impact assessment sections of this report.

Scope of Work / EIA Scoping

13.4 The scope of the landscape and visual impact assessment and structure of this chapter of the EIAR is set out as follows:

- Planning policy (e.g. landscape policies, designated landscapes, sites of nature conservation importance);
- Receiving Environment – definition of the study area and description of the landscape and visual baseline;
- Impact Assessment – a description of the aspects of the development which are likely to cause landscape and/or visual effects, including the methodology for and an assessment of landscape and visual receptor sensitivity, as well as the magnitude and significance of the landscape and visual effects;
- Mitigation Measures – a description of the measures which will be integrated to mitigate any landscape and visual effects of the proposed development; and
- Residual Impact Assessment – a summary of the landscape and visual effects with mitigation measures in place.

13.5 The assessment is informed by Landscape Policy and County Landscape Characterisation contained in the Kildare County Development Plan 2017-2023. The assessment is also supported by a series of illustrated figures as follows:

- Figure 13-1 Scenic Routes and Viewpoint Locations; and
- Figure 13-2 Photographs of existing views at Viewpoints A, B and C.

13.6 A description of the proposed landscape and restoration scheme can be found in Chapter 2 of this EIAR and is illustrated in Figure 2-3 – Landscape and Restoration Plan.

Consultations / Consultees

13.7 Following a review of published development plans and the site survey, it was considered that there was no requirement for a separate formal consultation to be carried out with regard to landscape and visual effects of the proposed development.

Contributors / Author(s)

13.8 The assessment, including site work and completion of drawings, was carried out by a suitably qualified Landscape Architect, and full member of the Irish Landscape Institute, with SLR Consulting Ireland.

Limitations / Difficulties Encountered

13.9 No difficulties were encountered during the assessment process. The field survey was undertaken from publicly accessible locations.

REGULATORY BACKGROUND

Planning Policy

13.10 The Kildare County Development Plan (CDP) 2017-2023 is the statutory plan detailing the development objectives/policies of the authority.

Landscape

13.11 Chapter 14 of the CDP contains policies and objectives in relation to landscape. It also refers to the landscape character assessment contained in volume 2 of the Kildare County Development Plan 2005-2011 and related landscape sensitivity assessment. The CDP also identifies areas of high amenity, protected views and scenic routes.

13.12 Policies of relevance to this assessment are documented below.

13.13 Policy LA 1 "*Ensure that consideration of landscape sensitivity is an important factor in determining development uses. In areas of high landscape sensitivity, the design, type and the choice of location of proposed development in the landscape will also be critical considerations*."

13.14 Policy LA 2 *"Protect and enhance the county's landscape, by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the existing local landscape."*

13.15 Policy LA 3 *"Require a Landscape/Visual Impact Assessment to accompany significant proposals that are likely to significantly affect:*

- *Landscape Sensitivity Factors*
- *A Class 4 or 5 Sensitivity Landscape (i.e. within 500m of the boundary)*
- *A route or view identified in maps 14.2 and 14.3 (i.e. within 500m of the boundary)."*

Scenic Routes and Protected Views

13.16 Section 14.6 of the current county development plan states the following: *"Scenic routes and protected views consist of important and valued views and prospects within the county. Table 14.2 lists the specific scenic routes which provide views of the landscape of the county and many built and archaeological features."*

13.17 The following scenic routes are located within the study area for this assessment. These are illustrated in Figure 13-1 Scenic Routes and Viewpoint Locations.

13.18 "Scenic Route 1 - Views of Old Kilcullen, from the R418 Motorway Interchange to South of Moortown House. Location: Knockbounce, Old Kilcullen, Hacklow, Halverstown. Extensive and open views of the undulating lands are available from the R418, when looking north towards Old Kilcullen village. The commonly smooth terrain of the area allows for long-distance vistas of this part of the County, whilst the existing topography and vegetation (e.g. hedgerows and scattered trees) add complexity to the views and partially screen the highly scenic vistas. Nevertheless both the hill south of Old Kilcullen and the Wicklow Mountains in the distance to the east remain always visible, defining the skyline when viewed from any section along the designated road. Although scattered housing is located along the local roads, vistas remain generally unaffected."

13.19 "Scenic Route 2 - Views to the East of Yellowbogcommon, from the M9 Motorway Interchange to Halverstown Cross Roads. Location: Yellowbogcommon, Glebe South. As a result of the flat topography in this area of the County, extensive vistas are available along the designated section of the former N9 (now the R448). The generally smooth terrain and the low-lying vegetation provide little screening and thus allow open and long-distance visibility. The ridgelines of the Wicklow Mountains define the skyline and the extent of the available views. The rural landscape character of the area and the limited number of occurring development, prove to be the key for the scenic and visual amenity value of the views obtained from this section of the former N9 (R448)."

13.20 "Scenic Route 35 - Views of Dún Áillinne from the R418 - Moortowncastle to Knockbounce. Location: Moortowncastle, Moortown, Old Kilcullen, Glebe North, Knockaulin, Knockbounce. Open vistas of Dún Áillinne are available from the R418 regional road. Although the undulating landform of the area determines the extent of visibility to the surrounding environs, extensive vistas to the undulating lowlands can be obtained along the R418. Scenic views are also available to the east, which include the undulating lowlands, St Patrick's Hill and the Wicklow Mountains in the far distance."

Designated Nature Conservation Sites

13.21 There are no Designated Nature Conservation sites located within the Study Area. The closest protected site is the River Barrow and River Nore Special Area of Conservation (SAC) (site code: 002162) which is located over 9km to the west of the application site – refer to EIAR Chapter 4: Biodiversity.

Extractive Industry Policy

13.22 Section 10.7 of the CDP contains a number of policies and objectives with regard to the extractive industry. Those of relevance to this assessment are documented below.

13.23 Policy EI 2 *"Recognise the role and facilitate the exploitation of County Kildare's natural aggregate resources in a manner which does not unduly impinge on the environmental quality and the visual and residential amenity of an area, while continuing to regulate the extraction of aggregates and to seek the delivery of environmental benefits in the form of sustainable habitat creation in conjunction with the restoration phases."*

13.24 Policy EI 3 *"Facilitate the sourcing of aggregates for and the operation of the extractive industry in suitable locations, subject to the protection of landscape, environment, road network, heritage, visual quality and amenity of the area."*

13.25 Policy EI 5 *"Ensure that development for aggregate extraction, processing and associated concrete production does not significantly impact the following:*

- *Sensitive landscape areas as identified at Chapter 14 of the Development Plan.*
- *Scenic views and prospects.*
- *Established rights of way and walking routes."*

13.26 Policy EI 9 *"Require a detailed landscaping plan to be submitted with all planning applications indicating proposed screening for the operational life of the site. The predominant use of native plant species in the proposed landscaping plan is encouraged."*

13.27 Policy EI 10 *"Require detailed landscaping and quarry restoration plans to be submitted with each application. Habitats and species surveying shall be carried out and shall influence the restoration plan for the site."*

Protected Structures

13.28 Chapter 12 of this EIAR documents the assessment of effects on protected structures within the study area.

Guidelines

13.29 The landscape and visual impact assessment was undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Management & Assessment, Third Edition, 2013; hereafter referred to as GLVIA 3).

RECEIVING ENVIRONMENT

Study Area

13.30 A study area measuring 2km from the centre of the application site was identified on the basis of both desk top study and field based assessment. The detailed field based assessment revealed that the visual envelope, i.e. the area from where the proposed development would actually be visible, would be much smaller than the identified 2km due to the presence of abundant screening vegetation and the influence of the surrounding local topography.

Baseline Study Methodology

13.31 The landscape and visual baseline study has involved a desktop study, field work, data processing and analysis. The aim of the landscape baseline study *"is to provide an understanding of the landscape in the area that may be affected"* (Section 3.15 of GLVIA 3), including its constituent elements, landscape character and its geographic extent.

13.32 With regard to the visual baseline GLVIA 3 (Section 3.15) states that it is the aim *"to establish the area in which the development will be visible the different groups of people who may experience views of the development, the places where they will be affected and the nature of the views and visual amenity at those points."*

13.33 Representative and illustrative viewpoints were selected for inclusion in the detailed assessment in respect of the following parameters:

- types of receptor: to include residents of settlements and dwellings, road users, recreational users of footpaths, cycle paths, promoted viewpoints, picnic areas, beauty spots and other recreational locations where landscape is an important part of the experience;
- different distances from the development;
- different directions from the development with the aim of achieving a distribution of viewpoints from different compass points around the site; and
- different elevations.

Sources of Information

13.34 The desktop study and field work was supported by, inter alia, information available on the internet, digital as well as paper (Ordnance Survey) maps at different scales and the Kildare County Development Plan (CDP) 2017-2023.

Field Survey / Monitoring / Inspection Works

13.35 A site survey was carried out on 25th July 2017 in bright conditions, with good visibility. The assessment concentrated on the publicly accessible areas such as the surrounding road network and residential areas.

Landscape Baseline

Baseline Landscape Character – Kildare County Development Plan Landscape Character Assessment.

13.36 Chapter 14 of the County Development Plan 2017-2023 refers to the landscape character assessment contained in Volume 2 of the Kildare County Development Plan 2005-2011 and related landscape sensitivity assessment. The application site is located within the Eastern Transition Lands Landscape Character Area (LCA). This comprises an undulating landscape located between the lowland landscapes to the west and the upland landscapes further east associated with the foothills of the Wicklow Mountains.

13.37 The published landscape character assessment described The Eastern Transition Lands as follows. *"The terrain gently rises from the lowland areas to the hilltops of the Eastern Kildare Uplands (see Chapter 19). The land undulates through a series of hilltops, the main ones being: Old Kilcullen Hill (179m O.D.) Bullhill (174m O.D.), Mullacash Hill (171m O.D.), Nine Tree Hill (168m O.D.) and Carrighill (166m O.D.). The elevated vantage points along the local roads provide long-distance views of the Kildare lowlands. The skyline to the east of this unit is defined by the Eastern Uplands, distant views including the neighbouring Wicklow Mountains, define the extent of visibility. The hilltops of the Chair of Kildare Hills (see Chapter 9, volume1) partially define the skyline to the west.*

13.38 Preferred scenic drives are located within this unit as part of the drives from Naas and Kilcullen to Ballymore Eustace. The unit is perceived as having some development potential to the south, along the primary national road.

13.39 *The major and most extensive landuse in the area is pasture, with patches of non-irrigated agricultural lands (mainly tillage). Small clusters of naturally occurring vegetation together with some coniferous forests and woodlands can also be found."*

13.40 Critical Landscape Factors are cited as follows.

13.41 "Undulating topography: Undulating topography, which characterises this unit, provides a physical shielding within the lee of hills and thus, can conceal relatively large new features on the lower-lying lands. Furthermore, the dynamic and complex nature of undulating land encloses local vistas, rendering development unobtrusive on the overall landscape.

13.42 Slopes: Sloping land often provides an area with its character and intensifies the visual prominence of any feature over greater distances. The gentle slopes of the hills in this character unit start to define the visual boundary of the adjacent lowland areas (further defined by the Eastern Uplands) and provides an increased potential for development to penetrate the ridgelines when viewed from local roads and villages in the area.

13.43 Low Vegetation: The grassland, tillage fields and generally low hedgerows of this area are usually uniform in appearance, failing to break up vistas, and allowing long distance visibility. Existing well maintained hedgerows partially screen the lowest land parcels. Nevertheless, the commonly low vegetation proves unable to visually absorb new development.

13.44 Shelter Vegetation: Shelter vegetation is represented at some stretches of this unit by coniferous plantations and the presence of scattered trees that grow on field hedgerows. In a similar manner to undulating topography, shelter vegetation has a shielding and absorbing quality in landscape

terms. It can provide a natural visual barrier and also adds to the complexity of a vista, breaking it up to provide scale and containment for built forms.

13.45 *Localised River Valley Views: This character unit is bisected by the River Liffey valley. River valleys are visually enclosed and highly localised areas of distinctive character with a high degree of visual consistency.Due to the undulating nature of this area, many views of the river valley are available from vantage points along the local roads."*

13.46 The CDP 2017-2023 refers to the landscape sensitivity rating applicable to Kildare's landscapes. This is defined as being *"a measure of the ability of the landscape to accommodate change or intervention without suffering unacceptable effects to its character and values. It is determined using the following factors: slope, ridgeline, water bodies, land use and prior development."*

13.47 The Eastern Transition Lands is judged to be of class 2 medium sensitivity and is defined as follows: *"Areas with the capacity to accommodate a range of uses without significant adverse effects on the appearance or character of the area."*

Landscape character of the site and study area

13.48 The application site is located within a rolling pastoral landscape which features an irregular field pattern defined mostly by mature dense hedgerow vegetation. Occasional clumps of deciduous woodland and tracts of commercial forestry are present. Elevation generally varies between 120 and 132m AOD. Occasional hills at higher elevations are apparent as focal points in the local landscape. These include Brewel Hill at 222m AOD located to the south and another hill located to the north near Old Kilcullen at 179m AOD.

13.49 The main settlements located closest to the application site include Old Kilcullen, located to the north and Calverstown located to the south west. Isolated dwellings and clusters of dwellings are located on the regional and local roads surrounding the site.

13.50 The M9 motorway crosses this landscape in a north south direction. The R448 regional road extends broadly parallel to the M9 motorway and links the surrounding settlements of Kilcullen, located to the north of the site and Ballitore, located to the south. The R418 regional road extends in a north east to south west direction linking the settlements of Kilcullen with Calverstown.

Visual Baseline

13.51 The visibility of the application site was initially assessed by a desktop study of OSI Discovery Maps (1:50,000) and available aerial photography, followed by a field survey.

13.52 The influence of the mature hedgerow vegetation and hilly topography including locally prominent hills referred to above is such that visibility of the application site is limited. The existing site entrance is visible from a very short section of the R448 road. Further west along the local road north of Calverstown, glimpse views are available of elements located within the application site including some existing stockpiles and tall structures.

13.53 Visibility along road routes within the study area is generally confined to the adjacent farmed fields and mature boundary hedgerows. In elevated locations, where breaks in the existing vegetation afford longer distance views, the skyline of the Wicklow Mountains to the east is

visible. Other isolated locations afford views of local hills as focal points including Brewel Hill, Knockaillinne and a local hill near Old Kilcullen.

Visual Receptors

13.54 The receptors with existing views of the planning application area and/or potential views of the proposed development comprise road users and residents of dwellings at a small number of locations within the study area. The location of each of the viewpoints is indicated on Figure 13-1 and described in Table 13-1 below. The table lists the viewer types at each viewpoint and describes the nature of existing views. Photographs depicting the existing visual amenity at each viewpoint location are presented in Figure 13-2.

Table 13-1
Viewpoints and Existing Visual Amenity

ID	Location	Viewer Types	Existing views / Visual amenity
A	R448 Regional Road	Road users	Open views of the site entrance and field to the north are available at short range against the backdrop of a local hill near Old Kilcullen. Stockpiles located along the access road are clearly visible as detracting elements in the distance.
B	Local Road between Halverstown cross roads and Old Kilcullen	Residents of Dwellings Road Users	Open views are available of the local road lined with mature wooded vegetation and dwellings. A large expanse of farmland with mature hedgerow vegetation and scattered mature trees is visible in the distance. Elements of the existing facility are clearly visible in the distance including a stockpile, located along the access road and also some landforms (earthworks) which are currently seeded over.
C	Local Road north of Calverstown	Residents of dwellings Road Users	Expansive views of farmland are available against the backdrop of the Wicklow Mountains skyline to the east in the distance. Brewel Hill is clearly visible as a distinctive focal point to the south of the viewer. Structures and stockpiles associated with the existing facility are visible as very small elements in the distance within this panoramic view of the landscape.

IMPACT ASSESSMENT

13.55 This section of the report presents the assessment of effects on landscape and visual amenity. The methodology for the assessment is presented followed by an assessment of effects on landscape character and visual amenity during construction, operational and post operational stages.

13.56 The proposed change comprises a sequence of landfill operations which would take place on a phased basis within the application area measuring 17.5 ha. These activities would take place over a period of approximately four years after which, measures to restore the landscape of the

application area would be implemented – refer to Chapter 2. Effects on landscape and visual amenity associated with vegetation removal and topsoil stripping in advance of infill operations are documented under Construction Stage Impacts. Effects associated with the infill operations are documented under Operational Stage Impacts. The restoration of the application site and longer term effects associated with this are documented under Post Operational Stage Impacts.

Evaluation Methodology

13.57 In order to arrive at conclusions about the significance of landscape/visual effects, this LVIA links judgements about the sensitivity of a receptor with the magnitude of change. According to GLVIA 3, section 3.26, the sensitivity (or 'nature') of a receptor is *"made up of judgements about:*

- *The susceptibility of the receptor to the type of change arising for the specific proposal; and*
- *The value attached to the receptor".*

13.58 The magnitude (or 'nature') of change is "made up of judgements about:

- *The size and scale of the change - for example whether there is complete loss of a particular element of the landscape or a minor change;*
- *The geographical extent of the area that will be affected; and*
- *The duration of the change and its reversibility."* Duration is described in GLVIA 3 with reference to three categories, short term lasting up to 5 years, medium term lasting between 5 and 10 years and long term lasting between 10 and 25 years.

13.59 The judgements about the sensitivity and magnitude are supported by a number of pre-defined parameters, where possible, as described in more detail below. They are then summarised using word scales and combined using a matrix to arrive at the overall significance of the effects.

Landscape Sensitivity

13.60 The sensitivity of the landscape is made up from a combination of judgements about the susceptibility of the landscape to change and the value attached to the landscape.

13.61 Susceptibility to change means the degree to which a landscape type/area/element is able to accommodate change (arising from a particular development) without detrimental effects on its character. Depending on the type of development proposed, this varies, inter alia, with the existing land use, the pattern and scale of the landscape, the visual enclosure/openness of views and the scope for appropriate mitigation. The value attached to the landscape can be judged, inter alia, by way of existing designations, landscape/scenic quality, rarity, recreation value.

13.62 For the purpose of this report landscape sensitivity is defined as HIGH, MEDIUM, LOW or NEGLIGIBLE, based on professional interpretation of the findings with regard to the susceptibility and value.

Visual Sensitivity

13.63 Viewpoint sensitivity is made up from a combination of judgements about the susceptibility of visual receptors to changes in views/visual amenity and the value attached to views.

13.64 The susceptibility to change in relation to different receptor types is defined in terms of high, medium and low susceptibility in Table 13-2 below.

13.65 The value attached to views is judged taking account of planning designations, such as protected views and other indicators of the values attached to views, e.g. in relation to heritage assets, views marked on maps or the provision of facilities for the enjoyment of views.

Table 13-2
Susceptibility of Visual Receptor to change

Susceptibility	Visual Receptor Types
High	Users of outdoor recreational facilities including strategic recreational footpaths, cycle routes or rights of way, whose attention may be focused on the landscape; important landscape features with physical, cultural or historic attributes; principal views from residential buildings, beauty spots or picnic areas; communities where views contribute to the landscape setting enjoyed by residents in the areas.
Medium	Other footpaths; secondary views from residential properties, people travelling through the landscape on roads, trains or other transport routes.
Low	People engaged in outdoor sports or recreation (other than appreciation of the landscape), commercial buildings, and other locations where people's attention may be focused on their work or activity.

13.66 The overall sensitivity of the visual receptors is summarised on a scale of HIGH, MEDIUM, LOW or NEGLIGIBLE based on the criteria and professional judgement.

Magnitude of Landscape/Visual Change

13.67 The judgements of the size or scale, geographical extent and duration/reversibility of the changes in the landscape are based on guidance contained in GLVIA 3, sections 5.49-5.52 including:

- *"The extent of existing landscape elements that will be lost ...;*
- *The extent to which aesthetic or perceptual aspects of the landscape are altered ...;*
- *Whether the effect changes the key characteristics of the landscape ...;*
- Scale at which effects may have influence (e.g. site level, immediate setting, landscape type/character area);
- Duration of the effect (i.e. short term = 0-5 years, medium term = 5-10 years, long term = 10-20 years, 20+ years = permanent); and

- Whether full/partial reversibility is possible.

13.68 Based on GLVIA 3, sections 6.39-6.41, the judgements of the size or scale, geographical extent and duration/reversibility of visual effects are based on information including:

- *"The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition ...;*
- *The degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;*
- *The nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses;*
- *The angle of view in relation to main activity of the receptor;*
- *The distance of the viewpoint from the proposed development;*
- *The extent of the area over which the changes would be visible;*
- Duration of the effect (i.e. short term = 0-5 years, medium term = 5-10 years, long term = 10-20 years, 20+ years = permanent); and
- Whether full/partial reversibility is possible.

13.69 The overall magnitude of change on the landscape and visual amenity is summarised on a scale of 'substantial', 'medium', 'slight' or 'negligible', based on professional interpretation of the findings with regard to size or scale, geographical extent and duration/reversibility. In order to assist the assessment, brief definitions of each level of magnitude are provided in Table 13-3, below.

Table 13-3
Magnitude of Change

Category	Description
Substantial	Total loss or major alteration of key elements/features/characteristics of the baseline conditions such that post development, landscape character or view composition attributes of the baseline would be fundamentally changed.
Medium	Partial loss or alteration to one or more key elements/features/characteristics of the baseline conditions such that post development, landscape character or view composition attributes would be partially changed.
Slight	Minor loss or alteration to one or more key elements/features/characteristics of the baseline conditions. Change arising from the loss/alteration would be discernible, but the underlying landscape character or view composition attributes would be similar to the baseline.
Negligible	Very minor loss or alteration to one or more key elements/features/ characteristics of the baseline conditions. Change would be barely distinguishable, approximating to 'no change'.

Significance of Effects

13.70 The significance of any identified landscape or visual impact has been assessed in terms of 'major' 'moderate', 'minor' or 'none'. These categories have been based on combining the overall sensitivity of landscape/visual receptors and overall magnitude of effects, as shown in Table 13-4 below. This process is not a quantitative process; there is not an absolute scoring system. Instead, the correlation of the two factors, although reflecting recognised features and methods, is in the end a matter of professional judgement.

Table 13-4
Significance of Landscape and Visual Effects

	Magnitude - Substantial	Magnitude - Medium	Magnitude - Slight	Magnitude - Negligible
Sensitivity - High	Major	Major/Moderate	Moderate	Moderate/Minor
Sensitivity - Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Sensitivity - Low	Moderate	Moderate/Minor	Minor	Minor/None
Sensitivity - Negligible	Moderate/Minor	Minor	Minor/None	None

13.71 The above matrix is not used as a prescriptive tool and the methodology and analysis of potential effects at any particular location must allow for the exercise of professional judgement. Thus in some instances a particular parameter may be considered as having a determining effect on the analysis.

13.72 Table 13-5, below, provides a brief definition of the full range of significance criteria. For the purpose of this report, it is considered that Major and Major/Moderate effects are significant.

Table 13-5
Definition of Significance Criteria for Landscape and Visual Effects

Category	Description
None	The proposed scheme is appropriate in its context. It may be difficult to differentiate from its surroundings and would affect very few or no receptors.
Minor	The proposed scheme would cause a barely perceptible impact, and would affect few receptors.
Moderate	The proposed scheme would cause a noticeable difference to the landscape, and would affect several receptors.
Major	The proposed scheme would completely change the character and/or appearance of the landscape for a long period of time or permanently. It would affect many receptors.

Construction Stage Impacts

Landscape and Landscape Character

13.73 The effects arising from the clearance of vegetation and stripping and storage of topsoil on the application site in advance of filling operations are documented below.

13.74 Limited areas of woodland and scrub vegetation would be removed from the western infill area in advance of fill operations. In the northern infill area, located north of the existing access road the pastoral farmland measuring c. 3.7 ha. would be temporarily stripped of vegetation and topsoil set aside for reinstatement at a later stage in advance of fill operations. The vegetation losses would comprise grassland and a relatively limited extent of hedgerow vegetation located along the northern side of the access road. These direct changes are considered to result in a very minor alteration to key landscape characteristics, namely loss of pastoral landcover and woody vegetation in the context of the existing exhausted sand and gravel pit facility. Due to the nature of the change, being small in scale and of short term duration occurring intermittently over 1-2 years, the character of the Eastern Transition Lands LCA within the study area would not be altered to the extent that would result in significant effects on character.

Visual Effects

13.75 Road users on the R448 Regional Road at viewpoint A would clearly see the activities associated with vegetation removal and topsoil stripping in the northern infill area, north of the access road in the context of the existing facility (site entrance).

13.76 Residents of dwellings and road users on the local road at viewpoint B would see the activities associated with vegetation removal and topsoil stripping in the northern infill area, north of the existing access road in the context of the farmed landscape in the foreground and with partial screening by intervening vegetation.

13.77 Residents on the local road north of Calverstown at Viewpoint C would not see the construction activities.

13.78 Taking into account the short term nature of these activities and the fact that the views would be attained in the context of the existing facility especially at Viewpoint A, significant visual effects are not predicted to arise.

Operational Stage Impacts

Direct Impacts on Landscape

13.79 Direct changes would occur to the landscape of the site at Halverstown within the Eastern transition Lands LCA. These changes relate to the introduction of fill material to the previously worked out sand and gravel pit. Fill material would also be introduced to the field located north east of the access road.

13.80 The introduction of fill material over time would result in changes to the existing landform within the application area.

Indirect Effects on-Landscape Character

13.81 The fill operations would take place over a minimum period of four to five years. However these could have duration of up to eight years – refer to Chapter 2. This would result in short to medium term effects on the character of the surrounding landscape. These operations would be potentially apparent in the surrounding landscape for a distance ranging from 1-2km. In reality, the influence of existing mature hedgerow vegetation and scattered mature trees is such that these operations would have very limited influence apart from a small area of farmland east of the application site and isolated elevated locations from which new landforms associated with the fill operations would gradually become apparent over time. Such effects would only arise at locations where vegetation screens are absent, for example, parts of the south east facing slopes of the hill at Old Kilcullen.

13.82 At distances greater than 2km, potential effects on landscape character are not generally anticipated to arise. These would be limited to the summits of isolated hilltops such as that at Brewel Hill.

Landscape Sensitivity – Eastern Transition Lands LCA

13.83 This assessment considers Eastern Transition Lands LCA, where it occurs within the study area, to be of low susceptibility to the proposed change. This is due to the undulating topography and the extent of mature hedgerow and woodland cover. As a result of these landscape characteristics, a development of the scale proposed is likely to have limited influence on this LCA. The presence of the existing sand and gravel facility is also a factor contributing to the low susceptibility evaluation.

13.84 The susceptibility of the main landscape elements, including farmland and hedgerows is also low, as they are abundant in the surrounding landscape and a very limited extent of these features would be affected by the proposed development.

13.85 In terms of value, the Eastern Transition Lands LCA, where it occurs within the study area carries no landscape designation. The farmed landscape is considered to be intact and in good condition. Hilltops in the local landscape represent notable localised focal points. These together with the outlook towards the Wicklow Mountain skyline to the east are factors which contribute to the value of the local landscape. Sections of the R448 and R418 roads and a local road between Halverstown Crossroads and Hacklow Crossroads, located within the study area are designated scenic routes and as such contribute to the value of the local landscape.

13.86 This assessment considers Eastern Transition Lands LCA, where it occurs within the study area, to be of medium sensitivity to the proposed change. This is due to the topography and extensive mature hedgerow vegetation which serve as visual screens and also the presence of the existing sand and gravel pit facility. As a result this landscape is considered to have capacity to accommodate development such as that proposed on the application site. This broadly corresponds with the Kildare County Landscape Character Assessment which judges this landscape to be of Class 2 Medium sensitivity and considered to have capacity to accommodate a range of uses without suffering significant adverse effects.

Magnitude of Landscape Change – Eastern Transition Lands LCA

13.87 The size and scale, geographical extent and duration/reversibility of the identified landscape effects are described in Table 13-6 below and a judgement of the overall magnitude of landscape effects is made.

Table 13-6
Magnitude of Landscape Change – Eastern transition Lands LCA

Category	Description
Size and Scale	The proposed fill operations would be contained within site boundaries featuring mature hedgerow vegetation and as a result, the scale of the effect would be largely limited to the application area. The fill operations would result in effects on the character of small areas of landscape surrounding the application site. The scale of the change would be small on the Eastern Transition Lands LCA within the study area.
Geographic Extent	The extent of the surrounding landscape that would be affected by the change is limited to the farmed landscape to the east in the vicinity of the R448 Road of the application area. Some of these changes would also be apparent from the farmland immediately north of the application site through leafless vegetation in wintertime.
Duration and Reversibility	The fill operations would be short to medium term (5-8 years) although resulting in changes to landform would be permanent and not reversible.
Overall Magnitude of Change	Taking into account the size and scale and geographic extent of the change as well as the duration, the overall magnitude of change on landscape character as a result of the proposed development is therefore assessed as NEGLIGIBLE.

Significance of Effect – Eastern Transition Lands LCA

13.88 The sensitivity of Eastern Transition Lands LCA, as well as the individual landscape elements was assessed to be MEDIUM. Combining this with the assessed NEGLIGIBLE magnitude of change results in a MINOR and not significant adverse effect.

Visual Effects

13.89 Effects on viewers in the surrounding landscape are documented below.

Visual Receptor Sensitivity

13.90 Table 13-7 below judges the susceptibility of the visual receptors at each of the identified viewpoints, based on Table 13-2 above. The table further describes the value placed on views from each of the viewpoints and makes a judgement of the sensitivity of each receptor at each viewpoint.

Table 13-7
Visual receptor Sensitivity

ID	Susceptibility	Value	Sensitivity
A	Road users are of low susceptibility as the view is incidental to the journey	No protected views or scenic routes. Entrance to the existing	LOW

		facility is visible.	
B	Residents of dwellings are of high susceptibility as they have continued interest in their surroundings.	No protected views or scenic routes. Existing facility is partially visible.	HIGH
	Road users are of low susceptibility as the view is incidental to the journey		LOW
C	Residents of dwellings are of high susceptibility as they have continued interest in their surroundings.	No protected views or scenic routes. Existing facility is partially visible.	HIGH
	Road users are of low susceptibility as the view is incidental to the journey		LOW

Magnitude of Change at Viewpoints

13.91 Table 13-8 below describes the magnitude of change to views from each of the viewpoints, in terms of the size and scale, geographical extent and duration/reversibility of the main visual effect, concluding with an overall magnitude of change.

Table 13-8
Magnitude of Visual Change

ID	Description	Magnitude of Change
A	**Size & Scale**: The existing site entrance would continue to be visible along with the activities, in particular the fill operations which would take place in the field north east of the existing access road. **Geographical Extent**: The proposed view would be experienced by individuals travelling along the R448 Road. A very limited section of this route, close to the existing site entrance would be affected however at this particular viewpoint, the fill operations in the farmed field to the north west of the access road would constitute a notable alteration to a key element in the existing view. **Duration/Reversibility**: The duration of the effect associated with the northern infill area, being in the range of 2-3 years, is considered to be short term.	Slight
B	**Size & Scale**: The scale of the change would be relatively limited. Fill activities, in particular at the northern end of the application area would be partially visible above the line of existing hedgerow vegetation and with farmland in the foreground. **Geographic Extent**: A small proportion of the existing view would change, in particular, in wintertime with leafless vegetation. **Duration/Reversibility**: The duration of the effect associated with the northern infill area, being in the range of 2-3 years, is considered to be short term.	Slight / negligible
C	**Size & Scale**: The scale of the change would be barely perceptible. Some of the proposed fill operations in the site overall may be barely visible where breaks in vegetation and absence of built structures afford glimpsed long distance views. **Geographic Extent**: Scarcely any part of the existing view would change. **Duration/Reversibility**: The duration of the effect, being in the range of 5-8 years for the entire site, is considered to be short to medium term.	Negligible

Significance of Visual Effects

13.92 The significance of the visual effect is outlined below for viewers at each of the selected viewpoint locations.

13.93 At Viewpoint A, a slight magnitude of change is considered to arise. Whilst the fill operations in the northern infill area located to the north west of the access road would be of a noticeable scale, altering a key element in the existing view. The activities at this particular part of the site would be of short term taking place over two to three years. Fill activities in the existing sand and gravel pit would be mostly screened from view by existing mature roadside hedgerow and tree vegetation. Road users at this location are considered to be of low sensitivity and would experience a minor and not significant effect over a very short section of the R448 road.

13.94 At Viewpoint B, a slight/negligible magnitude of change is considered to arise. The fill operations would be partially visible at a distance over a relatively short duration and the change would not fundamentally alter the view composition. For residents of dwellings, who are of high sensitivity, this would resulting in a moderate / minor and not significant effect. Road users of low sensitivity would experience a minor not significant effect.

13.95 At viewpoint C, the change to the existing view would be barely noticeable in the distance and would be limited to a very small proportion of the existing view to the left of the dwellings as seen in this viewpoint. This would result in minor / negligible effects for residents of dwellings and negligible effects for road users.

Table 13-9
Significance of Visual Effects

ID	Sensitivity	Magnitude	Significance
A	Road users - LOW	Slight	Minor
B	Residents of dwellings - HIGH	Slight / Negligible	Moderate / minor
	Road users - LOW		Minor
C	Residents of dwellings - HIGH	Negligible	Minor / negligible
	Road users - LOW		Negligible

Impact on Landscape/Planning Designations

Strategic Landscape Policy

13.96 The proposed development would occur in a landscape which features an exhausted sand and gravel pit and existing concrete manufacturing facility. The introduction of fill material, resulting in new landforms would take place within the existing sand and gravel pit and also the adjacent farmed field, located north of the existing access road. Loss of hedgerow vegetation would be limited if any and loss of pastoral landcover would be limited to the field in the northern part of the application area.

13.97 The assessment concludes that the proposed changes would not result in significant adverse effects on landscape character. Furthermore some beneficial effects are predicted to arise as a result of the restoration plan which would be in compliance with Policy LA-2.

Views and Prospects

13.98 Sections of three designated Scenic Routes occur within the Study Area. Effects on these routes are not expected to arise as outlined below for each route in turn.

- Scenic Route 1 relates to views of Old Kilcullen from the R418 Motorway Interchange to South of Moortown House. The views which are the subject of the designation are directed towards Old Kilcullen, away from the application site and therefore no effects are predicted to arise.

- Scenic Route 2 relates to views of Yellowbogcommon from the M9 Motorway Interchange to Halverstown Cross Roads. The designation applies to views to the east towards an open landscape and further afield to the Wicklow Mountain skyline. These views are directed away from the application site and therefore no effects are predicted to arise.

- Scenic Route 35 relates to views of Dun Aillinne from the R418 road. The designation applies to views to the north towards the hilltop location of Knockaillinne which is associated with the Dun Aillinne site and views to the east of the Wicklow Mountain skyline. The overall view direction extending from the north to the east includes the application site. The proposed development would not be visible due to the screening provided by intervening vegetation, topography and structures and as a result, effects are not predicted to arise.

Extractive Industry and Building Materials Production

13.99 A Restoration Plan is provided in Chapter 2 of this EIAR, detailing the restoration of the lands to an agricultural use and featuring areas of woodland and hedgerow vegetation. The proposed restoration plan is shown on Figure 2-3. Having regard to this and the assessment findings, the proposed development is deemed to be in compliance with Policies EI 2, EI 3, EI 5, EI 9 and EI 10 set out in the current Kildare CDP.

Post – Operational Stage Impacts

13.100 During the post operational stage, mitigation measures in the form of a landscape restoration plan would be in place. Impacts on landscape, landscape character and visual amenity are therefore documented under Residual Impact Assessment.

'Do-nothing Scenario'

13.101 If no further works within the planning application area were carried out, the existing site would remain and this would result in no change to the surrounding landscape and visual amenity.

MITIGATION MEASURES

Construction Stage

13.102 The application area is bounded by extensive mature hedgerow and tree vegetation. The vegetation at the site boundaries would be retained and measures outlined in BS 5837 Trees in

relation to construction would be implemented to protect this vegetation whilst operations relating to the clearance of grassland and the stripping and storage of topsoil would be undertaken.

Operational Stage

13.103 The application area is bounded by extensive mature hedgerow and tree vegetation most of which would be retained. Measures outlined in BS 5837 Trees in relation to construction would be implemented to protect this vegetation for the duration of the fill operations.

13.104 Further planting would be undertaken to enhance existing boundary hedgerows, in particular along the eastern boundaries of the site adjacent to the R448 and also along the northern and south western boundaries of the site. These mitigation measures would be part of the permanent landscape and are illustrated in the landscape and restoration plan **Figure 2-3**

Post – Operational Stage

13.105 At the end of the fill operations, the application area would be restored to farmland featuring topography of a gentle rolling gradient shaped to be sympathetic to the surrounding rolling farmland. Woodland and hedgerow planting would be introduced in a manner similar to that previously present on this site during the nineteenth century. Details of the landscape restoration plan are provided in Figure 2-3:Landscape Restoration Plan.

RESIDUAL IMPACT ASSESSMENT

Construction Stage

13.106 As the effects during construction take account of the mitigation measures, namely the retention of existing vegetation, the residual effects are the same as that documented under construction stage impacts.

Operational Stage

13.107 Effects during operation take account of the mitigation measures, namely the retention of existing vegetation and the proposed enhancement planting to existing hedgerows. Any newly introduced planting would have established and although not mature, this planting may begin to contribute (to a small degree) towards screening of the proposals. Residual effects are considered to be similar to that documented under operational stage impacts

Post – Operational Stage

Direct Impacts on Landscape

13.108 Direct changes would occur to the site at Halverstown as a result of the implementation of the restoration plan. A large expanse of relatively flat, derelict land representing the previously worked out gravel pit would be restored by the introduction of material to create the proposed rolling landforms designed to complement the surrounding landscape character. These areas

would be reseeded and planted with hedgerow vegetation and trees. These new landscape elements would replace the existing sand and gravel pit which is currently a detracting element in the local landscape along with the various spoil heaps located along the access road which would be removed.

Indirect Effects on Landscape Character – Eastern Transition Lands LCA

13.109 Beneficial effects on the character of the wider landscape surrounding the site are predicted to arise as a result of the proposed restoration of the application site to farmland with topography and hedgerow patterns that accord with the character of the surrounding farmland. Beneficial effects would also be associated with the absence of stockpiles currently apparent as an industrial element which detracts from existing landscape quality.

13.110 The sensitivity of Eastern Transition Lands LCA, as well as the individual landscape elements was assessed to be MEDIUM. The restoration works are predicted to have very limited influence on the character of this landscape as it occurs within the study area and hence a negligible magnitude of change is predicted to arise. This results in a minor and not significant beneficial residual effect.

Visual Effects

13.111 The restoration of the application site to a farmed landscape with topography and planting comprised of hedgerows and woodland areas designed in a manner that is sympathetic to the surrounding landscape character is judged to result in beneficial residual effects on viewers.

Magnitude of Change at Viewpoint

13.112 The residual magnitude of change at each viewpoint is documented in Table 13-10 below.

Table 13-10
Magnitude of Visual Change

ID	Magnitude of Change
A	**Size and Scale:** The existing site entrance would continue to be visible. New boundary planting introduced to enhance existing boundary hedge vegetation would be visible. The proposed landforms in the field located to the north of the access road would be partially visible as restored pastoral farmland along with new hedgerow planting located along the access road. Over time, as pasture and new planting becomes established, this area would be seen as established farmland which will be largely consistent in character with the farmland in the surrounding area. **Geographic Extent:** The proposed view would be experienced from along a very short section of the R448 Road. Elements of the restoration such as new planting, the absence of stockpiles would be visible. The restored pastoral farmland would be partially visible with partial screening provided by the roadside planting introduced as part of the restoration. A considerable proportion of the existing view would change albeit the changes would be beneficial.

	Duration/Reversibility: These effects would be permanent and not reversible.
B	**Size & Scale:** The scale of the change would be relatively limited. Stockpiles currently visible would be absent and this would represent a positive change to the existing view. The proposed changes to landform in the field located to the north of the access road may be barely noticeable, especially as these areas would be restored to farmland. **Geographic Extent:** A small proportion of the existing view would change, in particular, in wintertime with leafless vegetation. **Duration/Reversibility:** These effects would be permanent and not reversible.
C	There would be scarcely any change to existing views.

13.113 At viewpoint A, the changes to the topography in the field located to the north west of the access road, restored as farmland, would be clearly visible at short range at the site entrance. The absence of stockpiles currently located along the access road would represent a beneficial change. Boundary planting introduced to enhance existing retained hedgerows would be visible and would limit views currently available into the site. A medium magnitude of change is predicted to arise. Road users at this location are considered to be of low sensitivity and would experience a moderate/minor beneficial effect over a very short section of the R448 road.

13.114 At viewpoint B, the restored farmland at the northern end of the application site would be partially visible albeit seen as somewhat indistinguishable from adjacent farmland. The absence of stockpiles, located along the access road would represent a beneficial visual change. A slight / negligible magnitude of change is predicted to arise. For residents of dwellings, who are of high sensitivity, this results in a moderate / minor beneficial effect. Road users of low sensitivity would experience a minor beneficial effect.

13.115 At viewpoint C, the improvements to the landscape as a result of the restoration plan would be scarcely visible at all resulting in negligible effects.

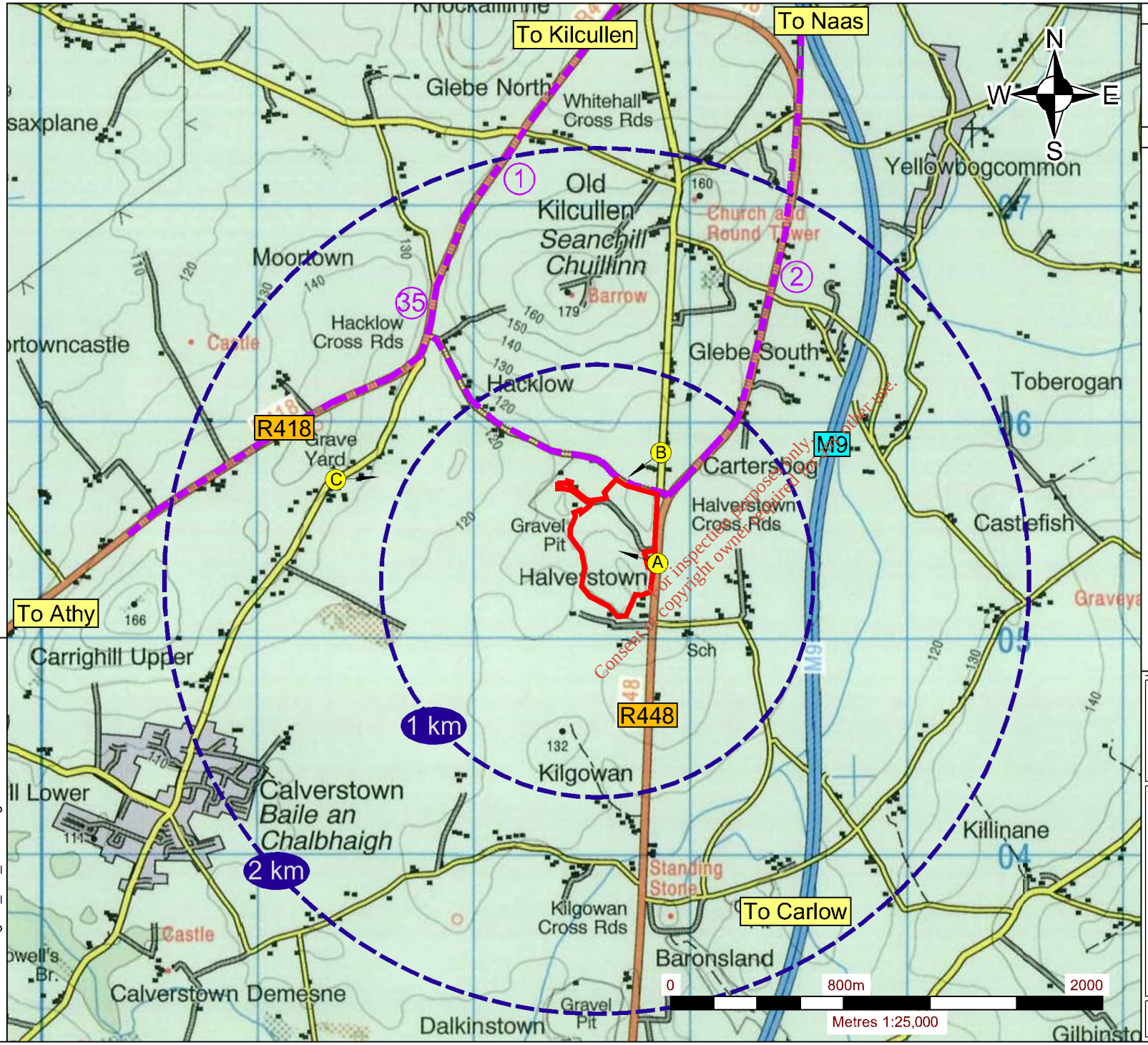
REFERENCES

The Landscape Institute with the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, Third Edition, Routledge.

The Landscape Institute (March 2011) Advice Note 01/11 – Photography and photomontage in landscape and visual assessment, The Landscape Institute.

Environmental Protection Agency (EPA) (May 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports, EPA Ireland.

FIGURES



NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAPS NO. 55
2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000718 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

- PLANNING APPLICATION AREA (c.17.5 Ha)
- VIEWPOINT LOCATIONS
- APPROXIMATE DISTANCE FROM APPLICATION SITE BOUNDARY

LANDSCAPE DESIGNATIONS:

- SCENIC ROUTES (KILDARE COUNTY DEVELOPMENT PLAN 2017-2023)

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KILSARAN CONCRETE
Environmental Impact Assessment Report

PROPOSED WASTE RECOVERY FACILITY
HALVERSTOWN, CO. KILDARE

SCENIC ROUTES &
VIEWPOINT LOCATIONS

FIGURE 13-1

Scale	Date
1:25,000 @ A4	MARCH 2018

00036.00054.Fig 13_1-2_LVIA.dwg

VIEWPOINT A: R448 Regional Road

Approximate Grid Coodinates: **282861, 205406** Approximate Elevation: **124m AOD** Distance from planning application boundary: **adjacent** Direction of View: **West**

Description: Open views of the site entrance and field to the north are available at short range against the backdrop of a local hill near Old Kilcullen. Stockpiles located along the access road are clearly visible as detracting elements in the distance.

VIEWPOINT B: Local road between Halverstown Cross Roads and Old Kilcullen

Approximate Grid Coodinates: **282874, 205959** Approximate Elevation: **128m AOD** Distance from planning application boundary: **500m** Direction of View: **South**

Description: Views are available of the local road lined with mature wooded vegetation and dwellings. A large expanse of farmland with mature hedgerow vegetation and scattered mature trees are visible in the distance. Elements of the existing facility are clearly visible in the distance including a stockpile, located along the access road and also some landforms (earthworks) which are currently seeded over.

VIEWPOINT C: Local road north of Calverstown.

Aproximate Grid Coodinates : **281402, 205748** Approximate Elevation: 434 **m AOD** Distance from planning application boundary: **1.2km** Direction of View: **East**

Description: Expansive views of farmland are available against the backdrop of the Wicklow Mountains skyline to the east in the distance. Brewel Hill is clearly visible as a distinctive focal point to the south of the viewer. Structures and stockpiles associated with the existing facility are visible as very small elements in the distance within this panoramic view of the landscape.

NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAPS NO. 55

2. ORDNANCE SURVEY IRELAND LICENCE NO. SU 0000718 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

PLANNING APPLICATION AREA (c. 17.5 Ha)

VIEWPOINT LOCATIONS

APPROXIMATE DISTANCE FROM APPLICATION SITE BOUNDARY

VIEWPOINT LOCATION MAP (1:25,000 @ A3)

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KILSARAN CONCRETE
Environmental Impact Assessment Report

PROPOSED WASTE RECOVERY FACILITY
HALVERSTOWN, CO. KILDARE

PHOTOGRAPHS OF EXISTING VIEWS AT VIEWPOINTS A, B & C

FIGURE 13-2

Scale	Date
N/A	MARCH 2018

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CHAPTER 14

ROADS AND TRAFFIC

CONTENTS

TABLES

FIGURES

INTRODUCTION

14.1 Trafficwise Ltd. (www.trafficwise.ie), specialist Traffic & Transportation Planning Consultants, have been retained by Kilsaran to prepare this section of the EIAR which provides an assessment of the traffic generation characteristics associated with the proposed sand pit restoration scheme and inert soil recovery facility at the site of the existing Halverstown Concrete Works.

14.2 The aim of this traffic study is to assess existing traffic conditions, to provide estimates of potential future short-term uplift in development traffic arising from the current proposal and to provide an assessment of the impact of such development traffic upon the local road network. Where appropriate, measures are proposed to improve road safety and mitigate impact upon the receiving road network.

14.3 The study includes a review of the traffic characteristics of the current development together with detailed turning count surveys of the receiving local road network. Where appropriate recommendations are made to the Applicant regarding traffic management at the development and to the Local Authority regarding management of traffic on the receiving road network.

14.4 The National Roads Authority (NRA) and Chartered Institution of Highways and Transportation (CIHT) guidelines recommend various thresholds which provide guidance to developers and Local Authorities as to when a detailed traffic impact assessment study should be undertaken. In this case, based upon preliminary calculations and an initial review of traffic survey data it is considered highly likely that such thresholds will be exceeded by the proposed development. The NRA thresholds are generally based upon the size of the development and/or the quantum of potential traffic generation considered in the context of the potential increase in traffic on the receiving road network. Notwithstanding the guidance of the NRA, the CIHT 'Guidelines for Traffic Impact Assessment[1]' advises of circumstances where the conventional threshold test might not apply. An example of such circumstances would include an inert soil and stone waste recovery development where the increase in traffic includes mostly heavy goods vehicles (HGV). This traffic study has been commissioned on the principle of the threshold rationale and the increase in traffic being mostly HGV.

14.5 The analyses, conclusions and recommendations of this report aim to provide the Planning Authority with a satisfactory level of traffic assessment upon which to evaluate the proposal and determine the planning application. Assumptions and calculations, some from first principles, are made throughout the traffic assessment. In each case such assumptions and the basis for calculations are specifically set out and clearly detailed. Where appropriate the assessment tests the effect of various alternative assumptions and includes tests/evaluation of traffic generation rates higher than the typical average.

EXITING CONDITIONS

Site Access and Receiving Road Network

14.6 The existing concrete works site is located approximately 4.5km south of the centre of Kilcullen. The site is accessed directly from the R448 Regional Road running from Naas in the north to Kilcullen, Carlow and Waterford in the south. The existing site access is located on the east side of the R448 approximately 3km south of the M9 Junction 2 interchange immediately south of Kilcullen.

14.7 Subject to a speed limit of 100km/h, the R448 is the former N8 National Primary Road and is a wide single carriageway with hard shoulders on both sides. The existing site access is a stop controlled simple priority arrangement augmented with ahead and right turn arrows on the southbound approach, referred to in NRA TD41-42[2] as a Nearside Passing Bay layout. The nearside passing bay layouts are used for existing roads where the traffic flow levels are not enough to warrant the provision of a ghost island. The nearside passing bay allows through vehicles to pass right turning traffic that may be required to wait to in the centre of the major road carriageway to turn right. There are restrictions on overtaking on both approaches to the existing site access. The R448 Regional Road is subject to a posted speed limit of 100kph.

14.8 The road surface of the R448 in the vicinity of the existing site access was observed to be in good condition during a recent site visit.

14.9 The R448 is straight or nearly straight to the south of the access whilst there is a large radius left handed bend for southbound traffic approaching the existing site access location. The verge on the inside of this bend is locally wide and provides increased forward visibility to southbound drivers. Photographs are provided in **Appendix 14.3** that show the sightline visibility available from a setback of 3.0m from the edge of the road. The standard requirement is a sightline of 210m which is exceeded in both directions. **Appendix 14.3** also provides photographs of forward visibility to the site access on both approaches.

14.10 Kilsaran Concrete operates the existing Halverstown Concrete Works which currently manufactures concrete blocks and includes an existing open sided block curing shed. Historically aggregates were sourced on site at Halverstown, but supplies are worked out some time ago, which necessitates the importation of all the aggregates and cement used in the manufacturing process.

14.11 Sand and gravel extraction was first established at this site at Halverstown in the early 1940's, pre dating implementation of the Planning Act in 1964. This pre-1964 authorised area has been fully exhausted of sand and gravel reserves since before 1988. The northern area continues to be used for concrete block manufacturing. It is proposed to imported approximately 1,200,000 tonnes of imported inert natural materials, principally excess soil, stones and/or broken rock to fill and restore a disturbed landform created by previous extraction of sand and gravel and to improve lands currently in agricultural use

14.12 A Waste Permit and Planning Permission was granted by Kildare County Council in August 2016 (WP Ref. No. WFP KE 16 0085 01 and Plan File Ref. No. 15/189) for partial infilling of the lands previously used for sand and gravel extraction. This development has commenced and associated infrastructure, including a wheelwash and weighbridge with office, has been constructed under this permission. The permission is for the intake of 20,000t to 25,000t per annum of inert waste for a term of 5 years. The permitted infill development currently generates an average of 5 HGV trips and 1 private car trip per day.

Current Traffic Flows

Threshold Approach for a Traffic and Transport Assessment

14.13 In Ireland, a Traffic and Transport Statement (TTS) should accompany all planning applications for developments that could potentially act as traffic generators.

14.14 A Traffic and Transport Statement is a brief outline of the transport requirements for the development and is used as a first step to identify the likely impact of any development. A Traffic and Transport Statement can also be used to determine if further, more detailed traffic modelling analysis is required to evaluate potential impact upon the capacity of links and junctions on the receiving road network.

14.15 An in-depth analysis of the impact of a development in terms of traffic is carried out through the preparation of a Traffic and Transport Assessment (TTA).

14.16 The NRA Traffic and Transport Assessment Guidelines[3] recommend the following thresholds for undertaking a TTA:

> *"Applications that exceed any of the following thresholds will be required to produce full TTAs, in addition to completing a TTS. The TTS should summarise the findings of the TTA and briefly outline the mitigating measures proposed by the developer or agent:*
>
> - *Industry GFA in excess of 5,000 sq.m*
> - *Distribution and Warehousing GFA in excess of 10,000 sq.m*
> - *100 trips (in/out combined) in the peak hour*
> - ***Development traffic exceeds 10% of two-way traffic flow on adjoining road***
> - ***Development traffic exceeds 5% of two-way traffic flow on adjoining road if congestive or sensitive***
> - *100 on-site parking spaces"*

14.17 In accordance with the above advice we have included in this assessment locations on the local roads network considered as having the 'potential' to experience traffic flow fluctuations of between +5% and +10% based upon the potential traffic generation of the proposed development.

14.18 The proposed sand pit restoration scheme and inert soil recovery facility at Halverstown, Kilcullen, Co. Kildare provides for:

- Use of approximately 1,200,000 tonnes (including permitted 25,000t under Plan File Ref. No. 15/189) of imported inert natural materials, principally excess soil, stones and/or broken rock to fill and restore a disturbed landform created by previous extraction of sand and gravel and to improve lands currently in agricultural use;
- Use of existing and/or previously approved site and services infrastructure including, site office, staff welfare facilities, weighbridge (with dedicated office), wheelwash, hardstand areas, fuel storage tanks, waste inspection and quarantine facility and covered shed;
- Temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site;
- Restoration of the excavated landform (including placement of cover soils and seeding) to its natural habitat, rough grazing and tillage;

Traffic Survey

14.19 In establishing the scope of the study it was estimated that the influence of additional traffic generated by the proposed development was not likely to be significant beyond the R448. In the interest of a comprehensive assessment of traffic patterns on the local roads network in the vicinity of the proposed development the Applicant has commissioned classified traffic turning count surveys at the R448 entrance to the existing site.

14.20 The manual traffic surveys were carried out by Abacus Transportation Surveys Ltd. on Tuesday 10th May 2016 over the period 07:00-19:00hrs. A copy of the base survey data is provided in **Appendix 14-1**. As is standard industry practice, the surveys were carried out on a 'neutral' day of the week. Generally traffic flows manifest on a neutral day are considered more likely to be representative of typical traffic conditions on the local roads network. It is also acknowledged that May is a representative month in traffic terms and includes for normal schools related traffic, which can have a significant impact on the operation of the general roads network during the commuter peak hour. A preliminary review of TII traffic counter data at M09 020.0 ID 020091 between M9 Junction 2 and 3 indicates that in terms of annual average traffic flows May is likely a representative month.

14.21 The survey at the site access not only recorded the number of vehicle movements but also the category of vehicle. Further sub-categories of the vehicles entering and leaving the site are also provided. Excluding site traffic, the total two-way traffic flow recorded passing the site access between 07:00 and 19:00hrs was 3,799 vehicles (north of existing access).

14.22 Albeit that HGV traffic flows remain relatively constant in both directions throughout the day there is a tidal pattern to total traffic flows which is reflective of the traditional commuter travelling periods. The morning and evening peak hour periods for network traffic flow on the R448 past the site were recorded in the traffic survey as being 08:00-09:00hrs and 17:00-18:00hrs respectively. These times correspond to the typical network commuter peak hour periods and are again

confirmed as representative by reference to TII traffic counter data at M09 020.0 ID 020091.

14.23 The traffic turning count surveys recorded morning peak hour cumulative two-way traffic flow on the R448 occurred in the period of 08:00-09:00hrs and comprised 424 two-way vehicle movements; 391 of which are cars and light vans and 33 are HGV. In total 108 cars and 15 HGV travelled southbound whilst 283 cars and 18 HGV travelled northbound. The recorded evening peak hour cumulative two-way traffic flow on the R448 occurred in the period of 16:30-17:30hrs and comprised 431 two-way vehicle movements; 392 of which are cars and light vans and 39 are HGV. In total 282 cars and 22 HGV travelled southbound whilst 110 cars and 17 HGV travelled northbound.

14.24 Based upon the 12 hours of traffic survey data the HGV content of the R448 was recorded to be 12%. The recorded traffic data suggests a bi-directional tidal characteristic to the flow of traffic passing the site. The trend is for relatively similar volumes of traffic travelling in either direction throughout the day between the recorded peak hours.

14.25 Figure 1 of **Appendix 14-2** shows the surveyed R448 total traffic flow graphed by direction as recorded in each 15 minute interval of the traffic surveys. The graphed flows are those recorded to the north of the existing development site access. Figure 2 of **Appendix 14-2** shows the volume of HGV traffic travelling on the R448 to the north of the existing site access.

Existing Traffic Generation

Hours of Operation

14.26 Normal operations do not commence before 07:00hrs and do not continue after 18:00hrs Monday - Friday, and 14:00hrs on Saturday. Loading of vehicles does not take place before 07:00hrs. No work takes place on Sunday or Bank Holidays.

14.27 Operations relating to the existing and similarly the proposed inert soil and stone waste recovery will not commence before 08:00hrs and will cease at the same time as the existing concrete works operations at 18:00hrs.

Transport of Aggregate

14.28 The existing manufacturing plant requires deliveries of aggregates for use in the manufacture and production of concrete blocks.

14.29 When importing aggregates to the concrete block manufacturing plant the operators of the site generally ensure that deliveries are in as economical loads as feasible. Given that the manufacturing sites has aggregate storage facilities such supply is clearly not directly driven by demand and it follows therefore that aggregates are imported in fully laden vehicles, which in the case of rigid HGV is 20t per vehicle and for articulated HGV is 29t. The traffic surveys show that aggregates are imported by the latter vehicle type.

14.30 A guide to the carrying capacity of the typical HGV used in the transport of aggregates is provided in Table 14.1.

Table 14-1
Aggregate Transportation Vehicle Statistics

Vehicle Type	Length	Max Weight	Capacity
4 Wheel x 2 Axle Tipper (Five Wheeler)	7.6m	24.5t	**14.5t**
6 Wheel x 4 Axle Tipper (Six Wheeler)	8.2m	26t	**16t**
8 Wheel x 4 Axle Tipper (Eight Wheeler)	9.8m	32t	**20t**
Articulated	**14.2m**	**44t**	**29t**

Import of Cement

14.31 Cement used in the manufacture of concrete blocks is ordinarily delivered in fully laden vehicles with a maximum payload of 25t.

Traffic Generation of Existing Concrete Block Manufacturing Plant

14.32 Production records for 2015 show that some 2,674,377 concrete blocks were manufactured at the existing site. The volume of production is relatively steady throughout the year with a modest uplift in the summer months. The following Table 14.2 shows the monthly fluctuations in block production recorded in 2015.

Table 14-2
Concrete Block Production 2015

Month	Number of Blocks Manufactured	Percentage of Annual Production
January	231,354	**9%**
February	239,160	**9%**
March	229,065	**9%**
April	257,561	**10%**
May	225,307	**8%**
June	285,621	**11%**
July	275,986	**10%**
August	249,890	**9%**
September	247,188	**9%**
October	158,184	**6%**
November	173,677	**6%**
December	**101,384**	**4%**

14.33 Typically a fully laden concrete block lorry carries 1,000 blocks which are composed of approximately 20t of aggregate and 1.25t of cement. Based upon these figures

the following Table 14.3 provides an estimate of the current annual and estimated daily traffic generation of the manufacturing element of the existing site. The average daily rate is based upon the average of monthly production rate over the elevated period which includes the months of May, June, July and August which equates to 10% of annual production in each month. Assuming 5½ working days per week and a total of 46 weeks per annum the following average daily traffic generation rates arise.

Table 14-3
Existing Annual HGV Site Traffic Generation Rate

Month	Annual Vehicle Trips	Daily Trips
Concrete Block Export	2,675	**13**
Aggregate Import	1,845	**9**
Cement Import	134	**1**
TOTAL	**4,654**	**22**

14.34 The traffic surveys include only for the manufacturing processes and recorded some 36No. HGV arriving/departing from the north of the site and 3No. HGV arriving/departing from the south. From discussions with the site manager we have established that on the day of the surveys more than the daily average quantity of aggregate was imported and stockpiled. This is an operational characteristic. On days when fleet trucks are available they are dedicated to aggregate importation for the day and so are freed up on days where commercially driven demand for aggregates may require their use elsewhere. It can be seen from the data that aggregate importation can vary by ±100% from day to day, where some days no aggregate is brought to the site and other days it is stockpiled at a rate of approximately double the average set out in Table 14.3.

14.35 Figure 3 of **Appendix 14-2** shows the recorded movements of HGV by direction at the existing site access. On average the figures show between 1 and 2 HGV per hour currently entering and existing the site over the course of the working day. The peak development HGV traffic generation is recorded as 4No. arrivals and departures in the hour beginning 15:30hrs.

14.36 Figure 4 of **Appendix 14-2** shows the HGV traffic generation of the existing development graphed against the total HGV traffic flow along the R448 to the north of the existing access whilst Figure 5 of **Appendix 14-2** shows the corresponding data for the R448 to the south of the access.

14.37 In terms of total two-way HGV flows on the R448 the HGV generated by the Halverstown Concrete Works site equates to approximately 15% of all HGV north of the R448 and approximately 1% of HGV to the south of the access.

Employment & Sundry Traffic Movements

14.38 The traffic surveys undertaken in May 2016 show that the site generates 21No. cars and vans on a daily basis.

14.39 A graph of the recorded car/van traffic movements is provided in Figure 6 of **Appendix 14-2.** This figure includes for both staff and sundry vehicle movements associated with the day to day running of the site. In total some 16No. Vehicles enter and leave from the north whilst 5No. Arrive and depart from the south of the existing access.

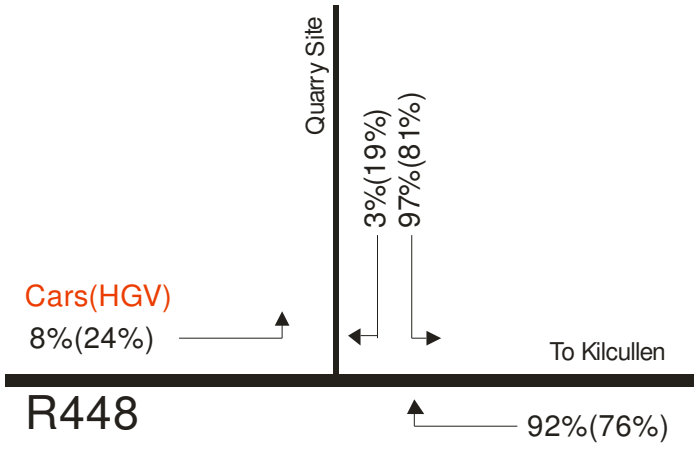
14.40 The existing site requires a workforce of ten personnel which includes for HGV drivers, accordingly not all staff movements are by car or van and this is borne out in the traffic surveys.

Total Non-waste Related Traffic Generation of Existing Site

14.41 Figure 7 of **Appendix 14-2** shows the total traffic generation of the existing manufacturing element of the development graphed against the total traffic flow along the R448 to the north of the existing access whilst Figure 8 of **Appendix 14-2** shows the corresponding data for the R448 to the south of the access. In terms of total two-way traffic flows on the R448 the traffic generated by the existing Halverstown Concrete Works site equates to approximately 2.7% of all traffic north of the R448 and approximately 0.5% of HGV to the south of the access.

14.42 The following Figure 14.1 shows the distribution of Halverstown Concrete Works traffic recorded in the traffic survey undertaken in May 2016.

Figure 14-1
Existing Site Traffic Distribution (150,000t)



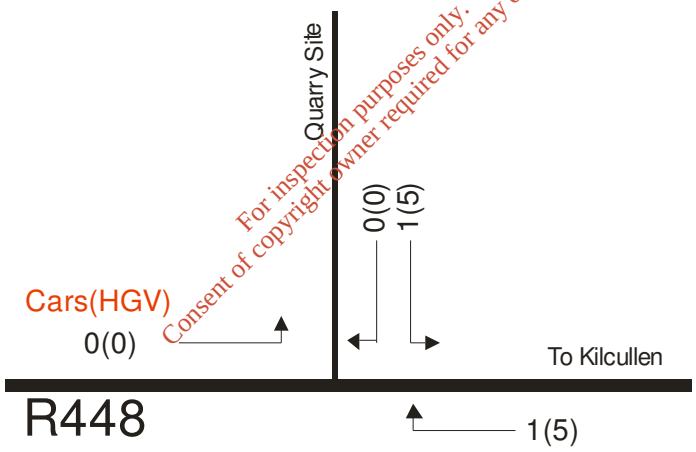
Current Transport of Permitted Waste Import

14.43 Waste materials incoming to the site are transported by similar vehicles to those that are used to transport aggregates, which in the case of rigid HGV have a payload of 20t per vehicle and for articulated HGV is 29t.

14.44 Based upon the permitted import of 20,000t – 25,000t of material per annum and based upon 5½ working days per week and 46 working weeks and assuming 20t per vehicle the permitted waste recovery operation gives rise to an additional 4-5No. HGV trips per day.

14.45 The following Figure 14.2 provides a summary of the total daily traffic generation associated with the permitted current waste recovery activity. The figures account for the private car trips undertaken by one additional employee required to operate a bulldozer on site.

Figure 14-2
Permitted Waste Import – Daily Traffic Generation (25,000t)



Cumulative Existing Daily Traffic Flows

14.46 The total traffic generation arising from the existing manufacturing operations and permitted inert soil and stone waste recovery activity at the existing Halverstown Concrete Works is shown in the following Table 14-4.

Table 14-4
Existing Daily Total Traffic Movements on R448

R448 12 Hour 07:00-19:00hr	Site Traffic NORTH OF ACCESS		Site Traffic SOUTH OF ACCESS	
	Existing Traffic Cars(HGV)	Waste Recovery Cars(HGV)	Existing Traffic Cars(HGV)	**Waste Recovery Cars(HGV)**
3,799 (467)	**30 (73)**	**+2 (+10)**	**16 (4)**	**+0 (+0)**

PROPOSED DEVELOPMENT

Traffic Characteristics of Proposed Development

Forecast Potential Traffic Generation

General

14.47 The current proposal is for waste recovery activity at the application site. The current proposal is for permission to increase the current permitted intake of 20,000t to 25,000t per annum of inert waste to a total of 1,200,000t for a term of 5 years. There is a requirement for the import of 18,000m^3 of topsoil to be imported which equates to approximately 27,000t.

Transport of Waste Import

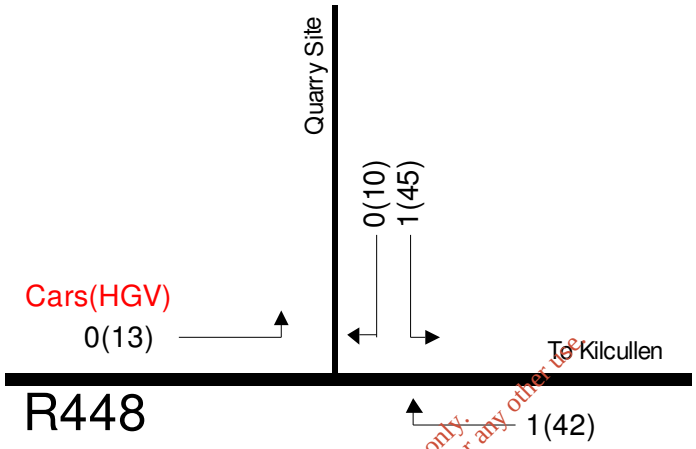
14.48 Waste materials incoming to the site will be transported by similar vehicles to those that are used to transport aggregates, which in the case of rigid HGV have a payload of 20t per vehicle and for articulated HGV is 29t. The traffic surveys show that aggregates are imported to the manufacturing site by the latter vehicle type.

14.49 Based upon the proposed total import of 300,000t of material per annum and based upon 5½ working days per week and 46 working weeks and assuming the lower value payload of 20t per vehicle the proposed waste recovery operation is considered likely to give rise to a total of 59 No. HGV trips per day. Accounting for the current 4-5No. HGV trips per day associated with the permitted waste importation the proposed development is forecast as likely to give rise to an additional 55 HGV trips per day.

14.50 Based upon these forecast average traffic generation and based upon the current distribution of traffic flows the following Figure 14.3 provides a summary of the

total daily traffic generation associated with the proposed waste recovery activity. It is assumed for the purposes of the calculations that one additional employee will be required to be present at the site while recovery operations are undertaken, principally to operate a front-end loader and to monitor and inspect the quality and suitability of inert waste being brought to the facility.

Figure 14-3
Forecast Additional Traffic Movement Generation (300,000t)



Forecast Increase in Traffic Flows

14.51 The forecast increase in traffic generation arising from the proposed increase in inert soil and stone waste recovery activity from 25,000t to 300,000t per annum at the existing Halverstown Concrete Works is shown in the following Table 14-5.

Table 14-5
Forecast Potential Increase in Traffic Movements on R448

R448 12 Hour 07:00-19:00hr	Site Traffic NORTH OF ACCESS		Site Traffic SOUTH OF ACCESS	
	Existing Traffic Cars(HGV)	Waste Recovery Cars(HGV)	Exisitng Traffic Cars(HGV)	**Waste Recovery** **Cars(HGV)**
3,799 (467)	**32 (83)**	**+2 (+87)**	**16 (4)**	**+0 (+23)**

Likely Significant Impacts

14.52 The forecast increase in traffic on the R448 to the north (more heavily used by site traffic) of the existing site access equates to an uplift in total traffic flow in the order of 2.34%.

14.53 The two-way HGV traffic flow north of the existing site access is forecast to increase by an average of 87 HGV movements from 467 to 554 HGV per day which is an increase in HGV traffic in the order of 18.6%.

14.54 Based upon the forecast increase in total traffic flows and based upon the typical threshold criteria for set out in the NRA Guidelines for Traffic and Transport Assessment and in the context of the carrying capacity of the receiving high quality receiving road environment it is reasonable to conclude that the traffic generation associated with the proposed waste recovery activities at the existing Halverstown Concrete Works site is unlikely to give rise to significant impact upon the carrying capacity of the regional road.

14.55 The forecast increase in traffic equates to an average of approximately 5-7 HGV per hour. In the context of the ultimate carrying capacity of the receiving R448 (formerly the N8 National Primary Road the forecast traffic is unlikely under normal traffic flow conditions to give rise to significant increases in delay on the receiving road network.

MITIGATION MEASURES

Existing Development Access

Advance Signing

14.56 Under file reg. ref. 15/189 the existing site is permitted to receive inert soil and stone construction and demolition waste for a 5 year period. At the time of the application there were no advance warning signs on the approaches to the site access. The planning application included proposals for the erection of advance warning signing and proposed the following configuration with the sign size conforming to Traffic Signs Manual specification for 100km/h roads and located in the verge 200m in advance of the existing site access. Conditions 26, 27 and 28 relate to the provision of the proposed signing. The final configuration of the signs is to be agreed with the Roads and Transportation Section. There are 100km/h speed limit sighs located at 200m in advance of the access on both sides. It is hoped that in agreeing the signs a configuration which includes the suggested layout below can be combined with the existing speed limit signs (above warning sign) on a single grey background in order to avoid roadside clutter.

REFERENCES

1. **Chartered Institution of Highways and Transportation (1994)** Guidelines for Traffic Impact Assessment

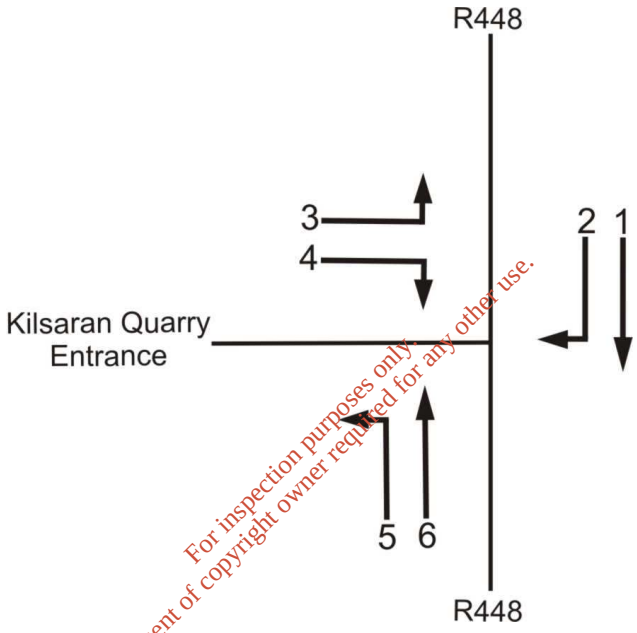
2. **The National Roads Authority, Design Manual For Road and Bridges** Technical Directive TD 41-42

3. **The National Roads Authority (2014)** Traffic and Transport Assessment Guidelines

APPENDIX 14.1:

Traffic Survey Data: Copy of Classified Traffic Count Surveys

Movement/Directions



Job number: Ath/16/043	Job date: 10th May 2016	Drawing No: Ath/16/043-1	abacus Transportation Surveys
Client: Trafficwise	Job day: Tuesday	Author: SPW	

ABACUS TRANSPORTATION SURVEYS

KILSARAN, HALVERSTOWN TRAFFIC COUNT **MAY 2016**

MANUAL CLASSIFIED JUNCTION TURNING COUNT **ATH/16/043**

SITE: 01 DATE: 10th May 2016

LOCATION: R448/Kilsaran, Halverstown DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2										MOVEMENT 3									
											KILSARAN		OTHER								KILSARAN		OTHER				
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU
07:00	6	1	0	1	0	8	9	0	2	0	0	0	0	0	0	2	2	0	0	0	2	0	0	0	0	2	5
07:15	3	4	2	0	1	10	12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	3
07:30	12	1	1	3	0	17	21	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	1	1
07:45	14	9	2	2	0	27	31	1	0	0	0	1	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0
H/TOT	35	15	5	6	1	62	73	1	3	0	0	1	0	0	0	5	6	0	2	0	2	1	0	0	0	5	9
08:00	9	3	0	2	0	14	17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
08:15	7	7	1	2	1	18	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	27	4	1	0	0	32	33	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	3	5
08:45	30	6	1	1	0	38	40	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
H/TOT	73	20	3	5	1	102	111	0	0	0	0	1	0	0	0	1	2	1	1	1	1	0	0	0	0	4	6
09:00	21	5	1	4	0	31	37	0	1	1	1	0	0	0	0	3	5	0	0	0	0	1	0	0	0	1	2
09:15	9	9	0	2	0	20	23	0	0	0	0	1	0	0	0	1	2	0	0	1	0	0	0	0	0	1	2
09:30	15	3	2	4	0	24	30	0	0	0	1	0	0	0	0	1	2	0	1	0	0	0	0	0	0	1	1
09:45	12	3	0	1	1	17	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	57	20	3	11	1	92	109	0	1	1	2	1	0	0	0	5	9	0	1	1	0	1	0	0	0	3	5
10:00	8	7	1	2	0	18	21	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	5
10:15	14	4	4	0	0	22	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	9	5	0	1	2	17	20	0	1	0	0	1	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0
10:45	11	5	0	4	0	20	25	0	0	0	1	0	0	0	0	1	2	0	0	0	1	1	0	0	0	2	5
H/TOT	42	21	5	7	2	77	91	0	1	0	1	1	0	0	0	3	6	0	0	0	2	2	0	0	0	4	9
11:00	14	6	1	2	0	23	26	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
11:15	12	9	2	2	0	25	29	0	0	0	0	2	0	0	0	2	5	0	0	0	1	1	0	0	0	2	5
11:30	14	5	2	3	1	25	31	0	0	0	1	0	0	0	0	1	2	0	0	0	0	1	0	0	0	1	2
11:45	15	5	1	4	0	25	31	0	1	0	0	1	0	0	0	2	3	0	0	0	1	1	0	0	0	2	5
H/TOT	55	25	6	11	1	98	116	0	1	0	2	3	0	0	0	6	13	0	0	0	2	3	0	0	0	5	12
12:00	24	6	2	1	1	34	37	0	1	0	0	2	0	0	0	3	6	0	0	0	0	0	0	0	0	0	0
12:15	30	5	1	2	0	38	41	0	1	0	1	0	0	0	0	2	3	0	1	0	0	2	0	0	0	3	6
12:30	25	6	2	2	1	36	41	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	3
12:45	20	8	3	3	2	36	43	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
H/TOT	99	25	8	8	4	144	162	0	2	0	1	2	0	0	0	5	9	0	3	0	1	2	0	0	0	6	10

ABACUS TRANSPORTATION SURVEYS

KILSARAN, HALVERSTOWN TRAFFIC COUNT **MAY 2016**

MANUAL CLASSIFIED JUNCTION TURNING COUNT **ATH/16/043**

SITE: 01 DATE: 10th May 2016

LOCATION: R448/Kilsaran, Halverstown DAY: Tuesday

	MOVEMENT 1							MOVEMENT 2										MOVEMENT 3									
											KILSARAN		OTHER								KILSARAN		OTHER				
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU
13:00	21	4	3	2	0	30	34	1	0	0	1	1	0	0	0	3	6	0	0	0	0	0	0	0	0	0	0
13:15	18	6	0	3	1	28	33	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
13:30	24	5	3	3	2	37	44	0	0	0	1	0	0	0	0	1	2	0	0	0	0	1	0	0	0	1	2
13:45	26	4	0	2	0	32	35	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	5
H/TOT	89	19	6	10	3	127	146	1	0	0	2	2	0	0	0	5	10	0	0	0	1	2	0	0	0	3	7
14:00	24	7	2	3	2	38	45	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
14:15	27	5	2	2	1	37	42	0	0	0	1	0	0	0	0	1	2	0	0	0	0	1	0	0	0	1	2
14:30	27	4	3	3	0	37	42	0	0	0	0	1	0	0	0	1	2	0	1	1	2	0	0	0	0	4	7
14:45	38	8	0	2	0	48	51	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
H/TOT	116	24	7	10	3	160	180	0	0	0	1	3	0	0	0	4	9	0	1	1	2	1	0	0	0	5	9
15:00	27	5	3	2	0	37	41	0	0	1	0	1	0	0	0	2	4	0	0	0	0	2	0	0	0	2	5
15:15	22	2	2	0	1	27	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
15:30	24	4	3	2	1	34	39	0	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
15:45	26	6	0	1	0	33	34	0	1	0	1	3	0	0	0	5	10	0	0	0	0	1	0	0	0	1	2
H/TOT	99	17	8	5	2	131	144	0	3	1	1	4	0	0	0	9	16	0	0	0	0	4	0	0	0	4	9
16:00	32	8	3	0	2	45	49	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	4	8
16:15	44	10	4	2	0	60	65	0	0	0	2	2	0	0	0	4	9	0	0	0	1	0	0	0	0	1	2
16:30	41	8	4	2	1	56	62	0	1	0	0	1	0	0	0	2	3	0	0	0	0	2	0	0	0	2	5
16:45	45	16	3	3	1	68	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
H/TOT	162	42	14	7	4	229	249	0	1	0	2	3	0	0	0	6	13	0	1	0	2	5	0	0	0	8	17
17:00	52	18	3	1	0	74	77	0	0	0	1	0	0	0	0	1	2	0	1	0	0	0	0	0	0	1	1
17:15	57	23	2	1	0	83	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	54	17	3	2	2	78	84	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
17:45	49	8	0	2	0	59	62	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	1	1
H/TOT	212	66	8	6	2	294	308	0	1	0	1	0	0	0	0	2	3	0	3	0	0	0	0	0	0	3	3
18:00	58	10	3	0	1	72	75	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18:15	62	19	2	1	0	84	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	47	12	2	1	2	64	68	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
18:45	30	9	1	0	0	40	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	197	50	8	2	3	260	270	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	1	1
P/TOT	1236	344	81	88	27	1776	1958	3	13	2	13	21	0	0	0	52	97	1	13	3	13	21	0	0	0	51	97

ABACUS TRANSPORTATION SURVEYS

KILSARAN, HALVERSTOWN TRAFFIC COUNT **MAY 2016**

MANUAL CLASSIFIED JUNCTION TURNING COUNT **ATH/16/043**

SITE: 01 DATE: 10th May 2016

LOCATION: R448/Kilsaran, Halverstown DAY: Tuesday

	MOVEMENT 4										MOVEMENT 5										MOVEMENT 6						
				KILSARAN		OTHER								KILSARAN		OTHER											
TIME	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	6	0	0	0	41	41
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	18	1	1	2	71	75
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	13	0	1	2	67	70
07:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	56	12	2	0	0	70	71
H/TOT	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	191	49	3	2	4	249	257
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	5	60	13	1	2	0	76	79
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	14	3	2	1	81	86
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	11	2	1	0	87	89
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	5	0	2	0	45	48
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	5	232	43	6	7	1	289	302
09:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	64	16	4	0	0	84	86
09:15	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	43	7	2	1	2	55	59
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	4	2	5	2	39	49
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	6	2	4	0	31	37
H/TOT	0	0	0	0	1	0	0	0	1	2	0	1	0	0	0	0	0	0	1	1	152	33	10	10	4	209	231
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	8	1	4	0	35	41
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	5	2	3	0	36	41
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	4	1	4	0	27	33
10:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	14	3	3	1	1	22	26
H/TOT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	80	20	7	12	1	120	140
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	3	2	2	0	30	34
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	4	3	1	0	40	43
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	4	3	2	1	38	43
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	5	2	3	1	43	49
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	16	10	8	2	151	168
12:00	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	2	26	3	3	2	1	35	40
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	5	2	1	0	30	32
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	4	1	2	1	32	36
12:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	21	6	0	6	2	35	45
H/TOT	0	1	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	2	3	93	18	6	11	4	132	153

ABACUS TRANSPORTATION SURVEYS

KILSARAN, HALVERSTOWN TRAFFIC COUNT **MAY 2016**

MANUAL CLASSIFIED JUNCTION TURNING COUNT **ATH/16/043**

SITE: 01 DATE: 10th May 2016

LOCATION: R448/Kilsaran, Halverstown DAY: Tuesday

	MOVEMENT 4										MOVEMENT 5										MOVEMENT 6						
				KILSARAN		OTHER								KILSARAN		OTHER											
TIME	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	RIGID	ARTIC	RIGID	ARTIC	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	4	1	3	1	32	37
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	2	0	5	0	25	32
13:30	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	22	5	2	2	1	32	37
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	7	1	2	0	42	45
H/TOT	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	95	18	4	12	2	131	151
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	6	1	2	0	32	35
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	5	1	0	1	24	26
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	6	2	1	1	38	41
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	7	3	0	0	55	57
H/TOT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	24	7	3	2	149	158
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	4	3	1	1	41	45
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	2	2	4	1	29	36
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	4	2	3	0	31	36
15:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	25	3	1	2	0	31	34
H/TOT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	99	13	8	10	2	132	151
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	3	1	2	0	30	33
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	3	0	0	2	34	36
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	4	2	2	1	34	39
16:45	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	17	8	2	2	0	29	33
H/TOT	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	95	18	5	6	3	127	140
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	5	3	1	1	30	34
17:15	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	26	6	2	0	0	34	35
17:30	1	1	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	22	4	3	1	1	31	35
17:45	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	21	4	2	0	1	28	30
H/TOT	2	2	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	89	19	10	2	3	123	134
18:00	2	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	18	4	2	1	2	27	31
18:15	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	21	5	1	2	0	29	32
18:30	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	20	3	0	1	1	25	27
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	5	1	0	0	27	28
H/TOT	3	1	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	80	17	4	4	3	108	118
P/TOT	6	5	0	0	1	0	0	0	12	13	1	4	1	1	1	0	0	0	8	11	1434	288	80	87	31	1920	2104

Abacus Transportation Surveys Ltd for
Trafficwise Consulting Engineers
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APPENDIX 14.2:

Traffic Survey Graphical Analysis

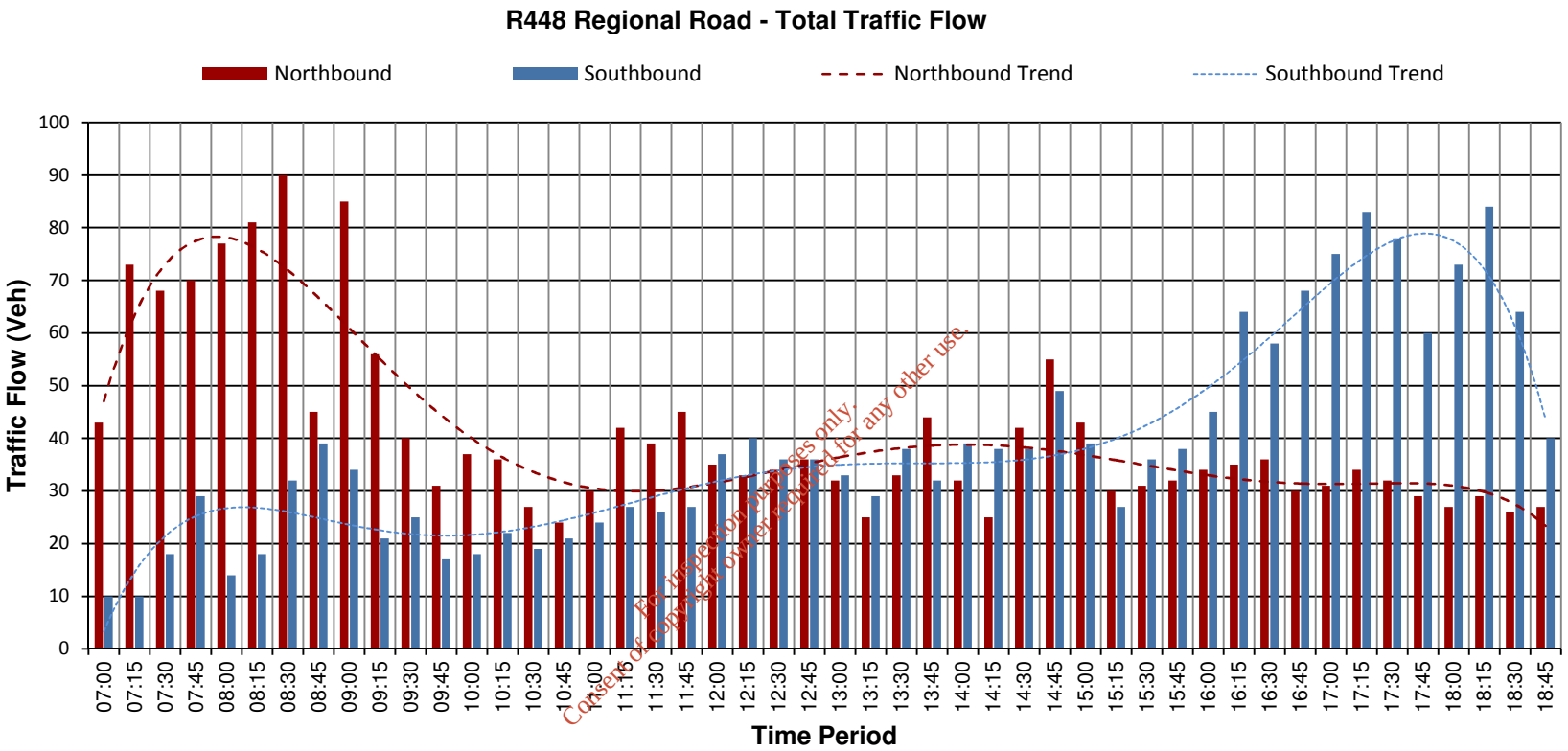

Figure 1 R448 Total Traffic Flows by Direction (North of Existing Access)

Survey Site 1 Data

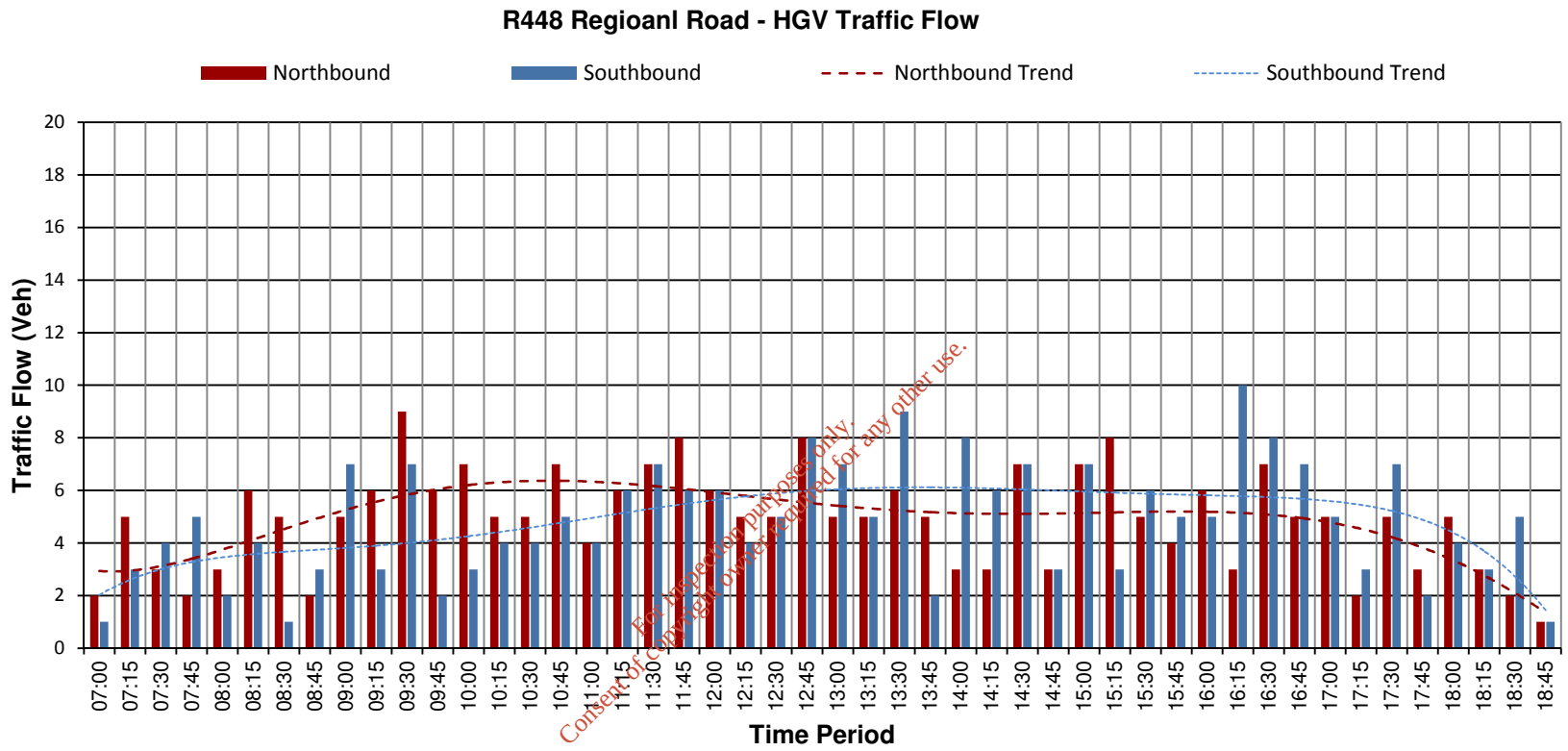

Figure 2 R448 HGV Traffic Flows by Direction (North of Existing Access)

Survey Site 1 Data

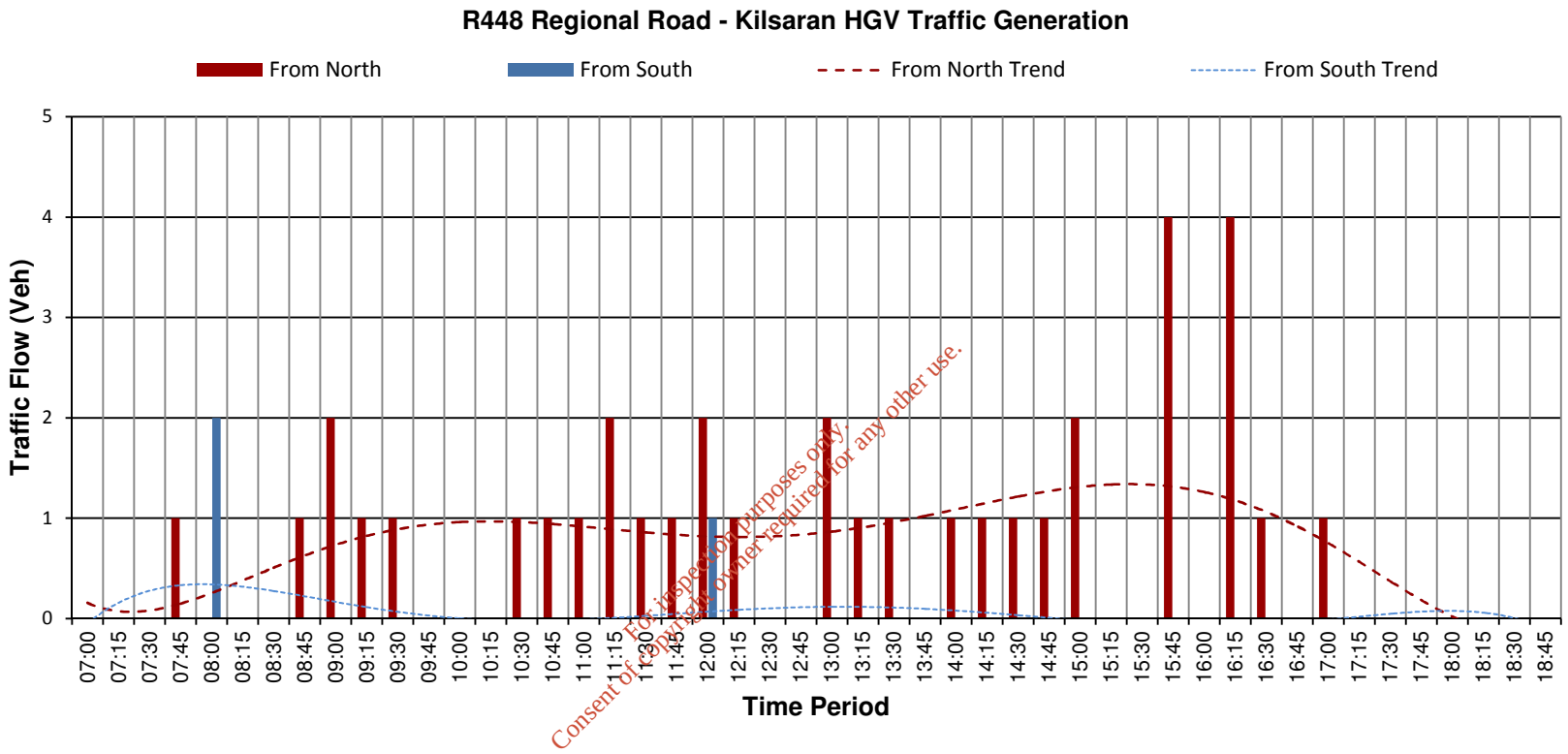

Figure 3 Existing Concrete Works HGV Traffic Generation by Direction

Survey Site 1 Data

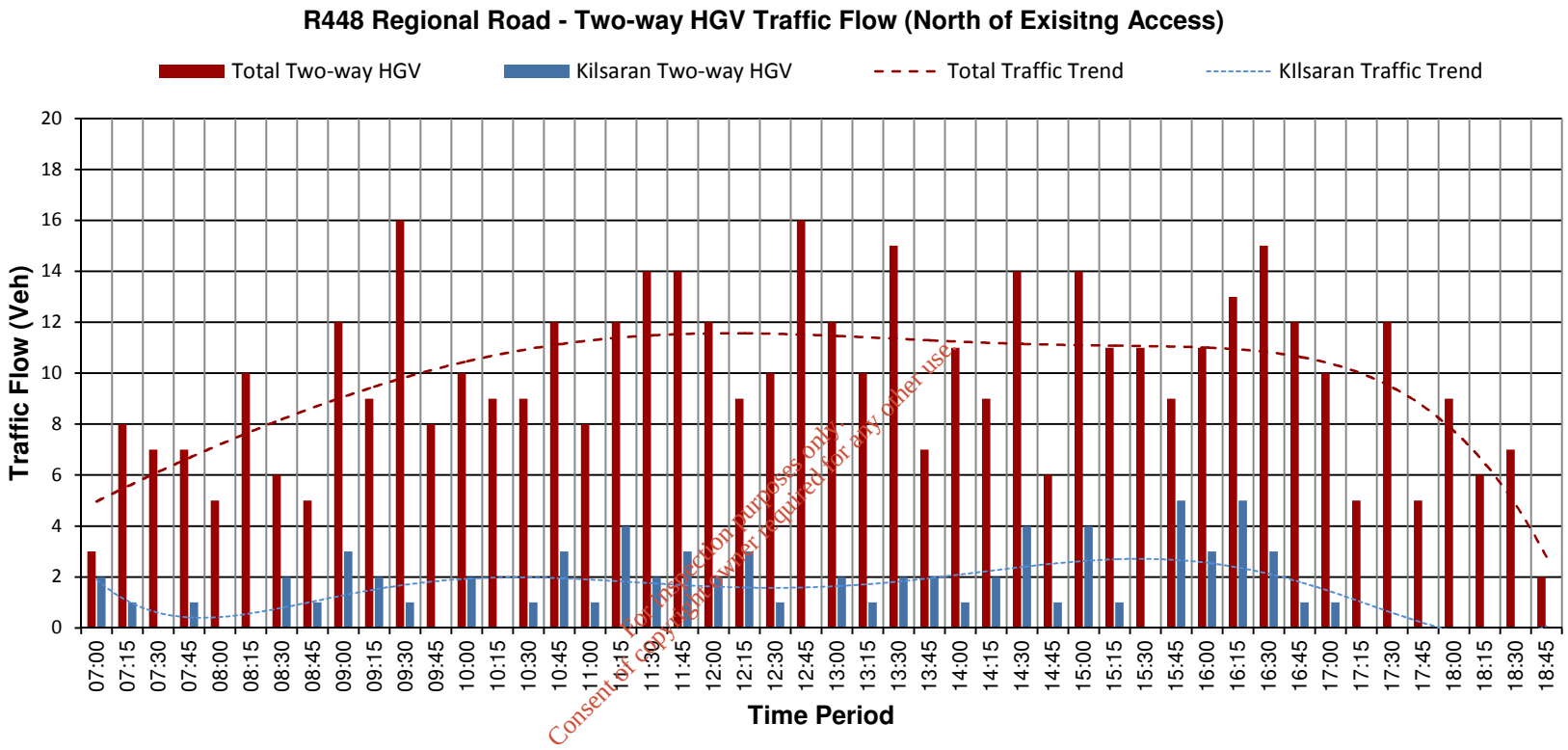

Figure 4 Existing 2-way Site HGV and Total HGV Traffic (North of Access)

Survey Site 1 Data

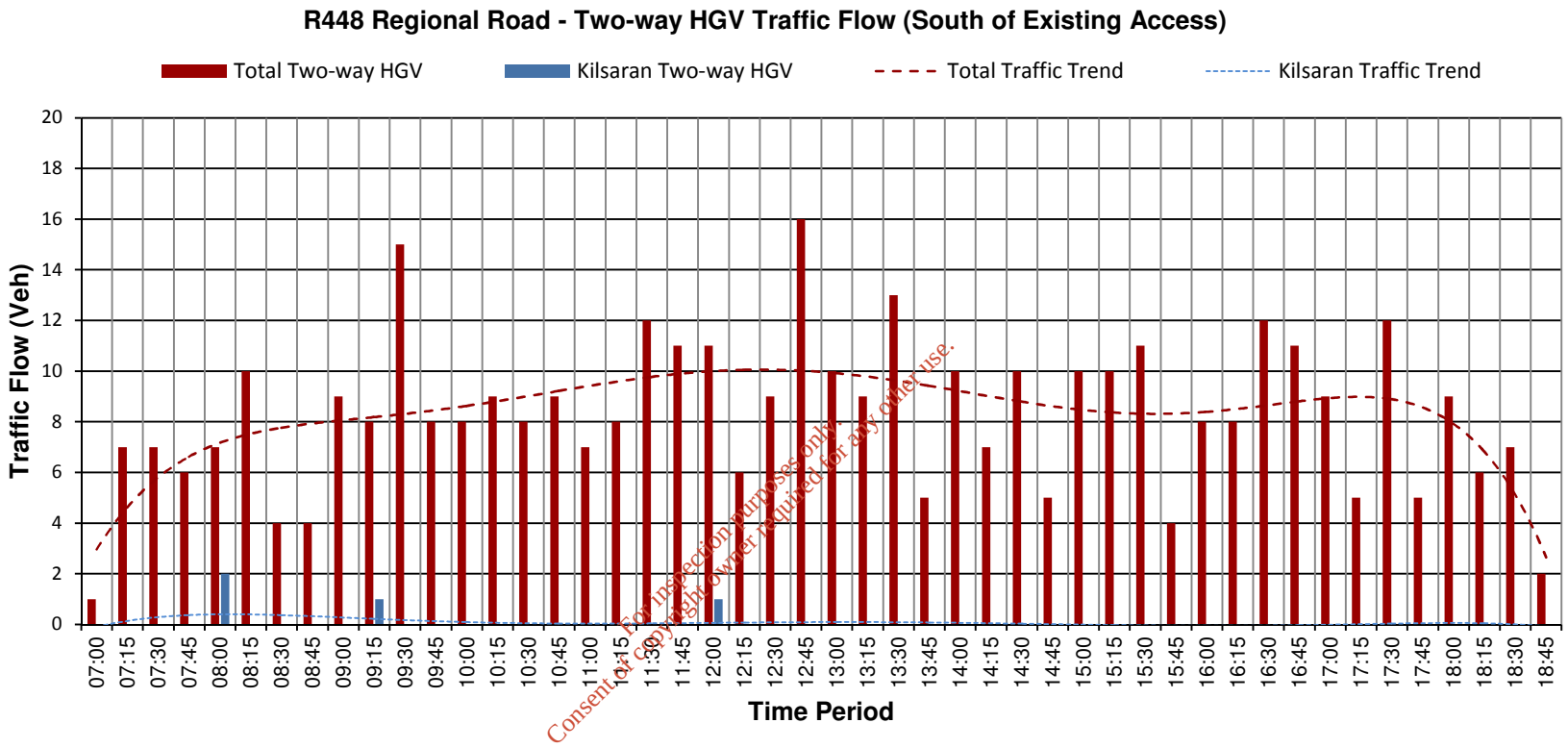

Figure 5 Existing 2-way Site HGV and Total HGV Traffic (South of Access)

Survey Site 1 Data

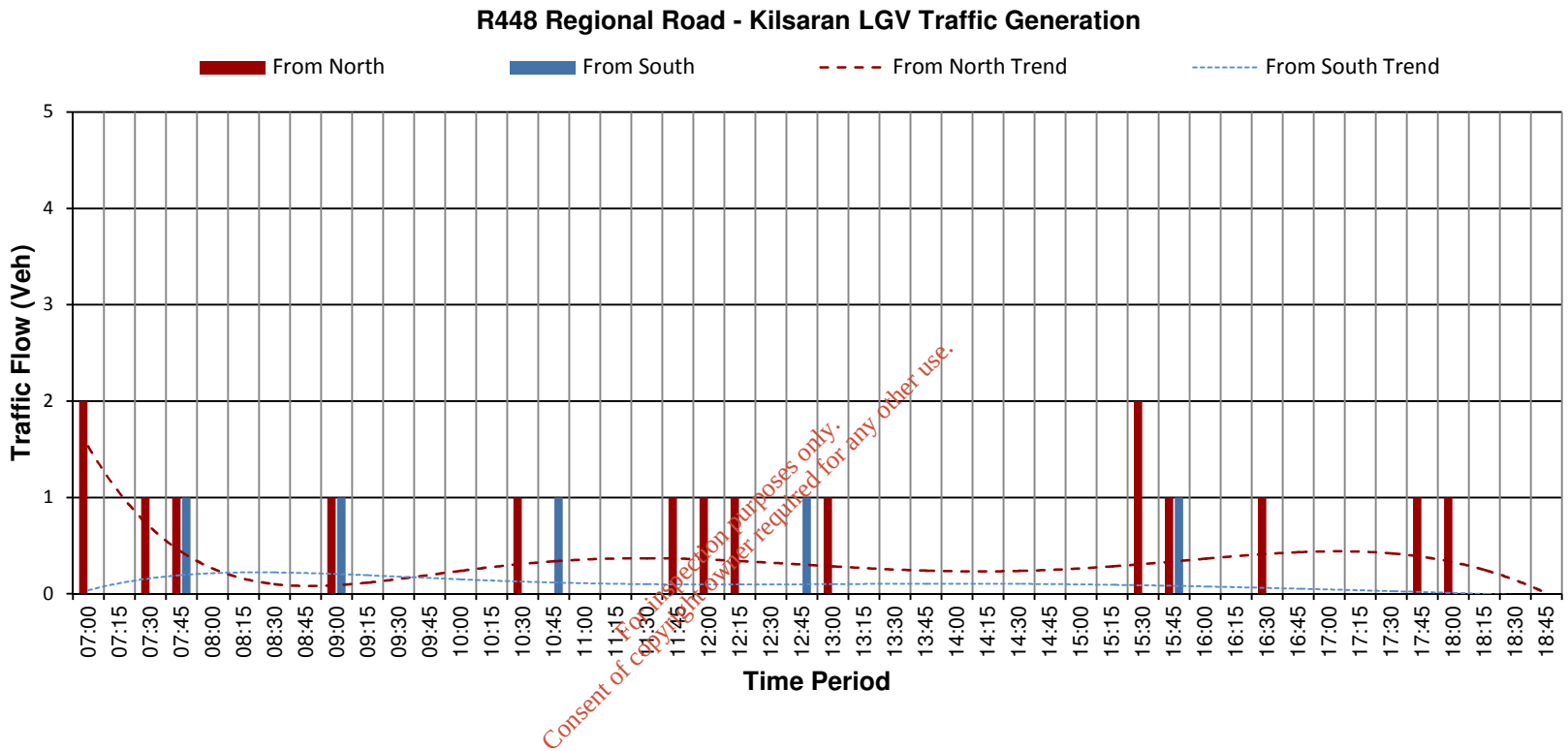

Figure 6 Existing Concrete Works Car/Van Traffic Generation by Direction

Survey Site 1 Data

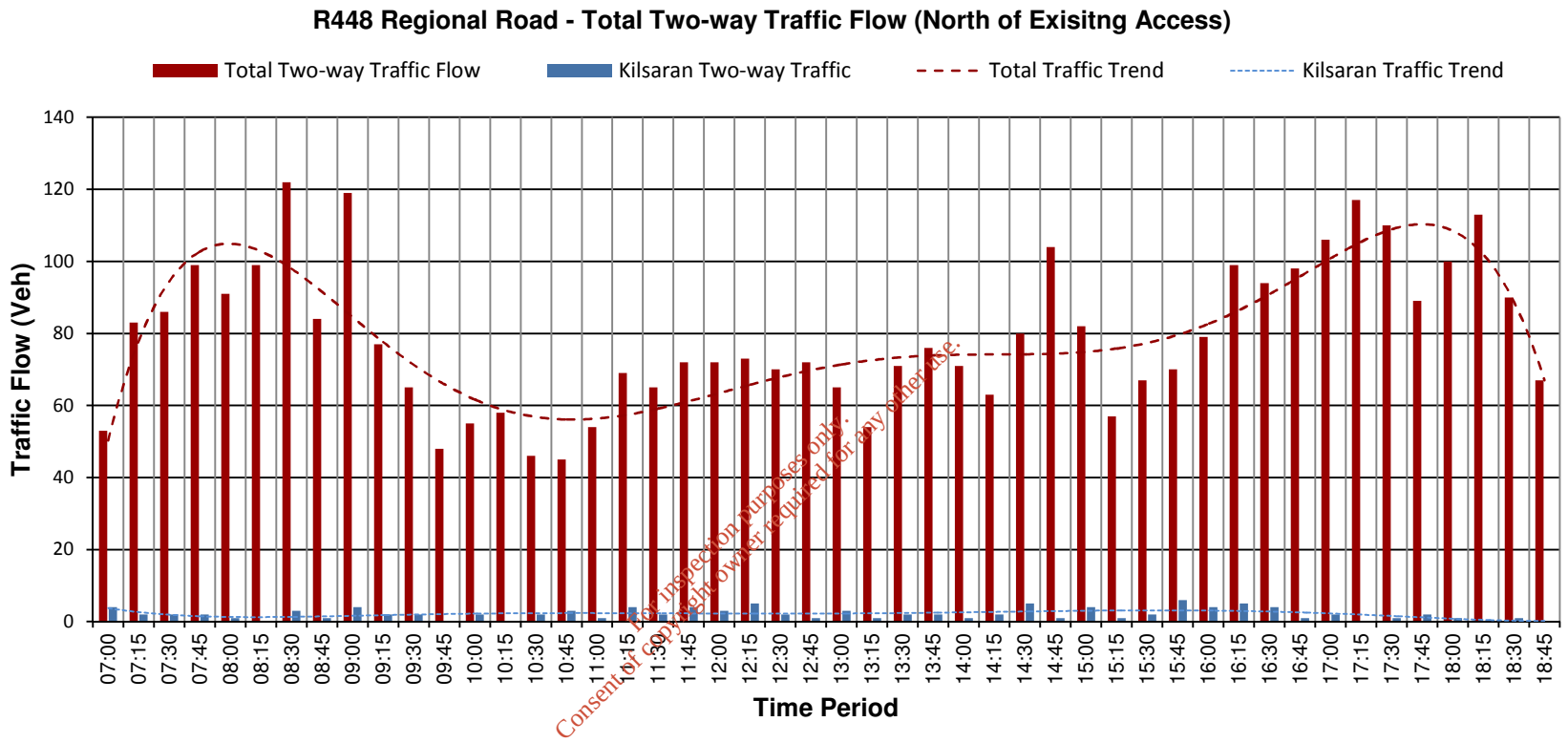

Figure 7 Existing 2-way Site Traffic and Total Traffic Flow (North of Access)

Survey Site 1 Data

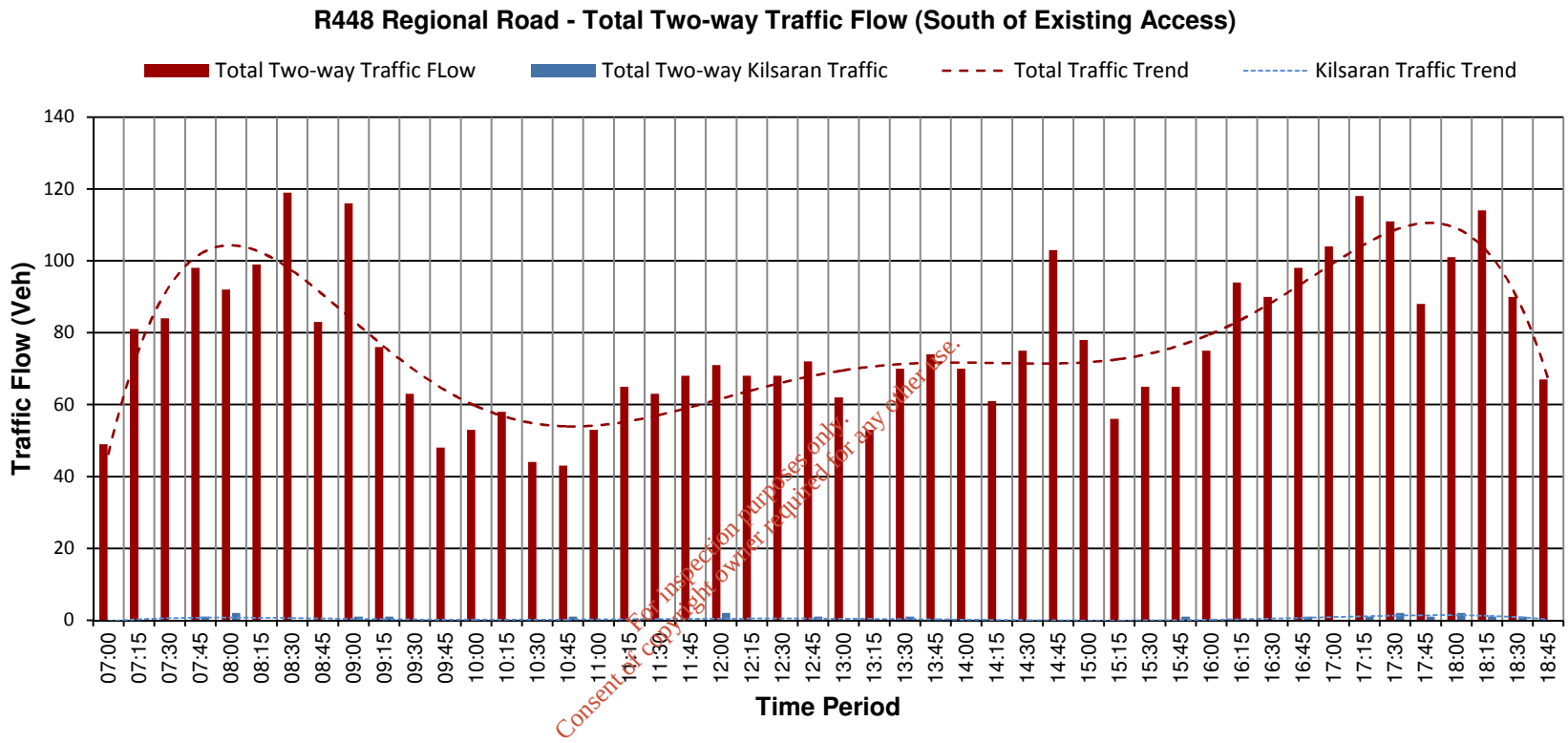

Figure 8 Existing 2-way Site Traffic and Total Traffic Flow(South of Access)

Survey Site 1 Data

APPENDIX 14.3:

Existing Site Access – Visibility Sightlines

Photograph 1: Site Access Visibility Sightline to South

Photograph 2: Site Access Visibility Sightline to North

Photograph 3: Southbound Forward Visibility

Photograph 4: Northbound Forward Visibility

CHAPTER 15

INTERACTIONS

CONTENTS

Table 15.1 Impact Interaction and Interrelationships Matrix

INTRODUCTION

15.1 All of the reasonably predictable significant impacts of the proposed development and the measures in place to mitigate them have been outlined in the EIAR. However, for any development with the potential for significant environmental impact there is also the potential for interaction amongst these impacts. The result of these interactions may either exacerbate the magnitude of the impact or ameliorate it. The interaction of impacts on the surrounding environment needs to be addressed as part of the Environmental Impact Assessment process.

15.2 This Environmental Impact Assessment Report was prepared by SLR Consulting on behalf of Kilsaran Concrete as an integrated document, rather than a collection of separate reports.

15.3 The interaction between the various environmental topics has been covered within each of the EIAR Sections, 4 through to 14, where relevant. For example, the interaction of geology and groundwater has been addressed in EIAR Chapter 7.

15.4 The environmental components which might potentially be impacted by a development of this kind and at this location have been identified through the site assessment as follows:

- Effects on land use and amenity;
- Impacts on local sensitive receptors;
- Loss of natural heritage and wildlife habitats and disturbance to flora and fauna;
- Impacts on groundwater, soils and bedrock geology;
- Nuisance potential and or public health effects due to noise, dust or lighting emissions;
- Impacts on local archaeology;
- Change in landscape and visual character;
- Impacts on material assets such as infrastructure or local utilities.

15.5 A matrix method has been used, in which the environmental components addressed in the previous chapters of this EIAR have been placed on both axes of a matrix, these interactions are summarised in **Table 15-1** below.

15.6 The purpose of the effects matrix is to identify potential interactions. Actual interactions and their significance are dealt with in the relevant chapter of the EIAR with a brief overview of some of the more pertinent interactions provided in this chapter.

Table 15-1
Impact Interaction and Interrelationships Matrix

	Biodiversity	Land, Soils & Geology	Water	Air Quality	Noise & Vibration	Landscape and Visual	Traffic	Cultural Heritage	Population & Human Health
Biodiversity									
Land, Soils & Geology									
Water									
Air Quality									
Noise & Vibration									
Landscape and Visual									
Traffic									
Cultural Heritage									
Population & Human Health									

POTENTIAL INTERACTIONS

Population and Human Health

15.7 According to the relevant guidelines, human health should be considered in the context of the relevant environmental topics addressed by the EIAR. Also, effects on human health should be considered in relation to relevant pathways (such as air, soil and water) and should be considered in the context of accepted standards for exposure, dose or risk.

15.8 Human health is considered in the context of the relevant pathways, such as noise, air, soil and water in the context of acceptable doses or limits. The EIAR shows that the proposed inert waste recovery facility would operate within acceptable limits for noise and dust and potential effects on

soil and water would be addressed through good practice and mitigation measures to avoid accidental spillages of fuel, etc..

15.9 The key matters in relation to amenity are noise, dust, vibration, landscape and traffic. As stated above, the EIAR shows that the inert waste recovery facility would operate within acceptable levels for noise, dust and vibrations. The restoration of the pit void would be beneficial when compared against the existing baseline – refer to EIAR Chapter 13 (Landscape).

Biodiversity

15.10 Potential interaction associated with the proposed landscape mitigation and restoration proposals are discussed in Chapter 4 (Biodiversity), Chapter 13 (Landscape) and Figure 2.3 (Landscape and Restoration Plan).

Land, Soils and Geology

15.11 The stripping of topsoil and the potential interactions with other environmental topics are discussed in Chapter 4 (Biodiversity), Chapter 7 (Water), Chapter 12 (Cultural Heritage), Chapter 13 (Landscape) and Figure 2.3 (Landscape and Restoration Plan).

Water

15.12 The potential impact of the proposed inert waste recovery facility in relation to water and the potential interactions with other environmental topics are discussed in Chapter 4 (Biodiversity), Chapter 6 (Land, Soils and Geology) and Chapter 7 (Water).

Air Quality

15.13 The interaction of Climate (Chapter 9), Air Quality (Chapter 8) and Population and Human Health (Chapter 4) are discussed in the relevant chapters of the EIAR.

15.14 The Air Quality Chapter presented in EIAR **Chapter 8**, indicates that with the implementation of industry standard air quality mitigation measures, no residual impacts will result from the proposed development. Therefore, the interaction is considered to be acceptable.

Noise & Vibration

15.15 The interaction between noise / vibration and population and human health is discussed above.

15.16 The Noise and Vibration assessment, presented in EIAR **Section 10**, indicates that with the implementation of industry standard noise mitigation measures, no residual impacts will result from the proposed development. Therefore, the interaction is considered to be acceptable.

Landscape & Visual

15.17 The proposed infill design and the landscape mitigation and restoration proposals and the potential interaction with Biodiversity are discussed in Chapter 4 (Biodiversity), Chapter 13 (Landscape) and Figure 2.3 (Landscape and Restoration Plan).

Traffic

15.18 Potential interactions associated with traffic movements from the proposed inert waste recovery facility with the general population and air quality are addressed in the preceding sections of this chapter.

Cultural Heritage

15.19 Potential interactions associated with topsoil stripping from the unstripped part of the application area and the discovery of previously unknown subsurface archaeological deposits or finds are discussed in Chapter 12. Archaeologically monitoring is proposed for all new topsoil stripping.